Journal of

THE MICROSCOPICAL SOCIETY OF SOUTHERN CALIFORNIA

Volume 2 Number 6 June 1997

MICROSCOPE, MACROSCOPE, TELESCOPE — WHAT'S IN A NAME?

CORNELL'S OXYMORON

(Better Known As "THE DAVON MICRO-TELESCOPE")

Stuart L. Warter

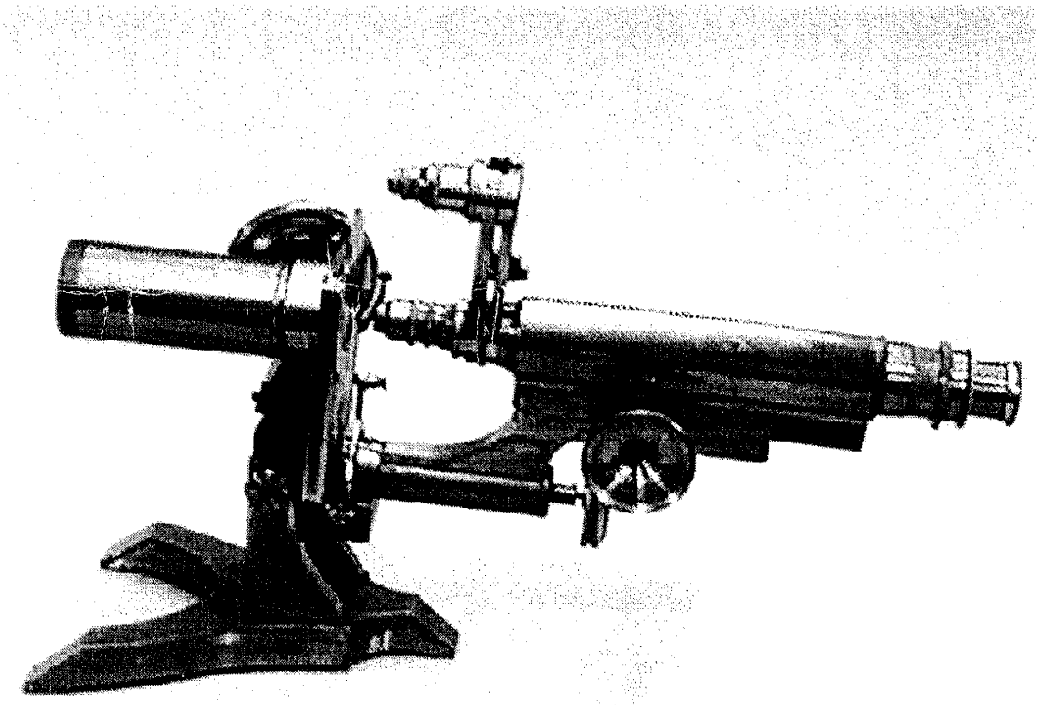

Fig. 1 Microscope with short focus telescope.

In 1912, one A. Cornell, of Tonbridge, Kent, patented a form of what was called a telescope objective, which could be attached to the substage of an ordinary microscope to convert it into a telescope. Superior definition was obtained by providing a series of consecutively reduced stops culminating in a pinhole at the end farthest from the telescope's objective lens. An inverted aerial image was formed at the level of the microscope stage aperture; the image was then erected by the microscope acting as an eyepiece telescope. It had a focal length of 7 inches, and with a microscope objective of one inch focal length would provide a magnification of 45 diameters. For astronomical use, a reflector was affixed to the end of the telescope for convenience of the observer who could sit at a table and resolve four of the moons of Jupiter. A 1 1/2 inch microscope objective was considered best for general use, and magnifications of 20X to 48X could be obtained by adjusting the draw tube length and focusing knobs. Cornell's Micro-telescope was "noticed" in the Journal of the Royal Microscopical Society in October of 1912[1].

The patent rights were acquired by F. Davidson & Co., manufacturing opticians of London, who marketed the instrument with a "short focus attachment" for distances from 10 inches to 3 feet (fig. 1), and a "long

focus attachment" for distances from 3 feet to infinity with which an attachable first-surface mirror with removable cap was also supplied for astronomical use (fig. 2). It could be used both for micro- and telephotography. Davidson demonstrated his instrument before the Royal Microscopical Society's monthly meeting of November 19, 1913, at which he was met with disapproving comments from Conrad Beck, who considered the use of a microscope with the telescope objective nothing more than the substitution of an overly complex and heavy eyepiece for the simpler and lighter conventional telescope eyepiece. Davidson's retort was that he did not regard his instrument as a substitute for the telescope, but merely as one which enhanced the usefulness of the microscope[2].

Conrad Beck's disparaging remarks notwithstanding, the micro-telescope apparently enjoyed at least a modicum of success, being noted for high definition, flatness of field, and a width of field nearly equivalent to that of a prism binocular with greater transmission of light[1,3]. Eventually it was even issued as a hand holdable telescope (in more than one design) with its own eyepiece microscope (figs. 3,4), either in monocular or binocular configuration[3]. In this form, the telescope tubes were fitted with iris diaphragms at the rear, rather than pinholes, in order to meet the requirements of varying lighting conditions encountered during use in the field.

While not as functional as any of the instruments it replaces, as an accessory to the microscope the Microtelescope could allow the owner of a microscope the flexibility of being able to duplicate for at least occasional use an astronomical telescope, a terrestrial telescope, a (very) long working distance microscope, and the venerable aquarium microscope, without having to purchase a closet full of expensive specialized instruments that he might seldom use and perhaps could ill afford. Add to this the ability to photograph through a single instrument with a single camera setup such a wide variety of subjects, and the appeal of the Microtelescope to the Late Victorian/Edwardian period microscopist becomes apparent[4] (fig. 5).

The concept of the Victorian aquarium microscope lives on as an example of a costly single purpose instrument in one that looks like a modified prismatic spotting scope with a 45 degree angled eyepiece. It is being marketed as "a unique horizontal viewing long working distance microscope" or "Macroscope LWD" (fig.6.). It mounts on a tripod and provides magnification of 7X to 20X at a distance of 500mm (~20 inches). I could have used this one when I was studying fire ants and other nasty stinging beasties as a graduate student! However, its currently advertised *discounted closeout* price is $1000, so the idea of something like the Davon looks better and better. Get the message? Now, if Davidson had not retained Cornell's oxymoronic name of "micro-telescope," which makes about as much sense as "jumbo shrimp"....

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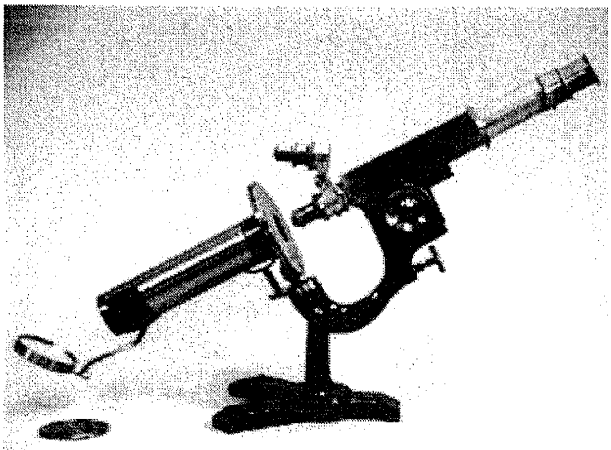


Fig. 2 Microscope with long focus telescope.

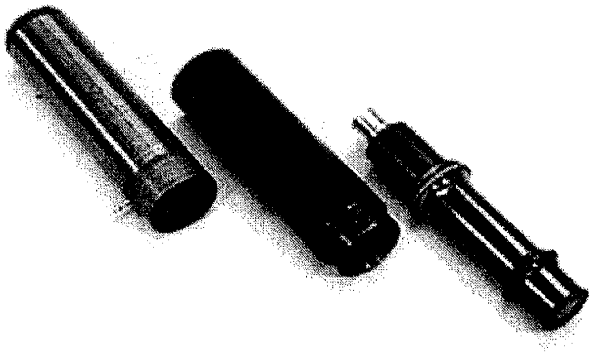


Fig. 3 Hand held monocular telescope, disassembled.

Fig. 4. Hand held monocular telescope, assembled.

REFERENCES

(1) Journal of the Royal Microscopical Society, 1912, part 6, pp 553 - 555.

(2) Journal of the Royal Microscopical Society, 1913, part 6, pp 643 - 644.

(3) Bell, Louis. The Telescope. 1922. McGraw-Hill, NY., pp. 148 - 149.

(4) Journal of the Royal Microscopical Society, 1913, part 6, inside back cover.

THE "DAVON" (Reg. Trade Mark)

MICRO-TELESCOPE

(CORNELL'S PATENT)

AN EPOCH MAKING INVENTION

For anything too large for the microscope, . . . or too small for the telescope . . .

Not a Compromise but a perfect combination of both microscope and telescope

AS A TERRESTRIAL TELESCOPE

Magnification, 45-50 diameters. Range, from 3 feet away to the planets, with long focus attachment.

With short focus attachment you can examine a microscopic area 10-12 inches away.

The attachments are made of standard size, so can be fitted to one's own microscope.

Price: £1 10 0 each

Distance makes no difference to this instrument. You can see a microscopic object or the craters of the moon by a simple turn of the focusing head. It gives a marvellous stereoscopic effect upon ordinary photographs. Both micro- and tele-photography can be done.

ABRIDGED PRESS NOTICES

"Jupiter and his moons were seen with astonishing clearness. Although the focal angle is extreme the flatness of field and wide angle of same are extraordinary."—*Knowledge*, Sept., 1912.

"We were able to identify plants growing on a wall ¼ mile away, while the same instrument magnified pollen grains with splendid definition."—*The Garden*, July 12, 1913.

"Last week I had a micro-telescope to try. I could plainly make out the essential organs, the so-called honey guides on the petals of some of the flowers in my garden 60 feet away from the point of observation. At a distance of 8 to 9 miles it entirely eclipsed my prism binocular. The local M.E.A.A. says it revealed Jupiter's moons."—*The English Mechanic*, July 25, 1913.

"At the distance of a few feet a spider magnified to the size of a large cat can be seen spinning its web, the spinnerette being magnified to the size of a teacup."

The outstanding character of lichen, moss, and fungus, and all in focus, is quite a revelation. The geography of the moon, Jupiter's moons, Saturn's rings, etc., are absolutely definable under ordinary telescopic conditions. We have seen the things we write about."—*Science Siftings*, Oct. 4, 1913.

An Essential Feature of this Instrument is its Low Cost.

