TSEM

Texas Journal of Microscopy

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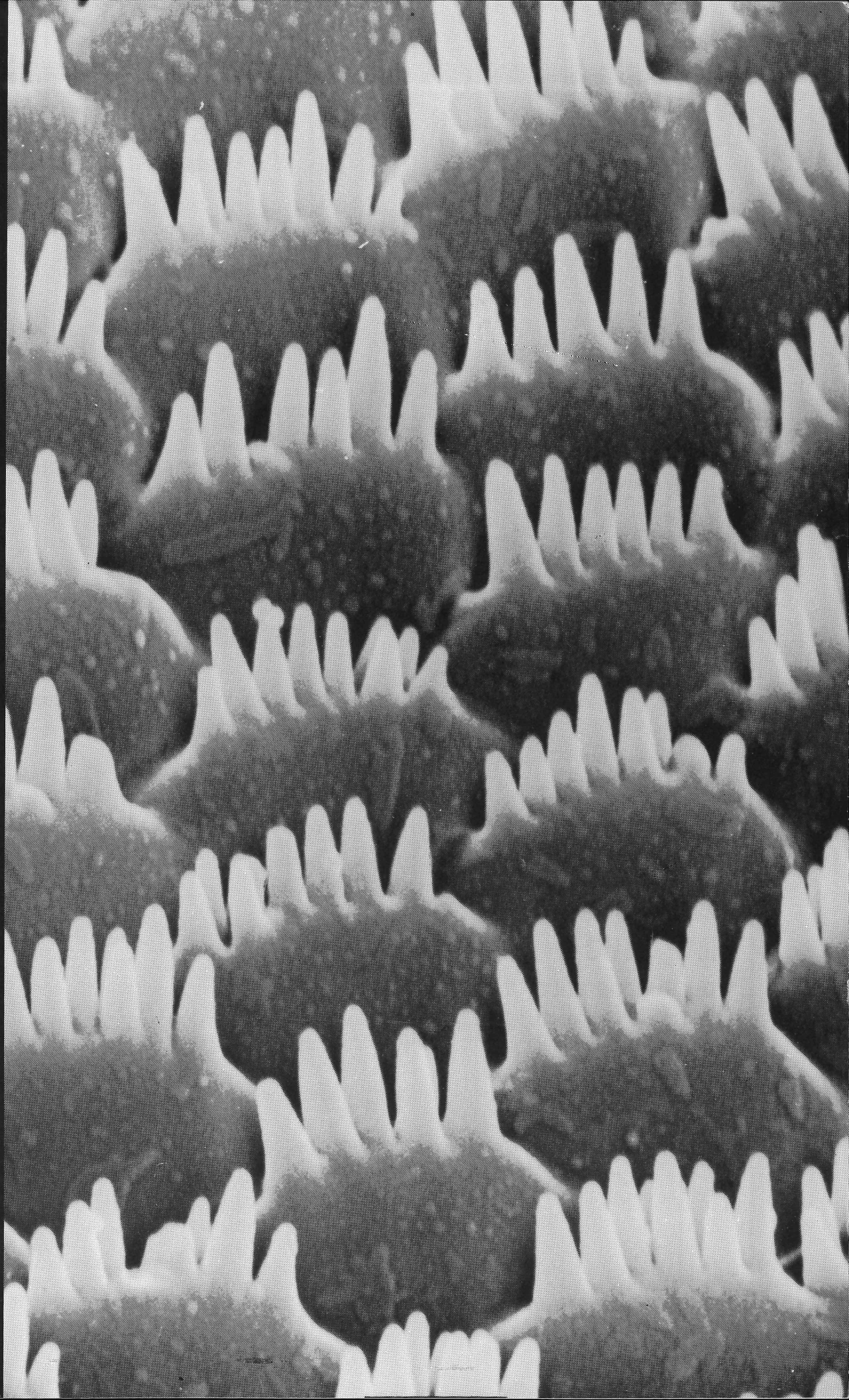

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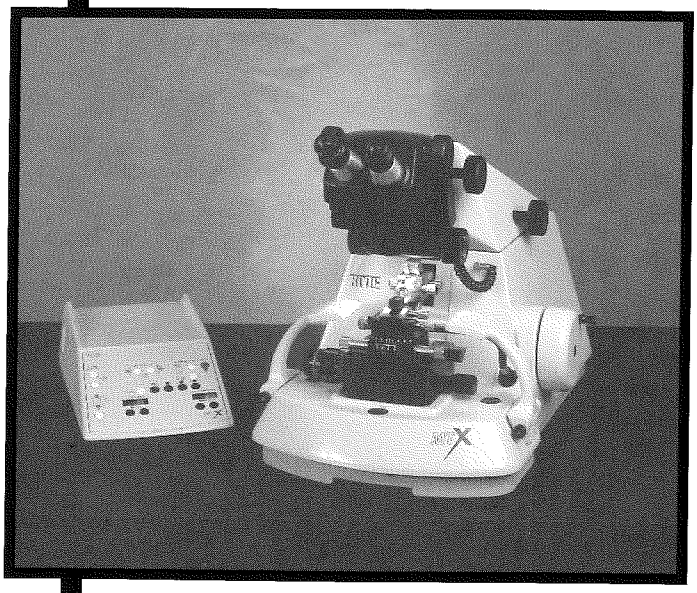

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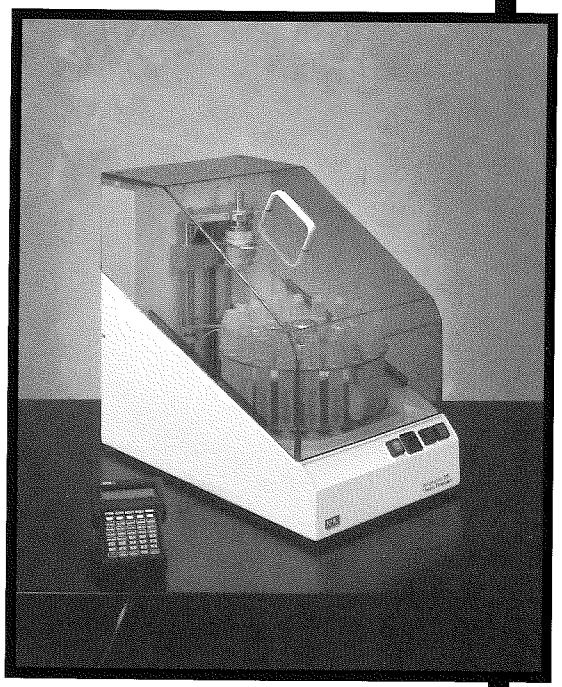

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VOLUME 29, NUMBER 1, 1998
ISSN 0196-5662

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

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"TSEM - Embracing all forms of microscopy."

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What Is It? . . . . . Back Cover

ON THE COVER
Imbricated and toothed scales on a lateral surface of the head of the ground beetle, *Chlaenius tricolor* (Carabidae). Insect collected in Tarrant County, TX by Charles Wolf in 1981. Bar = 2.5μm. Magnification = 11,600X. Micrograph by Howard J. Arnott and Cathy Boyles. The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

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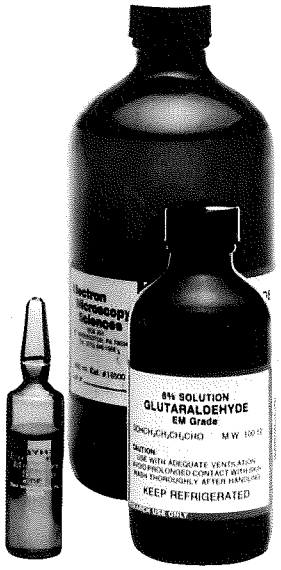

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President's Message

We are changing our name! After the details are worked out, we will be known as the Texas Society for Microscopy. For the past few years, the Executive Council and many among the membership have discussed the possibility of a name change to better reflect our desire to embrace all forms of microscopy. The Microscopy Society of America, formerly the Electron Microscopy Society of America, articulated a similar reason in support of its name change. The positive outcome of our vote to modify the by-laws indicates our desire to be a more inclusive society. All forms of microscopy contribute to our research and teaching efforts and we want to advance each and every one.

Another of the changes in the by-laws involves the duties of the nominating committee. The nominating committee will no longer be required to have two candidates for each officer position. Although we would prefer to have several candidates for each office, in the recent past it has been extremely difficult to identify candidates willing to run. This is a serious problem for the society. We need to bring more of our membership into active participation in the society to insure our future success. If you are willing to serve the society, please volunteer your time and expertise. Becoming actively involved in the society can be a rewarding experience.

We encourage you to publicize our name change. Invite your colleagues to join the society and contribute to our mission of promoting microscopy. The benefits of membership in the Texas Society for Microscopy are many. Our two meetings each year provide the opportunity to interact with colleagues. Because our connection may be microscopy rather than a specific field of study, we are able to learn about new areas of science and also to find out about new techniques that we may apply to our own research. Our corporate members give us the opportunity to sample their products and benefit from their expertise in microscopy. Hopefully, we become their customers! For students, the society offers a supportive environment for the presentation of those first research efforts. For me personally, a student presentation at the spring 1980 TSEM meeting was one of my first positive experiences in a scientific setting. We give financial support to student presenters and have recently reinstituted a student presentation award. Our fall 1997 award winner, Sandra Westmoreland from the University of Texas at Arlington, gave a presentation that exemplifies to type of effort we aim to encourage in our student members. In the future we hope that student award winners will publish the results of their research efforts in the Texas Journal of Microscopy.

