TSM

Texas Journal of Microscopy

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Number 2, 1999
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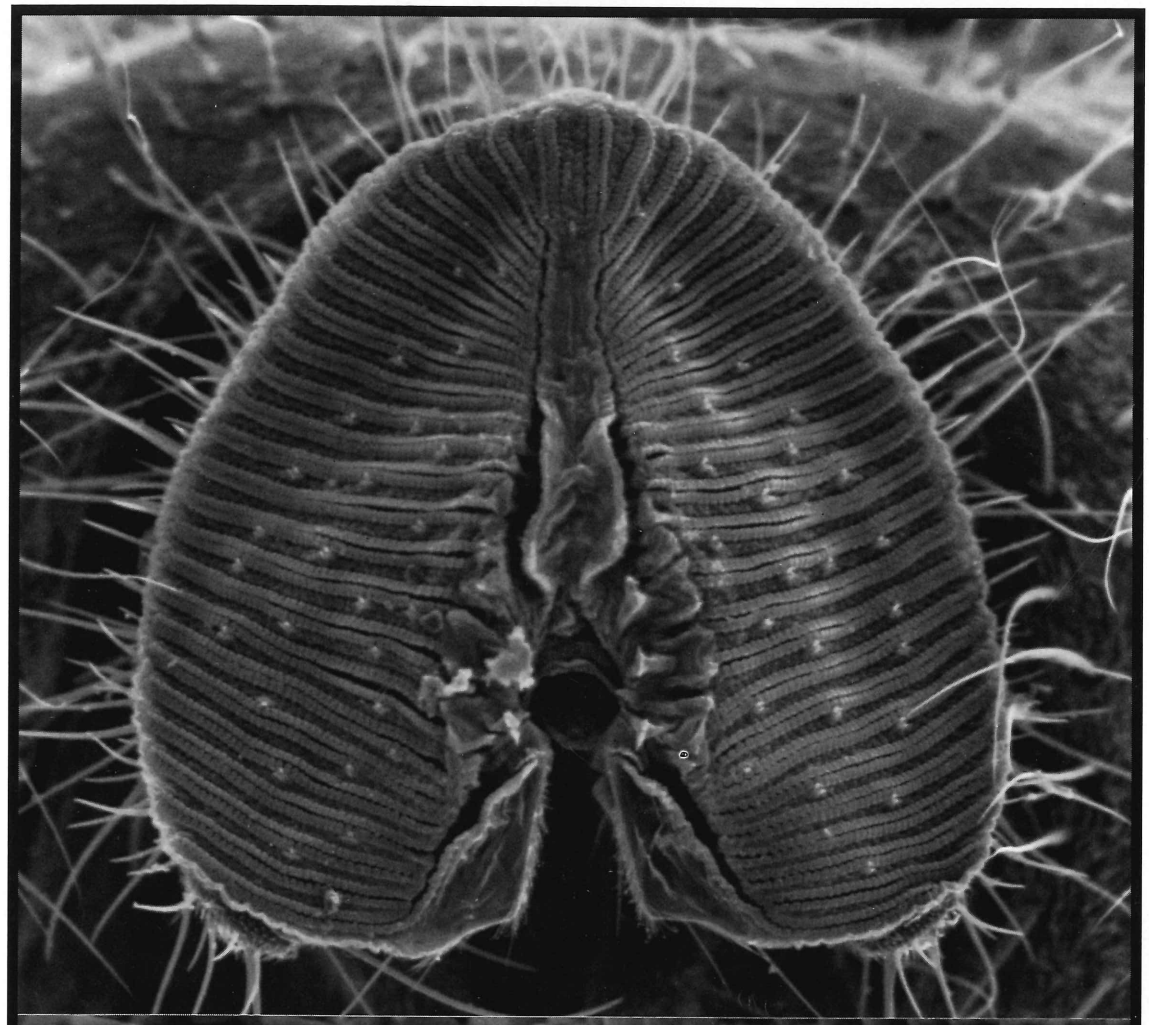

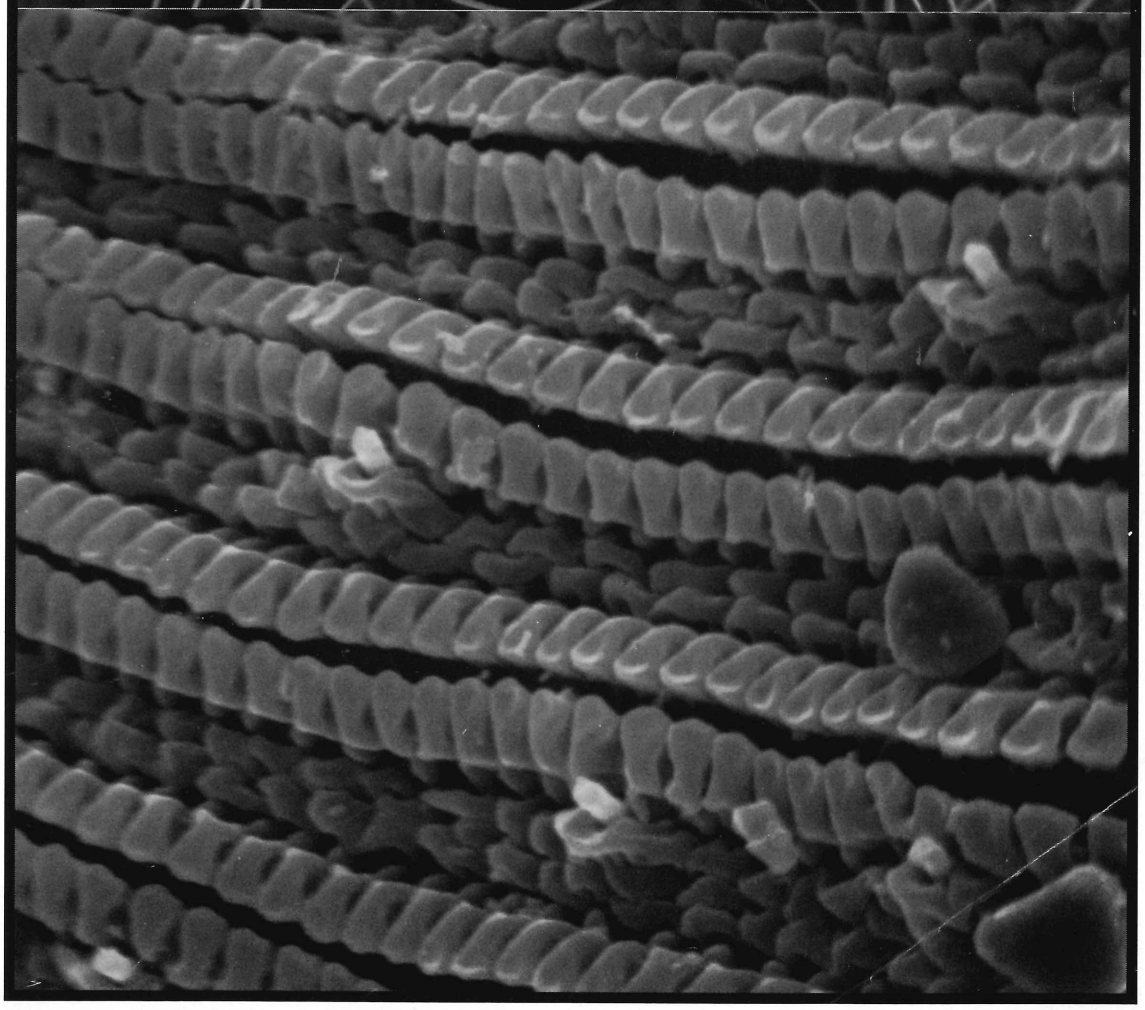

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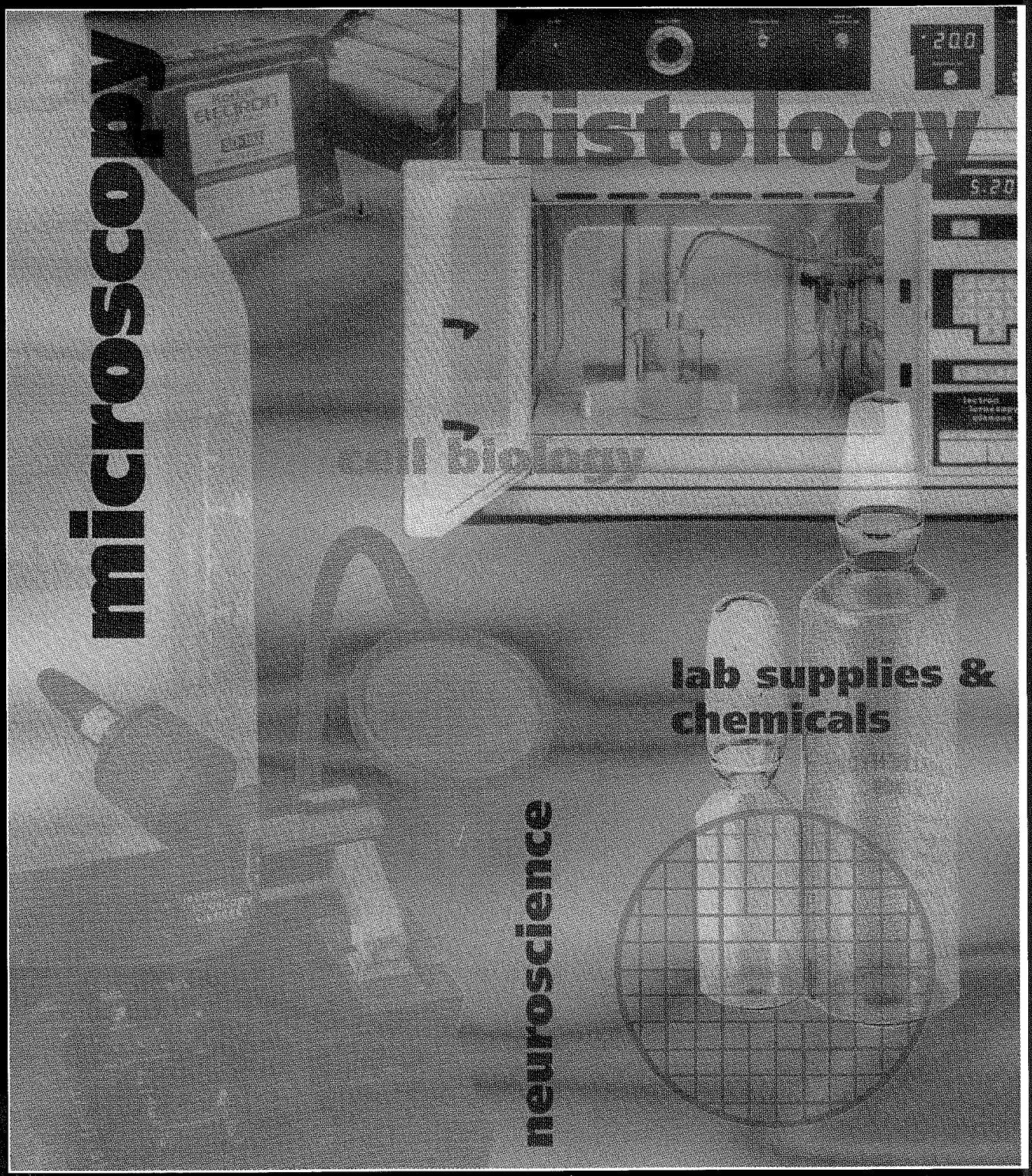

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TEXAS JOURNAL OF MICROSCOPY
VOLUME 30, NUMBER 2, 1999
ISSN 0196-5662

David C. Garrett, Editor
Department of Biological Sciences, University of North Texas, Denton, TX 76203

Official Journal of the Texas Society for Microscopy
"TSM - Embracing all forms of microscopy."