£7 15 0 Or with Telephoto Lens and Camera - - - £10 15 0

THE OWNERS OF THE PATENT ARE THE SOLE MAKERS—

F. DAVIDSON & CO., Manufacturing Opticians, 29 Great Portland St., London, W.

Patents are pending in U.S.A. and on the Continent. DESCRIPTIVE BROCHURE POST FREE.

Fig. 5. 1913 advertisement from JRMS. (Courtesy James Solliday)

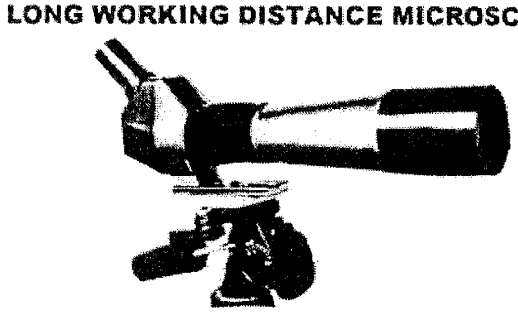


Fig. 6 Macroscope LWD (RF Inter-Science Co., Coram, NY)

THE LENS

A Quarterly Journal of Microscopy and the Allied Natural Sciences

Norman H. Blitch

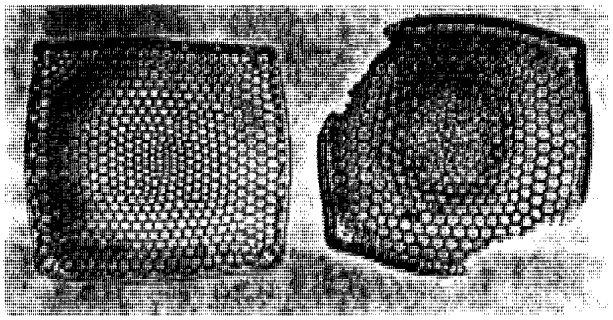


Fig. 1 Woodburytype of the diatom Triceratium Fimbriatum by J.J. Woodward.

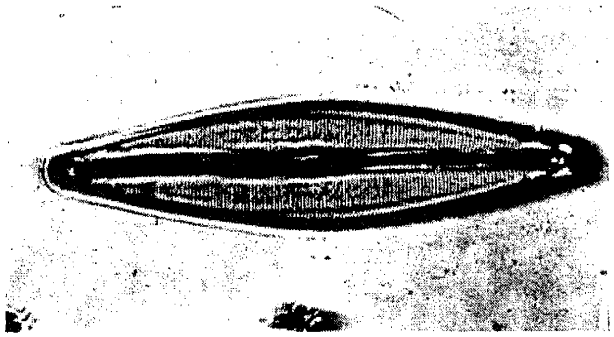


Fig. 2 Photomicrograph of the diatom Frustulia Saxonica by J.J. Woodward.

Only two volumes of *The Lens* were published by the State Microscopical Society of Illinois, comprising a grand total of eight issues. Number I was issued in January, 1872, and Number VIII in December, 1873. The first issue was off the press and stacked, awaiting mailing, by October, 1871. The completed press run consisted of 250 copies of the journal, plus an additional 250 copies of the plates. Stored in the same room in the Chicago Academy of Natural Sciences were numerous pages of the second issue, which had been printed in advance of the publication date.

Mrs. O'Leary's cow chose this moment to kick over the lantern that, some say, started the Great Chicago fire on the eighth of October, 1871. The Chicago Academy of Science was not saved, and the first issues of *The Lens* went up in smoke, printing plates and all. Also lost were the new edition of the Members' Handbook and the steel engraving for the Society's Certificate of Life Membership; they happened to be at the binder's, whose establishment burned. The only bright spot was that the editor, Samuel A. Briggs (one of two Vice-Presidents of the Microscopical Society of Illinois) had taken home six copies of issue Number I for review. If you should encounter a pre-fire copy of Volume I, Number I of *The Lens*, buy it and prosper.

When things calmed down after the disaster, the first number was reconstructed, with a few additions, and was published almost on schedule. This was quite an achievement when you consider that a third of the city, about 18,000 buildings, were destroyed, several hundred people were killed, and the total property damage was estimated at about two hundred million dollars.

During its brief two-year existence, *The Lens* presented some 75 articles related to microscopy, a fourth of them concerned with the nature and taxonomy of diatoms. Prominent among the authors were Dr. J.J. Woodward, of the U. S. Army Medical Museum; M. C. Cooke, well known Mycologist; Professor H.L. Smith, Diatomist; Dr. Lionel Beale, author of *How to Work With the Microscope*; John H. Martin of England, author of *Manual of Microscopic Mounting*; Professor Samuel Lockwood, author of a Harper's series on *The Microscope*; and, many others.

The issue of April, 1873, reproduced the entire James W. Queen & Company 1870 *Catalogue of Optical Instruments*, with all illustrations, totaling 80 pages; and Queen's 27-page *Catalogue of Achromatic Microscopes and Accessories Manufactured by R. and J. Beck*, as well. Thus, 107 pages of the 237-page issue consisted of the descriptions, engraved pictures and prices of the then-current James Queen offerings. At the time, Queen's addresses were 924 Chestnut Street, in Philadelphia, and 535 Broadway, in New York.

Of special interest are several early photomicrographs, printed or mounted on journal pages, including two original Woodburytypes, both by Woodward : one is a Woodburytype of the diatom Triceratium Fimbriatum, showing striations, mounted in Vol. I, Number II, and the second is a Woodburytype of the first six hands of Nobert's plate in a combined print with Webb's Test, "The Lord's Prayer," in microscopic writing, mounted in Vol. II, Number IV. Shown in Fig. 1 above is the forementioned Triceratium Fimbriatum diatom Woodburytype and in Fig. 2 is a Woodbury photomicrograph of a Frustulia Saxonica diatom.

Of the various photographic techniques available in the 19th Century, surely among the most difficult to employ must have been the Woodburytype, patented by Walter B. Woodbury in Manchester, England in 1864. Only the absence of grain and the precise tonal gradation could have made the process worth the effort, to say nothing of the cost of a 5-ton press!

The Woodburytype process starts with a glass/collodion base over which is poured a gelatin solution sensitized with potassium bichromate. After it has dried, the resulting gelatin film is exposed through a photographic negative and developed by dissolving away the unexposed gelatin with hot water. The thickness of the resulting gelatin master varies according to the degree of exposure, thus producing something line a relief map of the original image. A mold is then made by pressing a slab of lead against the gelatin under high pressure, using a press capable of at least 5 tons per square inch. The impression on the lead plate can then be printed, using an ink of pigmented gelatin. The method has disadvantages. The gelatinous ink, when compressed under such high pressure, tends to ooze out from the lead/ gelatin sandwich and forms a ridge, which, when hardened must be trimmed off. Also, it is impossible to print a white border around the final image. Furthermore, printing of the photograph in the same press with type is not feasible, as the Woodburytype mold is intaglio, while type is in relief. Thus, a Woodburytype print in a publication is always an original which has been independently trimmed and mounted.

The Lens is remembered today as a publication beset by problems in its short life, including no less than the great burning of Chicago. The journal maintained high standards of professionalism in its treatment of many of the ongoing microscopical endeavors of its time. For example, Woodward's test of markings in the diatom Triceratium resulted from his photographic test of statements made by Dr. William Carpenter in his 4th edition of *The Microscope and Its Revelations*. In turn, Carpenter in his 5th edition refers to Woodward's confirmation of the markings as reported in *The Lens*. This type of published interchange is the essence of scientific method. Since the contents of the journal cannot be reproduced here, and the journal itself has become quite scarce, I will be glad on request to put together a summary of the Tables of Content and, subsequently, extracts of specific articles, for members of the Microscopical Society of Southern California.

Zeiss Optical and Mechanical Design Improvements

Herbert A. Layfield

All members of the MSSC who are interested in the development of the modern microscope will have appreciated the excellent historical article *The Story of Zeiss* by Roy Winsby of the Manchester Microscopical Society which was republished with his kind permission in the April 1997 issue of the MSSC Bulletin.

The average microscopist, however, is probably not aware of the many technical, i.e. optical and mechanical improvements that were made to the microscope by Zeiss designers. Listed below are some of the most important:

1886 Ernst Abbe succeeded in making objectives of a very high correction which he named Apochromats and furnished with special matching eyepieces which he called 'compensating' objectives.

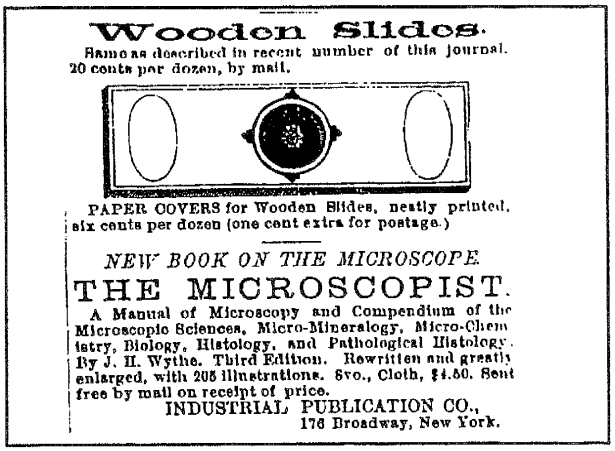
1896 Zeiss built the first Greenough Stereo-Microscope.

1933 Zeiss revolutionized the construction of the microscope stand by introducing the 'L Stand' which is not tiltable and in which the stand is always horizontal with low focusing controls.

1935 Coating, or "blooming" of optical elements was invented by Zeiss. This process was classified as a military secret by the German Government because the "blooming" process was used in all prismatic binoculars, range finders and other military optics.

1936 Zeiss built a prototype of the Phase-Contrast System based upon suggestions of Professor Zernike who later won the Nobel Prize.

1944 Zeiss obtained a patent for a magnification changing system called "Optovar" which was designed to obviate frequent changing of eyepieces of different magnification.



Advertisement from 1876 American Journal of Microscopy
Courtesy of Richard Jefts

AN ENIGMATIC BINOCULAR EYEPIECE

David L. Hirsch

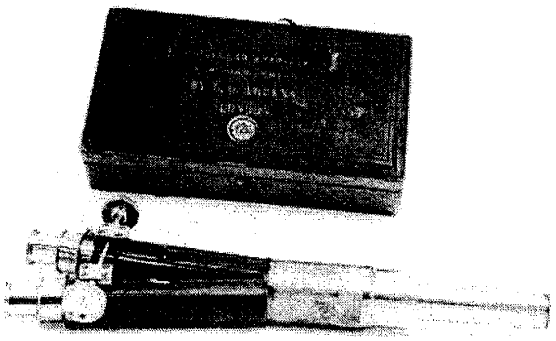


Fig 1. Ahrens binocular eyepiece.