Finally, I would like to thank the Oklahoma Microscopy Society and Bill Meek, their program chairman, for planning an exciting spring meeting with the help of our program chairman, Robert Spears. The program includes several workshops and invited presentations along with contributed presentations and posters. We welcome the opportunity to interact with our colleagues from Oklahoma and look forward to a productive meeting.

Sincerely,
Ann E. Rushing
President, 1997-1998

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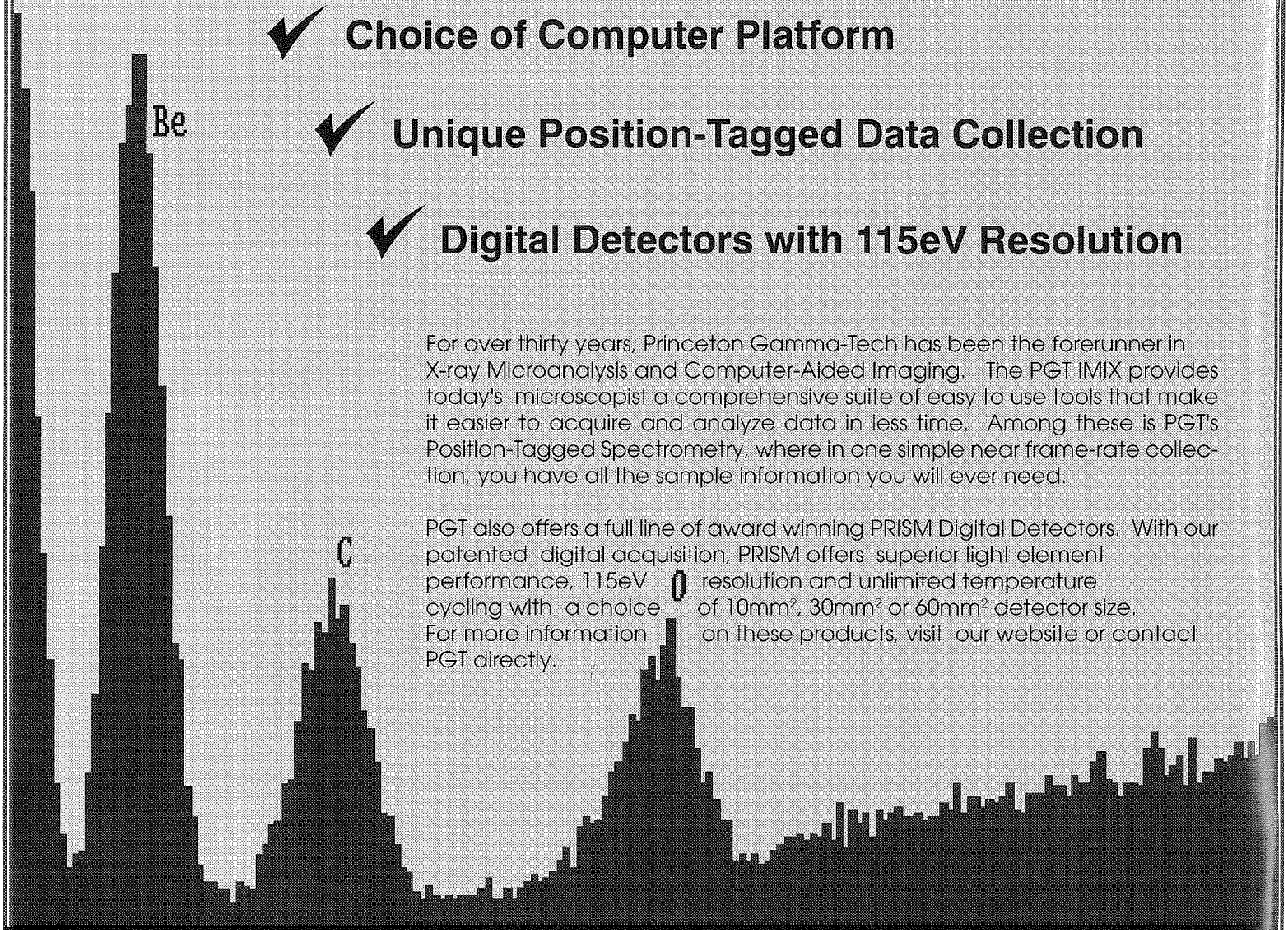

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Treasurer's Report

TEXAS SOCIETY FOR ELECTRON MICROSCOPY TREASURER'S REPORT

For Period Ending March 12, 1998

ASSETS AS OF JANUARY 1, 1998:

Checking Account No. 110649558	$5,258.91	
Certificate of Deposit No. 1882289323	$4,079.37	
TOTAL		**$9,338.28**

RECEIPTS:

Dues	$1,385.00	
Grants and Donations	$100.00	
Checking Account Interest	$12.99	
Interest on Certificate of Deposti No. 1882289323	$77.20	
TOTAL RECEIPTS		**$1,575.19**

EXPENSES:

Bank Chargeback Fee	$3.00	
Total Expenses		**$3.00**

ASSETS AS OF MARCH 12, 1998

Checking Account No. 110649558	$6,831.10	
Certificate of Deposit No. 1882289323	$4,079.37	
TOTAL		**$10,910.47**

TREASURER'S 1997 YEAR END REPORT

for period beginning Jan. 1, 1997 and ending Dec. 31, 1997

ASSETS AS OF JANUARY 1, 1997:

Checking Acct. No. 1882774506	$5,978.20	
Certificate of Deposit No. 1882289323	$4,079.37	
Total		**$10,057.57**

RECEIPTS

Dues	$3,544.00	
Spring Meeting 1997, Fort Worth		
Meeting Registration	$1,680.00	
Workshop	$210.00	
Exhibitors Donations/Grants	$400.00	
Guests	$80.00	
Fall Meeting, 1997, Galveston		
Meeting Registration	$1,210.00	
Workshop	$215.00	
Exhibitors Donations/Grants	$425.00	
Guest	$40.00	
Misc (Overpayment)	$10.00	
Checking Account Interest	$90.89	
Interest on Certificate of Deposit No. 1882289323	$136.28	
Close out of Secretary's Account	$62.24	
Line Item Correction to Account Receipts	$5.18	
Journal Advertisement Revenue	$3,125.00	
TOTAL RECEIPTS FOR 1997		**$11,233.59**

EXPENSES

Journal Printing	$3,537.30	
Student Travel	$754.00	
Secretary's Account/Mailout Office expense	$1,500.00	
Office expenses	$380.02	
Workshop expenses	$110.00	
Spring Meeting Hotel expenses	$2,552.78	
Fall Meeting Hotel expenses	$3.047.36	
Misc. Meeting Expense	$15.12	
Overpayment Reimbursement	$10.00	
Bank Charge back (Items + fees)	$32.00	
Bank Fees	$14.30	
TOTAL EXPENSES FOR 1997		**$11,952.88**

ASSETS AS OF DECEMBER 31, 1997

Checking Account No. 110649558*	$5,258.91	
Certificate of Deposit No. 1882289323	$4,079.37	
TOTAL		**$9,338.28**

*formerly Checking Acct. No. 1882774506

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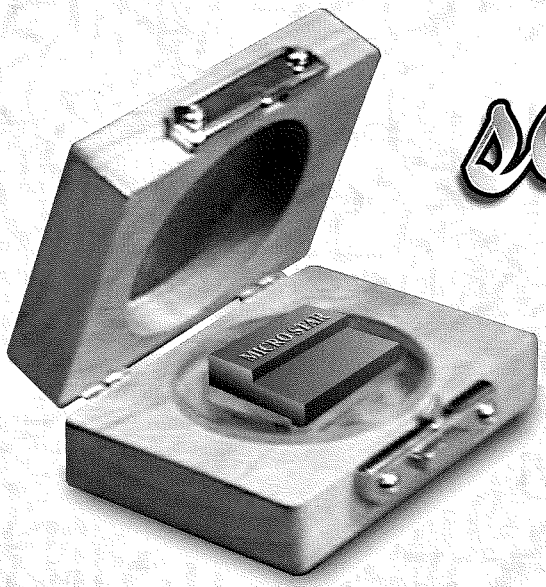

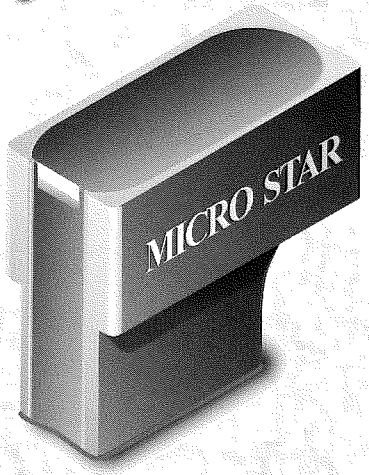

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"D3"	1	1	2 & 3 only	NONE	NO	NO	NO	$ 1,750	$ 2,500
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Abstracts

BIOLOGICAL SCIENCES
PLATFORM PRESENTATION—SPRING 1998

APO-A1 IS LOCATED WITHIN THE SECRETORY PATHWAY OF TRANSFECTED MDCK CELLS AND ITS EXPRESSION RESULTS IN AN INCREASED GLYCOGEN ACCUMULATION. V. DHEVAN AND V.L. RUDICK. Dept. of Anatomy & Cell Biology, UNT Health Science Ctr., Ft. Worth, TX 76107.