ON THE COVER
The oral disc of the proboscis of *Musca domestica* (House fly) observed with scanning electron microscopy (upper micrograph; X 200). The ventral surface of the oral disc consists of two distinct lobes on either side of the mouth. Each lobe, or labellum, bears a number of parallel transverse ridges that enclose pseudotracheae, a series of channels that deliver liquid food to the mouth. The tracks of pseudotracheae, as well as chemoreceptive interpseudotracheal papillae interspersed between them, are shown at higher magnification in the lower micrograph (X 1600). Jason L. Lankford, Department of Biology, Box 13003, Stephen F. Austin State University, Nacogdoches, TX 75962.

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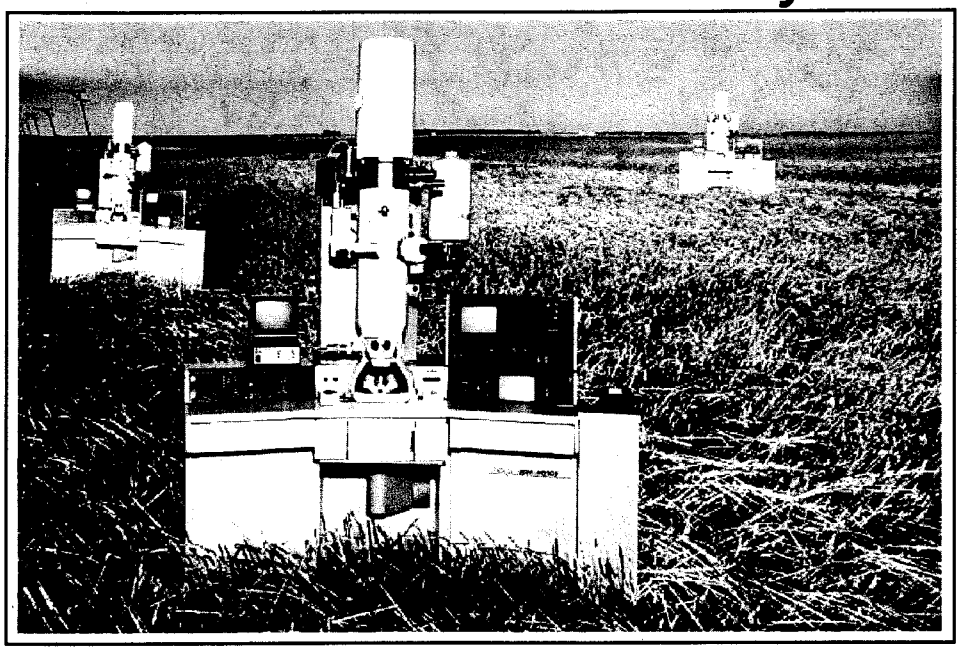

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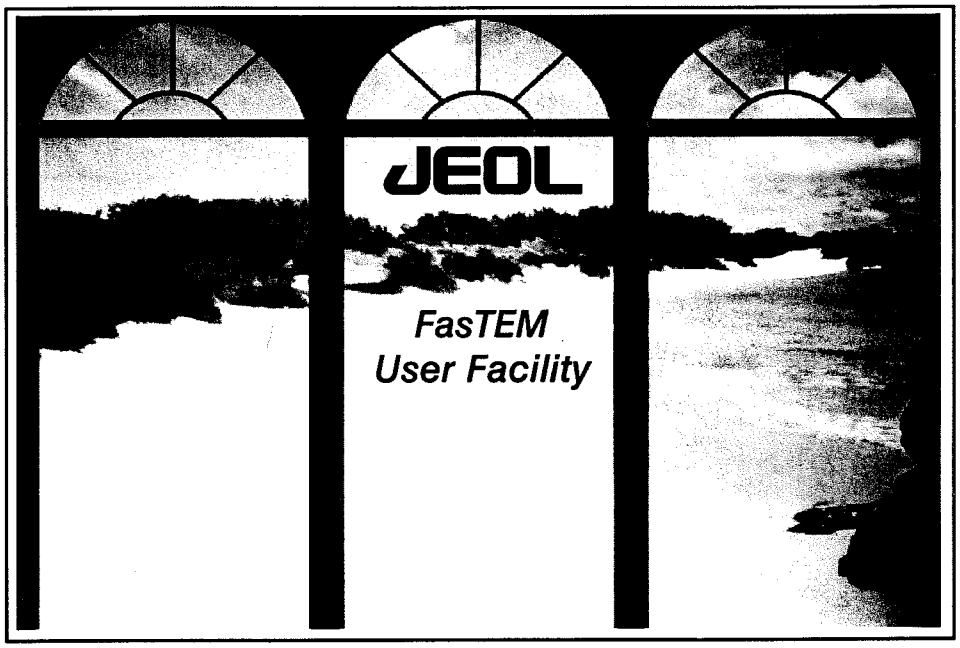

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President's Message

On behalf of TSM, I would like to convey my thanks to those who helped to make our Spring Meeting in Waco a success. Ann Rushing took the lead in organizing our workshops. Those participating in the workshop sessions enjoyed a tour of the Laboratory for Surface Analysis and Modification and the W.M. Keck Foundation Center for Electron Microscopy on the campus of Baylor University. Dr. Darrell Vodopich presented a hands-on image manipulation workshop that was very informative, with the arrangement set up so participants could directly follow Darrell's instructions at individual workstations. Thanks to Don Smith and Bob Droleskey for arranging the meeting program. TSM is very appreciative of our invited speakers, Ron Anderson, Kenneth Ashworth, and Kenneth Park, whose presentations were excellent. Our banquet at the Texas Sports Hall of Fame was great. We enjoyed a fine meal and an entertaining atmosphere filled with memorabilia from great Texas athletes and teams. As a sports fan and a proud Texan, I was definitely in my element. Thanks go out to our corporate members, whose support made such an enjoyable banquet venue possible. Finally, our meeting would not have been a success without our paper and poster presenters. Thanks for your time and effort in preparing and making your presentations.

This journal will be published in conjunction with our Fall 1999 meeting in Houston. In response to member requests, invited presentations on forensics microscopy and a workshop on optimizing the light microscope will be presented. TSM needs your input concerning topics that you would like to see at future meetings. Please let us know your needs, and we'll see that they get addressed as soon as possible.

The remainder of my message deals with a special opportunity that came up this past summer. TSM was contacted by the Foundation for Advances in Medicine and Science, Inc. (FAMS) and *SCANNING, The Journal of Scanning Microscopies*, to participate in SCANNING 2000, their joint meeting to be held at the Sheraton Four Points Riverwalk Hotel in San Antonio, May 9-12, 2000. This invitation warranted serious consideration. Joint meetings are never perfect situations. In particular, the date falls at a very busy time for those of us in academic settings. However, the consensus that developed as the Executive Council discussed this issue was that the positive aspects of such an interaction for TSM outweigh the drawbacks. We have pledged to participate in this conference, and I would like to present to you our justification for doing so.

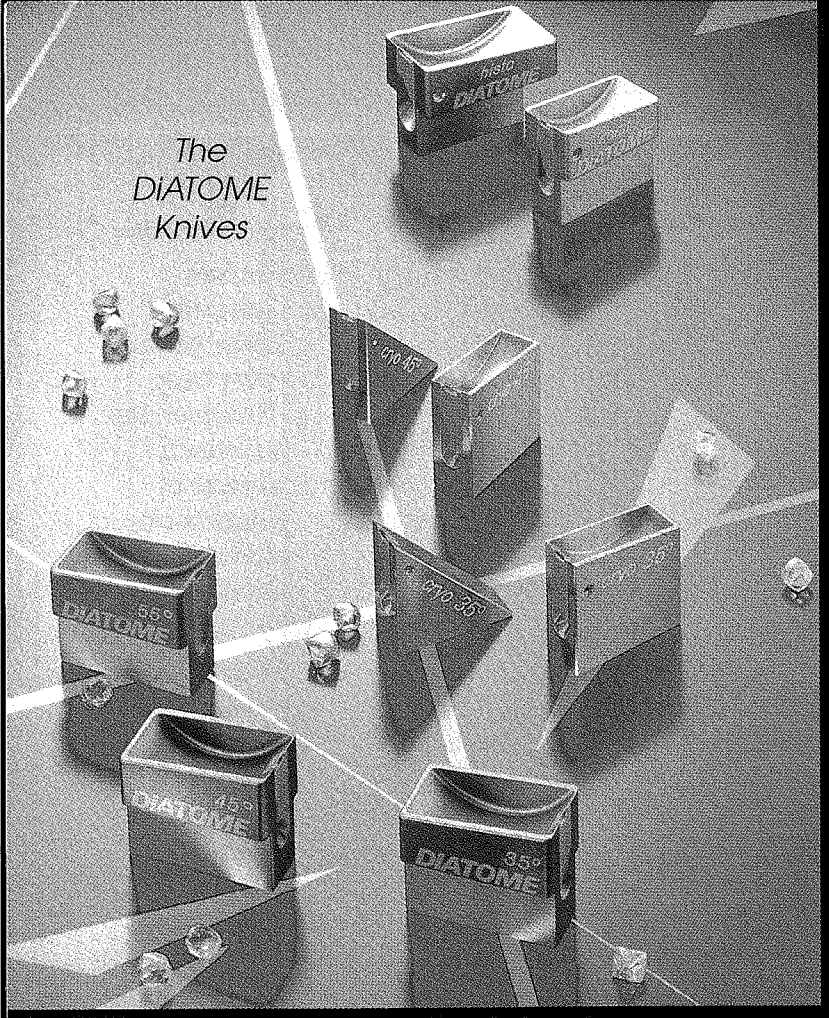
Most significantly, the exposure of TSM to scientists from across the state and nation will be a major plus. As we all realize, there are many microscopists in Texas that don't know about our organization. The SCANNING 2000 meeting will include a diverse array of topics. I encourage you to check out the SCANNINGS-FAMS web site at http://www.scanning-fams.org/. There you can peruse programs from previous meetings, where sessions on confocal microscopy, atomic force/scanning tunneling microscopy and cryo-SEM have been held. What an opportunity to recruit new TSM members working in these areas!