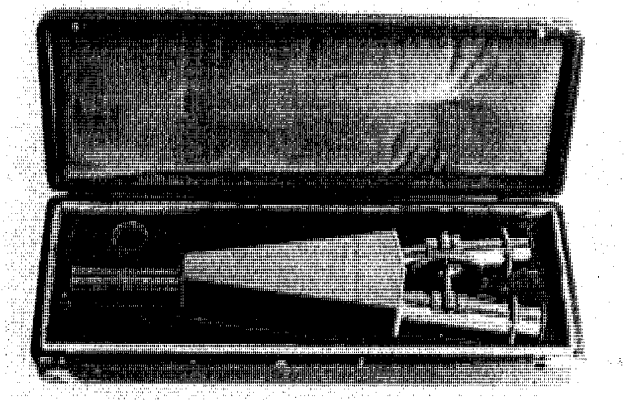


Fig 2. Hartnack/Prazmowski eyepiece.

On occasion, the collector of microscopes will acquire an instrument or an accessory which, though signed, may lack information relating to provenance and application. Such is the case with the Hartnack/ Prazmowski binocular eyepiece discussed here. Inquiries concerning this eyepiece were sent to: Professor Gerard L'E Turner at the Museum of the History of Science, Oxford, England; Mme Brieux, a Parisian dealer in scientific antiquities; and to Dr. J.C. Dieman, curator, Utrecht University, Netherlands. Dr. Dieman mentioned an early Abbe type binocular eyepiece made by Zeiss; a part of the Utrecht University museum collection. L'E Turner called attention to the 1989 edition of his book: *The Great Age of the Microscope*, pp 326-327, where he cited the binocular eyepiece by C.D.Ahrens, London, circa 1871 (The same year Mrs. O'Leary's' cow kicked over a lantern in her barn on DeKoven street, starting the Great Chicago Fire).

The Ahrens binocular eyepiece (Fig. 1) is 295 mm long, in its collapsed state. The internal workings of the Arens eyepiece include: "A double-image prism, made from Iceland Spar (Calcite) and located in the tube that inserts into the microscope. Above the prism, a double-wedge prism of flint glass renders the light achromatic. Symmetrical tubes take the rays to the eyes, and interocular distance is varied by rackwork. The whole, together with two eyepieces, packs into a wooden box covered with red leather and lined with blue velvet and silk. This device is fully described and illustrated in C.D.Ahrens: 'On a new form of binocular eye-piece and binocular microscope for high powers'. MMJ(1871), pp. 113-115".

The principal difference between the Ahrens and the Hartnack/Prazmowski eyepieces is within the end tube where, in the latter, the end tube terminates in a plano-convex lens.

The Hartnack/Prazmowski eyepiece (Fig. 2) has inscribed on its front surface:

E. Hartnack and A. Prazmowski
A.Prazmowski, sucr.
Paris

The eyepiece is 270 mm long, and can be extended to 305 mm, by means of rackwork actuated by a 42mm dia. knurled wheel offset to the front and centered between the eyepieces. The interocular distance between the individual eyepieces is adjustable by means of the knurled wheel. The prism array is contained within the body, which tapers from 73mm at the top, to 42mm at the bottom, where the body joins a 24mm by 62mm long extension. Both the front and back surfaces of the body taper toward the sides. The eyepiece assembly is made of brass, and is covered with a well preserved lacquered finish.

The fitted case is made of alder wood, 308mm long by 108mm wide by 54mm deep, and covered on all sides with black, pebble grained paper. The inside surfaces are fully lined with blue velvet. A pin type closure is located on the right hand side of the hinged case.

At this time, a literature search revealed no information on the application of the binocular eyepiece. Attempts to fit the eyepiece into several microscope stands proved unsuccessful. The center of gravity of the assembly is 165mm from the end of the lower extremity with the oculars in a retracted position. The binocular eyepiece weighs 450 grams. Because of the size and shape of the assembly, it is assumed that a mating stand will be required that is massive enough to support the binocular eyepiece without toppling.

The answer to this enigma lies somewhere out there in the microscope collectors cosmos. It remains for some knowledgeable MSSC member or others sympathetic to our objectives (no pun intended) to come forth and supply the information which will shed light on this interesting, though enigmatic binocular eyepiece. Illustrations showing the application of this eyepiece would be of particular interest.

The Ewarts – John, Peggy, Tom and Marcia – and Jennifer Marion

TRAGIC MOTHER'S DAY PLANE CRASH KILLS MSSC MEMBERS JOHN AND PEGGY EWERT

John and Peggy Ewart flew airplanes like most of us drive our cars or trucks, friends remembered yesterday. They flew for the sheer joy of it, and whenever possible, to help people in trouble.

They also loved photography and together they built Ewert's Photography into a thriving "anything photographic" business that served Silicon Valley for the past 26 years.

Sunday night, May 11, the Ewerts, both 64, of Sunnyvale were killed when their A36 single-engine Bonanza plane crashed shortly after taking off from Truckee-Tahoe Airport. Also killed in the crash were their two children, Thomas Ewert, 39, of Sunnyvale, and Marcia Ewert, 38, and a family friend, Jennifer Marion, 26, both of San Jose.

Reprinted from the San Jose Mercury News and the San Francisco Chronicle.

Remembering the Ewerts

I met John Ewart some years ago, and being of similar ages, and sharing a fondness for microscopes, we enjoyed many hours together. One day, Dianne went to lunch with Steve Craig and the Ewarts, for the Craig-Ewart friendship was of many decades.

That very day Dianne began to help Peggy Ewart in the operation of the office of Ewart Photo-Scientific Co., and they have worked together since. The Ewarts and Fields worked together, played together and even flew together. In fact, together, we convinced Klaus and Sheila Kemp to sample the pleasures of general aviation.

John Ewart and I enjoyed a friendly competition; we would each try to find some Leitz instrument from the past which the other had not found or even seen. This was a simple "one up" game in which we both took pleasure and in which no ordinary person, nor member of my family, (except my wonderful wife) would appreciate.

Peggy Ewart was probably even more enthusiastic about flying than was John, however, both were very careful and experienced pilots with over 4000 hours of flight time. Their plane was very well equipped and was well maintained. Yet, on May 11th of this year the remote possibility of an air mishap became a reality and their plane went down, ending the lives of our members John and Peggy Ewart, as well as two of their children and a friend.

We are gradually coming to accept that we will not again see their always smiling faces, nor share more of their enthusiasms. They will always be with us in spirit and in memory. Our fellow members may remember that they flew to our wedding at Gil and Denise's home, and, late last year, flew Klaus and Sheila to their evening with us. We are grateful to have shared part of their lives.

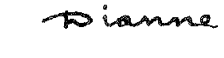
John Field

At Ewart's Photo, Peggy administered the computers, the offices and the accounting. I was her part-time assistant for almost four years. I was blessed with her good humored tolerance of my odd schedule-late "banker's" mornings, and days, even weeks off so that I could accompany John when he had vacation time. Peggy was eager for retirement, for she had worked long and hard. She wanted to travel, to baby sit her twin grandbabies and to fly. She was good natured about her work, but it took family and flying to make her spirits soar.

Her absence confounds me. I just cannot get used to it. We, at the store, stagger on, still a bit numb, forever bumping into someone's absence.....John, Peggy, Tom, Marcia..... For Peggy, her family came first. So she lost everything: her husband, two of her children and her own life-celebrating mother's day.

There is just no getting used to this.

Dianne Field



MEMBER PROFILE

Ronald M. Morris

Ronald M. Morris

I was born in Knoxville, Iowa during the post WW II baby boom years. My father had been an aerial photographer over Korea during the "conflict" of the 1950's. We always had cameras around the house, Rollei and Kodak Brownies in particular. I grew up on and around farms during my childhood, and learned to appreciate nature and animals at an early age. On my grandpa's farm, there was a large selection of animals - pigs, cats, dogs, sheep, goats, cows, horses, ducks, geese and chickens.

The veritable supply of hay also made for great infusions; the garage shelves were often lined with my jars of things bubbling away and the micro-zoo harvest was plentiful. I spent hours with a magnifying glass examining all the critters swimming about. Later, I tried yeast, and other items to spice up the mixture.

My folks bought me my first microscope when I was about 10 years old. It was from the Kress company (K-Mart) in Chicago. It was beautifully made, with a nice shiny, baked-on green enamel finish, real glass lenses, and a built-in illuminator. It was sold under the "Focal" brand name. It came in a large, fitted mahogany wood case with every imaginable accessory: specimens like frogs and snails in formalin jars, complete staining set, slide making set (with that nice smelling Canadian Balsam), all kinds of tools, chemicals, etc. I was very proud of this set, especially since I knew it was a hardship for my dad to buy it. The especially brutal winter weather that year had kept him out of work as a construction worker since early fall, but he had managed to scrape together enough money to buy me the gift that I still remember to this day. I had more fun with that scope than anything else that I can think of.

Being around the farm also helped me develop mechanical skills early in life. There were always things to fix, overhaul, or just to take apart. If it had a nut or screw on it, it was made to be taken apart! Later, bicycles, sleds, swings, and my sister's dolls were fair game. My folks supported my interests in tools and things mechanical, and science. I was allowed my own shed in the back yard of some of the tract homes we lived in as my father traveled around as a carpenter. I was interested in chemistry and electricity. Chicago came in loud and clear on my home-made crystal set, and sometimes I could hear as far south as Texas. I rigged up battery powered telephone set to communicate with my sister in the house. I also grew up around tube radios since my father and grandpa were interested in them as a hobby. My father attended DeVry institute in Chicago and learned radio and, later, TV repair. I enjoyed watching the glowing tubes and the occasional fireworks as he worked on them. This probably "sparked" my interest, and later career choice, of electronics.

We moved to California in the early sixties, and I attended school in the Long Beach area. In school, I was very interested in science and industrial arts. My best subjects were English and History, but my first love was industrial arts. I took all the metalshop, woodshop, and electronics classes that I could fit into my schedule. I was very fortunate to have some very good teachers whom I can definitely say played a pivotal role in my developing many of the interests that I have today. The lessons I learned early during these years about being a scholar and paying attention to details would also follow me into my adult life.