MDCK cells were transfected with the gene for human apolipoprotein A1 (Apo A1) and one clone (designated N2A) was chosen for further study. To localize Apo A1, paraformaldehyde fixed cells were incubated with antibodies for Apo A1 and/or the following organelle specific markers: ß Cop (Golgi), calreticulin (ER) and cathepsin D (lysosomes), followed by incubation with the appropriate fluorescent labeled secondary antibodies. Cells were viewed with a Nikon Microphot fluorescence microscope and photographed using Fuji 1600 ASA color film. Immunofluorescence of double labeled cells revealed Apo A1 to be present in the secretory pathway, particularly within the Golgi. TEM demonstrated that transfected cells had amorphous pools within them that resembled similar structures found in intestinal enterocytes (Caco-2 cells), which endogenously produce Apo A1. Untransfected MDCK cells or those transfected with an empty promoter did not produce such structures. It was postulated that these pools might be glycogen, and cytochemical analyses using periodic acid-Schiff reagent at the light level and bismuth subnitrate at the TEM level indicated that this was so. N2A cells were immunostained for glycogen synthase (GS), and fluorescence microscopy revealed that the GS was associated with the glycogen pools. In addition, co-localization of GS with ER (calreticulin) and GS with Apo A1 was also examined. In summary, the presence of Apo A1 within the secretory pathway leads to the accumulation of glycogen within kidney cells.

A COMPARISON OF UNTREATED MAMMILLARY CONES OF INCUBATED EGGS OF THE DOMESTIC FOWL WITH THOSE TREATED WITH SODIUM HYPOCHLORITE FOR PROTEIN REMOVAL. 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.

Evidence has been provided in a prior study to support and advance the theory that during incubation of a fertilized egg the avian eggshell undergoes changes in its mammillary cones as calcium is removed from the shell to provide for the needs of the developing chick. The changes in the eggshell have been shown to be associated with only the portion of the eggshell which is in contact with the chorioallantoic membrane (never in the airspace region where this membrane is separated from the shell) and to occur only after the time when this membrane is said to be in place and functional (after day ten of incubation). Sodium hypochlorite in a 5.25% concentration was used in this prior study to remove the proteinaceous shell membranes to expose the mammillary cones. Voids were seen in the cones beginning at day thirteen and becoming progressively larger until the end of incubation. No voids occurred in the cones of the airspace region of the shell. Because there was some concern that sodium hypochlorite may affect the crystalline appearance of the mammillary cones of incubated eggs, the study was repeated using untreated, incubated shells for comparison. It was found that the shell membranes could be separated manually from the shell in eggs incubated for fifteen days or more. The mammillary cones of these shells were different in appearance from those treated with sodium hypochlorite. The cones had crater-like voids which did not appear to become visibly larger with a longer incubation time. It is theorized that changes in the mammillary cones during incubation render them more susceptible to the effects of sodium hypochlorite which may cause changes in the crystalline structure.

A LIGHT MICROSCOPIC INVESTIGATION OF THE CHICKEN'S EGGSHELL AS SEEN IN THIN GROUND SECTIONS. 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.

In an effort to better understand the changes that occur within the eggshell during incubation of the domestic fowl (*Gallus domesticus*) thin sections of the shells were prepared using geological preparation techniques. Fully mineralized eggshells at 15, 17, 19 and 22 days of incubation were used in these preparations. The technique involves embedding the eggshells in epoxy plastic under pressure and heat. The resulting blocks containing the eggshells were sectioned with a diamond blade, affixed to a microscope slide and ground to a thinness of approximately 40 micrometers. Each set of sections consisted of equatorial and airspace samples, the latter serving as a control. Some of the sections were stained with Fast Green or Coomassie Blue while others were cover-slipped unstained. The sections were examined and photographed using both conventional and plane polarized light. The general structure as seen in SEM was easily confirmed with these sections. The outer and inner membranes and the calcite layer with mammillary cones are clearly visible. Examination with plane polarized light confirmed the optical nature of the mammillary cones, indicating that each (most) have the crystal axes alined so that the entire cone will extinguish when in the correct orientation to the plane polarized light. The close relationship between the outer membranes and the caps of the mammillary cones could also be shown. However, we were not able to confirm the existence of a one to one relationship between a mammillary core and each mammillary cone. Dense areas of the appropriate size and position were found but not consistently. The relationship between the possible cores and the surrounding crystals could not be ascertained.

CYTOLOGICAL STUDIES ON THREE LEGUMINOUS TREES AND ELECTRON MICROSCOPY ON THEIR *IN VITRO* CULTURE
Nabarun Ghosh, A. Chatterjee and Don W. Smith
Department of Biological Sciences, University of North Texas, Denton, TX
CAS, Department of Botany, University of Calcutta, India

We have selected three fast growing leguminous tree species for tissue cultural and cytological study. *Albizia falcataria* and *Albizia lebbeck* are the two fast growing tropical trees having economic importance. *Dalbergia sissoo* is commonly known as rosewood and produces valuable wood. We established *in vitro* cultures of the three species on MS media supplemented with different growth regulators (6-BAP, IBA, NAA) and growth factors (coconut milk, casein hydrolysate). We used the root tips from the germinated seeds and tissue from *in vitro* culture to analyze the karyotype and genetic stability. Clonal propagation of a plant via callusing may result in genetic instability in the clones. Callus culture of forest trees may display genetic instabilities: polyploidy, aneuploidy, etc. (Bonga 1977; D'Amato '78). So, it is necessary to analyze the cytological status of the cultured tissue subjected to regeneration. We found that complex growth factors like casein hydrolysate and coconut milk were able to prevent genetic deterioration of the cultured tissue. We followed pre-treatment, fixation and squashing techniques to study the chromosomes from somatic metaphase plates (Sharma and Sharma 1980). The Karyotypic analysis revealed the standard somatic chromosome numbers for *Albizia falcataria* (2n=26), *A. lebbeck* (2n=26) and *Dalbergia sissoo* (2n=20). We also utilized SEM to distinguish between the regenerated and non-regenerated callus tissues.

MORPHOLOGICAL CHANGES IN *PSUEDOMONAS FLUORESCENS* IN THE PRESENCE OF THE PROTOZOAN PREDATOR *OCHROMONAS DANICA*. HURT, M. A. AND T. H. CHRZANOWSKI. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

Ochromonas danica is a mixotrophic protozoan. When forced to exist solely by photosynthesis, the protozoan grows weakly or not at all. When supplied a bacterial food source, growth is rapid. *Psuedomonas fluorescens*, a gram negative rod, was grown in chemostats and fed to *Ochromonas danica* as the sole food source. In the absence of the protozoa, the bacteria maintain a single cell, unclumped morphology. In the presence of protozoa, the bacteria clumped into large aggregates. *Ochromonas* typically feed by drawing in single cells through an oral groove and incorporating the cell into a food vacuole. This clumping behavior suggests that the bacteria may alter their morphology to avoid predation.

USE OF SCANNING ELECTRON MICROSCOPY TO EXAMINE THE CAUDAL APPENDAGES OF FIVE SPECIES OF *ISCHNURA* (ODONATA: COENAGRIONIDAE). ALICE M. STACEY, HOWARD J. ARNOTT AND JAMES V. ROBINSON. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

Male damselflies have specialized structures on their terminal abdominal segments known as caudal or anal appendages. These consist of paired processes emanating from the tenth segment dorsally and ventrally. The dorsal pair (formally known as the superior appendages) contain unsegmented cerci, while the ventral pair (inferior appendages) contain paraprocts. The cerci and paraprocts function to grasp the mesostigmal plates of the prothorax region of the female damselfly. This nongenitalic coupling is known as tandem linkage and occurs prior to copulation and, in some species, during oviposition. The form of these structures is species-typical and is one of the most useful and reliable methods of identification of a particular species (Westfall, Jr. and May, 1996). In the present study, the caudal appendages of five selected species of *Ischnura* were examined using scanning electron microscopy. Variation in length, width and shape of both pairs of appendages were observed. Possible ways in which the morphology of the paraprocts and mesostigmal plates may affect the mating activities of the damselfly will be addressed. Future expansion of this study will include representatives from the remaining 10 North American species of *Ischnura* and will consist of a more detailed analysis of the form and possible function of the anal appendages in the life history of these insects.

