Bulletin of

THE MICROSCOPICAL SOCIETY OF SOUTHERN CALIFORNIA

Volume 2 Number 1 January 1997

SWAMMERDAM: THE BOOK OF NATURE OR THE HISTORY OF INSECTS

by Norman H. Blitch

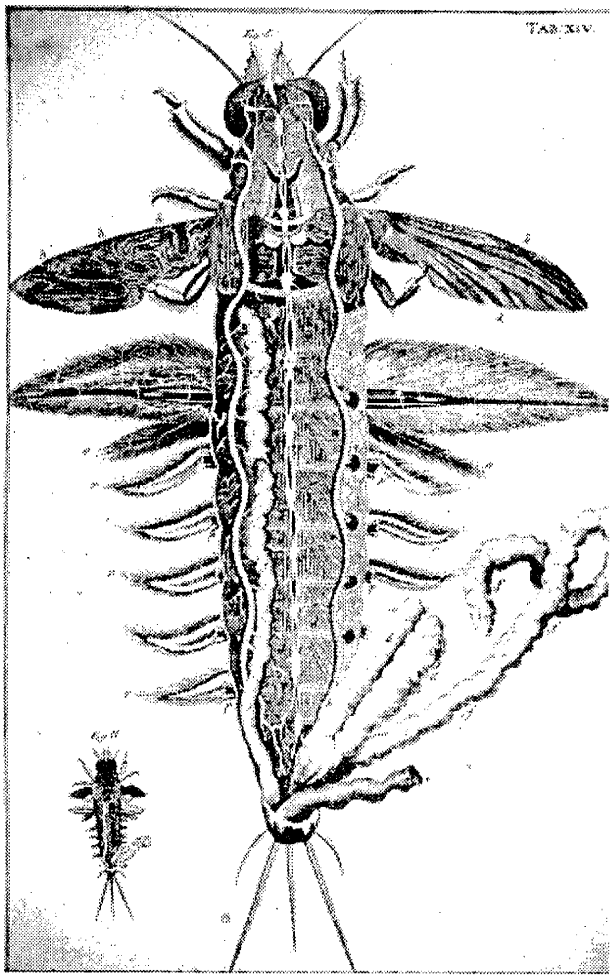

Plate XIV Dissection of the Ephemerus Worm

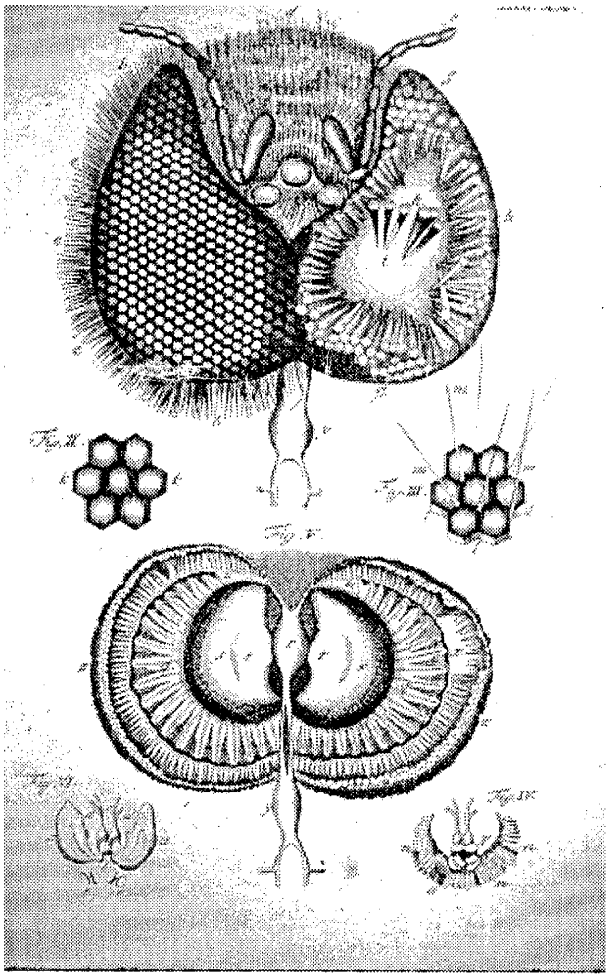

Plate XXX Head of the Male Bee, showing magnified Parts

Jan Swammerdam was born in Amsterdam in 1637 and died in 1680. He was educated in Leyden and received his M. D. in 1667. He never saw a copy of his own 2-volume master work, *Bibel der Natur*, or *Book of Nature*, which was published in 1737-8, 57 years after his death at age 43. Sub-titled *The History of Insects*, it presents the results of lifelong fascination with the form and nature of insects.

This massive work, as published, must be viewed as (at least to some degree) a collaboration. It is acknowledged as the work of one of the most outstanding microscopists of the 17th Century, but more recent ideas, even revisions, may have crept into the text by the time of its publication.

Each of the following would have had opportunities to effect changes in the author's original intentions: Thomas Flloyd, who translated the text from the original Dutch and Latin to English, John Hill, M.D., who "revised and improved" the book before it was first published posthumously in 1737 (as a microscopist of wood fibers, Hill also designed the first "cutting engine" and had it made by Ramsden. Later renamed "microtome," it was pictured in his "Construction of Timber"), and finally, by Herman Boerhaave, M. D.

Although Boerhaave was only 12 years old when Swammerdam died, he was destined to become the author's biographer as well as an eminent Dutch physician and a skilled and innovative chemist. It was Boerhaave who edited and eventually published Swammerdam's most important work, long after Swammerdam's death.

Fortunately, Boerhaave wrote his own *Life of Swammerdam* and included it as a preface to the *Book of Nature*, thereby providing the major source of biographical data on the author.

Swammerdam's grandfather, James Theodorus, was born in Swammerdamme, on the Rhine between Leyden and Woerden in Holland. He moved to Amsterdam to enter the timber trade and became known as Swammerdam after his native village. His son John James, father of Jan, became an apothecary and, most importantly, an avid collector in the natural sciences. His private collection contained curiosities of all sorts, especially from the Far East. Thus, Jan grew up surrounded by animals, insects, instruments, fossils and artifacts of all kinds. He eventually formed his own collections, ultimately concentrating on insects. Along the way he became a meticulous dissector and observer of insect life (collecting and observing in the natural sciences became highly popular, and by Victorian times, had become a singular passion of many amateur scientists as well as a parlor pastime). It was in Amsterdam that Swammerdam met Antoni Van Leeuwenhoek. Their acquaintanceship could have been mutually inspiring, but Leeuwenhoek was somewhat older, and did not take up his own interest in microscopical studies until much later.

Swammerdam's work fell into two main categories: (1) Medical Studies Although he had received his M. D., Swammerdam never practiced medicine. He engaged in studies of human anatomy and physiology, and (2) Descriptive Entomology. His lifelong passion was the collecting, analysis and depiction of insects of all kinds and sizes. *The Book of Nature* was his magnum opus in this field. It does not incorporate his findings in the medical field.

Swammerdam's greatest talent lay in the collection

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CONTENTS

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and extremely precise dissection of flying insects, and systematic study of their life cycles, mutations, propagation, etc. Most of his best conclusions were based directly upon careful microscopical observations, and he was blessed with exquisite drafting skill, which he communicated directly to the engraver. In this regard, he compares very favorably with Robert Hooke's illustrations for *Micrographia*. He studied insect anatomy and made copious notes for future classification. *Historia Insectorum Generalis* was published during his lifetime, in 1669, and much of it was later to be incorporated into his *Book of Nature*, posthumously.

The *Book of Nature* contains 53 full page (folio) copperplate engraved plates of his drawings. A few of the plates are illustrated here, primarily to exemplify the precision of his delineation. The first German edition was published in 1752, and the first English edition in 1758.

The author was, through extensive usage, a master of the techniques for killing and processing insects of all sizes and forms. The advances he made in microtechniques have not been fully credited.

In Boerhaave's preface is found only very limited description of the author's instruments and working methods:

"His microscopes were of various sizes and curvatures; his microscopical glasses being of various diameters and focuses, and from the least to the greatest, the best that could be produced, in regard to the exactness of the workmanship, and the transparency of the substance."

He "by nature and use was so incomparably dexterous in the management of these useful instruments, that he made every observation subservient to the next, and all tend to confirm each other, and complete the description."

"his knives, lancets and styles (as needles?) were so very fine, that he could not see to sharpen them without the assistance of the microscope; but with them he could dissect the intestines of Bees with the same accuracy and distinctness, that others do of large animals."

Described elsewhere in the text is a small brass table, made for him by Samuel Musschenbroek, to which were mounted flexible arms (Musschenbroek's nuts?) to one of which was attached the object to be observed, and to the other was mounted whichever microscope to be used. The description seems to be of an auxiliary stand rather than of the microscope itself. Although Swammerdam apparently knew Musschenbroek personally, I have been unable to find a more specific reference that might have allowed identification of either the microscope or its maker. A single lens Musschenbroek microscope such as illustrated in Clay and Court might have been available to him, but it is never specifically stated. Brian Ford calls Swammerdam one of the great pioneers of insect micro-anatomy, and assumes that he used single lenses made by Musschenbroek. It is a reasonable assumption, but not necessarily so.