I had some wonderful science teachers in middle school that helped me develop and appreciate the use of the microscope. We had the usual A/O and B&L scopes, but to me they may have just as well been full-on research scopes. I used to go in during lunch time and after school and use the instruments and help the teachers for extra credit. I remember one day, one of my teach-

ers named Mr. Conn gave me an old scalpel that he had. I was so honored by this gesture that I carefully kept it razor-sharp. I spent many enjoyable hours preparing slides and performing dissections. My eighth grade science teacher, Mr. Neil instructed me on the finer points of sheep eyeball dissection and the preparation of slides.

I spent many hours in the school library reading and gazing at the pictures of research type microscopes such as Zeiss Universal , Nikon and Wild . One of my favorite books was *Microscopes and Microscopic Life*, by Peter Healey. While other kids were breaking bones on the football field, I was enjoying quiet solitude reading as many books as I could get my hands on. I was often ill as a child, and also had a near fatal bicycle accident in which I was hit head-on by a truck that crossed the yellow line. The accident left me disabled for some time, but a slow recovery allowed me time to enjoy my scientific and scholarly interests even more.

One day my pet rabbit died in the backyard from peritonitis after being bitten in the belly by the cat next door. Tearfully, I went out to pick up his stiff little furry body, and was going to bury him, when I remembered that we were supposed to do some dissections that day. I wanted to do something special, rather than the usual fetal pig or frog, so I quickly wrapped up the rabbit in a bag, and hurried with it to school. My biology/physiology teacher, Mr. Thompson, at Lakewood High was shocked when I ran into the room with the bagged rabbit. Ordinarily, the school forbade warm blooded mammal dissection, but he made an exception this time. We skinned and prepped it with formalin, double injected it for contrast of veins and arteries, and put it in the lab fridge.

I ended up dissecting out the entire nervous system, and mounted it with eyes and brain still attached. I got the highest points ever in that year's class, and my fellow students were dumbfounded. Even though it was hard for me to work on my own pet that had been a living creature only a few hours before, I had to set my emotions aside to follow through with my science project. Anyway, I felt that my bunny would have probably approved if he could have voiced his opinion. In a way, I thought I honored his memory as a terrific pet by carefully and respectfully performing the dissection on him. His death had become a learning opportunity for me and the other students, and we also learned a lot more that semester, especially about life and death.

I entertained thoughts of being a doctor, and even spent some time working as a health occupations intern at the local VA hospital. I thought that medicine was interesting, but couldn't handle the psychological stress of it. After stints in EKG/EEG, and cardiopulmonary, I ended up working in Manual Arts Therapy, teaching spinal cord injury patients how to revitalize their motor skills using industrial arts.

At this time, the Vietnam conflict was still going on, and the draft numbers were getting pretty close to mine. I decided to enlist in the Army since going to medical school was out of the question due to my family's financial situation. I ended up at Fort Knox, Kentucky and Fort Polk, Louisiana. I became a weapons specialist in anti-armor weaponry. The TOW missile was just being introduced, and I was one of the fortunate ones to be able to use it. I was also responsible for training the WACs (women in the Army) how to qualify with the .45 automatic and/ or the M16 carbine. Grenade practice was also required, and there were many near-misses as a well-intentioned, but poorly thrown live grenade plopped only a few yards away from the safety concrete barricades we stood behind. Glass windows in the range officer control tower were shattered as well as my nerves, as the explosive concussion rattled our innards!

After the service, I worked as a locksmith, alarm installer, building materials salesman, and a few other jobs. One of the bosses I had in the alarm business was a laid-off Rockwell engineer who had worked on the Apollo moon rocket project. He saw that I had an interest and aptitude in electronics, and allowed me to help him modify the alarm control circuit boards.

Next, I took a job in an optical instrument shop that worked on a variety of instruments such as surveyor's transit-levels, theodolites, submarine periscopes, etc. My teacher was a strict craftsman from Switzerland, and he instilled the concepts of skillful craftsmanship and precision work to the nth degree. As part of my apprenticeship training, I was required to take machine shop classes at Long Beach City College at night. We had just started taking in laser electronic distance measuring equipment (EDM), and optical tooling instruments used at Douglas Aircraft Co, and I soon learned to repair these as well. I soon added electronics to the shop classes that I was taking at Long Beach City College. With the completion of my training, I became a journeyman instrument repairman and worked on many brands such as Wild-Heerbrugg, Leitz, Nikon, Berger and Brunson and White.

I covered all aspects of precision instrument repair, from cementing lenses and prisms, making parts from scratch on the lathe and mill, cleaning , lubricating, and finally collimating the optics. Many of the instruments we worked on were over a hundred years old, and parts had to be made. However, I enjoyed the challenge of working with electronic instrumentation more with each passing day, and I knew that I needed more training in that area. My interests were drifting towards electronics.

I then enrolled in the electronics technology program at Long Beach City College, where I attended for about 5 years. I took some radio and TV production classes with the dream of being the next Wolfman Jack on radio. I actually did some voice-over work and

radio commercials for some local businesses. I hosted a local afternoon radio show, and did some radio production work for the Long Beach Unified School district campus radio stations. Unfortunately, out of a class of 35 students, only one landed a permanent job in radio, and that was in Nebraska! Maybe I needed to change my major emphasis.

I had heard that Hughes and TRW were hiring a lot of technical people in radar and microwave areas, so I took a lot of courses in that direction as well as digital and microprocessors. I had a lab partner that was going to leave the state for Idaho to work for the hydroelectric plants there. He said that he probably could get me in as his replacement at Bendix Flight Systems, which he did. There, I worked on complex navigation and control systems for aircraft such as the DC-10, 747, and the Lockheed S3A/P3 anti-submarine aircraft. Precision rate gyros and accelerometers, cockpit instruments, flight computers, analog and digital air data computers, and pitch, roll, and yaw auto pilot computers became my forte.

I also worked on classified secret projects such as the "MAD" boom for detecting magnetic anomalies created under the ocean by Soviet subs. I developed very good soldering skills and received both Mil-spec and NASA soldering certificates. This allowed me to work on the cockpit instruments that were being prepared for the first Space Shuttle, the Enterprise.

Unfortunately, much of the work we did was being transferred to Alameda and North Island Naval Air Stations. I could see the writing on the wall, and started perusing the classified ads. Then I noticed that the Mattel Toy company was looking for electronics people to help start up a new division. I was hired to help set up an engineering R&D lab from scratch. Those years with Mattel were among the most enjoyable of all the time I have been in electronics. I helped develop new projects such as Barbie's radio controlled pink Corvette car and the Masters of the Universe castle, complete with echo-sound microphone. I also worked on some hand-held games and educational toys to compete with Texas Instrument's Speak and Spell game.

After the disastrous crash of the video game market of the early eighties, I was ready for change. I contracted for a while with Hughes, TRW and Parker-Bertea, just to name a few. I ended up in a small company doing designs for industrial fluid dispensing equipment controllers.

Rockwell was hiring people for their newly created Semiconductor Products Division in Newport Beach, which had spun off from the Autonetics division in Anaheim. There, I was involved in the development of high speed modems and data communications equipment. I also worked on some of their 6502 micro-processor development systems, and even on the controller for the space shuttle robot arm! We worked on the 9600 FAX engine board that was to be widely used by about 80% of the FAX machine makers such as Sharp, NEC and Matsushita. I was also involved with a military-application secure telecommunications system for both voice and data transmission over the same line. This later was spun off as a separate company which is known today as Pair-Gain. I spent 3 years on this project, which was one of the most complex I have ever worked on. The circuit board was 8 layers thick, with 13 digital signal processor (DSP) chips on it, each chip having 64 pins!

It was about this time that I met Jim Solliday after he responded to an ad I had placed in the Recycler newspaper to sell a Reichert Zetopan, and a Leitz Metallux. He came over, we chatted, and he invited me to a meeting at the County Museum of the, then, LAMS organization. He and I have become good friends, which I value very much. I have learned a lot from him, and he always makes time to show me, or anyone else, the finer points of microscopy. I had heard of LAMS from Tri-Ess Science in Glendale, where an old, yellowed and tattered meeting announcement flyer hung among Ira's pyrotechnic supplies.

While still at Rockwell, I finished my engineering education at the University of California, Irvine in both electronics engineering and microcomputer hardware and software system design. After a reduction in force at Rockwell, I spent a year at McDonnell-Douglas working on development engineering crew-station flight simulators, both fixed and motion-based for the DC-10, MD-11 and the C17.

I started work with my present company, Silicon Systems in 1989, where I help manage a large R&D lab with about 120 engineers and 15 technicians. We design and develop mixed-signal, application-specific (MSICS) integrated circuits for the storage products marketplace, which includes nearly every personal computer on the market for the last 20 years. If it has a floppy disk drive, hard disk drive, CD, tape backup or now DVD in it, chances are very good that it has an SSi chip inside.

We were once owned by TDK, the Japanese magnetic tape company, but about a year ago we were acquired by Texas Instruments, Inc. We employ over 1200 people worldwide, with annual sales approaching 1 billion dollars a year. I am very fortunate to have access to many fine microscopes and electronic test equipment at my job. I have become somewhat of a specialist using Nd-Yag lasers to perform delicate micro-surgery under the microscope on silicon wafers, with lines being laser cut down to only 0.2 micron wide! We microprobe these circuits with micropositioner tungsten needles with tips only 0.1 microns wide.

Sometimes the acceptance of a contract with a customer rides on whether or not I can successfully perform laser surgery on a sample chip. When the possibility of a contract worth tens of millions of dollars in revenue to our company is riding on my shoulders as I

probe and laser cut, it is a good time to be decaffeinated!

Even though I never became a medical doctor, I feel that I am working in a field that challenges me, and is probably just as delicate as any brain-surgery. My engineering career has allowed me to combine my interests and skills in industrial arts, science, technology, writing, and of course, microscopy. I feel that I am most fortunate to be working in the semiconductor manufacturing industry.

My present boss and company both recognize and support my involvement with our microscope club. I am very fortunate to have this kind of support from the company. For instance, it has helped me to acquire the Cambridge SEM for the Crossroads school. I think nearly everyone in the company knows about my "strange" hobby of microscopes.

My current interest in microscopes is in acquiring used, but recent models that can be used to do quality work. I haven't quite yet been bitten by the antique microscope collecting bug, but I do have a few Leitz microscopes from the early 1900's. My favorite models are the Wild M-20 and the Leitz Ortholux. I also enjoy using the Wild M450 photomacroscope. Someday I would like to own a Zeiss Universal or Photoscope, mainly because it just looks so impressive, with the nice rounded back and graceful curves . I really think that the looks and the feel of a microscope are just as important as the optical path qualities, and certainly just as enjoyable.

My outside interests are in antique clock repair and restoration, photography, and amateur radio. I hold an FCC license, call sign KF6JGU, and I regularly broadcast on 2 meters in the south Orange County area.