THE ETHICS OF DIGITAL IMAGING. MIKE DAVIS AND HOWARD J. ARNOTT. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

With the advent of more resolute and advanced digital cameras and more powerful and versatile desktop computer systems, the method of all-digital photography is becoming a popular technique among scientists and engineers. Digital image acquisition offers almost instantaneous results, ease of computer analysis, and various storage capabilities. It also offers the ability for a user with a typical desktop computer and software to accomplish hours of darkroom work, or even feats that are impossible photographically, in seconds. Photo editing software allow users to manipulate images at their own discretion and therefore opens up the distinct possibility of over manipulation and/or fraud. The scientific community has not implemented any means of authentication for digital images. At most, some journals have adopted (or maintain) an 'honor system' in which the burden of truth is left with the perspective author(s). Although documented cases of image fraud in the fields of science are rare, it is important to understand and appreciate the ease at which images can be manipulated. It is also important to set up guidelines for what can and cannot be manipulated or enhanced. This survey explores the ethics of computer image manipulation by providing examples of acceptable and unacceptable image manipulation. It also provides suggestions for which image components can be enhanced, and those which should or must be left unaltered. Also discussed are some methodologies for image authentication that are being designed for the purpose of discouraging fraud.

CRYSTAL IDIOBLASTS AND CRYSTAL TYPES OF *NELUMBO NUCIFERA*. CINDI L. SCHWARTZ AND HOWARD J. ARNOTT. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

Nelumbo nucifera, or the sacred lotus, has leaves (both lamina and petioles) with several different types of crystal idioblasts. The lamina contains multicellular trichome idioblasts on the adaxial surface. These trichomes have been shown to help repel water from the surface of the leaf, a phenomenon known as the "Lotus Effect". The lamina also contains unicellular idioblasts on the periphery of the airspaces which are abundant in the lower half of the leaf. The crystals within these idioblasts have unique star-shaped druses with long sharp-pointed arms surrounded by attenuated cell walls. A small number of "rose-like"druses were found which have flattened plate-like appendages (arms) also surrounded by cell walls. Occasionally, small prismatic-like crystals were seen in the mesophyll. The petiole also contains interesting crystal idioblasts. Within the intercellular air space chambers of the petiole, two distinct types of crystal idioblasts were found. The first type, a massive, multicellular, spindle-like trichome approaching 0.5 mm in length, has a star-shaped druse on its apex. The other type is a short, unicellular crystal idioblast that contains a star-shaped druse crystal. The latter type of idioblast line up in files along the length of the petiole. While the unicellular crystal idioblasts usually contain star-shaped druses, rose-shaped druses also are seen.

LEAF LIGULE IS THE BOUNDARY BETWEEN THE NON-CRYSTALLINE WAX ZONE AND THE WAX DEPOSITION ZONE IN LEEK (*ALLIUM PORRUM* L.). C.G.-A. MAIER and D. POST-BEITTENMILLER, The Samuel R. Noble Foundation, Plant Biology Division, Ardmore, OK 73402

A region on the leek leaf that coincided with the ligule area and where wax production and biosynthetic enzymes were induced was identified (Rhee et al, Plant Physiology, in press). To address the issue that wax production was induced at the ligule level itself on the adaxial side of the leek leaf, SEM and GC-MS analyses were performed on dissected ligules from 7 consecutive leek leaves in comparison to leaf blade and sheath areas. The epicuticular waxes (EW) on the abaxial side of older leaf ligules showed the characteristic crystalline pattern of the blade EW, although the crystals were not as well developed as those on the blade. The cells on the adaxial side of the ligule were covered by smooth, non-crystalline EW. On the abaxial side of the leak leaf, the transition zone from the non-crystalline to crystalline EW, characterized by wax crystal deposition in patches, was identified in the sheath area (Rhee et al.). On the adaxial side of the leek leaf, however, such a transition zone was practically absent. The non-crystalline EW zone extended from the base of the leaf to the edge of the ligule, in the sheath area. The wax deposition zone started on the abaxial side of the ligule and continued on the adaxial side of the leaf blade. GC-MS analysis of ligule EW from 7 consecutive leek leaves indicated changes in composition and load due to the leaf developmental stage primarily, but also due to the microenvironment inside the false stem of leek. Hentriacontan-16-one, the dominant wax compound in the blade EW, was present only in the EW of ligule from older leaves. Total EW load decreased with consecutive leaves, and was mainly composed of alkanes and putative branched-chain alcohols. The levels of the latter increased with consecutively younger leaves. Although they were not found on the ligule from the oldest leaf or on green leaf blades, they were present, however, in the EW of sheath. In conclusion, (1) the ligule tissue seems to be the site of wax induction, at least on the adaxial side of the leek leaf, and (2) although branched-chain compounds have not been previously reported for leek, they appear to be normal components of leek EW, probably induced by high humidity and low light intensity conditions inside the false stem.

LIGHT MICROSCOPIC STUDIES ON THE EFFECT OF DIAZINON ON *ALLIUM CEPA* (ONION) CHROMOSOMES

Gena Smith, Nabarun Ghosh and Don W. Smith

Department of Biological Sciences, University of North Texas, Denton, TX

Diazinon is an organophosphate compound frequently used as a wide range pesticide to control household pests like insects, nematodes and ants. It is also used in agricultural and commercial fields. The present investigation was carried out to devise a convenient test system to detect the effect of Diazinon on plant chromosomes. *Allium cepa* (onion) is a widely used test system for detection of toxicity of any physical or chemical agent on the plant genetic system. We cut off and discarded the existing roots from green onion bulbs collected from a supermarket and placed them in 30 ml glass vials which contained Knop's solution (x10). The onions were secured at the top with cotton and placed near a growth light. After 3 days the newly formed root tips were excised, pre-treated with *para*-Dichlorobenzene solution for 3 hr, fixed in Carnoy's fixative overnight, stained in 2% aceto-orcein : 1N HCl (9:1) and squashed in 45% acetic acid. We did the standard karyotype of *Allium cepa* from well scattered metaphase plates (2n=16) for comparison. We subjected the onion bulbs with growing roots to different concentrations of Diazinon (0.1-1 ppm). We counted the dividing cells and abnormal cells from several microscopic fields to determine the Mitotic Index (MI) and Abnormality Index (AI). Concentrations of Diazinon higher than 0.2 ppm were lethal. We also detected the rate of recovery by transferring the treated onion bulbs to Knop's solution. With increasing concentrations of Diazinon, the Mitotic Index decreased and there was a sharp increase in the Abnormality Index. From our investigation it is very clear that Diazinon interferes with cell division and has a deleterious effect on plant chromosomes.

A MORPHOLOGICAL EXAMINATION OF *CANDIDA ALBICANS* BY SCANNING ELECTRON MICROSCOPY. EDWARD D. KOSTERMAN III, DAVID C. GARRETT, AND MARK A. FARINHA. Department of Biology, University of North Texas, Denton TX. 76203

Candidia albicans is a dimorphic yeast of significant clinical importance. The organism causes a wide variety of infections usually in those individuals who have become immunocompromized and have decreased immune survalence. *Candidia albicans* is capable of exhibiting several different morphologies including yeast-like cells, pseudohyphae, and true hyphae. Using scanning electron microscopy this investigation will document the life cycle of the yeast, and the distribution of dimorphic forms in colonial growth. In order to induce the growth of both yeast and hypae forms, colonies were inoculated on nitrocellulose membrane or nylon squares and placed on top of the growth media. In this procedure both a rich media (blood agar) and minimal media (corn meal agar) were used. When incubated on blood agar at 37C° for 24hrs, yeast forms predominated. Conversely, when incubated on less substantial media for longer incubation times (72hrs), colonies begin to produce hyphae that grew along the surface of the substrate in search of better nutritional conditions. Following the maturation of the samples, each was fixed in 2% aqueous osmium tetroxide vapor followed by dehydration in a series of butenol/water saturations. The specimens were then air dried and examined with a JEOL T-300 scanning electron microscope.

A SCANNING ELECTRON AND LIGHT MICROSCOPIC STUDY OF THE CRYSTAL IDIOBLASTS OF *LEMNA MINOR*. **MICHAEL. R. JOHNSON AND HOWARD J. ARNOTT.** The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington Texas 76019.

Lemna minor, often called duckweed, is a small, cosmopolitan aquatic plant used commercially for detoxification of water, particularly sewage-contaminated water. *L. minor*, along with other members of the family Lemnaceae, is among the smallest of the flowering plants. *L. minor* produces numerous calcium oxalate crystal idioblasts within the fronds and roots, and the idioblasts represent a significant structural component of the organism. In this study, whole plants of *L. minor* were prepared for electron microscopy by gluteraldehyde fixation, ethanol dehydration and freeze-fracturing in liquid nitrogen using absolute ETOH as a support fluid. Structural characteristics of the crystal idioblasts in both fronds and roots were studied using SEM. Isolated crystals from the root and stem were also examined. Information regarding the distribution of the crystal idioblasts was made using clearings of whole plants and plotting via image analysis. Cleared specimens were prepared by fixation, dehydration, and subsequent treatment with xylene. Mounted specimens were observed with light microscopy using plane-polarized light which demonstrates the presence of birefringent crystals of calcium oxalate in-situ. The distribution of idioblasts in the fronds seems random. However, zones of idioblast concentration were found in the roots. The zones of crystal deposition in the root of *L. minor* poses an interesting physiological problem.