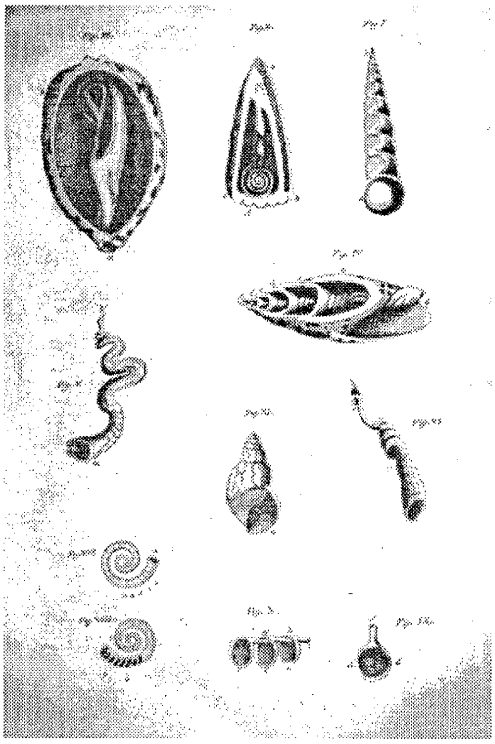

Plate VII Dissected Shell Parts of Various Snails

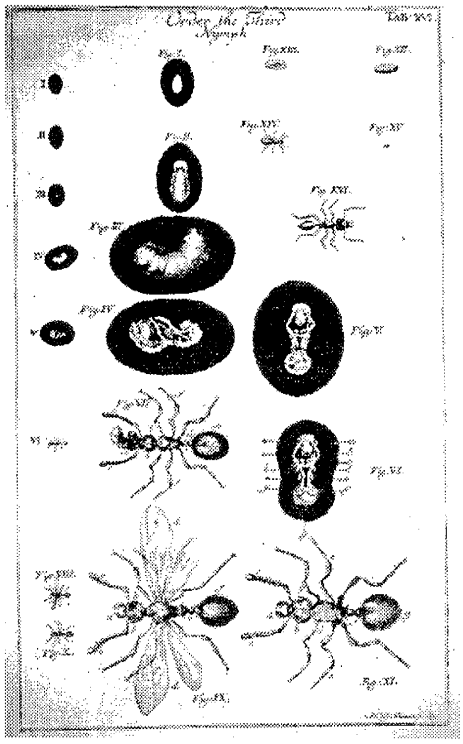

Plate XVI The Ant: Stages from Egg Through Nymph to Adult Ant

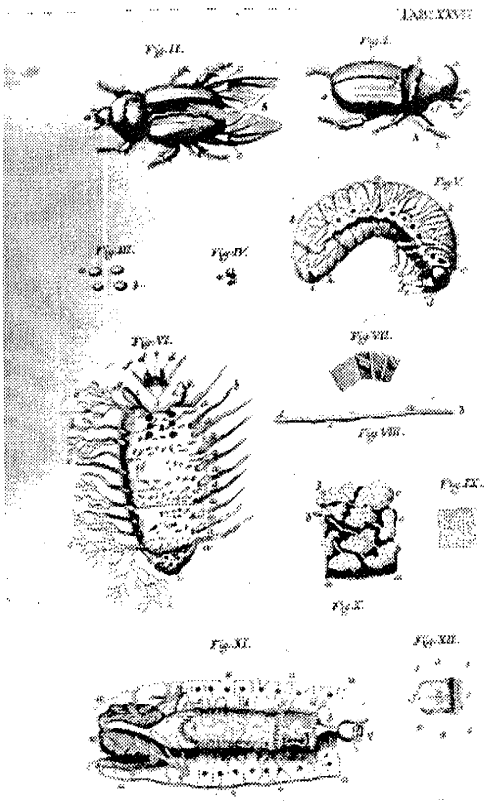

Plate XXVII Life History of the Horned Beetle

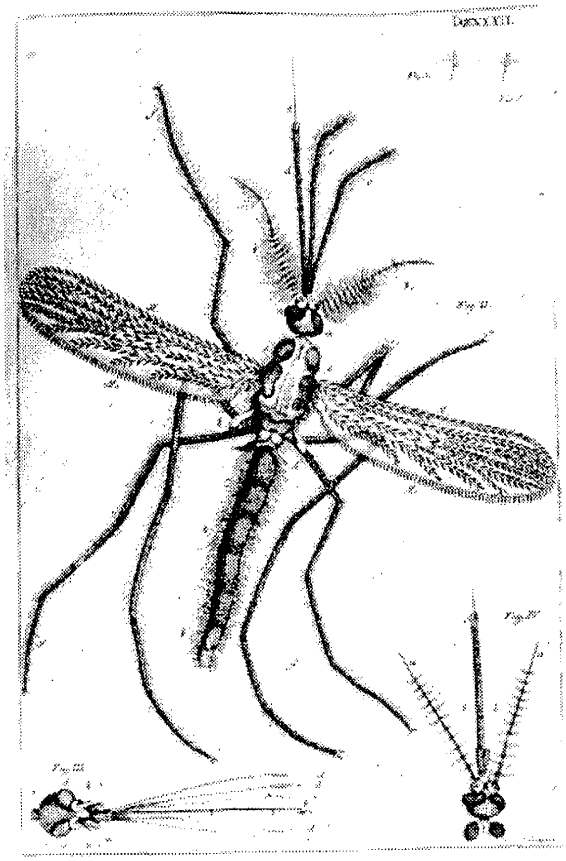

Plate XXXII The Male "Gnat"