SOME MICROSCOPE - RELATED WEB SITES

John Busey

http://microscopeexchange.com/index.htm National Microscope Exchange
http://nunic.nu.edu/~jdavis2/Forensicnet1.html Dr. JOE DAVIS' FORENSIC SCIENCE NETwork & RESOURCE PAGE for 1997
http://www.sln.org/resources/index.html SLN: Explore Our Resources
http://www.demon.co.uk/forensic/index.html Forensic Science Society Home Page
http://www.criminalistics.com/ABC/index.htm American Board of Criminalistics
http://www.minstrument.com/index.html Meridian Instrument Home Page
http://www.msa.microscopy.com/ Microscopy Society of America
http://www.nikonusa.com/gallery/smallworld/smallworld.htm NIKON Small World Gallery
http://www.wangbiomed.nl/ Welcome to Wang BioMedical
http://charfacnu.cie.umn.edu/glossary.html Glossary of Microscopy Terms
http://www.commercial.com/cms/index.html Welcome to Capital Microscope Services
http://bluebio.com/#Top Blue Spruce Biological Supply
http://www.gly.fsu.edu/books.html Science publication links
http://www.rms.org.uk/ Royal Microscopical Society
http://www.sciplus.com/ American Science & Surplus
http://www.fullam.com/product.htm Electron Microscopy Products from Ernest Fullam, Inc.
http://www.vwrsp.com/ VWR Scientific Products
http://www.math.ucla.edu/~barry/CF/suppliers.html Suppliers
http://www.sargentwelch.com/ Sargent Welch Science Education
http://www.edsci.com/ Edmund Scientific
http://www.carosci.com/ Carolina Biological Supply Company
http://www.fisher1.com/ Welcome To Fisher Scientific
http://guide.nature.com/company/rpcargillelaboratoriesinc R. P. Cargille Laboratories, Inc.
http://www.mcri.org/index.html#top McCrone Research Institute Home Page
http://www.tufts.edu/~jlarsen/mlinks.html Microscope Links
http://megasun.bch.umontreal.ca/protists/opbs.net2.html Databases for Protistology
http://www.comet.net/gek/ GEK's home page
http://www.trendmicro.com/ Trend Micro Home Page
http://micro.magnet.fsu.edu/micro/primer/resource.html
Molecular Expressions Primer: Microscopy Resources on the Web
http://www.kodak.com/aboutKodak/bu/ci/education/lessonPlans/lessonplan109.shtml KODAK: Education Photomicrography
http://home.earthlink.net/~micro/#catalog West L.A. Microscope Co
http://www.microscopy-online.com/index.html Microscopy Online
http://www.plasma-art.com/MSSC.html# Plasma-art
http://www.tufts.edu/~jlarsen/micromentary.html MicroMentary Project Support
http://www.microscopy-uk.org.uk/index.html microscopy-uk.org.uk : Home of microscopy and biology in the UK

WORKSHOP of the Microscopical Society of Southern California
by: **George G. Vitt, Jr.**
Date: **Saturday, 3 May 1997**
Location: **Steve Craig's Lab**, 26 persons attended.

This has been another record-breaking attendance of the MSSC Workshop, despite the fact that several of our regulars were attending the Book Fair. However, some new faces were present.

1. **Kevin Bennet**, our corresponding member from Rochester, Minnesota paid the workshop a visit and told of his current efforts at the Mayo Clinic. Kevin investigates new technologies to find those that have useful applications at the Clinic. He also reported on his current experiments with Xray microscopy in the 10-125Kv range. His 1 micron size source of X-rays (Kevex) is produced by a 1 micron diameter electron beam striking a tungsten target. Kevin built his first X-ray device at the age of 12, using a Crookes tube and an induction coil! He has made some interesting X-rays of live beetles, by first giving them a tasty meal containing barium sulfate! He images on an X-ray image intensifier, and thence to a video screen, which gives a convenient means of viewing while being at some distance from the X-ray source. Kevin warned that the most biologically harmful X-rays are in the low voltage range (10-20Kv) which are fully absorbed by surface tissues. However, they can be blocked with a 1.5mm aluminum plate filter. High-voltage X-rays, on the other hand, pass entirely through the body with much less absorption and biological hazard. At this point, **Jim Clark** mentioned that this year is the 100th anniversary of the discovery of the electron.

2. **Dario Solaris**, a guest, hails from Argentina and heard of us from Larry Albright. Dario has a photo lab at home where he is set up for B&W and color processing, as well as photo and video-micrography.

3. **Matthew MacDavid**, member Larry MacDavid's son, was introduced as a guest.

4. **Steve Craig** gave a status report on the "new" and "old" SEM.

5. **George Vitt** described his recent telecon with former member **Dan Christensen**, who had moved to Virginia around 1990, where he and his charming wife, Livia, are expecting their second offspring. Dan has a superbly equipped machine tool lab where he makes super-precision and very miniature devices. Dan has now re-joined MSSC as a Corresponding Member. George then described some recent developments in the surface etching of glass with repetitive patterns, of subwavelength spatial period to produce any desired effective index of refraction at that surface. Changing the duty cycle of such patterns changes the refractive index.

6. **Jim Solliday** displayed a B&L "A" Stand microscope with a 16mm. objective mounted on a simple B&L beam splitter cube (using a tiltable cover glass) for vertical illumination. This is a simple scope with no substage facilities nor fine focus. Jim then discussed the history and characteristics of Fasoldt ruling slides used to test the resolution of microscope lenses. The earlier slides were of 8-12 bands with up to 90,000 lines/inch, with later slides being up to 24 bands. Fasoldt also made glass reticles, stage micrometers and dimensional standards. For a 'piece de resistance,' Jim announced, with pardonable pride, joy, and enthusiasm, that **James Fidiam**, of the San Francisco Microscopical Society, had given him a **one of a kind** Fasoldt slide having 120,000 lines/inch! No wonder Jim was floating some feet off the ground!

7. **Ernie Meadows** said that in the next month he will start making of 30 artificial hands and that he will need the assistance of some expert craftsmen to do the job. Meant as prosthetic devices for amputees, these hands are of Ernie's original design. **Stuart Ziff**, a talented designer and expert machinist who has a film industry award for the invention of a method to make smooth stop motion animation offered to help.

8. **Izzy Lieberman** brought and demonstrated a very rare DuNuoy **Surface Tensiometer** made by Central Scientific Co., S/N 124, dated 9-26-29. An 0.5 gram, 6.007cm circumference ring of chemically clean platinum wire is pulled up through the surface of the liquid whose surface tension is to be measured. The pulling force is provided by a steel torsion wire (a la torsion balance), the torsion being increased by the operator turning a dial. The force to lift the ring through the surface (the ring 'pops up' suddenly) determines the surface tension which is in units of dynes/cm.

9. **Pete Teti** described how he uses the microscope to get patterns of color which he sketches. He is looking for a 4" focal length lens which he needs for this work.

10. **Leo Milan** displayed a book on marine biology, in which he had colored the illustrations. He also exhibited a fine potted orchid plant from his extensive collection. Leo reported his progress in sorting through the histologic and crystal microslides from the **Bill Sokol** collection. So far, he has catalogued 300 of the former and 140 of the latter, having glued numbered micro labels to each slide.

11. **Ed Jones** showed many excellent color photomicrographs adorning the large covers of various technical lab magazine publications. **Steve Craig** expressed the desire to copy this collection of 97 covers on video and show the results at one of our meetings. Ed also displayed the book on protozoa, *Big Fleas have Little Fleas*, by Roger Henger (of Johns Hopkins), 1937, Williams & Wilkins Co.

12. **Jim Clark** announced that he had found a source of information on his Curta cylindrical calculator, made in Liechtenstein. It is the WWW page of the *International Association of Calculator Collectors* (IACC).

Jim recounted his visit to the symposium of the *American Model Engineering Exposition* in Wyandotte, MI. Here he saw a 1/30 scale Corliss steam engine by Mr. Kiefer, a photo of which Jim circulated. He then demonstrated the cutting of a very fine thread on his Sherline miniature lathe.

13. **Don Battle** displayed the book, *Lindsay's Chemical Cross-Reference*, Lindsay Publications Inc., Bradley, IL. This book is focused on the optical industry.

14. **John de Haas** described the work he had done at Hughes Aircraft Co. on the study of anomalies in magnetic tape. He imbedded tape samples in paraffin, cut them with a microtome and made photomicrographs through a Vickers microscope. He will bring sample photos to the next workshop.

15. **Gaylord Moss** showed many excellent color photomicrographic prints, made on ASA 400 Kodacolor, which he had mounted on a large display board. These were of calligraphic nibs made in the USA (Speedball), England(Mitchell) and Germany(Brause). The much higher quality of the foreign made pens was immediately evident. Gaylord used his Olympus microscope with incident EPI illumination. Among the prints was a photo of a wing of a tiny midge, shown in fine detail. He also described his method of determining the correct exposure.

16. **Alan de Haas** said he needed some leads to a material which changes reflectivity under stress, and operates at very high temperatures and levels of radiation.

17. **Larry Mac David** showed a 1997 Nikon calendar with many fine photomicrographs, which Steve Craig will put on video. He displayed his Questar 3.5" telescope with clockwork driven equatorial base. It had been modified by Questar to a "field mount" for tripod use. Unfortunately, this telescope is no longer made. He displayed two beautiful 16"x20" color photos (matted, glazed and aluminum framed) of the solar eclipse that he had taken in Bolivia in 1995. These showed the sun's corona during total eclipse. He said that to obtain photos of such geometric accuracy, one's location on the earth must be determined to a less than 1 km accuracy, and that they had used a GPS receiver to achieve this positional accuracy at an elevation of 14,000 feet. Larry had used his Questar for these photos, using an Olympus SLR camera at 1/100 sec., with many bracketing exposures. Larry also displayed an A/O Spencer stereo microscope (c.1950s) for which he had made an aluminum base plate.

18. **Zane Price**, who is a member of the Royal Microscopical Society, will take a "pay your own way" trip to mainland China July 12-25, 1997. He reports that the cost will be about $5,000. He reported that the Journal of the RMS lists many Internet sources of interest to microscopists. He then read a superbly crafted and worded letter of rebuttal (by Anon.) on visual microscopy vs: SEM capabilities and amateur vs: professional users contributions to the art and science of microscopy. This letter was so good that it should be reprinted!

19. **Robert Mendoza** showed literature on **"Super Alloy 1"**, by Cecil N. Muggy Co., 23109 Los Codona Ave., Torrance, CA 90505. This substance is used for filling and plating and may be of interest to our members.