MORPHOLOGY AND DEVELOPMENT OF A LABORATORY ADAPTED STRAIN OF *TAENIA CRASSICEPS* IN THE MOUSE HOST. D. A. DIXON, Dept. of Biology, University of Texas at Arlington, Arlington, TX 76019.

Larval *Taenia crassiceps* reproduce rapidly by budding following establishment of the parasite in the peritoneal cavity of the mouse host. Development is accompanied by distinct morphological changes and high levels of crowding toward the end of a six week period following infection. The objective of this study was to observe and record developmental changes in laboratory adapted *T. crassiceps* over a six week period following intraperitoneal infection, and determine whether morphological and/or degenerative changes were occurring as a result of extensive maintenance by serial transfer and lack of challenge by the definitive host. Parasites were harvested at 2, 4, and 6 weeks postinfection and examined using scanning electron microscopy.

It was found that *T. crassiceps* undergoes three distinct stages of larval development: single bladder larva (cysticercus), active budding larva, and degenerate larva with attached mature buds. Budding commences at the aboral end at about 2 weeks postinfection, and the developing buds are highly vascularized. Buds are initially released as they mature, but as conditions become more crowded, they remain attached to the parent bud. Our laboratory strain was found to bud at a much higher rate, and produce more buds per mature cysticercus than the 'high budding' ORF strain. In addition, the cysts showed numerous degenerative changes, such as missing rostellar hooks and holdfasts, everted scolices, and lack of differentiation of holdfast end tissues.

This study has shown that dramatic morphological changes occur in *T. crassiceps* larvae over the course of a 6 week infection and that our laboratory strain has undergone numerous adaptive and degenerative changes in response to being maintained exclusively in the mouse host.

Neuroendocrine Tumors of the Lung
Bruce Mackay, U.T. M.D. Anderson Cancer Center, Houston
An intriguing aspect of the pathology of lung cancer is the occurrence of neuroendocrine differentiation. It is manifested by several of the tumor types but the level of expression varies considerably. Neuroendocrine cells share features of endocrine and neural cells and these properties can be utilized to identify the cells with the use of immunohistochemical techniques and electron microscopy. The ultrastructural hallmark is the presence of cytoplasmic dense-core granules, and in the lung tumors the granules are comparable in appearance to those in similar tumors elsewhere in the body. As the classification of lung cancer has evolved in recent years, it has become apparent that there is a spectrum of differentiation among neuroendocrine lung tumors, and this is reflected in their ultrastructure. Transmission electron microscopy is therefore a valuable tool with which to study neuroendocrine lung tumors, and morphometric analysis using electron micrographs has provided useful information and contributed to a better understanding of relationships among the tumors.

BIOLOGICAL SCIENCES
POSTER PRESENTATION—SPRING 1998

SENSITIZED EMISSION IMMUNO-RESONANCE ENERGY TRANSFER (SEIRET) MICROSCOPY: APPLICATIONS TO ACTIN-ASSOCIATED PROTEINS. **J. Miles & D. Root, Dept. Biological Sciences, University of North Texas, Denton, TX 76203**

Dual labeling immunofluorescence staining and imaging of tissue sections for colocalization of proteins provides high contrast detection which can be directly compared to transmitted light microscopy of the same field. Preparations are also more facile and require milder treatments to the sample than immunoelectron microscopy. Unfortunately, images from light microscopy are limited in their resolution by the diffraction of light which raises questions regarding the closeness of association between two molecules colocalized by this method. Resonance energy transfer is a spectroscopic method that allows the proximity of two labeled molecules to be probed on the angstrom-nanometer scale. The marriage of resonance energy transfer spectroscopy with microscopic imaging can provide colocalization data with a resolution comparable to or exceeding those of immunoelectron microscopy but with mild preparations similar to immunofluorescence staining; although, the images produced are still diffraction-limited. Background interferences are mostly eliminated by delayed luminescence techniques exploiting the long-lifetimes of terbium chelates as resonance energy transfer donors and short-lifetime organic fluorophores as resonance energy transfer acceptors. The reduction in background allows lifetime measurements of resonance energy transfer to be made in tissue sections. A further advantage over immunoelectron microscopy is that SEIRET provides information on the fraction of molecules which are colocalized by resonance energy transfer. SEIRET is demonstrated by application to a postulated actin-binding protein, dystrophin, and also to calmodulin, a protein believed to be closely associated with actin-binding proteins. Results in two different tissue types, skeletal muscle and cerebral cortex, are compared. Both calmodulin and dystrophin are found to be associated with actin, and no evidence is found for interactions between dystrophin and calmodulin. Consistency between these data and proposed models in the literature support the use of SEIRET as a method for determining high resolution colocalizations with optical techniques.

MATERIALS SCIENCES
PLATFORM PRESENTATION—SPRING 1998

TEM ANALYSIS OF SELF-ASSEMBLED NANOSCALE SEMICONDUCTOR STRUCTURES OF QUANTUM-CONFINED CdS ON DNA TEMPLATES. Young G. Rho,[1] Russell F. Pinizzotto,[1] Xin Li,[2] Jeffery L. Coffer,[2] Irma L. Pirtle,[3] and Robert M. Pirtle,[3] [1]Materials Science Department, University of North Texas, Denton, TX. [2]Department of Chemistry, Texas Christian University, Fort Worth, TX. [3]Department of Biological Sciences, University of North Texas, Denton, TX.

TEM has been used to characterize self-assembled nanoscale semiconductor structures composed of quantum-confined CdS (Q-CdS) nanoparticles on deoxyribonucleic acids (DNA). Linear and circular pUC1.cu4 plasmid DNA and ϕX 174 RF II DNA were used as templates to control the overall shape and size of semiconductor structures. The structures were fabricated in three steps: First, DNA was deposited on carbon-coated TEM grids by floating the grids on drops of DNA solution. Second, the DNA was exposed to Cd^{2+} by dipping the grid into a cadmium solution. Third, the air-dried Cd^{2+}/DNA grids were exposed to H_2S gas to form the Q-CdS nanoparticle arrays. Analytical transmission electron microscopy (AEM) and high resolution electron microscopy (HREM) were used to analyze the semiconductor structures. Many individual CdS/DNA microstructures were found. The diameter of the nanostructures is approximately 5 nm, which is an array one Q-CdS nanoparticle thick. DNA anchored by this method remained on the carbon film when the grids were dipped into cadmium solution. Two distinguishable crystal sizes were observed from CdS only samples (without DNA). Selected area electron diffraction patterns of the two sizes were consistent with the diamond cubic (Hawleyite) phase and hexagonal close-packed (wurtzite) phase. These experimental results demonstrate the possibility of fabricating various sizes and shapes of mososcale semiconductor structures of Q-CdS using different DNA sizes and shapes.

DISLOCATION SUBSTRUCTURES IN TUNGSTEN-ALLOY BALLISTIC PENETRATORS. CHRISTINE KENNEDY, S. PAPPU, AND L. E. MURR. Department of Metallurgical and Materials Engineering, and Materials Research Institute, The University of Texas at El Paso, El Paso, TX 79968.

High density materials like depleted uranium and tungsten heavy alloys (WHA) have historically been relied upon as large caliber penetrators used in modern day tank gun ammunitions. Due to the environmental concerns associated with depleted uranium, there has been considerable interest in developing and improving tungsten alloys as comparable substitutes.

Recently, it was observed that tungsten single crystal projectiles, in the [100] orientation, performed exceptionally well in ballistics tests. A transmission electron microscope (TEM) study of the tungsten single crystals has revealed dislocation structures which have been described in the absence of a comparison with the starting, undeformed microstructure. In addition, no systematic microstructural analyses of conventional tungsten heavy alloy (WHA) penetrators have been reported for comparison.

In this research, both a precursor and residual (deformed, in-target) WHA (93W-4.9Ni-2.1Fe by wt%) sub-scale penetrator have been examined optically and through TEM. Dislocation substructures were observed in the microstructure of both the starting and deformed standard tungsten penetrators, and therefore may not be unique to textured, single crystal or even columnar-grained tungsten penetrators which are currently being investigated for comparison.