Although SCANNING 2000 runs for four days, the traditional TSM format will be maintained as a special TSM session planned for Friday, May 12. Students, you can receive free registration by serving as volunteer to assist a session chair with audio-visuals, and awards for best student presentations will be given.

It is my hope that the joint meeting with SCANNING 2000 will be a positive experience for TSM. I ask for your support in this endeavor. Please communicate your questions and concerns so we can input them as the program takes shape. I look forward to visiting with you on this issue, and to working towards a bright future for TSM.

Sincerely,

Josephine Taylor
TSM President, 1999-2000



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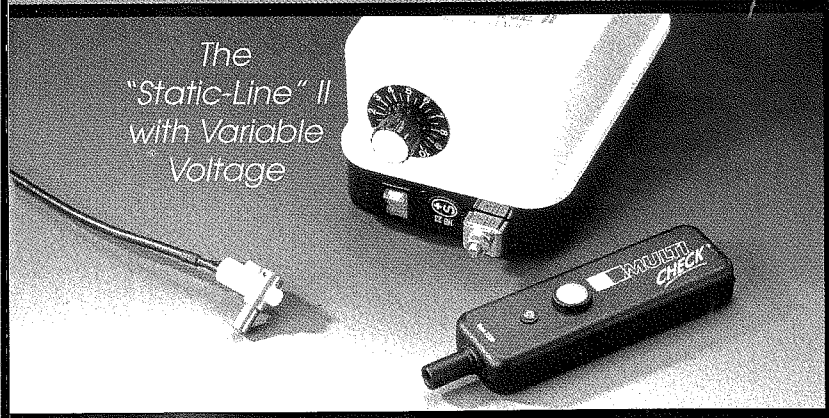

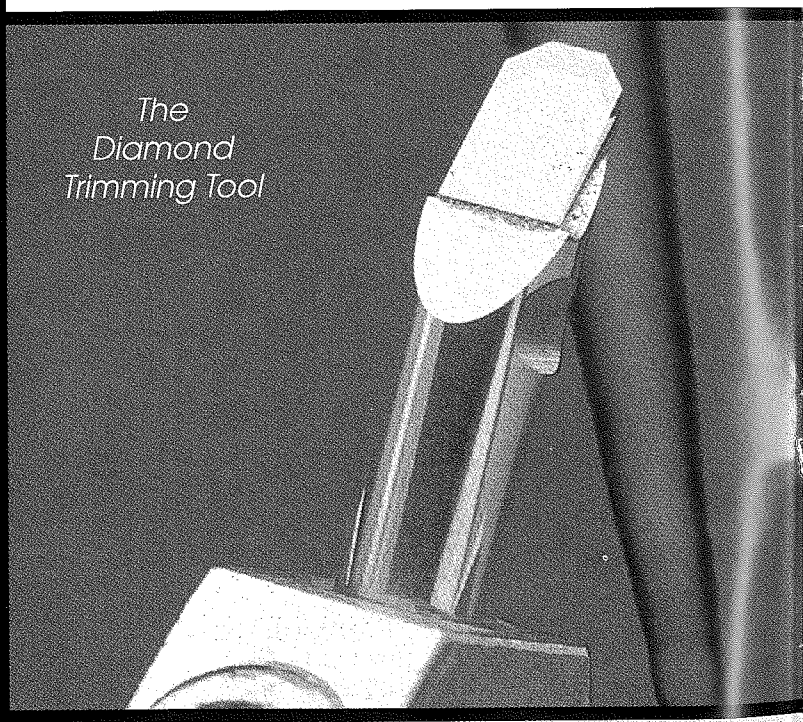

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Treasurer's Report

TEXAS SOCIETY FOR MICROSCOPY TREASURER'S REPORT
For Period Ending October 1, 1999

ASSETS AS OF JANUARY 1, 1999:		
Checking Account No. 110649558 (Norwest)	$4,851.90	
Certificate of Deposit No. 1882289323	$4,079.37	
TOTAL		**$8,931.27**
INCOME:		
Dues	$2,252.00	
Spring Meeting 1999, Waco		
Meeting Registration	$1,275.00	
Workshop	$70.00	
Donations/Grants	$300.00	
Journal Advertisement Revenue		
29:1	$125.00	
29:2	$875.00	
30:1	$1,550.00	
Checking Account Interest	$9.95	
Interest on Certificate of Deposit No. 1882289323	$297.22	
TOTAL INCOME		**$6,754.17**
EXPENSES:		
Journal Printing		
30:1	$1,685.02	
Student Travel	$615.79	
Student Award	$100.00	
Secretary's Account/ Mailing & Office Expense	$1,500.00	
Spring Meeting 1999 Expenses	$2,069.24	
Fall Meeting 1999 Expenses	$300.00	
Insurance Bond	$144.59	
Checking Account Fees (New Treasurer's Account)	$123.51	
PO Box Rental (Austin)	$84.60	
Postage	$76.16	
Past President's Plaque	$67.66	
Office Supplies	$24.10	
Dues Overpayment	$5.00	
Total Expenses		**$11,510.48**
Assets as of October 1, 1999		
Checking Account No.005772227833 (Bank of America)	$4,810.40	
Certificate of Deposit No. 1882289323	$4,079.37	
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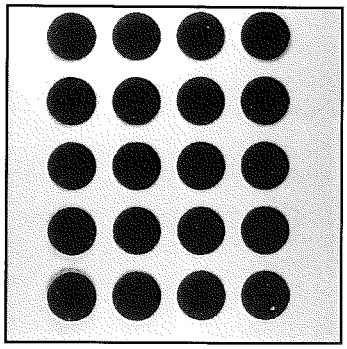

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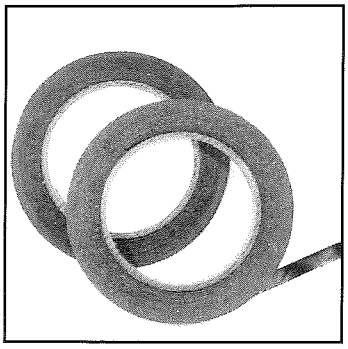

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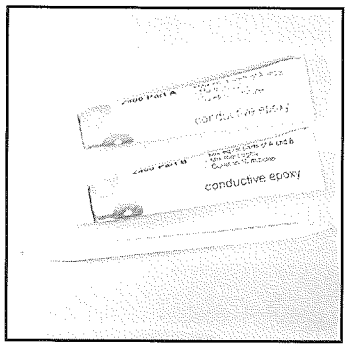

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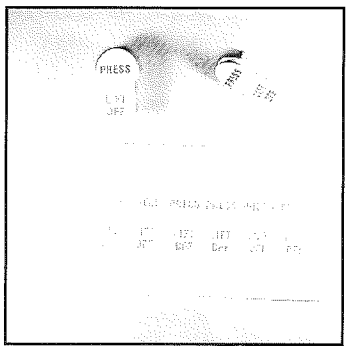

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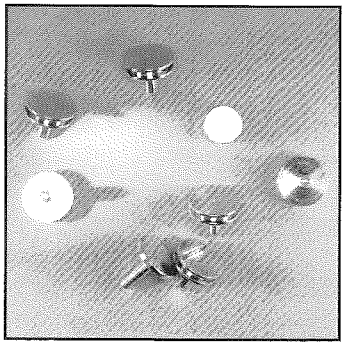

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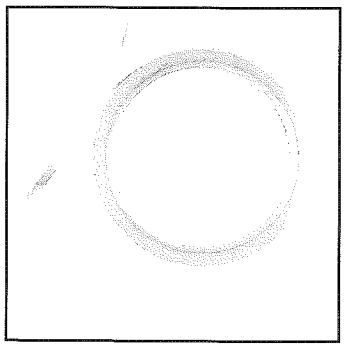

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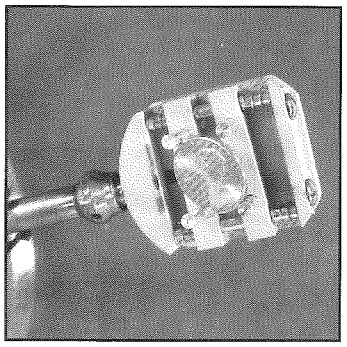

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Abstracts

BIOLOGICAL SCIENCES
PLATFORM PRESENTATION—FALL 1999

A MICROSCOPIC EXAMINATION OF A COMMERCIAL PRODUCT CALLED "SCOTCH OATS." HOWARD J. ARNOTT. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, Texas 76019.