After the Workshop a group adjourned to Coco's for more conversation.

We extend our thanks and appreciation to **Steve and Millie Craig** for their boundless hospitality and patience, as well as the tasty goodies and coffee served at our Workshops.

ERRATA: In the previous issue of the Journal, the report on the April 1997 MSSC Workshop, Item No. 10, had some errors and omissions, as pointed out by **Stuart Warter**, who exhibited two microscopes at that Workshop, and who later provided the writer with the following hard copy information:

"**Number**: M 203; **Maker**: Oberhaeuser Georges; **Location & Dates**: Paris 1835-1857; **Type**: Microscope Compound Monocular; **Model**: Continental; **Serial No.**: 2233; **Material**: Brass; **Size**: Ht Closed 9 1/2 in; extended 12 1/2 in.; **Accessories**: Articulated bullseye condenser on body tube ring; 5 oculars Nos 1-5; 3 tube & button objectives Nos 3 & 4 & 7 contained in leather covered wooden box; substage polarizer & cylinder condenser with wheel of stops; nosepiece analyzer w/adjustment lever & rotating prism; single-sided substage mirror with yoke mounted on swinging tailpiece; stage with free sliding brass slide carrier and attached stage clips; 19 paper wrapped slides 1/2 by 2 1/2 in; upright dovetailed hardwood cabinet with accessory drawer (probably American made); date of acquisition: 3/22/1997. **References**: Turner (RMS & Museo di Storia); Nuttall (Frank Coll); Mayall; Frey; Davis & Dreyfuss; A.Brachner (in De Clercq); Harting. **Notes**: Inclining column center mounted on harp-shaped platform base; column top fine focus wheel has quick motion - design differs from later Hartnack model; Oberhaeuser introduced horseshoe in 1848 for non-inclining column only; this form base apparently intended to compensate for instability of inclination; signed on draw tube in script: 'G:Oberhaeuser / Place Dauphine / Paris' (and on other side of tube) ' made for McAllister & co. / Philadelphia' (McAllister & Co w. 1336 -1853); Serial no stamped on wood lens block in green leather covered storage box; Oberhaeuser made 1800 microscopes by 1850 or 1851 and 3000 by 1856 (Brachner) or 1859 (Harting)."

REQUEST: In the interest of accuracy and briefness in the reporting on instruments shown at our Workshops, it is requested that all exhibitors provide the writer with a clearly written sheet containing the particulars necessary to identify and date the instrument(s) in question. It is suggested that fully detailed studies of particular instruments be presented as individual papers, submitted by the owners to our Journal. In some cases, the writer has found it difficult to record all the verbal descriptions during the sometimes tumultuous and rapid-fire exchanges of the Workshop! My apologies to all. Your cooperation will be much appreciated! G.G.V.

MINUTES FOR THE MEETING OF MONDAY, 12 MAY 1997.

David L. Hirsch

Tragedy. It is with profound sorrow that we inform the MSSC membership of a tragic event which occurred Sunday May 9, 1997 at the Truckee (Tahoe) airport. Corresponding Member John Ewert and his wife, Peggy, both experienced pilots, along with passengers Tom and Marcia (son and daughter) and Jennifer, Marcias' friend, were killed when their plane crashed and burned during takeoff. For further details, see the article appearing on page 107 of this journal.

Some MSSC members usually meet for lunch on Wednesdays at the Typhoon restaurant at the Santa Monica airport. On the last Wednesday in November, 1996, they left the restaurant in time to meet the arriving private airplane in which John and Peggy Ewert piloted English diatomist Klaus Kemp and his wife, Sheila, to Santa Monica. That evening, Mr. Kemp gave his memorable talk to the MSSC membership on the preparation of slide arrangements from diatoms and butterfly scales

A Noble Nosh. Intense mental salivation was the order of the evening as we viewed slide after slide of very collectible vintage microscopes. **Mr. Jeremy Collins, F.S.V.A;** the Scientific Instrument Coordinator for the venerable Auction House of Christie's South Kensington, London, showed us the many treasures created by scientific instrument makers going back to the 16th century. All of the microscopes that were shown, had gone under the hammer at Christie's auctions , which are held several times a year.

Christie's maintains locations throughout the British Isles. Goods other than scientific instruments are also sold at specialized sales. Mr. Collins distributed Christie's scientific instrument catalogs from previous auctions. Needless to say, these were quickly snapped up by MSSC members in attendance. The catalogs are printed in color on paper of high quality and are certainly worthy additions to any instrument collectors library. Catalogs for future auctions may be ordered via the telephone hotline:(0171)321 3152, or through the Internet at address http:// www.christies.com

Voxus Populi. After the refreshment break, matters of club business were discussed and settled by popular vote.

1. Society Dues. To assure necessary funding for the MSSC publication and other Society expenses, the dues will be increased by $20 across-the-board for fiscal year 1997-1998.

Type of Membership	Annual Dues	
	1996-1997	1997-1998
Regular	$ 30.00	$ 50.00
Corresponding	$ 20.00	$40.00

2. The MSSC publication has been officially designated as:"The Journal of the Microscopical Society of Southern California".

3. The MSSC Journal will accept paid advertisements from commercial companies if they are microscopically related, or of particular interest to microscopists. Advertising shall never be allowed to take up more than one page in the Journal . Members may still advertise their own personal microscopical items for sale or trade at no charge.

Logo. A logo for the MSSC will be selected by popular vote at a later meeting from among several candidates.

Wappenschawing. This archaic term of Scottish origin, concerned:"An exhibition of arms formerly held at certain seasons in each district". In a modern sense, we have substituted microscopes for muskets. Each meeting and workshop features the showing of many microscopically oriented artifacts. Scientific instruments and artifacts having little relevance to microscopes and microscopy, are sometimes brought to the meetings. This is done at the discretion of the exhibitor, and may be good for a laugh and little more. An occasional diversion from our 'stock in trade' may be acceptable, provided the item serves to show application of scientific principles.

Norm Blitch, a discriminating collector of instruments, books and historical documents, favored us with the showing of two choice instruments; a Watson 'Edinburgh' compound monocular microscope, circa 1893, in pristine condition, and an unsigned (Probably by Ladd), chain drive monocular microscope, circa 1863. Norm included two books to illustrate his microscopes. As an aside, if you bring in an instrument for Show and Tell, it would be helpful to include books or other documentation describing the artifact.

Jim Solliday prepared a showcase grouping applicable to American microscopists equipment of the 19th century. Included were: a B & L slide making turntable with a cast iron stand, circa 1895; a Queen Acme No. 5 students microscope,; an Acme oil lamp; a slide making kit signed "Stanley Optic, London"; a box of 72 prepared histological slides; and a travellers slide box holding 172 slides. Jim introduced his display as a contrast of what was in use in America at the time when the

elaborate English and Continental microscopes shown by Mr. Collins were available in Europe.The traveller's slide box fit in well with Jim's description of furniture makers in St. Louis making knock-down furniture to go in ox-drawn covered wagons for the arduous trip West.

Dave Hirsch showed a gold plated tie tac or lapel button featuring a highly detailed, one tenth scale replica of a circa 1930 Bausch & Lomb monocular microscope, bearing the initials: MSSC. This item will be offered for sale in the near future.

Our honored guests for the evening included two of **Pete Teti's** brothers: Salvatore and Mario from McKeesport, Pennsylvania, located about 16 miles south of Pittsburgh. Pete's third guest was a friend, Royal Uneather, from Garden Grove.

Alan deHass brought in several refurbished microscopes for sale. For information on these and other stands that are available, contact Alan at: (310)475-2873 or (310)475-5623.

Paraphrasing the article appearing in last month's MSSC Journal titled. "The One that Got Away", I must make mention of "the One that Didn't Get Away". In the Christie's auction catalog dated 9 April, 1997, page 1, is shown " a late 19th-century lacquered brass compound monocular microscope signed on the stand, NATCHET ET FILS 17 rue St. S'everin, Paris". The photo belies the modest description of the 1881 Microscope Grand Modele Perfectionne', including various compendia.Therein lies an intriguing tale. More about that, later.

Ron Morris reported that the Cambridge SEM was purchased by him at a price which included about $10,000 original cost in accessories. The items will be moved to Crossroads School and installed at their expense. We commend Ron for his great efforts in expediting the full project.

The time for renewal of membership has arrived! See the accompanying article for details. Any questions? Contact your Treasurer, **Dave Hirsch** at meetings or call : (310) 397-8357.

COLLECTING COPEPODS, OSTRACODS and CLADOCERA

In collecting Copepods, Ostracods and Cladocera, of the species that are free swimming or found in algae or the smaller aquatic vegetation, I find the task greatly facilitated by using a suitable glass vessel - say a quart preserve jar - into which the water is poured, then with the glass dipping tube or a convenient stick, the contents, algae, leaves, trash or whatever, is rapidly brought into quick rotation, a regular mimic whirlpool, after a moment the organisms will be found at the centre of the whirl at the bottom of the jar, and usually in clear water, that is fairly free from floating trash, the dipping tube will then take them up nicely.

From one to three rotations will be needed, according to the number of organisms present. If they seem to be, when first poured in, well entangled in the algal strands, a vigorous stirring will release most of them. The organisms are collected at the bottom centre of the whirl in a nice pyramidal little whirl in just the right shape to be drawn into the glass tube, practically free of the algal and other impedimenta in the water. If the water is too cloudy to permit seeing them through the side of the jar, unless the water is very muddy, they can be fairly seen by elevating it and looking through the bottom. *J.B. Underhill. Fork Union. USA.*

Watson's Microscope Record September 1926
Reprinted from the Balsam Post October 1995

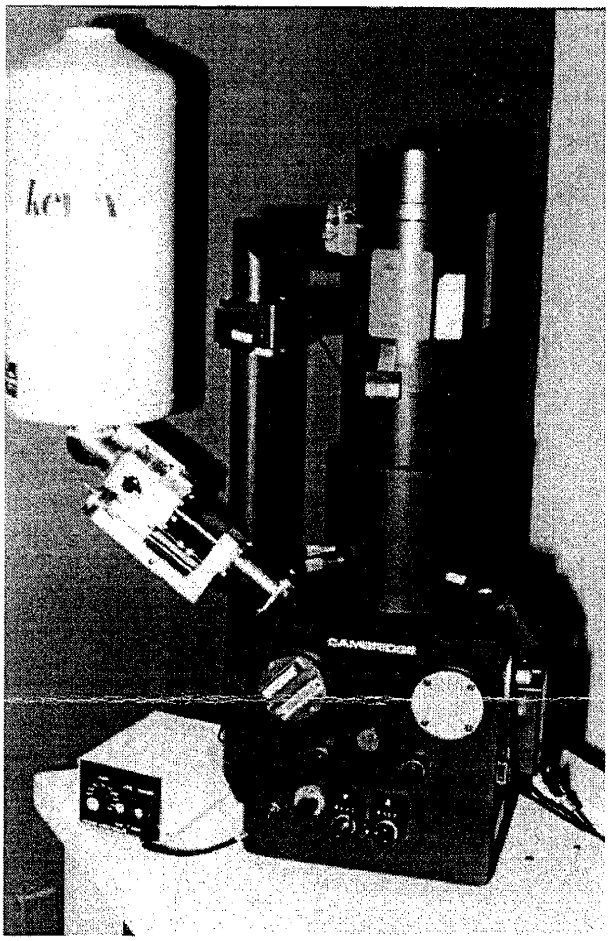
Advertisement from The American Journal of Microscopy 1877
Courtesy of Richard Jefts

PREPARING FUTURE MICROSCOPISTS

The Odyssey of the Cambridge 240 Scanning Electron Microscope

From Silicon Systems to the Crossroads School

Ronald M. Morris



Cambridge Stereoscan S240
Scanning Electron Microscope
at Silcon Systems Inc.