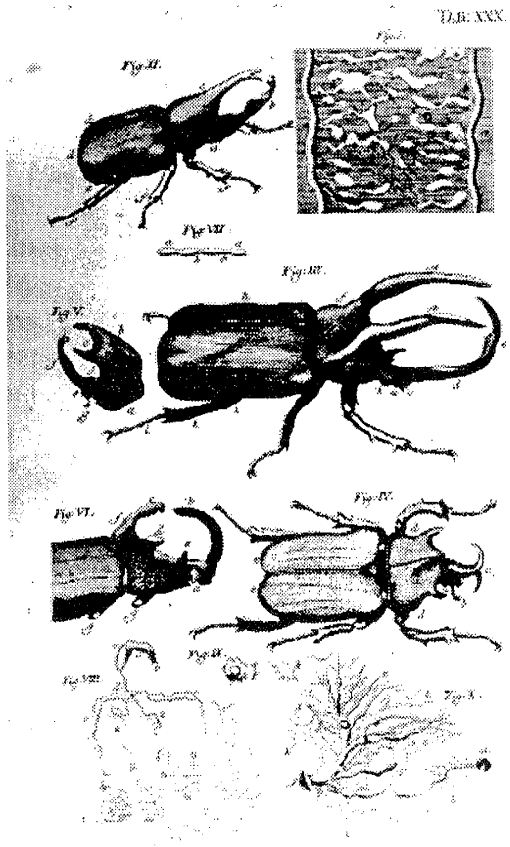

Plate XXX More Details of Horned Beetles

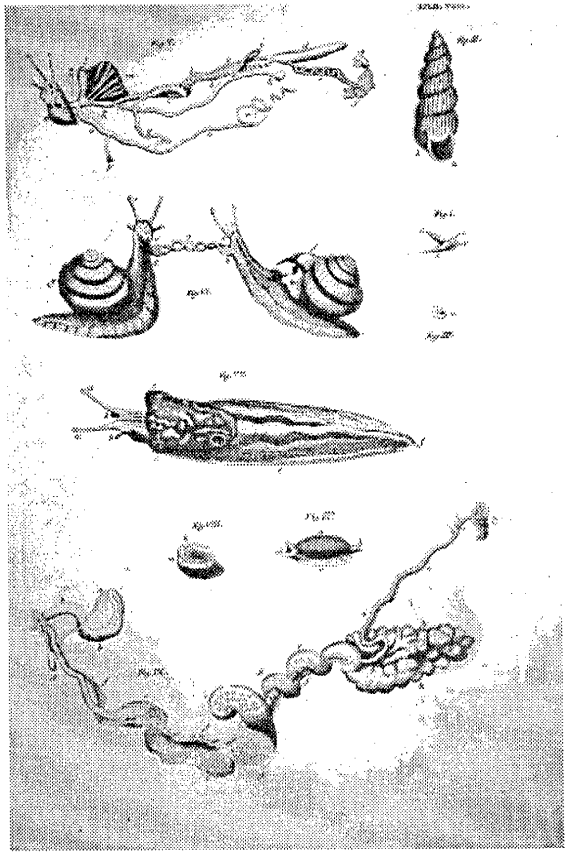

Plate VIII Further Details of Snails

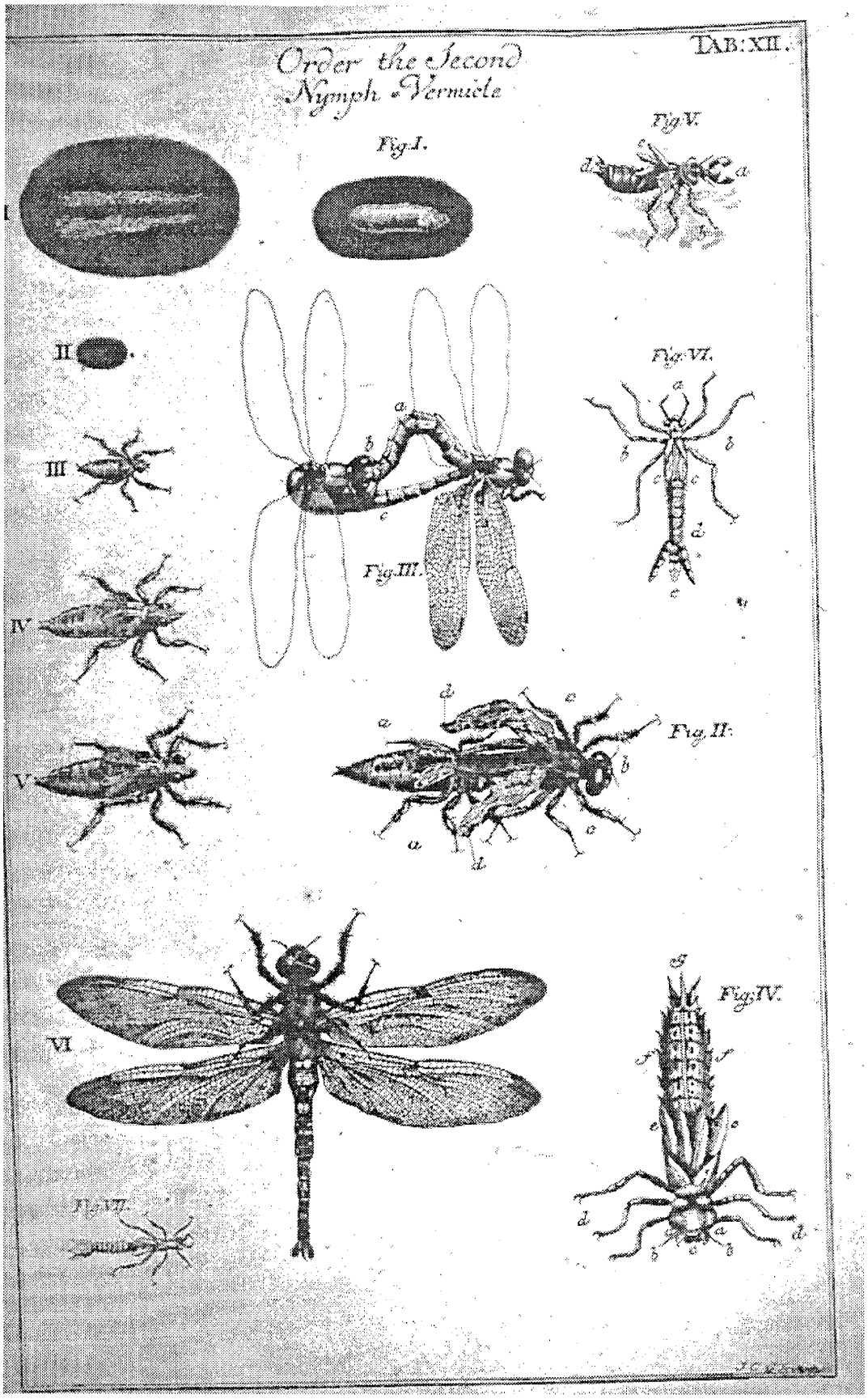

Plate XII Stages of the Dragon Fly

A METHOD FOR OBTAINING ACHROMATIC CRITICAL ILLUMINATION

by Alan G. de Haas

The following is a brief description of an illuminating system that I concocted to overcome some problems of resolution and contrast in low power microscopy. The uniformity of illumination and degree of achromatism achieved makes this system useful at all powers.

Problem 1:

The illumination reaching the specimen is dependent not only on the quality of the condenser but also on the illuminator itself. What good comes from using an expensive properly designed achromatic condenser when the optics of the source are designed for light gathering ability only and not for uniformity or achromatism? Think of the usual optical system found in most microscope illuminators: either a single aspheric or a two or three element group with short focal length and thereby steep curves, generating aberrations not compensated for by other elements.

Problem 2:

Most modern microscopes are not equipped for the establishment or proper control of oblique illumination. They do not allow the microscopist to optimize the illumination to suit the specimen (or to play around).

Solution:

Ideally the condenser should receive, from the source, a uniform beam without appreciable color. Because of the focal lengths of the lenses used and the ratio of the distances between them, there are two lens systems which are naturally achromatic: the Huygens eyepiece (and its Dolland variation) and the Ramsden eyepiece. I selected an old Leitz 5x stereomicroscope eyepiece. It has a field lens of the right diameter and is focusable. As uniform sources, lime light, gas mantles, carbon arcs and ribbon filament lamps are no longer common. The modern substitute is the fiber optic bundle. Many have attempted to use light conduits of various kinds, but it is necessary with any of these devices to use the appropriate lens group.

The microscope being used should permit the insertion of a plane mirror below the condenser or direction of the beam through the base of the instrument without the requirement of, or interference from, other lensetic elements. The fiber optic bundle is placed at or near what would normally be the eyepoint of the eyepiece. The beam exiting the field lens is brought to the bottom element of the condenser. The eyepiece can be canted to produce the desired degree of oblique illumination, focused for best uniformity and slipped along the axis of illumination to allow for differences in fiber bundle, condenser, etc. At a certain point it is possible to focus the individual fibers in the plane of the specimen. It is obvious that the eyepiece or bundle should be positioned so as to just avoid this. If the field is not completely filled one may notice color fringes at the edge, but this will fall outside the photographic area.

Those who have experimented with light sources will recognize this as a method for obtaining critical illumination. Using the achromatic condenser as though it were a microscope objective, we have, in fact, a microscope used in reverse to relay the image of the light source onto the specimen plane. Fig 1.

The benefit of using a fiber optic bundle is that the number of effective sources is very high. A 1/4" to 3/8" diameter bundle is as large as or larger than most lamp filaments and much more uniform. It is possible to select a bundle whose numerical aperture matches closely enough the acceptance angle of the eyepiece at the eye lens. Most off-the-shelf bundles will do quite nicely.

Since a Huygens eyepiece will accept a reticle for measurement when used in the normal fashion, it can also be used to allow projection of a reticle onto the specimen plane. For this procedure, the reticle must be free of all observable particulates.

Those who do not have access to an achromatic condenser can, of course, use an objective. One must remember that because of limitations in working distance at higher powers, it becomes necessary to mount the specimen not between slide and cover glass, but between two cover glasses. Due to the sensitivity of the preparation this method would not be desireable in a clinical lab setting.

Some math:

If an old Leitz stereo microscope ocular is not at hand, a substitute is easy to construct. Both lenses are plano-convex. Both convex surfaces face the condenser. The true Dolland formula is 3, 2, 1. This expresses in arbitrary units the field lens focal length, the distance between the lenses and the eye lens focal length. The Huygens formula is 4, 3, 2. Or as expressed in the tutorial section of the Melles Griot catalogue, the distance between

the lenses is the sum of the focal lengths divided by two as shown in Fig 2. Considerations of field flatness have brought about slight variations in formulation. To be absolutely correct, one should take into account the thickness of the elements.

I leave it to the reader-experimenters to assure themselves of the benefits of this type of illumination, especially for low power photomicrography.

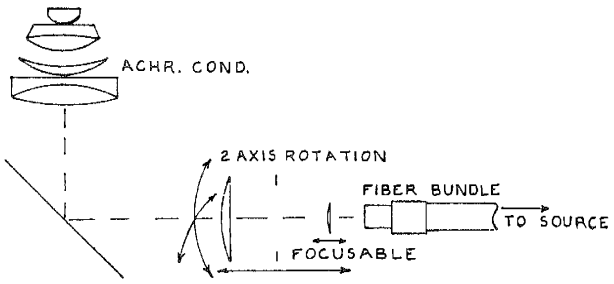

Fig 1. Reversed Microscope Illuminator

Bibliography:

1. Boutry, G.A. : Instrumental Optics, translated by R.Auerbach, Interscience Publishers Inc. 1962.
2. Hind and Randles: Handbook of Photomicrography, 1913.
3. Melles Griot Catalogue, 1995-96 .

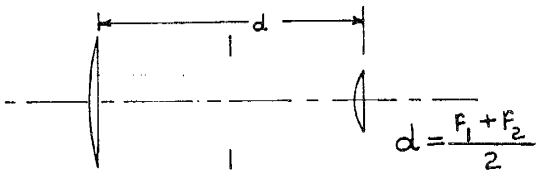

Fig 2. Eyepiece Lens Spacing

MICROSCOPISTS ARE NOTHING IF NOT PRACTICAL

N.H. Blitch

George Adams, Junior, may have started it all in 1787, when he subtitled his massive *Essays on the Microscope* as "containing a practical description of the Most Improved Microscopes." Subsequent authors in the field took it up with great enthusiasm:

Barnard, J. Edwin, *Practical Photomicrography,* 1911.
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Wright, Lewis, *The Microscope - A Practical Handbook,* 1922.

How many others are there?

MEMBER PROFILE

Leo Milan

Leo Milan with Wife Dori and Daughter Sharon

My family emigrated from France with one child before the turn of the century. As a former captain in the French Army, my father did not want to stay in France and fight the Germans.

Several years later, they had a successful dairy in Boudette, Minnesota and a family of five girls and one boy. A forest fire destroyed the town and their business. All people were forcefully evacuated. The only thing that was saved was a small herd of milk cows that the cattle dog, on his own, herded to the safety of the river. This half-wolf dog guarded them for several days until my father found them.

Apparently my mother had a nervous breakdown and she went back to France. She returned late in 1912 or early 1913 with her mother. As the time fits, I was the result of the welcome home. They then had a lumber claim in Ontario. My parents were getting tired of naming kids. My youngest sister was named Venice because our name, Milan, is also a city in Italy. So the kids were given the problem of naming me. There was a big Swedish lumberjack that they liked named Leo. Now there were two boys in the family.

When I was a baby in arms, my family moved to Arizona, where my father found work. He left Canada because the logs that he managed to sled down to the frozen lake did not thaw for three years. They did not reach the mill for payment. My parents separated and my mother left town when I was in the first grade. I did not see her again until I was 14 or 15.