"Scotch Oats" is a commercial product made from *Avena sativa*, the fruit of the common oat plant. The sample, "Scotch Oats # 7321," examined was purchased locally at the Whole Food Market. To the eye the sample consisted of small fragments with an overall creamy color. When examined with a simple microscope the fragments varied between >0.5 mm to slightly over 5 mm. They ranged in color from light brown to pure white with occasional dark brown stripes or fragments. Occasionally one may see yellow-translucent pieces witch represent whole or partial pieces of the germ (embryo). Careful examination shows that of the dark brown component narrow dark strip running along their long axis of light brown pieces. Some of the largest pieces are obviously fractured groats (oat seeds) in which you can see the oat seed coat and the internal starchy endosperm. In the SEM most of the pieces are covered with a coating of starch grains, or complexes of several starch grains forming a larger structure 50-100 μm in diameter, individual starch grains are usually not larger that 30 μm. In some places evidence of the surface of the groat can be seen but the fragments must be cleaned and or sectioned to show their real structure. The structure of "Scotch Oats" is very different from that of "old fashion rolled oats # 5893", and "fast oats # 5875" from the same source. Examination of rolled oats with a dissecting microscope shows that the entire groat has been flattened to an elliptical structure that is approximately 10 x 7 mm. Each oat "groat flake" shows a dark middle line on one side of the flake and on the opposite side the attached germ can be found. As a result of the rolling process, the surface of the groat has light brown patches separated by a series of curved and irregular cracks. "Fast oats" appear to have been rolled and then fractured into small pieces which expose much of the starchy endosperm. The fragments average about one forth of the size of a whole grain.

A MICROSCOPIC INVESTIGATION OF "OREGON GRAPE HERB," A HERBAL SUBSTANCE OF COMMERCE. HOWARD J. ARNOTT. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, Texas 76019.

A sample of "Oregon Grape Herb (# 12258)" was purchased in a local Whole Foods Market herbal department. The product consisted of small broken pieces of woody plant material. Most of the pieces had a light saffron yellow color although a few were dark brown; most of the pieces measured about 5 x 2 mm in size and appeared to be fragments of larger objects. Pieces of this product were mounted on stubs, coated with gold/palladium and studied in the scanning electron microscope. SEM examination revealed that the majority of the fragments appeared to be small pieces of wood, these most likely represent the yellow fragments that are seen by eye. In the wood fragments it was possible to see both components running both parallel and perpendicular to. In closer observations the parallel components turned out to be vessels and tracheids while the perpendicular components represent rays. The vessels had simple perforations plates, were about 20-30 μm in diameter with angular facets. The vessels were interconnected with numerous pits about 5 μm in diameter and having a slit-like inner aperture, often there were two parallel groups of pits present on a single wall facet. The elements running perpendicular to the long axis are ray parenchyma cells. The ray cell are interconnected with each other and with vessels by very small simple pits which are few in number. The rays are multiserate, consisting of 10 to 12 rows of elements at their widest point. The individual ray cells are densley packed with cell contents. The dark fragments, found less frequently in the original mixture, were composed of a tissue made up of small, relatively uniform sized parenchyma cells which did not have any cell contents. The latter could be pith or cortical cells from stems that have been fragmented.

FORMATION OF BIOFILMS IN A CONTINUOUS FLOW CULTURE SYSTEM. R.E. DROLESKEY, C. YOUNG, D.J. NISBET, AND L.H. STANKER., USDA/ARS/SPARC, 2881 F&B Rd., College Station, TX 77845.

A continuous-flow culture chemostat was modified to accept a stainless steel mesh basket to monitor the production of biofilms on 12mm Aclar® film membranes. The modified chemostat was inoculated with a commercial preparation of bacteria, MS Biosciences PREMPT™, which has previously been shown to be efficacious in inhibiting the colonization of poultry ceca by *Salmonella*. The preparation of bacteria contains 29 different strains of bacteria that are cultured under anaerobic growth conditions. Membranes were removed periodically from the chemostat over the course of two months and fixed for microscopic and immunologic evaluation. Additionally, at the termination of the experiment biofilms present on the inner surface of the chemostat vessel were removed and preserved for examination. Individual and clumped bacteria were observed attached to the membranes within the first week of culture. During the course of the experiment, progressive development of biofilms on the membranes was limited as compared to film formed on the chemostat vessel. Biofilms were probed with six monoclonal antibodies specifically prepared against bacteria found in PREMPT™. Cumulatively, these antibodies have previously been shown to recognize 10 of the 29 organisms found in the culture. Results of these assays, ELISA and immuno-fluorescent, indicated that only one of the possible 10 organisms recognized by these antibodies were detected in the preserved biofilms.

EXAMINATION OF MICRODERMATOGLYPHICS OF THE GENUS *PHRYNOSOMA* AND ITS POSSIBLE USE IN PHYLOGENETIC RECONSTRUCTION. C.L. SPENCER, Department of Biology, University of Texas at Arlington, Arlington, TX 76011.

I examined the microdermatoglyphics of the β-keratin layers of scales in *Phrynosoma* (horned) lizards to determine whether characters exist that can be used in phylogenetic reconstruction. I examined 25 specimens of four species, *P. asio, P. braconnieri, P. cornutum, and P. douglassi*, from the University of Texas at Arlington Vertebrate Collection. I surveyed scales from four body regions, dorsal body scales (including horns), dorsal head scales, ventral body scales, and labial scales. I determined 4 possible characters that could be phylogenetically important: presence of keels on ventral scales, structure of the macrohoneycomb pattern on dorsal body scales, and presence and shape of scale organs. I discovered a new type of scale organ never before seen in the family Phrynosomatidae, which consists of a pair of "setae"-like scale organs protruding posteriorly and laterally to the spine of the dorsal keel on a dorsal body scale. Possible uses for these structures could be mechanoreception of wind or water movements along the scale.

UTILITY OF SEM/EDXS IN DIAGNOSING AN ATYPICAL FATAL GUNSHOT INJURY: A CASE REPORT. H. Gill-King, D.C. Garrett and Mark Ingraham. Laboratory of Forensic Anthropology, Department of Biological Sciences, University of North Texas, Denton, Texas 76203.

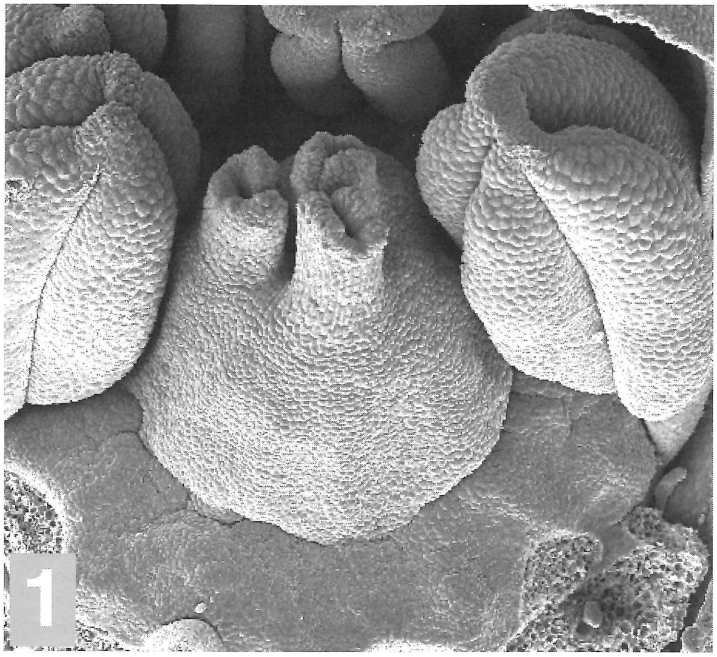
The value of scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDXS) analysis in the study of ballistic injuries of hard tissue is well known. Typically, wound margins are first scanned for debris, and fragments are qualitatively analyzed for inclusion or exclusion as possible ballistic artifacts. Semiquantitative EDXS analysis, may further refine the class of ballistic materials implicating some and excluding others.

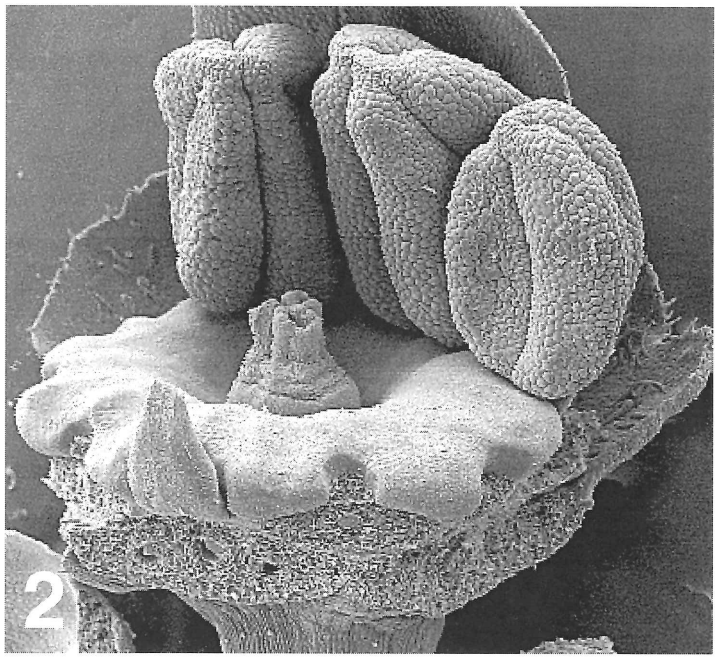
In this presentation we review a case in which the cause of extensive damage to a human skull was the subject of debate among informed professionals. The issue was settled using SEM / EDXS findings which revealed the cause of the injury as well as provided information about the surrounding circumstances.

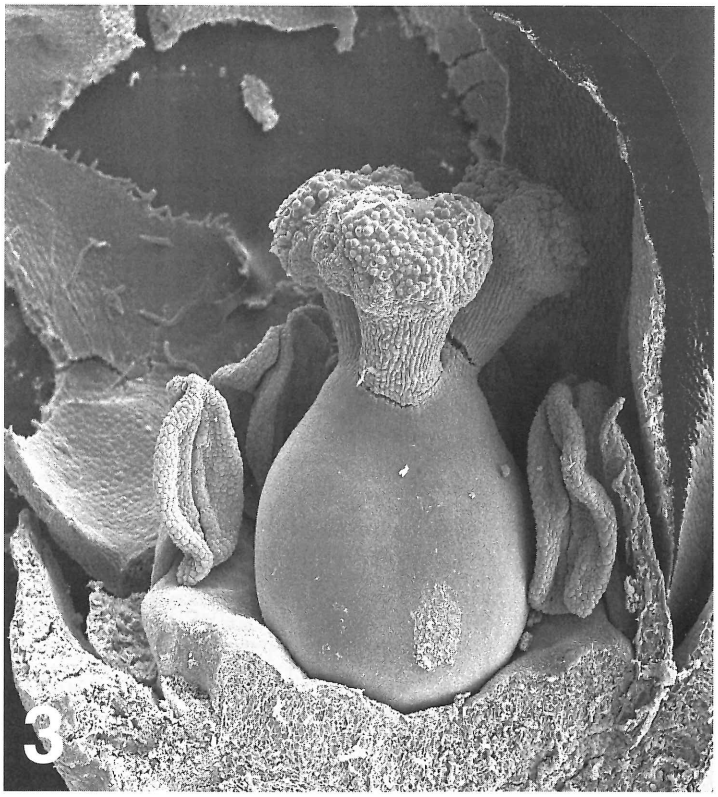
A LIGHT AND ELECTRON MICROSCOPIC STUDY OF THE FLOWERS AND FRUIT OF THE CALIFORNIA PEPPER TREE, *SCHINUS MOLLE*. **HOWARD J. ARNOTT AND DELILAH F. WOOD.** The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019 and The USDA Laboratory, Albany, CA 94710.