This research is supported in part by a U.S. Army Research Office Defense Augmentation Award (DAAG55-7-1-0238) for Science and Engineering Research Training (C. K.), an ARL Director's Research Initiative Award (ARDEC-DAAA21-94-C-0059, P00002), and a U.S. Department of Defense, Defense Logistics Agency, Defense National Stockpile Center Grant (DN-009)

TEM STUDIES OF CARBIDE PRECIPITATION ON SELECTED INTERFACES IN 304 STAINLESS STEEL

E.A. Trillo, and L.E. Murr, Dept. of Metallurgical and Materials Engineering, The University of Texas at El Paso, El Paso, TX 79968

Stainless steels, although highly resistant to corrosion, are nonetheless susceptible to sensitization when subjected to a heat treatment in the range of 500 - 800°C. Once this occurs $Cr_{23}C_6$ precipitates form at the grain boundaries and other selected interfaces leaving the area immediately surrounding the carbide depleted of chromium. The energy of the interface, the chemistry of the material, and the thermomechanical processes are all major contributors to the precipitation process. Of these factors energy plays a crucial role. This research will show that the energy of the interface plays a dominant role in determining whether or not precipitation will occur at all. Four different materials were utilized in this study with varying carbon contents (0.01, 0.025, 0.05, and 0.07%C) and were heat treated at 670°C for 10 and 50 hours. In addition the 10 hour samples were deformed (0 and 10% true strain) to observe strain effects. Electrochemical Potentiokinetic Reactivation (EPR) tests were performed to characterize the sensitization behavior, and the precipitation behavior was observed through a Hitachi H-8000 Scanning Transmission Electron Microscope. This analysis shows that carbide densities are different between large and small angle grain boundary misorientations. Different types of boundaries (i.e. grain boundaries, non-coherent twin boundaries, and coherent twin boundaries) also exhibited different precipitation behavior because their energies are measurably different. This study presents the first quantifiable interfacial energetic comparison of precipitation phenomena and illustrates a critical interfacial energy range for nucleating carbides in 304 stainless steel. Research supported by the U.S. Department of Defense, Defense Logistics Agency, Defense National Stockpile under Grant DN-009.

Examination of Er-doped Si Colloids by Transmission Electron Microscopy Yandong Chen, Russell. F. Pinizzotto, John St. John* and Jeffrey L. Coffer*, Department of Materials Science, University of North Texas, Denton, TX 76203, *Department of Chemistry, Texas Christian University, Fort Worth, TX 76129

The study of Er-doped Si wafers began in the early 80's. Erbium has a very stable and sharp emission peak in the infrared region due to its inner f-shell transition. Er doping might also break the spatial translation symmetry of single crystal Si to enhance the radiation. After the discovery of photoluminescence from quantum confined Si nanocrystals, Er-doped Si nanocrystals are being examined as a potential new material for optoelectronic devices. We have used a vapor- phase pyrolysis method to synthesize Er-doped Si nanocrystals. The oven temperature was at 1000 ^{0}C. The silicon/erbium colloids were collected in ethylene glycol. Analytical transmission electron microscopy was employed to analyze the chemical composition, microstructure and size distribution of the silicon colloids. High resolution transmission electron microscopy was used to determine the nanostructure, defects, sizes of the Si nanocrystals, and possible location of erbium. SADP shows that Si nanocrystals are the diamond cubic phase. XEDS data quantitatively confirm the presence of erbium .

SEM STUDIES OF IMPACT CRATER FORMATION IN SOFT ALUMINUM TARGETS. O. L.Valerio, E. Ferreyra T., S. A. Quiñones, and L. E. Murr. Department of Metallurgical and Materials Engineering The University of Texas at El Paso, El Paso, TX 79968

The projectile/target behavior and crater formation for modified 1100 aluminum (3.5 cm thick) impacted by 3.18 mm diameter ferritic stainless steel and soda-lime glass spheres ranging from 0.8 km/s to 4 km/s have been investigated by scanning electron microscopy (SEM) and crater geometries and geometrical ratios have been studied by light microscopy. There is an abnormal penetration and crater elongation at very low velocities in contrast to high velocities and hypervelocities (> 5 km/s) which is related to the projectile/ target strengths and spallation or other fragmentation of the projectile at higher velocities which correspond to critical pressure in the projectile. Especially peculiar fragmentation damage by spall fragmentation of the projectile in 1100 aluminum targets is compared with similar features in copper targets, and some preliminary computer simulation efforts will be presented. Research supported in part by CONACyT-Mexico fellowship and the Defense Logistics Agency of DOD, Defense National Stockpile Center, Grant DN-009.

RUBBER PARTICLE FORMATION DUE TO FRACTURING ON SURFACES OF STYRENE AND STYRENE BUTADIENE RUBBER. Anneke M. Post, Dept. of Material Science, David Garrett, Dept. of Biological Sciences, and Nandika D'Souza, Dept. of Material Science, University of North Texas, Denton, TX 76203.

Unplasticized pure polystyrene and plasticized styrene-butadiene rubber were used in brittle fissure and ductile fracturing to determine characteristic patterns of rubber particle formation under the scanning electron microscope. Tensile samples of styrene and SBR (styrene butadiene) polymers were fractured using a Material Test System 810 operating on a Teststar Os/2 platform. Fractured samples were analyzed using the scanning electron microscope. Sections were sawed at the fractured surface cross-section, mounted on aluminum stubs with carbon paint, and sputter-coated in a Polaron sputter-coater with a gold-palladium alloy. The samples were stained with aqueous osmium tetroxide by placing them in a controlled environment for two hours surrounded by, but not in direct contact with, the osmium. The different types of rubber particles formed due to the different elastic and straining potentials of the two polymer composites were analyzed. The SEM images produced indicate the size, depth, and general pattern of most types of rubber particles associated with certain stresses.

SOME STRUCTURE-PROPERTY-CORROSION ISSUES IN TITANIUM-TANTALUM ALLOYS FOR IMPLANT CONSIDERATION

H.M. Obispo, E.A. Trillo, S.W. Stafford, and L.E. Murr, Dept. of Metallurgical and Materials Engineering, The University of Texas at El Paso, El Paso, TX 79968

Titanium, tantalum, and their alloys have been used extensively as metallic implants. These materials have been proven to be suitable biomaterials due to their extremely high corrosion resistance to biological solutions. This resistance stems from the adherent oxide layer that is present on these materials naturally. The most utilized biomaterial is Ti6Al4V, however, recent issues concerning metal ion release has raised concerns as to its biocompatibility with new cell growth. This research, therefore considers two relatively new types of TiTa alloys (Ti40Ta and Ti50Ta) for implant consideration. Potentiodynamic tests were performed on these two materials in the as-received condition and a Ti6Al4V material for comparison. Their passive behaviors were compared in a simulated biological solution (Plasmalyte) at a constant temperature of 22 ± 1°C. Optical microscopy and transmission electron microscopy was also employed to observe the microstructure. These analysis reveal a second phase precipitate (α) surrounded by a $\alpha + \beta$ phase structure in both the Ti40Ta and Ti50Ta materials. In addition, a martensite phase was present in both materials, but was smaller and feathery in the Ti40Ta material.

For comparison, a specific heat treatment will be employed to the two TiTa alloys in order to obtain a material whose corrosion capabilities exceed that of Ti6Al4V. Potentiodynamic tests will be performed with the dame conditions as well as optical and TEM microscopy, to evaluate their corrosion behaviors and resulting microstructures. Research supported by the U.S. Department of Defense, Defense Logistics Agency, Defense National Stockpile under Grant DN-009.

MATERIALS SCIENCES
POSTER PRESENTATION—SPRING 1998

ELECTRON MICROSCOPY STUDIES OF CORROSION PHENOMENA IN AGING AIRCRAFT ALUMINUM ALLOYS. Maria Posada, L.E. Murr, R.A. Arrowood, Metallurgical and Materials Engineering Dept., University of Texas at El Paso, TX, 79968

Corrosion is increasingly becoming one of the major problems in aging aircraft. The material's degradation, natural or induced, is irreversible but controllable in intensity by engineering design. Therefore, a fundamental understanding of the mechanism for corrosion is essential in order to retard or eliminate this phenomena. Exfoliation corrosion, in particular, has been evident in aluminum body skin samples from the KC-135 aircraft. The KC-135 military aircraft, although low in actual flight hours, has been in service for over 30 years and is expected to continue in service until 2040. However, the environmental conditions experienced by the aircraft make it very susceptible to this type of corrosion.