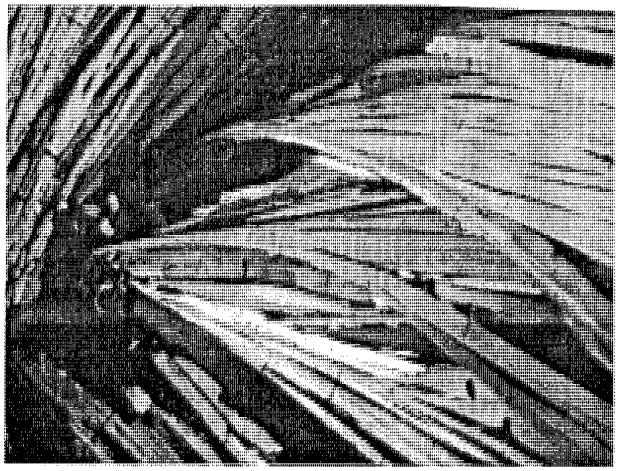
At an early age, I learned to sell papers. Even delivered my brother's paper route on horseback between my fourth and fifth grade vacation. This enabled him to work as a water boy at the mine. Of course, I had to bridle and saddle the mare by standing on a chair.

I was living with my brother and father, the sisters were in California. My brother was going to Denver for dental college. At age 12, I was sent to California to live with my oldest sister. We agreed that I would sell papers to earn part of my upkeep.

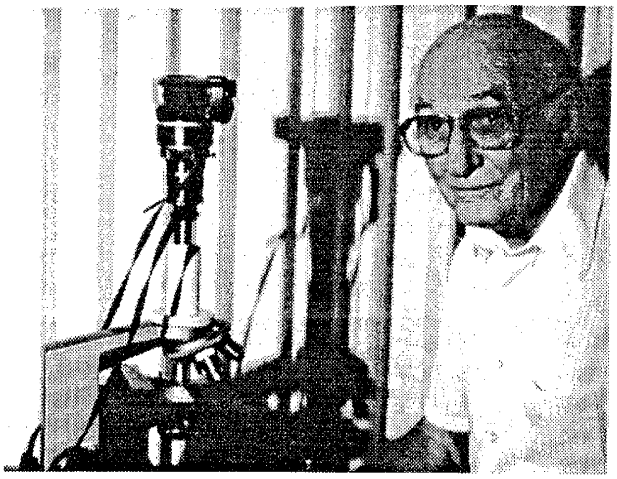
In a couple of months I had two paper routes. Other work followed such as counter jumper in drive-in restaurants, flunky in meat markets, plumbing helper, gas station attendant, waiter, chauffeur and janitor. The cheapest that I sold gasoline was 8 gallons for a dollar.

My brother early convinced me that I should go to college. I started saving very early. When I graduated from High School, my bank account was around $900. My college total costs were $1000 a year. I ended up borrowing $2000 from a brother-in-law, interest free. All this was subsequently paid, except for a final gift of $500. All these were in depression dollars.

Graduating from Caltech in 1936 with a BS in Applied Chemistry did not get immediate employment in this depression time. I thought there was work in Trona. I begged a ride in the Hollywood laundry truck that serviced this desert company. My first job was clean-up-man (janitor). On the first night, I was promoted to



Benzoic Acid - Photo by Leo Milan



Leo Milan at his Olympus Microscope

heater helper, since the former helper got drunk. Soon I became a Control Chemist.

After 10 months, I was employed as a Mud Engineer in the drilling department of Tidewater Associated Oil Company in Ventura. After 5 1/2 years, it became clear that there was little future there.

Next, I went to work in the Plant Engineering Department of Douglas Aircraft in Long Beach. Fortunately, my organizational capability was recognized, and I was promoted to General Foreman over my older foremen friends. We remained friends.

The real challenge came when I accepted an appointment in 1951 to become Chief Plant Engineer to activate a new Tulsa Plant. The Air Force wanted Douglas to build B-47s for the Korean Conflict. I spent millions of dollars in some construction contracts for foundations, buildings and a 10,000 foot runway. I also organized a complete maintenance staff and managed their operations. I was in Tulsa for 13 years until new management politics forced a move. I spent the rest of my career as a facility manager at Sacramento, Santa Monica and Huntington Beach plants. I retired after 33 1/2 years on the 18th of April in 1975, 200 years after Paul Revere's famous ride.

My interest in astronomy is very strong. It started when I saw the raw casting blank of the 200 inch telescope mirror being unloaded at Caltech to begin the grinding. I have been to Mount Wilson by the old Buss road several times. I have visited Mount Palomar and the 1000 foot reflective telescope in Puerto Rico. I have several pictures and tapes from JPL.

My wife and I have taken night courses and field trips with practicing geologists including those from Cal Tech.

My interest in Microscopy started when I saw a crystal program by William Sokol. I tried to make slides by macrophotography with little success. Finally I purchased an Olympic microscope. Next, I enrolled in a micro-biology course at Santa Monica City College to learn about my microscope. I joined the LAMS, now MSSC in 1982. I am not a microscope collector, but have matching Leitz objectives, an extensive collection of diatom slides that I obtained from the late John Cheslik, and diatom arrangements from Klaus Kemp.

I particularly enjoy photographing diatoms and crystal formations through the microscope with a Minolta MD-11 camera.

Interests

Gardening, Photography, TV -News, Football, Nature, Western Drama, Channel 28, Nature, Scientific, Columbo, Mash, Baseball, Murder She Wrote; Reading -LA Times, Time Magazine-since 1935, Microscopy, Science and Caltech Publications. Meetings- Microscopy, Fern Society, Begonia, Horticultural and Orchid. Travel - by car and aircraft, recent trip down the Yangtze; Fishing -for Edible fish in Baja such as; Wahoo, Bass, Yellow Tail and Dorado. Cinema - With little violence and profanity . Music -40's and 50's, classical, American, Light Jazz, Opera, Choir . Dining Out . Business -manage portfolio of stocks and bonds, have maintained a complete monthly record of expenditures by groups and income by source Health -now walk 20 to 25 blocks four to six days each week. Watch diet, limit one cup of coffee a day, low fat and low salt diet, very little alcohol . Like -To smell the roses, or watch a sunset. I enjoy my CD player which was recently acquired.

I have been retired for 21 years. My wife and I have been married for over 59 years. We knew each other several years before marriage, as we both went to North Hollywood High School. We have one daughter who is over 50. We lost our son when he was a young adult. We have no grandchildren.
I enjoy conversing in French, my first language.

THE AMAZING JESUIT, ATHANASIUM KIRCHER (1601 -1680) and THE VOYNICH MANUSCRIPT

by George G. Vitt, Jr. - 25 December 1996

In the Bulletin of the Microscopical Society of Southern California, Vol.1, No.4, p.65, our fellow member, Norman Blitch, describes the final address, as president, that Dr. Edwin Lankaster gave to the Microscopical Society of London in 1860, where he reviewed books of certain selected microscopists of the 17-18th century. Norm stated, "Dr. Lankaster could have mentioned other contemporaries, notable omissions being Athanasium Kircher, 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."

The name "Kircher" rang a resounding bell, and I knew that I had read of this man not too long ago - and in an area entirely disconnected from microscopy. What a coincidence! A little research brought some startling facts of this man's talents and interests. Microscopy seems to have been merely one of his many diverse interests. In those early years, men involved in the 'Natural Sciences' usually had broad interests and knowledge and are referred to as 'Renaissance Men'. The startling information I dug up on Jesuit Athanasium Kircher puts him near the top of this list and should be of biographical interest to our members. His life work sought to combine the totality of knowledge into a universal cosmology. If Leibnitz was the last man to know everything, Kircher may well have been the next-to-last!

Kircher was an acknowledged and celebrated German scholar and mathematician, and the most famous Jesuit scholar of the time. Being educated at the Jesuit college at Fulda, he became a professor of philosophy, mathematics and Oriental languages at Wurzburg. The 30 Years' War forced him to move to Avignon (Fr.) and then to Rome in 1635 where he taught mathematics for eight years in the Collegio Romano. Here he published a work on magnetism and an account of a calculating machine of his invention. He resigned his post to devote time to the study of hieroglyphics, orientology and archaeology, writing a number of works on these subjects. Kircher seemed not to lack a certain elan, for he had boasted that he had solved the riddle of the hieroglyphics. Despite the emptiness of these boasts, his writings were the first to call attention to the then mysterious Egyptian writings. Unfortunately, even though he was of wide learning, he was credited with lacking in critical discernment and judgement. Therefore, his voluminous writings on many subjects of pioneering work in natural philosophy, though of lasting historical interest, have been ranked as mere curiosities of literature.

He must also not only have possessed a very inquisitive mind, but also a most daring spirit. Wishing to investigate subterranean forces, he was lowered into the crater of Mt. Vesuvius, to do a bit of first hand investigation - a 'hands-on' study, if you will! This hazardous field trip won him great fame and, later, when he wrote on this subject, he was firmly established as *The Father of Volcanology*.

But he was also a Cryptologist who was deeply interested in the process of encipherment and multi-lingual codes. In 1663 in Rome, he published his *Polygraphia Nova et Universalis*. In this work, he compiled a Marconi-like code in 1,048 words for each of five languages - meant to serve as an international language. This was the first essay of its kind on this subject.