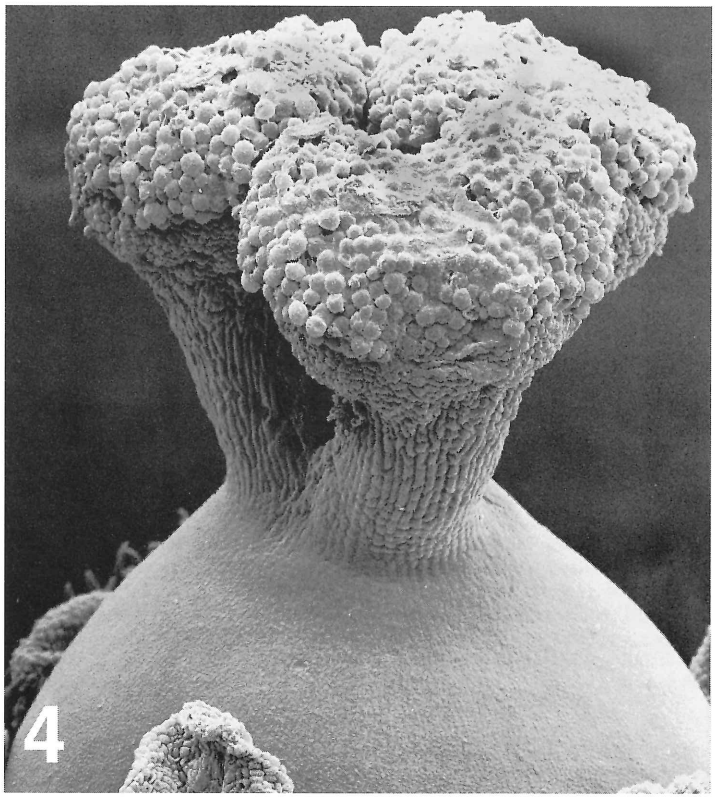
The California Pepper Tree, *Schinus molle* L., has been a popular cultivar in California for at least two centuries. The pepper tree is prized by horticulturists because they develop into large and elegant trees. They are also valued because of the colorful rose-pink berries which develop in the Fall. Mature pepper trees are sometimes found around the Missions of California and may have been introduced by the Franciscans from their origins in South America. The fruits of the closely related species, *S. terebinthifolius*, produce the pink peppercorn of commerce. The fruits of *S. molle* also have been sold as a spice. The flowers and fruits of *S. molle* used in this research were collected at various sites in North Central California, shipped overnight to Texas for fixation and further processing. Hand and freezing microtome sections of fresh materials as well as paraffin sections were studied by light microcopy. Some flowers and fruits were fixed in FAA, others were fixed in glutaraldehyde and postfixed in osmium. All SEM specimens were critically point dried, sputter coated with gold/palladium, mounted on aluminum stubs, and studied in the microscope. Digital images were collected for both light and electron observations.

The flower buds and flowers of *S. molle* are cream colored and have a floral pattern of five sepals, five petals, three carpels and ten stamens similar to that of other members of the Anacardiaceae. However, the flowers are functionally unisexual and found on separate trees. This functionality comes about through the abortion of the stamens in the otherwise perfect female flowers. A malfunction of the ovary development and discontinued growth of the flower after pollen release occur in the otherwise perfect male flowers. The male and the female flowers have a strongly developed hypogynous disc subtending the ovary and associated with the base of the stamens. The hypogynous discs in both flower types have ten notches which allow each filament to extend between the disc and the petals which closely surround them in the bud stage. In the male flowers each anther is supported by a filament attached below the hypogynous disc and extending upward through its notch. The anther appears to be attached at or near the stamen summit, however, the four sporangial lobes are each relatively separate below. The anther epidermis is made up of bulbous cells with a very reticulated pattern of cuticular structure. The abbreviated ovary of the male flower has three small relatively undifferentiated primitive carpel-like terminations. The male flower's ovary surface, unlike the smooth surface of the female flowers, is rough and irregular. Although undeveloped, the style and stigma of the male flowers are red-purple in color. In the female flowers stamens are present and are of normal dimensions except that four sporangia are collapsed which makes the anther quite flat. In the unopened female flower the ovary surface is very smooth and almost glossy. The female flowers show a second important difference from the male in that there is a marked differentiation of the style and stigma. Each of the three branches of the style terminate in an expanded-bulbous stigma having many protruding stigmatic cells on its surface. In the male flowers the style/stigma is also red-purple in color Initially the female flower ovary is shaped like a bowling pin, but as it begins to grow it becomes more and more sphere shaped. After its initial growth the style and stigma remain attached to the ovary, but do not continue to grow. As the ovary grows it remains smooth, occasionally a rough surface may develop in small patches, and it changes from its initial cream color to light green. Further development of the flower and fruit will be described in another paper.









Figures 1-4. Schinus molle L. Figure 1. View of a young male flower showing the "primitive" nature of the style/stigma and rough-textured surface of the ovary. Two functional stamens are seen in the upper part of the figure, the circular object in the center part of the figure is the hypogenous disc. 35X. Figure 2. Lateral view of unopened young male flower showing stamens, undeveloped ovary and hypogenous disc which has notches that allow the filament to pass between the disc and the surrounding petals. 21X. Figure 3. Unopened female flower showing the aborted stamens, smooth surface of the ovary and the well developed style/stigma. Part of the hypogenous disc has been broken away. 20X. Figure 4. Upper part of the ovary in an unopened female flower. This enlarged view shows three stigmas each connected to a separate style. Note the very smooth texture of the ovary as compared to that of male flowers. The stigmatic surface consists of numerous bulbous cells which form a landing platform for the pollen. 43X.

CHARACTERIZATION OF THE VANILLOID RECEPTOR EXPRESSED BY HUMAN MAST CELL LINE, HMC-1. C.L. Schwartz, J. Fernandez, S.E. Mercer, M.A. Wilk-Blaszczak. The Dept. of Anesthesiology at The University of Texas Southwestern Medical Center at Dallas, Dallas, TX 75235 and The Dept. of Biology at The University of Texas at Arlington, Arlington, TX 76019.

Mast cells play an essential role during development of inflammation after chemical and immunological insults. A number of studies have demonstrated a close physical and functional relationship between mast cells and sensory nerve endings during the inflammatory response. These neuro-immune interactions have been implicated in inflammatory conditions such as neurogenic cystitis and in autoimmune diseases such as rheumatoid arthritis. The etiology of these diseases is still unknown but is believed to be due to local production of proinflammatory cytokines, growth factors and neuropeptides by mast cells. However, the exact contribution of mast cells to these conditions is still largely unknown.

Capsaicin, the pungent ingredient in hot peppers, is a vanilloid compound that produces the sensation of pain via activation of the vanilloid receptor, VR1, in sensory neurons. In addition, capsaicin was shown to induce calcium uptake by mast cells, which suggests that these cells have functional vanilloid receptors on their surface. The presence of VR1 on mast cells might suggest that their role in inflammation and in particular in neurogenic inflammation is bigger than previously thought.

With RT-PCR techniques, we have shown the transcripts for two presently known homologues of capsaicin type receptors, VR1 and VRL1, are present in the human mast cell line, HMC-1. We confirmed the presence of VR1 with the immunolabeling techniques of western immunoblotting and immunocytochemistry. In electrophysiological experiments, we have shown a functional receptor-channel with the application of capsaicin. Capsaicin opens a non-specific cation current in about 35% of cells with two types of distinct currents, a short latency large amplitude current (1017 $\pm$ 800 pA) in 10% of cells, and a delayed small amplitude current (41 $\pm$ 45 pA) in 25% of cells.

We use HMC-1 cell line as a model to characterize the vanilloid receptor in human mast cells and their role in inflammation.

HISTOLOGY, CYTOLOGY AND SCANNING ELECTRON MICROSCOPY ON THE CULTURED TISSUE TO DETERMINE THE SITE OF REGENERATION IN IN VITRO CULTURE OF ALBIZIA FALCATARIA NABARUN GHOSH[1] A. CHATTERJEE[2] DON W. SMITH[1]
[1]Department of Biological Sciences, University of North Texas, Denton, TX. 76203-5220 [2]CAS, Department of Botany, University of Calcutta, India.

Albizia falcataria (L.) Fosberg is one of the fastest growing leguminous trees and offers enormous potential as a source of pulpwood (NAS 1979). As a member of Mimosaceae, it has bipinately compound leaves.

In the present investigation, we achieved the regeneration of this tree species using young leaflets as the explants without callus intervention. Of the different sets of culture, the leaf explants produced adventitious shoot buds directly on culturing on Murashige and Skoog's medium supplemented with 6-Benzylaminopurine (6-BAP), Indole-3-butyric acid (IBA) (4.0/0.05 mg/l) and 10% coconut milk (v/v). The optimum use of casein hydrolysate (w/v) and coconut milk (v/v) in addition to 6-Benzylaminopurine and Indole-3-butyric acid could induce morphogenesis and somatic embryogenesis in the cultured tissue. This opens a new way of in vitro culture of this important tree species that could be useful for mass propagation and genetic improvement of this woody species. We carried out a histological study on cultured tissue using thin sections following dehydration with ethyl alcohol and safranin-light green double staining technique. This study revealed the site of regeneration from the leaf explant. The formation of vascular tissue was noticed after three months of culture. Cytological studies were done to analyze the genetic stability of the regenerants following pre-treatment with para-Dichlorobenzene, fixation with Carnoy's fluid and staining with 2% Aceto-orcein solution. SEM study confirmed the embryogenesis.