In an effort to characterize the corrosion mechanism, several measures were taken: first, an elemental analysis was performed on precipitates and across grain boundaries using transmission electron microscopy (TEM) and energy dispersive spectroscopy (EDS). However, there was no evidence to suggest any significant elemental depletion or segregation along the in-plane view of the sheet. Second, a systematic analysis of grain boundary geometry and crystallography was performed along the in-plane and transverse sections of the plate using TEM and electron backscatter diffraction (EBSD) analysis in the scanning electron microscope. A bi-modal distribution was seen for the grain boundary misorientation measurements along the in-thickness section, while there was a random distribution for the misorientation measurements along the in-plane view. This research was supported by AFOSR-Grant F49620-95-1-0518 administered through the FAST Center for Structural Integrity of Aerospace Systems at UTEP

SOME STRUCTURE-PROPERTY-CORROSION ISSUES IN TITANIUM-TANTALUM ALLOYS FOR IMPLANT CONSIDERATION
H.M. Obispo, E.A. Trillo, S.W. Stafford, and L.E. Murr, Dept. of Metallurgical and Materials Engineering, The University of Texas at El Paso, El Paso, TX 79968

SEM STUDIES OF IMPACT CRATER FORMATION IN SOFT ALUMINUM TARGETS. O. L. Valerio, E. Ferreyra T., S. A. Quiñones, and L. E. Murr. Department of Metallurgical and Materials Engineering The University of Texas at El Paso, El Paso, TX 79968

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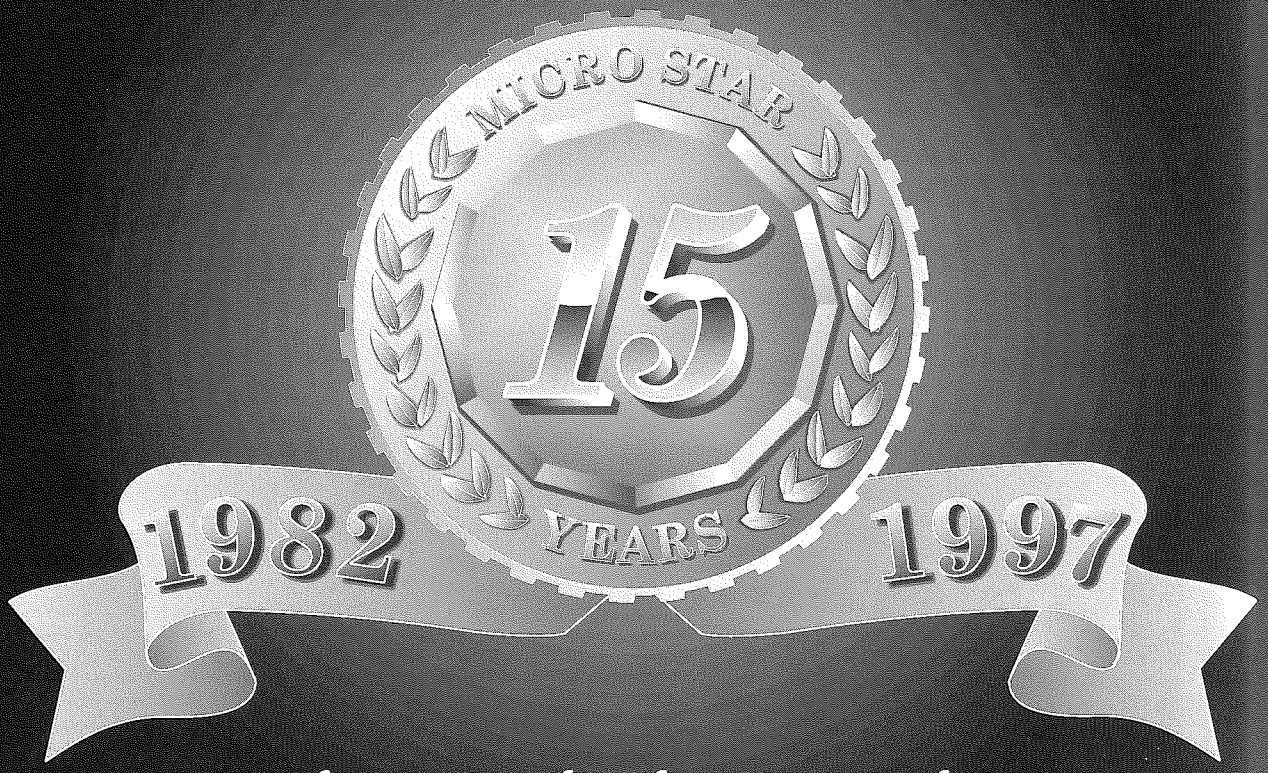

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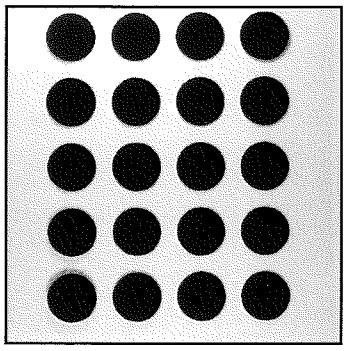

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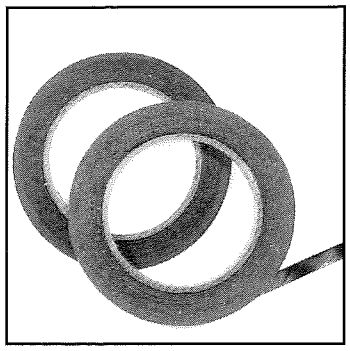

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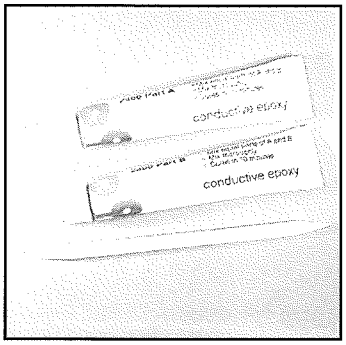

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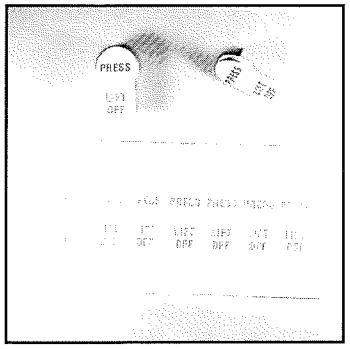

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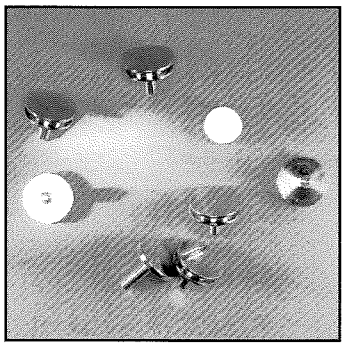

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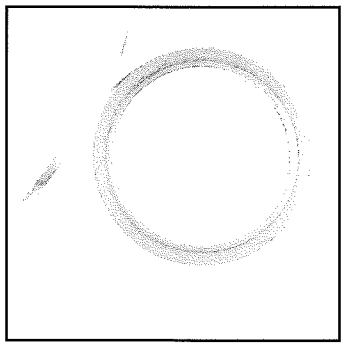
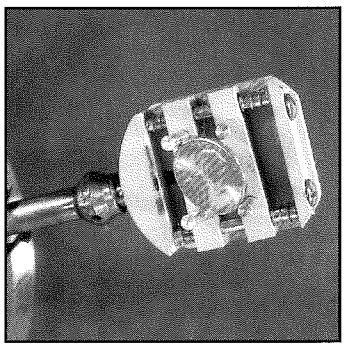


3M Copper Tape is a thin copper foil with a conductive adhesive, 1/4" x 18 yards.



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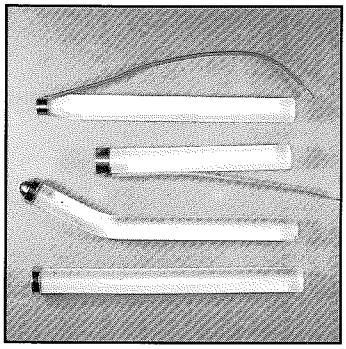

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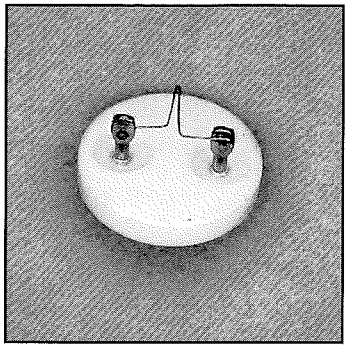

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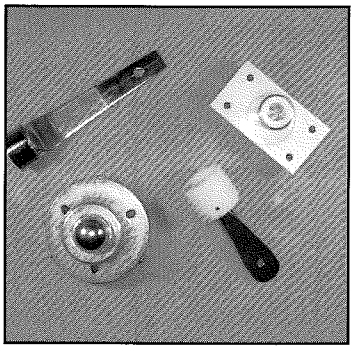

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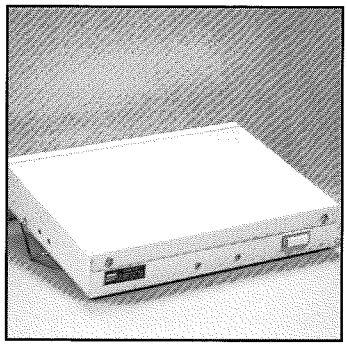

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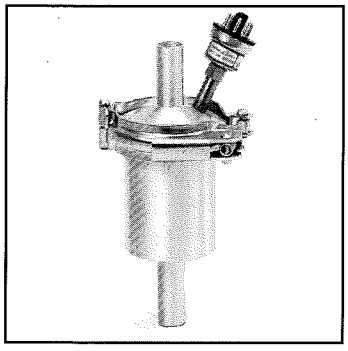

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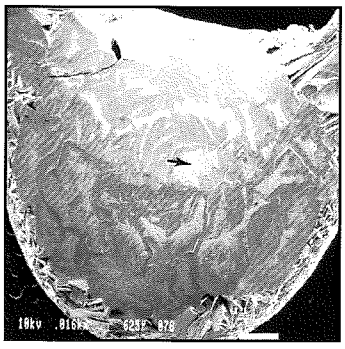