Perhaps the most intriguing part of his career was his involvement with what had become known as "the most mysterious manuscript in the world", the famous *Voynich Manuscript*, that remains unsolved to this day! It is unique in that it is the most extensive, the best known, the most tantalizing, the most heavily attacked, and the most expensive historical cryptogram. Worldwide attention was attracted to it when, in 1962, Hans P. Kraus, a New York rare book dealer asked $160,000 for the book that no one could read! Figure 1 shows a page from this 6"x9", 204 page volume with missing covers. (Ref.1) Kahn states, "At first glance, the text that is the heart of the mystery appears to be no problem at all. It does not look cryptic. It looks like ordinary late-medieval handwriting". It was first bought for 600 ducats by the Holy Roman Emperor, Rudolph II (who had built the observatories for Tycho Brahe and Johannes Kepler). The document first gained notoriety when, in 1666, the rector of the Univ. of Prague sent the document to his former teacher Kircher, hoping that he could decipher it - to no avail! It was thought that the mysterious author might be Roger Bacon (c.1214-1294), the English Franciscan friar. It was Bacon who had speculated on the possibility of microscopes, telescopes, motorboats, horseless carriages and flying machines - centuries before their time!

Kircher later deposited the manuscript in the Jesuit Collegium Romanum, and in 1912, Wilfred Voynich, the rare book dealer, purchased it for an undisclosed sum from the Jesuit school of Mondragone in Frascati, Italy. He circulated photostats to all of the world's best cryptologists, astronomers, linguists, and various governmental cryptoanalysts. One popular conclusion named Bacon as the greatest scientific discoverer of all time. Later analyses invalidated all these attempts at analysis and, in 1931, it was stated, ".. these results threaten to falsify, to no unimportant degree, the history of human thought". An analysis in the 1940s concludes that it was written in an artificial language. Can it be a gigantic hoax, like the Cardiff Giant or the Piltdown Man or the fossils of Prof. Beringer? Nobody involved in it seems to think so. Meanwhile, the book lies quietly inside its slipcase in Kraus's vault, possibly a time bomb in the history of science, awaiting the man who can interpret what is still the most mysterious manuscript in the world. And Kircher, the microscopist, was the first to take a stab at it.

References: This information was distilled from the following:

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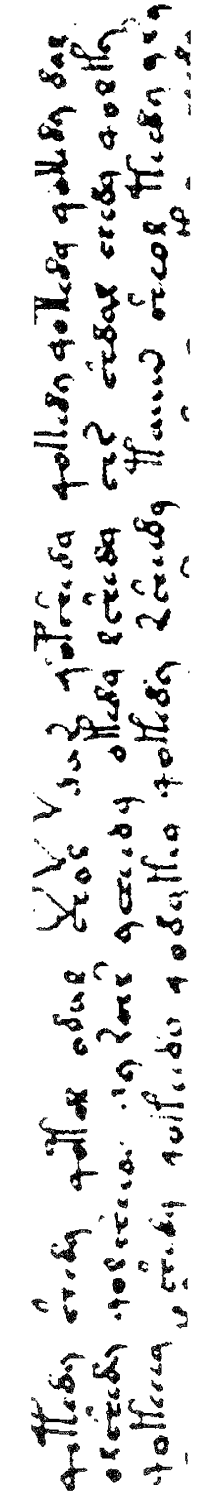
2. *Enc. Britannica*, 11th Edition, Vol. 15, p. 827a.

Voynich Manuscript



Voynich Manuscript: Lines 1 - 3 of this page -Magnified and Rotated

WORKSHOP of the Microscopical Society of Southern California

by: **George G. Vitt, Jr.**
Date: **Saturday, 4 January 1997**
Location: Steve Craig's Lab, 24 persons attended.

1. **Steve Craig** sadly announced the passing of long-time MSSC member, Hugh S. (Stan) Baird, on 27 December 1996, after a 5th stroke and a heart attack. He is survived by son, daughter and wife, Antoinette. Everyone liked and respected Stan, not only for his person, but also for his many inventive accomplishments in photography, stereoscopy, and microscopy. R.I.P. Steve then announced that it had been discovered that one of the parts for the SEM, that MSSC had donated to Crossroads School, was defective and has to be replaced. He also said that he needed volunteers who, after the Workshop, could complete the cleanup job with acetone several remaining uncleaned parts for said SEM. Steve and the rest of us wish to thank **Ron Morris** and **Izzy Lieberman** for volunteering their time for this job, and showing up to do it!

2. **George Vitt** reminisced briefly about some of Stan Baird's hospitality and accomplishments. He also announced the safe arrival of Katherine's family and that she is working as a research biochemist at a private University in San Francisco. George announced that **Jim Clark** will give an interesting demonstration of some of the precision **miniature** machine tools which he represents.

3. **Richard Jefts** told about how he got interested in microscopy (when yet a wee lad) by reading various books and *Popular Science* magazines, featuring The Home Chemist and Home Microscopist . He showed a copy of a *Popular Science* article, Dec.1934, by Philip O. Gravelle of So. Orange, NJ (Izzy, please note), who was the first to conceive the comparison microscope now widely used in forensic science.

4. **Pete Teti** solicited the submission of ideas for future workshops, and passed around a pad for this purpose. He proposed that we invite to our meetings some selected students from the Crossroads School - which met with universal approval. **Steve Craig** said that we have excellent relations with the school.

5. **Dave Hirsch** announced, with some jollity, and an understandable sense of relief,"..the last check has been cashed!" and that we now have 76 members (exclusive of other Societies and courtesy mailings). Dave displayed an excellent, cased, foldable, c.1880 R&J Beck stereo microscope with Wenham prism. It comes with camera lucida, rotating and x-y (Tully) stage, substage diaphragms and plane/concave mirror, Rack & Pinion coarse focus, fine focus by screw in arm, paraboloid DF Wenham type condenser, Lieberkuhn, 2 sets of objectives, calcite prism polarizer & analyzer, and a non-original bull's eye condenser. He got the microscope from Trevor Philips of German St., London (who used to be in Brighton). The microscope design is uniquely distinguished by the method used to incline the body tubes to any one of 6 preset positions, starting at vertical. The front foot is rigid relative to the body tube and the rear foot is hinged to the front foot about 4" above the base plate. The rear foot is also hinged to the rear of the base plate. Thus, the two feet and the base plate form an adjustable triangular structure which can be locked in any one of 6 positions by a pin projecting from the bottom of the front foot, which can then be inserted into one of 6 mating holes in the base plate. A very clever design.

6. **Norman Blitch** displayed two very interesting miniature (2.5-3" high) cased microscopes, c.1810, unsigned. One is a brass drum microscope, in excellent condition, which mounts in a dovetail cut into the mahogany cover of its case, the design going back to Benjamin Martin. The other is a finely constructed brass Compass type microscope, in pristine condition, c.1790, with folding lens arm and compass holder on a square brass horizontal arm, with a handle underneath this arm. There was a discussion as to why a compass microscope would be any better (or worse) that simply a magnifier held on ones hand and the specimen in the other! The consensus was that you could pass the compass microscope around from one person to another, all pre-focused and with the specimen immobilized - which should clinch the argument.

7. **Ken Gregory** displayed the fine large 2-vol. set of the English translation of *Histology of the Nervous System*, by Santiago Ramon y Kajal, translated by Neely Swanson & Larry W. Swanson, Oxford Univ.Press, New York, 1995. Ken had discovered (and researched) a newly acquired microscope of precisely the type used by this gentleman in his research on the nervous system, for which he won the Nobel Prize. It seems that, in 1885, he went to Zaragosa, Spain where the council presented him with a fine Zeiss microscope (1886) with the rare NA=1.18 immersion objective. Ken showed a published color illustration showing him using this very microscope in Zaragosa, Spain. A photo shows 3 microscopes, of which the one in the foreground is the same as was used in Zaragosa. Ken had scaled the various dimensions of the microscope

in the photo with a mm. scale and determined that the proportions matched, in every respect, to the one that he had found and brought to the workshop! How's that for research? Could it possibly be the very same microscope?!

8. **Stuart Warter** displayed a recently acquired brass microscope by Leopold Schrauer of New York, who had advertised his instruments during 1877-1882, stating that the greatest number of microscope makers in the USA operated during 1870-1880. It is a tall, very heavy monocular microscope with a 2 objective turret with Hartnack (a German working in France) lenses, coarse & fine focus, and tensioning screws meant to take up any slack due to wear - a quality feature. Now, here is the amazing part: The Davon Micro-Telescope that Stuart has had for some time (and which had been up by yours truly in a past bulletin as a *Tech Note*), fits the substage of this microscope precisely, giving an approximately 1 meter working distance - the microscope being tilted to horizontal for the purpose. The Davon bears the Pat.No. 13251/12, which indicates that it is a 1912 patent. The Davon can also be used as a hand-held telescope by attaching to the light-baffled triplet objective tube an "eyepiece microscope", which is a standard type of compound microscope with adjustable tube length. The unit had been made by Davidson, London West. Stuart also brought three very nice planimeters for the only MSSC planimeter collector that I know of, for which the latter gives sincere thanks!

9. **Ed Jones** reported that the comparison microscope was developed in 1880 for comparing mineral specimens, signatures, etc. and in 1925 started being used in Forensic Science for comparison of microstriations in bullets. Ed brought to show many books on cancer diagnosis (1962-1976), and a book for sale *The Shroud of Turin*. Ed then gave a history of said shroud and the part that Walter McCrone played in its investigation using tape lifts for pollen analysis and carbon dating. The tape lifts indicated pollen from the Middle East. Unfortunately, his samples have gone astray.