INFECTION AND DISEASE DEVELOPMENT OF *DIPLOCARPON ROSAE* ON SUSCEPTIBLE ROSE LEAFLETS. J.A. MARGOITTA, Department of Biology, Stephen F. Austin State University, P.O. Box 13003 SFA Station, Nacogdoches, Texas 75962.

Diplocarpon rosae is the causative agent of black spot disease of roses. *Rosa hybrida* cultivar Garden Party was the susceptible variety chosen for infection by *Diplocarpon rosae* in this study. Leaflets were inoculated artificially using a suspension of conidia collected from symptomatic tissue bearing mature acervuli. Naturally infected material was also obtained and prepared for electron microscopy. Tissue samples were fixed in glutaraldehyde and osmium tetroxide. For TEM analysis, material was dehydrated and embedded in Spurr's resin. SEM samples were critical point dried and coated with gold palladium. Various stages of the infection process were observed including conidium germination, subcuticular hyphae formation, haustorium formation, host cell responses and acervulus formation.

A COMPARISON OF THE MAMMILLARY CONE REGION OF THE EGGSHELL OF THE DOMESTIC FOWL AS OBSERVED IN THICK (30 μm) AND THIN (1 μm) EMBEDDED SAMPLES USING LIGHT MICROCROSCOPY. SANDRA L. WESTMORELAND AND HOWARD J. ARNOTT. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

The study of the mammillary cone of the avian eggshell is of particular interest as two key events occur in this region. First, during the calcification of the eggshell, the mammillary cone is the site of crystal nucleation. Secondly, during embryogenesis the mammillary cone provides the developing embryo a source of calcium that is more readily dissolved and transportable than the surrounding regions of eggshell. The purpose of this study was to examine the mammillary cone region of eggshell of the domestic fowl to identify features of the membrane, mineral, and matrix components visible in thin (1 μm) and thick (35μm) sections of embedded eggshell. Samples of eggshell of fertile eggs of the White Leghorn chicken that had been incubated for 15 days were used for this study. Ground sections of epoxy embedded shell samples were prepared by covering them in CIDA epoxy resin with Polycon hardener in a pressure vessel. The sample block was cut, mounted on a glass slide, and ground to a thickness of 30 μm. Other of the eggshell samples were fixed and embedded in Spurr's Kit embedding material. The acrylic block was sectioned 1 μm thick using an ultramicrotome with a diamond knife. Examination of the sections using plane and polarized light microscopy revealed that different features are visible using the two preparation techniques. In ground sections (30 μm) the calcium reserve assembly of the mammillary cone was seen as described by Dieckert, et.al. (1989, Poultry Science. 68:1569-1584). In the thin sections (1 μm) the calcium reserve assembly was not visible, however other substructures were viewed including the core and mantle of shell membranes, the limiting membrane, and possible matrix fibers.

MICROSCOPIC EXAMINATION OF PHIDIPPUS AUDAX SILKS. TIMOTHY L. HENRY. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019-0498

Ballooning and dragline (major ampullate) silks of *Phidippus audax* were examined using SEM microscopy, after sputter coating with gold. Light microscopic images were obtained after treatment with OsO4. Both types of silk are used by this species during different types of locomotion. Ballooning silk is approximately five and one half times thicker than the dragline silk. The mosaic crystalline patterns found in ballooning silk plainly distinguish it from the amorphous adult analog. Frost-like crystalline structures that fan over the tubular silk matrix in a botanical pattern toward the spiderlings appear responsible for increasing the drag that is necessary for ballooning. These structures may be poly-alanine rich nematic liquid crystals, characteristic of liquid crystalline polymers noted by Viney, et al. (19993). Silks emerge from one of seven different types of silk glands via spinnerets as liquid polymers of seven amino acids (mainly alanine and glycine) called fibroin. Silks are crystalline proteins, with substantial portions of their polypeptide chains forming crystallites of stacked beta-pleated sheets (Gosline, et al. 1995). These pleated sheet chains, although linked by weak van der Waals interaction, can stretch over 30% before breaking. Adult spider dragline silk has a tensile strength and durability greater than that of aramid fibers (Kevlar), polyamide fibers (nylon) or steel. Ballooning silk seems consistent in size and structure, whereas dragline silk fibroin appears homogeneous in structure, but varies in sizes via major and minor ampullate glands. Dragline silk can be spun in various diameters three at a time simultaneously (~1.5 μm - .6μm), while other triune samples were of identical diameters (~2μm). One notable difference between these types of silk is that the cylindrical polymer matrix of ballooning silk begins dissolving on the mounting adhesives (for SEM) within ten minutes of contact. This dissolution also occurs when captured on glass slide for light microcopy. Within forty-eight hours the only evidence of ballooning silk are remnants of the crystalline material. Adult and spiderling dragline silk is highly stable by comparison.

A MICROSCOPIC ANALYSIS OF LEAF SPOT DISEASE IN *ROSA WICHURAIANA*. J. TAYLOR, Department of Biology, Stephen F. Austin State University, P.O. Box 13003 SFA Station, Nacogdoches, Texas 75962.

A prominent leaf spot was observed on leaves of *Rosa wichuraiana*. Lesions appeared on leaflets and petioles as circular to angular necrotic areas that were dark brown in color. Spots merged with time as leaflets became chlorotic throughout, followed by necrosis and abscission. Fungal isolations from the diseased tissue resulted in the culturing of four genera previously associated with leaf or petal spots on roses: *Alternaria, Bipolaris, Colletotrichum,* and *Curvularia*. Light microscopy was used to characterize each of the isolates. Scanning electron microscopy was used to examine symptomatic tissue as the disease progressed in an attempt to use the development of fungal reproductive structures on the leaflet surface to identify the causal organism.

MATERIALS SCIENCES
PLATFORM PRESENTATION—FALL 1999

EFFECTS OF BODY CAVITY DECOMPOSITION ON STRIATIONS ON IMPLANTED FIRED BULLETS IN RABBITS. LAURA CZEPIEL, Department of Biology, University of North Texas, Denton, TX 76203.

Copper jacketed bullets fired into water recovery tank were implanted into five different body cavities (cranial, chest, abdominal, muscle, and adipose) of eight freshly sacrificed rabbits that were then buried 22-25 inches deep in Central Texas. After nine months, these bullets were recovered and compared against fired controls. It was found that those bullets recovered from cavities that contained more lipids showed more of a green patina than those from the more muscular cavities. This indicates that different body cavities upon decomposition can effect the physical features of bullets and bullet striations.

CHARACTERIZATION OF SiO$_x$ SMOKE PARTICLES BY ELECTRON ENERGY LOSS SPECTROSCOPY AND ENERGY-FILTERING IMAGING. D.C. DUFNER, S.A. DANCZYK, and M.S. WOOLDRIDGE*, Electron Microscopy Center and Department of Mechanical Engineering, Texas A&M University, College Station, TX 77843. *Department of Mechanical Engineering and Applied Mechanics, University of Michigan, Ann Arbor, MI 48109.

Combustion synthesis has led to many advances in materials science, in part via the synthesis of powders consisting of particles of nanometer dimensions. Particle morphology is a key concern regarding the powders produced, but also of comparable importance is particle composition. Electron energy loss spectroscopy (EELS) and energy-filtering imaging (EFI) can be used to interrogate the gas-phase combustion synthesis environment for elemental particle composition information.

For the current work, SiO_x particle samples are obtained from a $SiH_4/O_2/H_2/Ar$ flame by passing TEM grids directly through the combustion synthesis flame at various heights above the burner surface. Particle morphologies were characterized in the JEOL 2010 200kV TEM at Texas A&M University, and compositions were obtained by EELS from the VG HB501 STEM with a Gatan PEELS detector at Arizona State University. Energy-filtering images were obtained from a Gatan Imaging Filter (GIF) mounted on the Philips 430UHV TEM at Arizona State University operating at 200kV.

Various particle morphologies were characterized as a function of different burner conditions. Several individual particles were analyzed by EELS for Si, O, and C content and mapped for elemental distribution. Even though no carbon support film was used on the grids and no C-containing species were used in the flame reactants, C EELS signals were observed. Elemental maps revealed the presence of Si and O distributed throughout the particles, while C was localized along the edges of the particles. The SiO_x smoke particles produced using this technique were similar to silica gel particles having large surface areas that appear to promote adsorption of C-containing species. In this work, STEM/EELS analysis has become increasingly useful for obtaining particle compositions needed for the study of combustion mechanisms.

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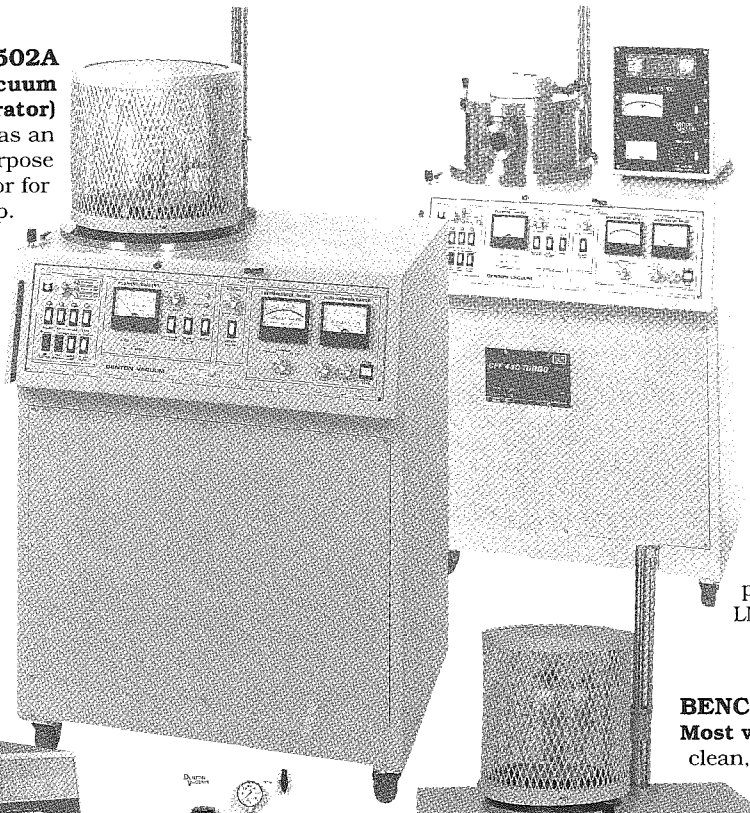