About two months ago, Frank, my supervisor at the company I work for, Silicon Systems, Inc., a subsidiary of Texas Instruments, Inc., walked into my office and said, "Gee, Ron, if you could have the very, very, best microscope in the world, what would it be?" I sat there kind of dumbfounded and thought for a while. "Well", I replied, "Maybe a Powell and Leland, or a Ross, or something of that nature." I was thinking, of course, about the antique ones. My boss replied, "No, something a little bit more recent." I was still very perplexed; I thought some more. "Let's see, we have some Leitz Laboluxs, some Nikons, etc.", I replied. "No", said Frank, "something even better than that!" I gave up, what in the whole wide world could it possibly be?

Finally, this mental agony ended, and I found out that the Company was going to surplus a Cambridge Stereoscan S240 Scanning Electron Microscope (SEM). I sat back in my chair, literally stunned. I had visions of hauling this instrument up the stairs to my tiny one bedroom apartment. Thankfully, reality soon came back to me, and I contemplated the purchase of the century.

The next two weeks were a paperwork jungle; any company the size of mine has to leave a paper-trail for just about everything. There was the enormous task of just going through all of the accessories and manuals for the SEM. It had been very well secured in a semiclean room area by it's previous operator, Margot. She had operated it before for our Reliability Lab that was on the company's premises while we still had a wafer fabrication plant here in Tustin, California. According to the paperwork that I found, it was bought in 1987 for around $250,000. It was built in 1985 in England by Cambridge Instruments.

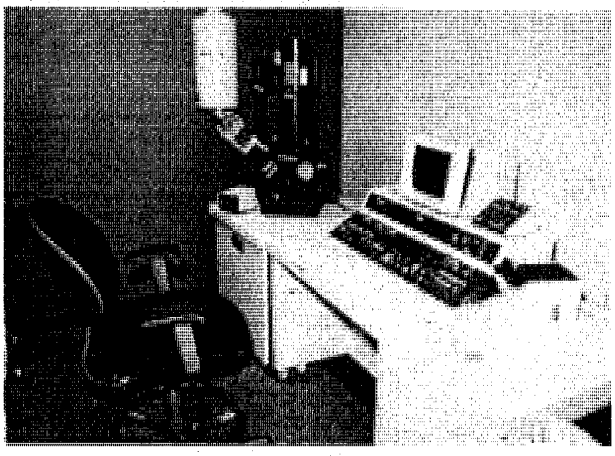
I was overwhelmed by the number of items that came with the SEM. There was the KEVEX-EDX electron disperser and x-ray analyzer for contamination particle analysis, complete with it's own mini- DEC PDP-11 type computer, terminal and line printer. The KEVEX dewar assembly hangs off the side of the SEM like a milk jug; it holds approximately 4 liters of liquid Nitrogen to keep the probe sensor cold. With this unit, one can detect particles down to the lowest element of sodium.

There was also a "gold-sputter" coater unit that is used to coat the specimens with either gold, or a gold/chromium mixture, or carbon graphite , as was commonly used at Silicon Systems. The coater can also be used with a palladium/gold mixture, 60/40 along with Argon gas.

The SEM itself uses two kinds of filaments to generate the beam of electrons. The first type is tungsten, which can run continuously for about 2 weeks. The other kind is known as a "Lab-6", and can run for up to 6 months straight, for a cost of about $400.

The SEM has the capacity to handle up to a 6 inch diameter wafer in the vacuum chamber. The specimen on the stage can be tilted 90 degrees, fully rotated 360 degrees, with movements in the X, Y, and Z axis. A 6 inch wafer can be tilted 30 degrees, and up to 4 inches of it's inner diameter can be scanned.

The visual output of the SEM is either by slow-scan monitor, NTSC compatible video output, or by a Polaroid camera unit permanently attached to the SEM. An optional computer interface can link images directly to a PC or MacIntosh computer.



Cambridge SEM at Silicon Systems Inc.

The maximum magnification of the Cambridge S240 SEM is approximately 100,000 X.

After going through all of the goodies, I was very excited about the prospect of getting this instrument. I had heard through the grape vine at work that one other person had placed a bid on it, but that it was very low.

I had to act fast, because the company was eager to close the books on this transaction. I placed a tentative bid on the unit, and waited. I then had to decide where the unit was to go to. I certainly couldn't keep it myself, I simply didn't have the room. I talked to several other MSSC members about it and of course had discussions about it at our meetings and workshops.

My "gut" feeling was where could it go to benefit the most people? If we kept it to ourselves among the club membership, it would be convenient, but then there would be the matter of maintainance etc. My first instinct was to give it to a school. My thoughts went to the Crossroads School, W.M. Keck Math/Science Institute in Santa Monica. They had previously accepted the donation of an older model SEM, but it proved a hopeless task to get it running. I thought about all of the dashed hopes of the students that had been eagerly awaiting the chance to use an SEM.

I contacted the school, and after some discussion, the science director of the school, Joe Wise, agreed to accept the SEM. He seemed very excited about receiving it, as he had plans to use it for smog particle analysis, and to make an "on-line" SEM setup on the Internet, so that students in other states, or even other countries could benefit from the use of this instrument.

Finally, I was notified by my company that they had, indeed, accepted my internal bid on the SEM. I started to make all of the arrangements for moving the SEM, and it's accompanying accoutrements.

The first thing was to contact the contractor who had been repairing the instrument for my company. His name is John Casey of Casey Electronics in Yorba Linda, California. I had heard good things about him from some of the people in my company who had used his services in the past. He was trained by Cambridge instruments, and was very familiar with this particular model SEM.

John came out to evaluate the instrument. There were a few minor problems - no video on the monitor, one power supply fan wasn't working. The instrument had been sitting idle for about 6 months, but the vacuum pump was still operational, and it appeared that the chamber was clean and hadn't been opened for some time. John felt that he could fix these minor problems, and have the SEM up and running in a matter of weeks.

John is a very busy man; he travels all over the U.S., and Canada to service Cambridge SEM's. Many universities use this model, the 240, and the later model 250. Some companies like Ricoh, the copier manufacturer, use a Cambridge SEM to analyze the toner particles. Other companies, like the one I work for, use an SEM to analyze contamination in silicon wafers and to do failure analysis work with semiconductor fabrication problems.

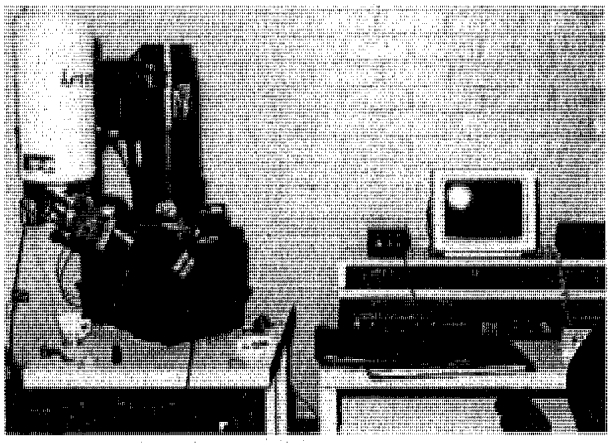
Well, finally the day came to move the SEM. Our esteemed workshop chairman and transportation expert, Steve Craig, rented a truck with a liftgate and drove from Los Angeles down to my company in Tustin. The truck he rented was brand new, with not a scratch on it! I had arranged for some facilities men from my company to help with the "brute-force" part of the move. John Casey and I had been busy that Wednesday morning carefully packing the SEM with bubble wrap and all of the other goodies with plastic wrap to keep everything together.

We had the SEM loaded in about half an hour. The SEM column had been carefully separated from the control console by John the day before by disconnecting about a zillion wires and cables. We were thankful that the truck had a liftgate! After securing the equipment with furniture pads and ropes, we were ready to hit the road. I led the caravan up interstate 5, crossing through war-torn south central L.A. on the 105, and finally reaching the 405 to the Santa Monica 10 freeway.

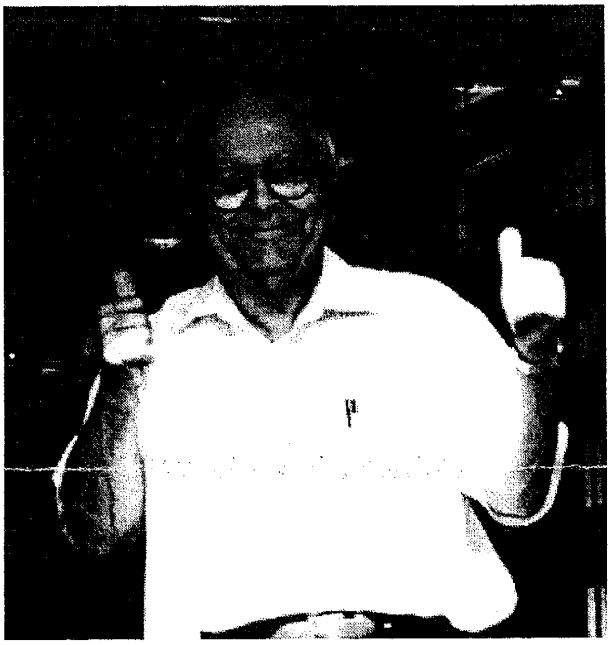
At the Crossroads school, with wide shining eyes, reminiscent of Christmas morning around the tree, Joe Wise from the school and our own Tom McCormick, who had most graciously underwritten the cost of moving the SEM, awaited our arrival with this grandest of toys. With the help of several of the school's security officers, the SEM was swiftly and safely moved from the truck to the school's science lab.