10 **Leo Milan** showed several periodicals: McDonnell-Douglas bi-weekly status bulletin; Science Times article on the speed of the Earth's rotation on its axis, around the sun, and through the solar system; Caltech's Engineering & Science article on Pythagoras' classification of numbers (primes). It may interest you to know that Leo said Caltech states that the largest prime number is [(2 to the power 10 to the 6th) - 1]. Leo announced that he has a VHS tape on *Bush Pilots of Alaska*. (I guess one may need a bush pilot to search for microscopes in Alaska!).

11. **Izzy Lieberman** displayed the 1856, 5th Edition of Sir Humphrey Davie's *Elements of Agricultural Chemistry*, which is a series of lectures he gave from 1802-1812. It contains drawings of plant stems and investigation results of studies which ask the question, "Why do plants grow upwards against the force of gravity?" An interesting experiment is illustrated therein showing plants being grown on the rim of a constantly rotating wheel, turning on a vertical axis, the centrifugal force giving a "g-force" radially. The plants grew in the direction predicted! There followed a discussion on the piezoelectric properties of plant tissue, human and animal bone, whalebone, and the early research done in this field in Russia. Piezoelectricity is undoubtedly the "sensor/transducer" which determines growth direction, and the development and strength of bone structure, etc. It pays to exercise that piezoelectric coupling coefficient!

12. **Frank Barta** added to the Pythagoras discussion relating to irrational numbers. Even though the number "PI" has been calculated to astronomic accuracy, it seems that certain educators have seriously suggested that "PI" should be made equal to 3, to make calculations easier! Math Ebonics? (As my late buddy, the Radar designer Fred Williams, used to say, "The answer to any physical math problem is "3", you simply have to define your units." Could this possibly mean that the speed of light is "3", the weight of any diatom is "3", and the index of refraction of any substance is "3"?! It gets a little complicated.) Frank then discussed the sputum test (sputum psychology) for lung pre-cancer determination and stated that only in New York hospitals (as I recall) are there analytical lab facilities to perform this highly reliable test. There is no such facility in L.A.!

13. **Larry Albright** announced that the next meeting will feature a talk and demonstration on the construction of a Leeuwenhoek microscope Those interested in getting the kit to make one can order same through Larry for $50. Larry displayed a fine c.1870+ Zentmayer microscope that he is in the process of refinishing. He showed a German radioactive slide using ZnS as the visual indicator of radioactivity. He described replica slides of this type that he had made, using butyl rubber separators and a spaced ZnS cover glass - using an eyepiece for observation. There followed a discussion on Spinthariscopes, Johnson Smith Co., radium bone cancer deaths of clock radium dial painters of the 1920s, etc.

14. **John de Haas** showed a rare and fine Zeiss binocular microscope Model LUG, c.late 1930s, which is very rare in the USA. It has a rotatable stage, attachable pancratic condenser substage light source (to achieve the same N.A. in both condenser and objective), triple EPI-W turret condensers for incident light with dark or bright field capability - using glass elements to direct the light for Epi, quick interchangeability of all above and below-stage assemblies, focus by rackable stage, all APO transmitted

light objectives, and binocular head. For that period, this is a very advanced research microscope with wide capability.

15. **Gaylord Moss** was the originator of the "PI"=3 statement. He showed a *Bio Photonics* freebie magazine, described the fabrication method of diamond coated Silicon microprobes with tip radii of less than 5 nanometers, which are used, for example, in force field microscopes and in an array configuration, for implanting in the cerebral cortex as a transducer of images generated by a TV camera. This is a test bed for artificial vision research and as a possible prosthetic device for the blind. Quite a research project. Another one of Gaylord's fascinating topics on "the wondrous structures in nature", was the manner in which a microscopic millipede of a certain species protects himself (or herself) from attacking ants, incapacitating and then causing their demise without having to raise a single foot! It seems that the creature grows on its surface microscopic "flake-off spines" which act as grappling hooks which tangle the ants means of movement! When they run out of spines, they grow new ones! When one of these micro-millipedes is dropped in an ant colony, the ants immediately back off! How long did it take the ants to learn this? Gaylord then showed some excellent bindings from Kinko's for our Bulletin, with mylar cover, card back and plastic U-strip binding or spiral binding.

16. **Jerry Bernstein** offered the use of his diverse stock of microscopes and equipment to any MSSC member who wishes to do certain work, but might not have the equipment. Jerry has graciously made this offer several times before, for which he has our thanks.

17. **Allen de Haas** described his experience in an unanticipated discovery he made while using fluorescence microscopy to study kidney sections by transmitted light. He could get no image contrast because of some type of flare! He was amazed to find that the slide glass itself fluoresced like a house on fire! Buyer beware.

18. **Ron Morris** brought a special box of 12 microslides that he had prepared, showing the progress of development and history of electronic microchip circuits. These include op-amps, LEDs, RAM, etc. His exceptionally fine and labor-intensive work displayed entire packages which he had dissected to show the circuits themselves and all the interconnections, capacitors, inductances, etc. These can be viewed by incident light metallographic microscopes, or, for that matter, any stereo microscope with incident illumination. His first such box for the PMS made a great impression and was a hit with all our English brethren, and they have put it in writing! They are a "must" for all microscopists and can be had from Ron for the very nominal sum of $25 for 12 slides! I have already put in for some, have you?

19. **Larry McDavid**, engineer and collector of scientific instruments, hails from Anaheim and was invited by **Larry Albright.** He is a very interesting and interested guest, (and a well-spoken nice guy!) who has this day joined the MSSC. WELCOME ABOARD! He delivered one of the most fascinating, well documented, thought-provoking and in-depth reports on the engineering and investigative work he has done on the "collision sensor design and defect detection aspects of automobile air-bag systems". He covered the dynamics of car crashes and the timing requirements of air-bag deployment, "fail-safe", and "false alarm" considerations as they affect sensor design, etc. Since 10 microinch dimensional tolerances are required to meet the viscous damping and operational requirements of the mechanical system of the crash sensor, the detection of intolerable burrs and imperfections in the finished parts posed a very difficult problem. In a recent litigation, in which he provided the evidence and was an expert witness, the only instrument that would allow him to make these determinations was an SEM, working at low power to give the great depth-of-field he needed! His superb SEM imagery enlargements spoke for themselves. There followed an animated discussion on such subjects as the detonation effects of azide compounds, and adverse effects on the human ear of air pressure step function increases in a closed car (with rise times of about 100 milliseconds), the pros and cons of air bags and their lethal properties.

20. **Daniel Cytron**, our computer guru friend, Typhoon restaurant lunch buddy, and swap meet regular, introduced himself. After the Workshop, he joined a bunch of us for lunch and conversation at Coco's. I hope Daniel joins our happy group at MSSC.

Again we thank **Steve Craig,** our Workshop Chairman, and his wife **Millie** for their hospitality and tasty goodies served during the Workshop.

THE RECUMBENT MICROSCOPIST

Sir David Brewster (1781 - 1868) set down in his "Optics" a series of rules for microscopic observations. Rule 3 was as follows:

"The best position for microscopical observations is when the observer is lying horizontally on his back. This arises from the perfect stability of his head, and from the equality of the lubricating film of fluid which covers the cornea. The worst of all positions is that in which we look downwards vertically."

NHB

HUGH STANLEY BAIRD
(Stan)
1913 - 26 December 1996
In Memoriam

Born in Michigan in 1913. Stan was a child when his family moved to the San Fernando Valley of Southern California.The natural beauty of the land inspired him to take up the hobby of photography, although he was an aircraft and aerospace engineer by profession. He and his wife Antoinette and two children Richard and Randy have lived in the west San Fernando Valley for about 30 years.

As an engineer, he worked in the aircraft and aerospace industries for over 40 years. He designed some high precision optical - mechanical instruments for military and industrial work. He became an expert photographer which led him to designing and building unique photographic equipment for micro and macro stereo photography. He is a rare combination of artist, equipment designer, and equipment builder. He was always intrigued by the extent of detail the camera sees that the human eye cannot perceive. These qualities made him uniquely qualified to understand the problems of stereo photographic art and to solve these problems with his own designs.

Stan was an active member of the Microscopical Society of Southern California from its earliest beginnings in the 1940s when the meetings were held in the basement of the Natural History Museum in Downtown Los Angeles. Everyone liked and respected Stan, not only for his person and the expert assistance he gave generously to his fellow members but also for his many inventive accomplishments in photography, stereoscopy, and microscopy and his many contributions to the Society. For instance, from simple dimensioned sketches furnished him by a friend, he precisely machined adapters for a 45° prismatic eyepiece for the rather tall Spencer/A-O Polarizing microscope, as well as other needed accessories. All were of the highest professional quality, done in anodized aluminum.

In his 'spare time' Stan privately designed, and manufactured commercially, equipment for the stereo photographer and macro/micro photographer. His products are noted for their excellent utility, kinematic design, ease of use, and ruggedness. They ranged the gamut from quick-detachable camera tripod heads, to slide bars, to stereo macro-positioners, to a finely adjustable rack for stereo projection using dual Ektagraphic projectors.

Those of us who have seen his photographic work may well recall some of his fabulous images. There are two examples that are memorable: a photo of the Los Angeles civic center, shot at twilight from hilltop some miles away using a 200 mm lens and 20 foot inter-ocular separation, using one camera: and a stereo photomicrograph of a superbly mounted proboscis of a blow fly!