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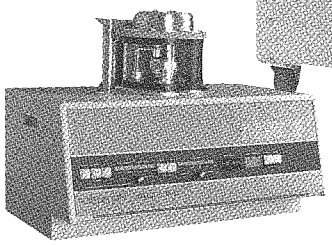

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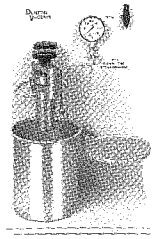

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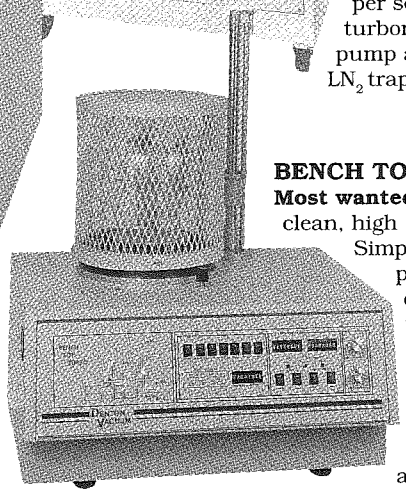

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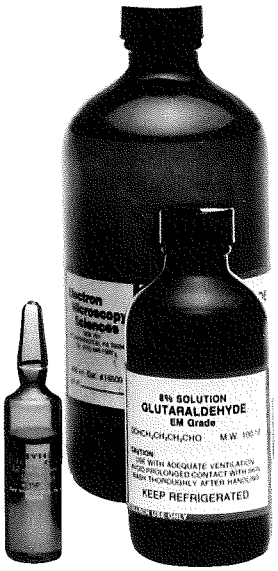

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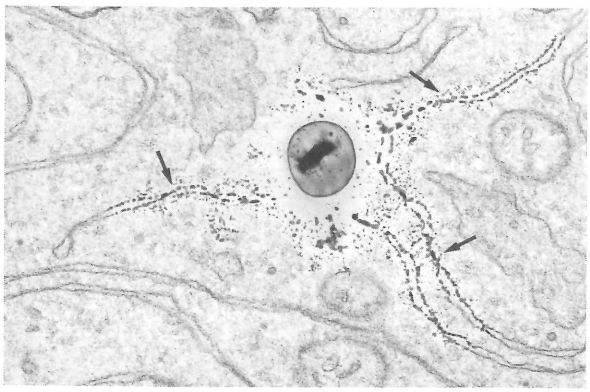

The micrograph on the back cover of Volume 30, Number 1, p. 32, 1999, is from a section illustrating one form of beam damage namely, redeposition of substances vaporized from the section. Note that dense contaminants on the section were used as models to illustrate the phenomenon only because they are much easier to see in micrographs than are the resin and tissue constituents. However, redeposition of resin and tissue components does occur and may represent a sizable redistribution of mass. Sections typically lose 7-40% of their mass to the beam and much of this is redistributed over the surface of the section. [A] A heavy spot of contaminant on the section was melted by the beam and vaporized in a selected pattern over the section (arrows). The same thing occurs with resin components and tissue elements vaporized from the section but these are less spectacular and usually not discretely visible. Courtesy Hilton H. Mollenhaur. USDA/ARS Food and Feed Safety Research Unit. 2281 F&B Road, College Station, TX 77854.

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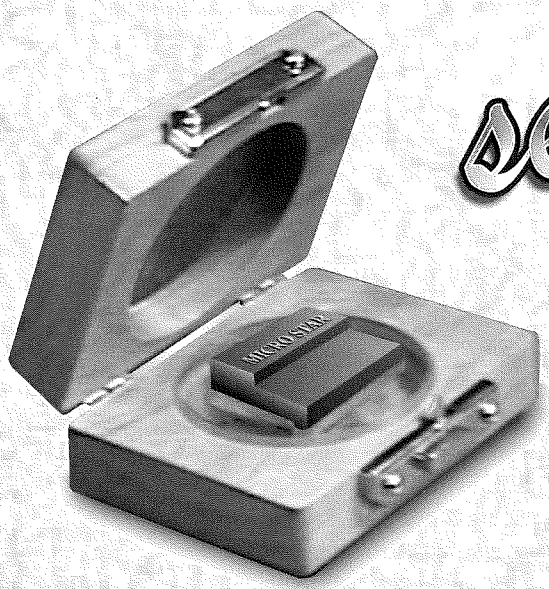

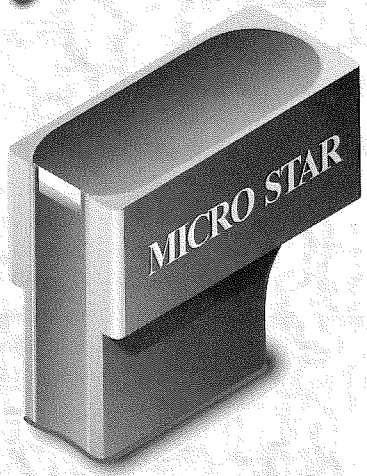

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(3) D. Gabor. Information Theory in Electron Microscopy, in: Quantitative Electron Microscopy. Eds. G.F. Bahr and E. Zeitler (Williams and Wilkins, Baltimore, 1956) 63-68.

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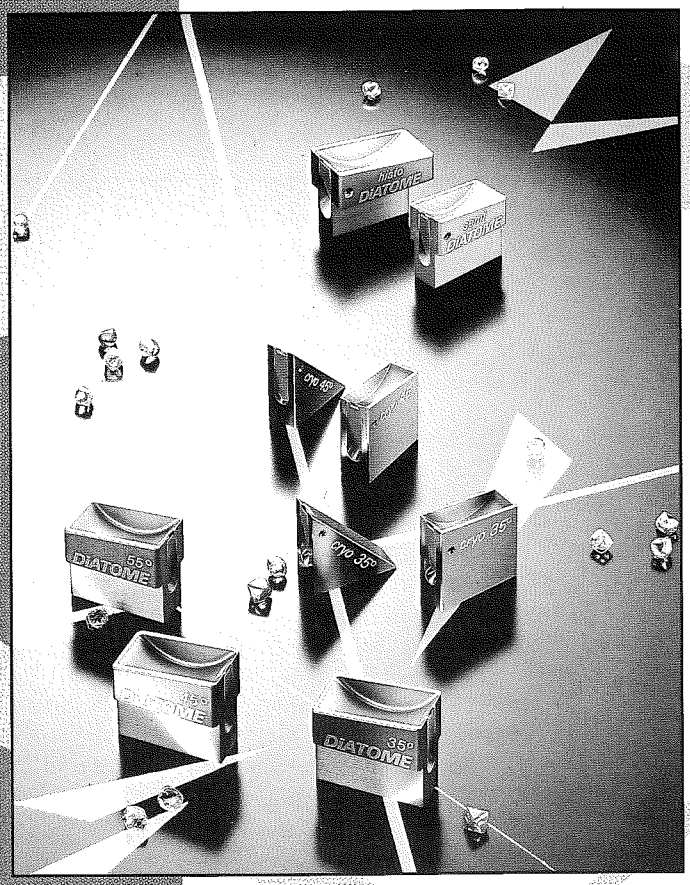

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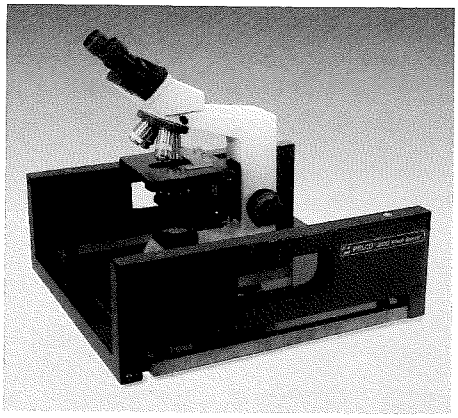

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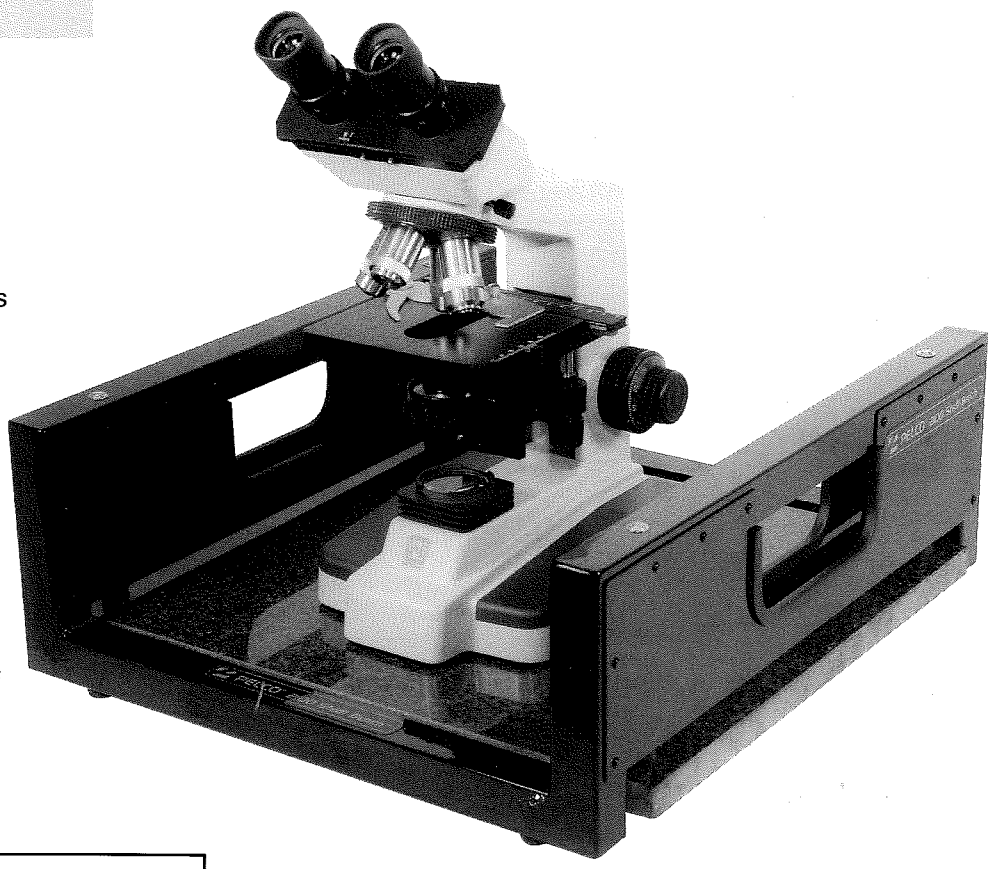