The next several days were spent unpacking the equipment, plugging in all the cables, and carefully bringing the SEM to life in it's new found home. As of this writing there still is some minor work to be done, but the video amplifier and processing boards seem to be

Unloading at Crossroads, left to right, Joe Wise, Steve Craig, John Casey and Tom McCormick.



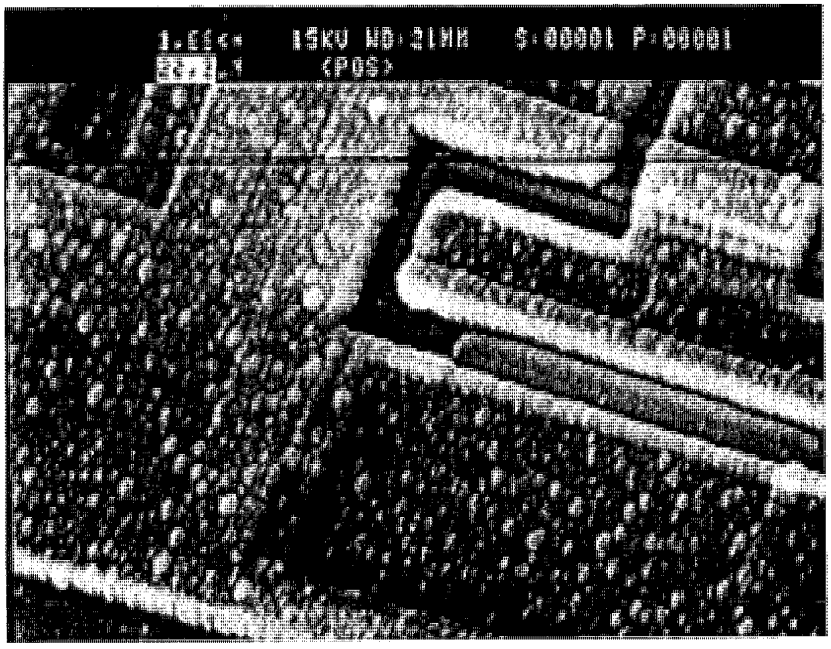
SEM Installed in new home at Crossroads School.



Steve Craig - All unloaded!

working, and the vacuum pump system is pulling a good vacuum with no apparent problems. With the replacement of the tungsten element, and the realignment of the column and some cleaning, the SEM should shortly be ready for use.

It is my sincere hope that the Cambridge S240 SEM will help inspire and sustain the interest of students in the appreciation of science and technology , and that these students will someday be the future scientists and engineers that pioneer the scientific breakthroughs of tomorrow, and beyond.
This is what has driven me to spend countless hours expediting the transfer of this SEM from SSi to the Crossroads school, and it has been a most gratifying experience for me.



First Image at Crossroads, May 31, 1997, 11:57 AM.

UPDATE

On Saturday, May 31, John Casey and Tom Mc Cormick worked from 9 Am until 8 PM, not stopping for lunch, tracking down and fixing problems with the SEM in its new installation at Crossroads. Their success is shown at the left in their amazing image of a microcircuit taken at 11:57 AM. There is more work to be done, some intermittant electrical glitches to find and a weak power supply to replace, but thanks to the dedication and hard work of a small group of MSSC members, The Crossroads School has a superb working SEM for new student programs in microscopy, and MSSC microscopists have off-hours access to an SEM for their own research.

GOODS, GEAR AND GADGETS

Richard M. Jefts

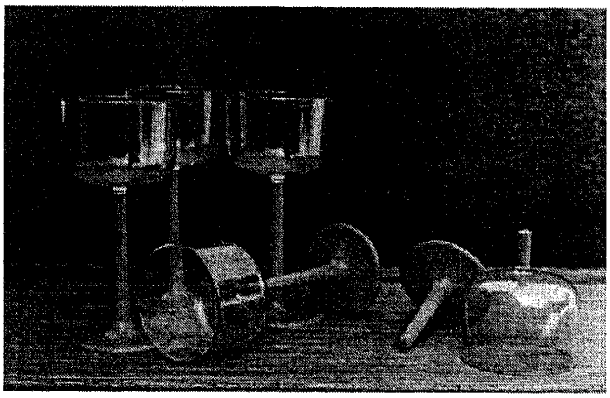


Fig 1. Plastic long stemmed drinking glasses.

Fig. 2 Plastic bell jars

In order to keep down the cost of both general and specific laboratory apparatus, the young and, perhaps less affluent budding microscopist has, over the years, been encouraged in both book and magazine articles to make much of his own equipment, to modify existing items, or to press into service, items that would serve his purpose, but which were originally designed for totally different tasks. An excellent example of this practical approach is a series of monthly articles in the magazine *Popular Science Monthly*, starting in the early 1930's, and the companion hard cover volume *Wonders Through The Microscope*, 1934 and later editions. Other and still more recent publications continue to offer similar encouragement.

Because of a recent major move, I had the opportunity to take stock of pretty much all of my own equipment and materials. While there was a time when making my own alcohol lamps, test tube racks and ring stands were options to be considered seriously, I realized that just about all of the equipment I have now has been purchased from scientific supply houses, dealers, catalogs and (best of all!), from fellow microscopists - the result of being certainly older and, perhaps even slightly more affluent. In further rummaging around, however, it was interesting to note that a number of items that I use daily or on a regular basis, were not originally designed for use in any science hobby, yet when taken or modified, do lend themselves admirably for use in the field, or at the microscopists workplace.

These items, gadgets and odds and ends are easily and inexpensively obtained, often from supermarkets, garage sales and thrift shops and so represent no great outlay of money. Admittedly, however, much of the practical pleasure comes in actually adopting the item itself and finding that the thing not only works, but works well.

With the thought that some of these gadgets may be of interest to others, this column is, tentatively offered. There will be an item, an adaptation or a modification presented on occasion, of short length, with an illustration or two and a few, hopefully, well chosen words.

We will start our gadget making, then, with a simple modification. Drum or dome shaped, long stemmed plastic drinking glasses are inexpensively obtained, new or used. The five illustrated in Fig. 1 are from a set of six purchased at a local thrift shop for a little over a dollar. The illustration is pretty much self explanatory. The stem is cut off at an appropriate length to serve as a handle, and the rough edges smoothed with sandpaper. When inverted, we have an excellent little plastic bell jar. I have grown half a dozen different batches of mold, all at the same time and each under its own covered dome. I have used various sizes for covering momentarily set aside eyepieces, objectives, microscope slides, glass and gelatine filters, etc. In short, any item to be kept handy but covered and so a little safer from a nudged elbow or from collecting dust during extended standing. Fig. 2 shows three of the mentioned possible uses.

It is true that almost any suitably sized inverted vessel will do a similar job, but, like drinking champagne from a jelly glass, something is lost in the translation!

These small, transparent plastic bell jars, then are inexpensive, simple to make, and are a practical pleasure to use-a small touch of nicety on the lab bench, desk or worktable.

June Meeting Features
ED JONES
and
FORENSIC MICROSCOPY
Wednesday, June 18 at 7 PM
Crossroads School
1714 21st Street
Santa Monica, CA

The June meeting will feature our long time distinguished member Edwin L. Jones, Jr. who will speak on 'Forensic Microscopy' with a wide ranging discussion of the types of microscopes and techniques used to solve particular problems in forensics. Bright and dark field, polarized and even electron microscopy will be among the methods discussed. Although the discussion of microscope techniques will be almost tutorial, Ed will provide his usual stimulating presentation by relating each technique to case histories including some of very high profile.

As longtime members know, Ed is an eminent expert in his field. He has a B.S. in chemistry from West Virginia Wesleyan College and an M.S. with a thesis in biochemistry from Marshall University in Huntington, West Virginia. He has a second M.S. in forensic chemistry from the University of Pittsburgh.

Ed worked for one year as a micro-analyst in the Georgia State Crime Lab in firearms identification and trace evidence. He spent the next 7 1/2 years as a one man crime lab for the city of Fountain Valley doing a wide range of criminalistic functions.

For the last 14 years he has been employed by the Ventura County Sheriff's Crime Lab in the serology and trace evidence section. This lab serves over 1 million people in Ventura County. Once a year, he teaches a course, entitled "Microscopy of Rape Evidence", at the California Criminalistics Institute in Sacramento.

Ed is a member of the California Association of Criminalists, The American Academy of Forensic Science and, of course, the Microscopical Society of Southern California.

Ed's hobby is collecting books on microscopy and forensic science; much to the benefit of members who can peruse the selections he brings to show at meetings and workshops.

This promises to be a very interesting meeting that will undoubtedly contain many surprises about what can be discovered from microscopic evidence, if one has the knowledge and skills.

Editor's Notes

This has been a momentous month for the MSSC.

The rapid acquisition of the splendid Cambridge SEM for the Crossroads school and its restoration to operation is a testament to the enterprise and dedicated hard work of several members. This could be a transition point in the society which will enable us to help the next generation of scientists and microscopists to whom we can pass on the love of things microscopical.

A sad note was the tragic event which took the lives of members, John and Peggy Ewart. Although geographically distant, they attended yearly functions and made many friends who will miss them greatly.

At the last regular meeting, all members present voted on three issues, by secret ballot, with the following results:

1. The membership dues will be raised by $20 per year across-the-board to $50 yearly for regular and $40 yearly for corresponding members. This will not only cover the publication of our expanded journal, but should provide funds for other activities, such as student assist programs.

2. The Society's monthly publication will be referred to as the Journal rather than the Bulletin. The reason is that many members feel that the quality of some of the articles submitted are not properly described by the time dependent connotation of the word bulletin. Our MSSC publication covers not only time dependent events and items about current members of the group but also scholarly articles of permanent interest to future students of the microscope. The feeling is that the word journal better describes the timeless content.

3. The Journal will accept paid advertising from microscopically related businesses. Personal items will still be advertised for sale or exchange at no charge to members. The paid advertising will never be allowed to exceed the total space of one page per issue.

As we go forward, we need some minimal organization to keep the Society functioning. However, we all want to minimize any administrative distractions from our enjoyment of each others company and the microscope. Our ability to resolve the above issues quickly by ballot at the last meeting is a hopeful sign that we are on the right track as a healthy functioning organization.

Another sign of the vitality of this organization is that 11 members contributed articles to this issue. Please continue this trend by sending in your own articles, letters or brief notes for publication.

Gaylord E. Moss Ed.