Stan used the techniques of macrophotography, which is the taking of larger-than-life photographs with ordinary camera lenses, and photomicrography, which is the taking of photographs through the a microscope lens. The full glory of the colors is captured on Cibachrome A a positive color printing process' which produces rich, brilliant color in a glossy finish similar to black plexiglass. The picture then seems to pop out almost three dimensionally. He has exhibited his beautiful prints of nature subjects and presented many stereo shows to many organizations.

The colors and designs created by nature fascinated him and thus, in 1959, Stan became interested in the fields of mineralogy and paleontology. In order to bring out the minute detail of small mineral and fossil specimens, he photographed them through the microscope. With his eye of an artist and the lens of his camera he created masterpieces of vivid beauty. He compiled a series of stereo slides which He and a mineralogist from Australia. used to illustrate lectures given to mineralogy classes, clubs and microscopical societies throughout Southern California, an area where his work was frequently exhibited.

He was also a regular guest lecturer in mineralogy courses at the California Institute of Technology (CALTECH). His stereo photographic work in this field had such an impact that he was awarded an Honorary degree for the Advancement of Mineralogy.

Some years ago, while visiting botanical gardens, Stan became interested in using these same photographic techniques to capture the intricate detail of flowers This led to a series of Photoflorals of striking beauty.

Then he turned his artistic eye and his camera on the chemical world While photographing chemical slides for a friend who was a chemical engineer. he was struck by the colors of the chemicals. A series of *Lens Paintings* created by photographing combinations of chemicals, was the result of this new interest

His work is a stunning example of the use of photography as a means of artistic expression. It is also a celebration of the infinite wonders of the universe and a reminder that we are surrounded by beauty if only we take the time to look.

AN INTERESTING HISTORICAL REFERENCE DESCRIBING THE USE OF PIGEONS TO CARRY MICROSCOPIC MESSAGES DURING THE 1870-71 SIEGE OF PARIS

from the archives of Stuart L. Warter

THE PROGRESS

OF

INVENTION

IN THE

NINETEENTH CENTURY

BY

EDWARD W. BYRN, A.M.

"Δός που στῶ, καὶ τὴν γῆν κινήσω."

(Give me where to stand, and I'll move the earth.)

—*Archimedes.*

MUNN & CO., PUBLISHERS

SCIENTIFIC AMERICAN OFFICE

361 BROADWAY, NEW YORK

1900

The Microscope.—Just as the telescope reveals the infinity of the great world above and around us, so does the microscope reveal the infinity of the little world around, about, and within us. Its origin, like the telescope, is hidden in the dim distance of the past, but it is believed to antedate the telescope. Probably the dewdrop on a leaf constituted the first microscope. The magnifying power of glass balls was known to the Chinese, Japanese, Assyrians and Egyptians, and a lens made of rock crystal was found among the ruins of Nineveh. The microscope is either single or compound. In the single the object is viewed directly. In the compound two or more lenses are so arranged that the image formed by one is magnified by the others, and viewed as if it were the object itself. The single microscope cannot be claimed by any inventor. The double or compound microscope was invented by Farncelli in 1624, and it was in that century that the first important applications were made for scientific investigation. Most of the investigations were made, however, by the single microscope, and the names of Borelli, Malpighi, Lieberkuhn, Hooke, Leeuwenhoek, Swammerden, Lyonnet, Hewson and Ellis were conspicuous as the fathers of microscopy. For more than two hundred and fifty years the microscope has lent its magnifying aid to the eye, and step by step it has been gradually improved. Joseph J. Lister's aplanatic foci and compound objective, in 1829, was a notable improvement in the first part of the century, and this has been followed up by contributions from various inventors, until the modern compound microscope, Fig. 197, is a triumph of the optician's art, and an instrument of wonderful accuracy and power. Its greatest work belongs to the Nineteenth Century.

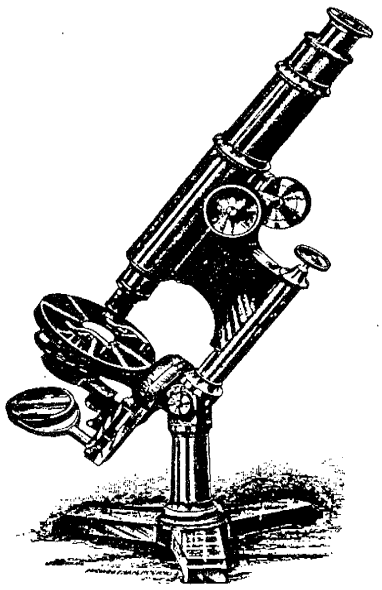


FIG. 197.—MODERN MICROSCOPE.

Multiplying the dimensions of the smallest cells to more than a thousand times their size, it has brought into range of vision an unseen world, developed new sciences, and added immensely to the stores of human knowledge. To the biologist and botanist it has yielded its revelations in cell structure and growth; to the physician its diagnosis in urinary and blood examinations; in histology and morbid secretions it is invaluable; in geology its contribution to the knowledge of the physical history of the world is of equal importance; while in the study of bacteriology and disease germs it has so revolutionized our conception of the laws of health and sanitation, and the conditions of life and death, and is so intimately related to our well being, as to mark probably the greatest era of progress and useful extension of knowledge the world has ever known. In the useful arts, also, it figures in almost every department; the jeweler, the engraver, the miner, the agriculturalist, the chemical manufacturer, and the food inspector, all make use of its magnifying powers.

To the microscope the art of photography has lent its valuable aid, so that all the revelations of the microscope are susceptible of preservation in permanent records, as photomicrographs. A curious, but very practical, use of the microscope was made in the establishment of the pigeon-post during the siege of Paris in 1870-71. Shut in from the outside world, the resourceful Frenchmen photographed the news of the day to such microscopic dimensions that a single pigeon could carry 50,000 messages, which weighed less than a gramme. These messages were placed on delicate films, rolled up, and packed in quills. The pigeons were sent out in balloons, and flying back to Paris from the outer world, carried these messages back and forth, and the messages, when reaching their destination, were enlarged to legible dimensions and interpreted by the microscope. It is said that two and a half million messages were in this way transmitted.

DIAMOND PASTES for knife sharpening

by Ernie Ives - Postal Microscopical Society - England

Since my series on cutting wood sections I have changed the materials used for sharpening the knife. The metal polishes, "Brasso" and "Silvo" have been replaced by diamond pastes.

It all started with a series of exchange letters with fellow microscopists concerning sharpening my microtome knife after reading Jeremy Sanderson's useful book "Biological Techniques".". Just before Christmas 1994 I contacted him about automatic sharpening machines and diamond pastes. Automatic sharpening machines seem out of the question on account of their size and cost. Jeremy's reply led me to other members and in all cases I received a great deal of advice and information - it all goes to show what a helpful Society we belong to.

The saga actually started some years ago after I had written to Engis Ltd concerning their range of diamond pastes. I knew they supplied them particularly for the die polishing industry they make polishing machines for. They put me on to their local rep who could not have been more unhelpful. He told me point blank that glass plates were no use with diamond pastes, I needed "Kemmet" plates, and said I should send my knives to Huntingdon for sharpening. Not exactly convenient when they need sharpening at least once for every batch of sections. I left it at that, and after some experimentation used the two metal polishes.

In his book, Jeremy does indicate that glass plates can be used with diamond pastes and aerosols. He did say they were extremely expensive. I mentioned this in a letter to another microscopist who put me on to Colin Kirk who cuts wax embedded botanical sections.

I wrote to Colin and he was most helpful and he sent me the remainder of a couple of tubes of 6 and 1 micron diamond paste to experiment with and a price list which indicated each tube would cost about £10 each plus VAT etc. but there was a minimum order which would mean ordering at least three tubes. At my present rate of use, full tubes will last me the rest of my life! Finding out how to use the pastes was the start of another saga!

Colin seemed to have got hold of a better contact with Engis. His rep suggested wood as the surface on which to apply the paste but wood only allows the knife to be dragged back first with a stropping action. I was able to have a little go at using the pastes. Stropping is quite a different technique to using a glass plate but one that I use sometimes with a leather strop. Anyway to start at the beginning. I thought about the question of what wood to use and thought why not use an artificial board material - MDF. I have a considerable quantity of offcuts of this material in pieces about 6" x l 1" x 15 mm thick. One side is already faced with a melamine impregnated paper. It is used in the manufacture of lower end of the market furniture by a local firm. It is homogeneous; has no pores; has a relatively smooth surface; doesn't readily warp etc. I thought it should be ideal. I made up three boards about 15" long x 5.5" wide with a batten underneath to hold it in the vise. I sanded the top surface with 400 grit paper.

Normally I use a mixture of two stroke oil, a little lubricating oil and white spirits for lubricating the blade when sharpening with metal polishes. It is also the mixture I use on my oil stones for sharpening chisels etc. I liberally brushed this on one of the boards and rubbed in some 6 micron paste. ' didn't have a clue on how much to use, so I just dotted some at intervals over the surface and used my finger to spread it. I no doubt now have diamond impregnated fingers! Presumably, once the board is impregnated, little extra paste is needed each time. I kept the surface of the board damp with more of the white spirit mixture while using it but the MDF rapidly absorbs the moisture.

I keep two bevels on each side of the knife; a primary bevel which I called the "Silvo" bevel and a secondary one, the "Brasso" bevel in the previous articles. In a book loaned to me on microtomy when I first started to try and cut sections, the author said that the primary (cutting) bevel should be kept as small as possible and that one could have as many secondary bevels as necessary. Over a period of time the primary bevel on my knife had almost become the only bevel - one of the reasons it seemed to take so long to sharpen.