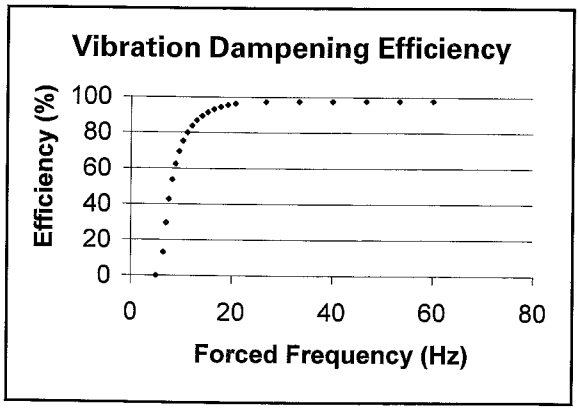

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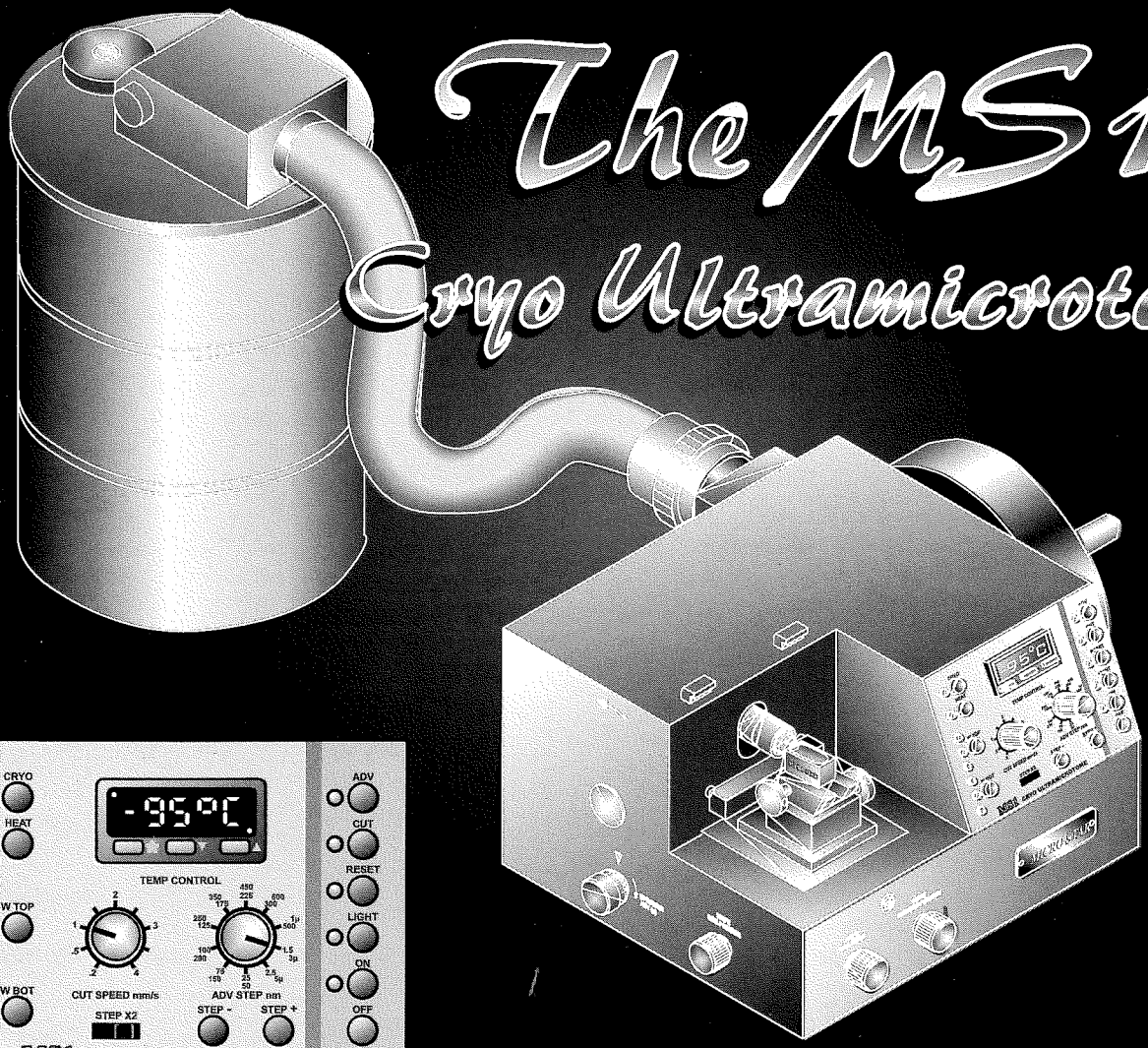

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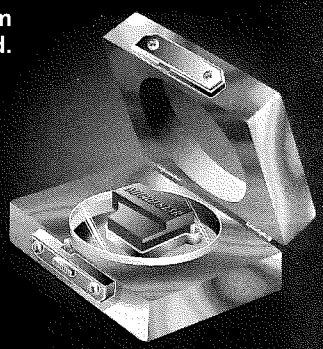

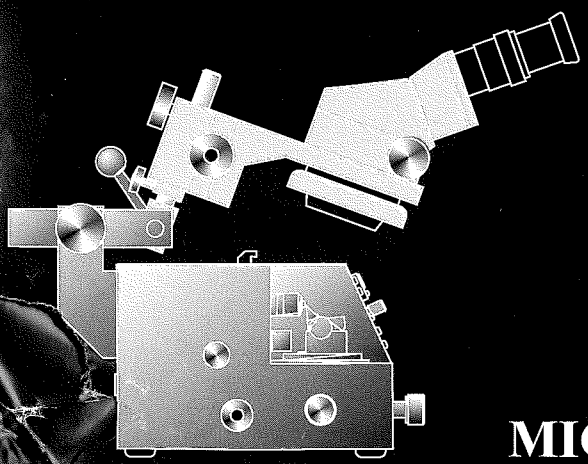

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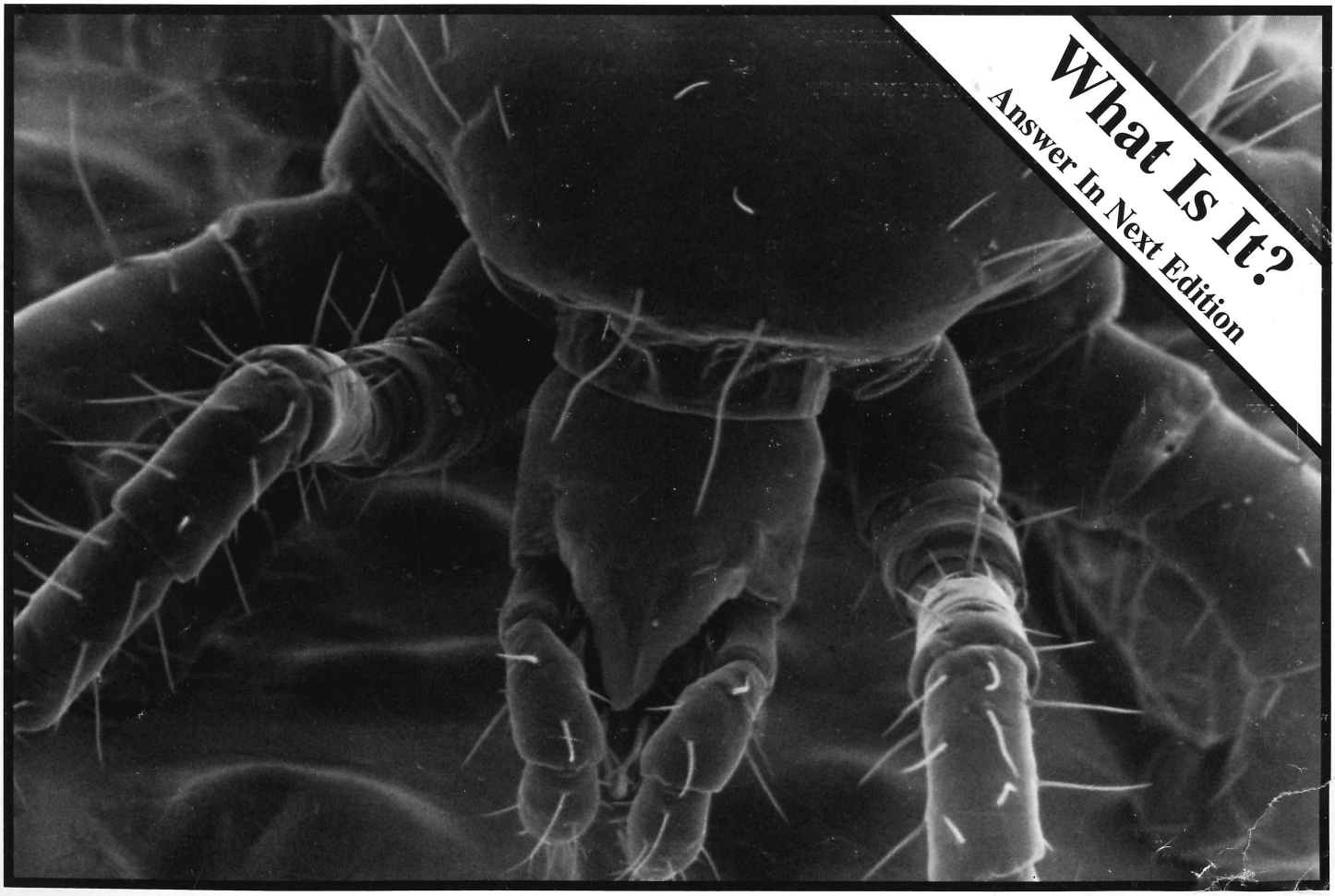

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