To create the two bevels I made two 'backs' for the knife. One about 22 mm diam. and another collar which fitted centrally over the first back. Using just the first back I started to work on the secondary bevel with the 6 micron paste and in a relatively short time I had taken this to the cutting edge. Under the stereo microscope it looked very good indeed. Great!

When I fitted the central collar and tried the same thing with the I micron paste on another board, I ran into problems. Because of the dragging, sliding motion of the blade it tended to rock on the central collar. Out into the garage. There I found a piece of an old bicycle frame tube which had the right internal and external diameters. This was cut to length, split down on my milling machine with two cuts to get the slot to more or less the correct

width (had some problems as the tube wanted to spring open after the first cut was made). Anyway I made a full length back that fitted over the first one and cleaned it all up bright and shiny

Full of high hopes, I went back to the 1 micron strop and worked on it for a short while, but the edge it produced was quite rough. By then it was time for tea. Examination showed the scratches produced by this strop were at least as coarse as the 6 micron one with a few deeper ones interspersed. Not good. Thinking about it overnight, brought the realisation that maybe the MDF has abrasive particles (well I know that it is a rather abrasive material because it plays havoc with the sharpness of a plane blade) and maybe there were also particles from the new back that I had made although I did wash it well after completing the machining and cleaning. Perhaps I shouldn't have sanded the board? Sanding may have left particles of the grit in the surface

Colin K used 'mahogany' for his boards but I thought the closer grain of beech might he better, but first I tried veneering one of the MDF boards with beech veneer. The results with 1 micron paste were not too bad but they were not as good as I expected. So I spread a little of the paste on the glass plate I used for "Silvo" and the results were far superior. So who says you can't use glass plates Probably though, by having been used for "Silvo" for a considerable time, the surface of the plate was somewhat matt and this held the paste in place. Following on the success of this I tried the 6 micron paste on the "Brasso" plate to hone the secondary bevel, again with excellent results.

Very little diamond paste is used, in fact, after eight months I am still using up the remains in Colin's tubes. My glass plates are about 12" x 8" and each time I put a 6 to 8 mm length of paste as it comes from the syringe in which it is supplied, on to the plate and rub it over the surface adding a few drops of the oil lubricant mentioned above. I use far less oil with the diamond paste (as recommended by Colin K) than I did with the metal polishes. The sections I have cut to date (quite a lot), using the diamond sharpened knife are every bit as good as those I cut previously and the sharpening time is much reduced.

That's the story so far. What next? Should I try finer diamond pastes? 0.5 and 0.25 micron are available. Will let you if anything further develops and if you have any further suggestions please let me know.

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TEA CRYSTALS

The preparation of a slide of caffeine from tea - by Derek Hellier

Caffeine (1:3:7 trimethylxanthine). molecular formula $C_8H_{10}O_2N_4$ m.p. 235 - 237^0 · Occurs in tea, coffee etc. [1]

C.A. Ealand [2] gives a method of assessing the quality of tea by gently heating it on a watchglass covered by another inverted watchglass and noting the amount of theine (an earlier name for caffeine) deposited on the inverted watchglass.A tea of poor quality had little or no theine deposited.

The following method was adopted to prepare a permanent slide of the crystals for viewing under the microscope, especially with polarised light and dark background.

Method - The contents of a tea bag were transferred to a 5 cm glass petri dish supported on a thin aluminium sheet above a spirit lamp. A slide with a thin aluminium ring fixed to it with Dryseal aluminium adhesive was rested on the top of the dish, with the aluminium ring facing downwards, above the tea.

Heating was commenced and continued for 10- 15 minutes after all the water had been driven off. (The heating time will be dependant upon the set-up used).The slide was examiined under the microscope to check that the crystals of caffeine had been deposited in sufficient quantity.Then the slide and top surface of the rng were carefully cleaned to remove unwanted caffeine, with a tissue dampened with isopropanol and placed over silica gel for 24 hours to dry.The cover slip was attached using Dryseal sealing cement and Dryseal protective cement, essentially as the method given by NBS [3].

Examination of the slide under the microscope showed the caffeine as very slender needle shaped crystals that were most attractive in appearance under polarised light.A slide so prepared fourteen months ago has shown a slight yellowing of the crystals, but is still of very pleasing appearance.

1. Organic Chemistry Vol two -I.L. Finar p. 613-616.
2.The Romance of the Microscope - C.A. Ealand p. 143-144.
3. NBS Microscope Booklet Thirteen - Making Dry Mounts.

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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) Stereozoom 7 Microscope. On Model A-B Stand. (Reflected and Transmitted light). 10X Widefield eyepieces. Includes 2X & 0.5 X objectives. Bought new in 1995. $1500. Gary Legal, 1306 Sheppard Dr., Fullerton, CA 92831. (714) 870-0439.

Nikon M Inverted Microscope. The heaviest microscope made! Has 1 objective a 40x Phase with coverslip adjustment. Biological and Metalurgical configurations.Two Camara ports. Circular stage plus Biological box stage.Two long working distance phase condensers.Two interference phase attachments for eyepiece. Trinocular head. Phase Telescope, several more attachments...$1000.
Larry Albright: 310-399-0865, 310-471-0424
1704 Mandeville Lane, Los Angeles, CA 90049

Microelectronics Slide Set
Prepared by Ron Morris, Member, Microscopical Society of Southern California (MSSC)

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 that I made for the Postal Microscopical Society. I am offering these slide sets to MSSC members for $25 each. Please make checks to:
Ronald F. Morris
1561 Mesa Drive #25
Santa Ana Heights, CA 92707

A description of the contents of each set is listed below.

Transistor, Bipolar- this is the basic building block of all integrated circuits.This sample originally was in a hermetically-sealed can to protect it from moisture.This one is a NPN type, three terminals and two silicon junctions. Circa late 1960's.

Light-emitting diode (LED)- this is used as an indicator, glows red in color when a small voltage around 1.2 volts is applied. It only draws around 20 milliamperes of current. Future T.V. sets may have their picture tubes replaced by arrays of these led's.

Operational Amplifier- these are widely used in electronics, and were the basis for early analog-type

Continued on Page 20

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

Letters

Please refer to the editorial on page 74 of the December 1996 Bulletin. Klaus Kemp had observed that there were no younger members at the regular meeting of the MSSC in November.

The Royal Microscopical Society has initiated a nation wide campaign designated " A Microscope for Every School". A Chinese manufactured Microscope designed specially for students ages 6 to 12 is now being imported into Britain and the U.S.A. It is named the "MOTIC" and is of quality metal construction 10 inches high. It has an inclined monocular eyepiece tube with locked-in eyepiece, and provides an erect image with a magnification of 15x. Because of the erect image, there will not be any confusion in the minds of the young as to what is seen with the un-aided eye and the image seen through the microscope.

The Microscopy Society of America which is an affiliate of the American Institute of Physics has, through its Educational Outreach Program been busy organizing workshops at several locations throughout America. This all requires financial support from Microscopical Societies and other groups willing to help.

The Microscopy Society of America is endeavoring to locate an all metal construction monocular compound microscope of good optical performance which can be purchased at a modest price. This instrument would be used by students 13 and older.

The "MOTIC" can be purchased from the following:

Lakeshore Learning Materials
2695 East Dominguez Street
Carson, CA 90749

Carolina Biological Supply Co.
2700 York Road
Burlington, NC 27215

Surely there are members of MSSC who can spare the time to develop school affiliated groups who will lay the foundation to keep microscopy alive and growing as a science and a most rewarding hobby.

Herb Layfield Member MSSC

January Regular Meeting at Crossroads School
January 15, 1997 at 7:30 PM.

Al Shinn will demonstrate the construction of a Leeuwenhoek microscope including the formation of a glass lens.

Al Shinn makes his construction kits available to MSSC members for $50.

Ron Morris Micro-Chip Slide Set - Continued

computers before digital ones. Their high-gain (amplification) and low-noise and offset makes them very useful in RF circuits. The circuit contains two opamps made up of transistors and passive components such as resistors and capacitors. Circa 1975.

Read-Write Amplifier- this is a high gain (200X) amplifier that is used to amplify the tiny signal that comes from the read/write magnetic head in a computer hard disk drive. It has high bandwidth (up to 200 MHz), and low noise characteristics.

Hard Disk Drive IC- these are used in conjunction with the read/write amp described above. It takes the amplified signal and strips off the data stream and the servo streamsfor pulse processing, adaptive equalization (filtering), pulse qualification and detection, servo demodulation, and data separation. This one I.C. does the work of what it took 8I.C.'s to do just a few years ago. Circa 1991- 1995.

Microprocessor-Intel 8751- this is a 8-bit microprocessor that has wide use in industrial control applications such as robots, modems, process controllers, etc. It has an on-board mask-programmable memory area for custom programs, or it can be electrically erased and reused similar to an EPROM. It has approximately 30,000 transistors. Circa 1988.

Electrically programmable read-only memory (EPROM)- these are used to hold the instructions for a microprocessor. The contents of the memory cells can be erased by an UV lightsource, and the chip reprogrammed. That is the reason for the glass window in the center of the package. Circa 1979.

Teledyne relay- this is a miniaturized relay widely used in both aerospace and commercial applications. It is hermetically sealed in a "can" to protect against moisture and dust. It runs on 5 volts d.c.

Editor's Notes

Ron Morris's slide sets described above are an incredible bargain. He showed a set at the January workshop in which the work to section the microcircuits was obvious. Many thanks to Ron for making these available to members. They are a unique record of the development of the microcircuit.
Also thanks to those who are responding with written articles to continue making our bulletin possible.

Gaylord E. Moss