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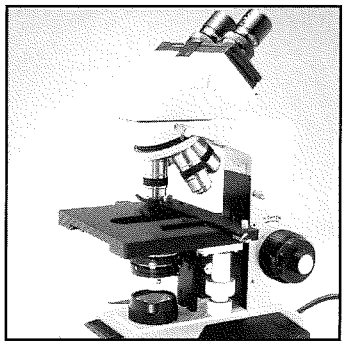

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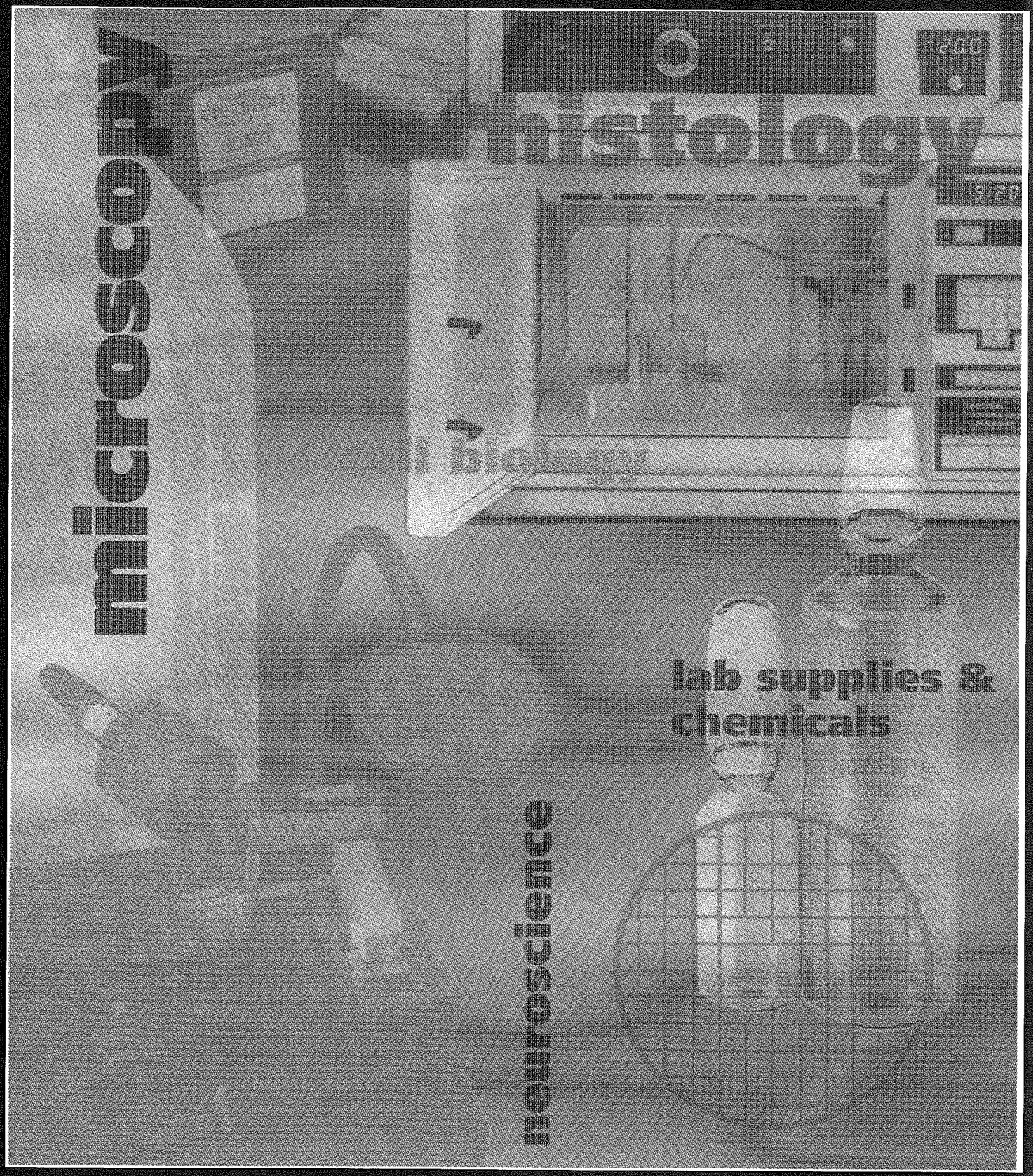

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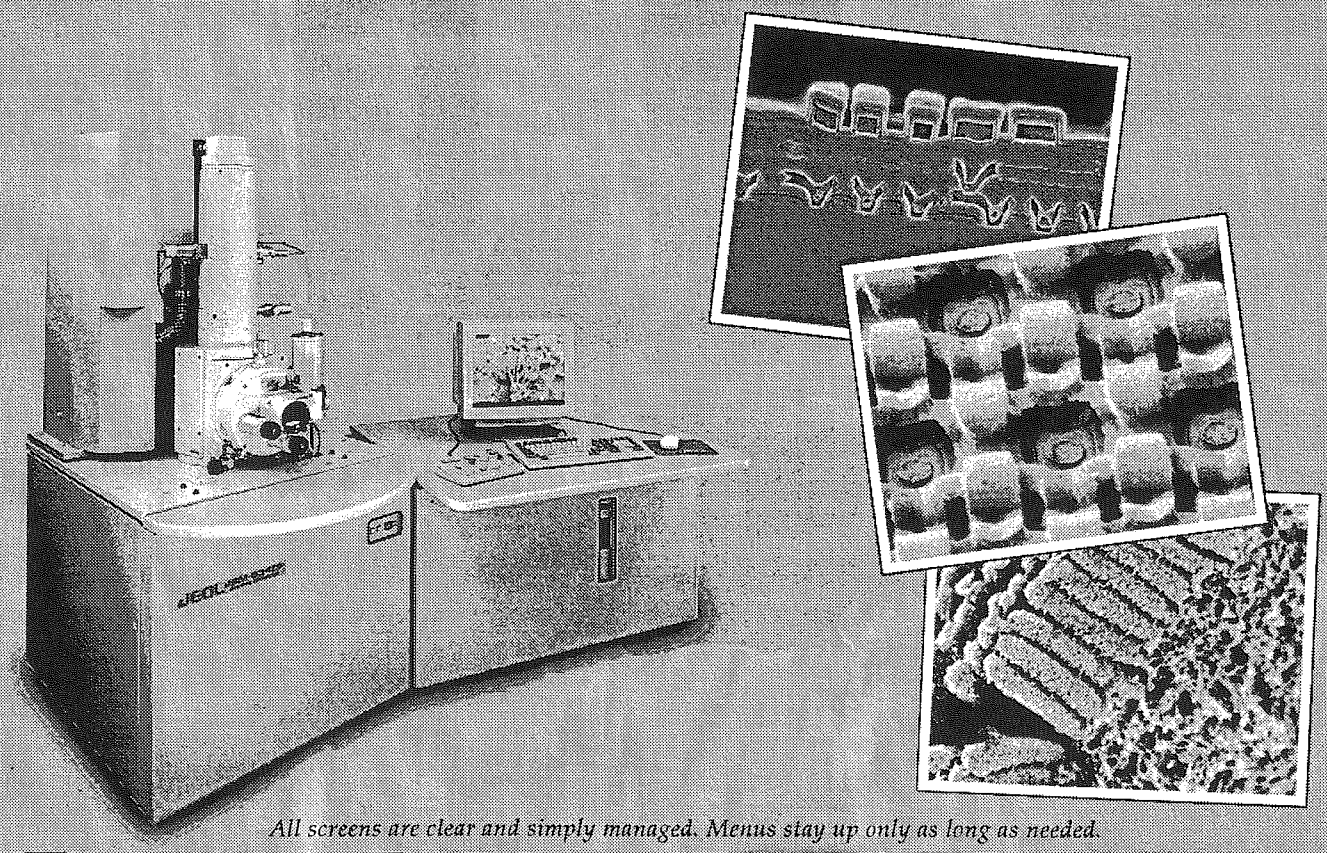

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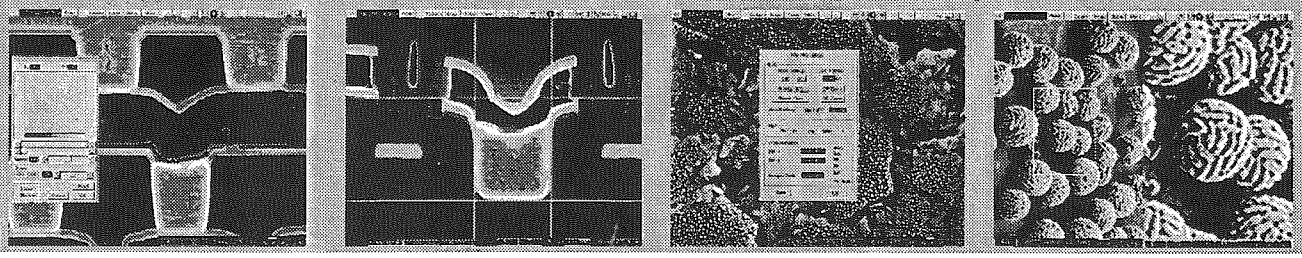

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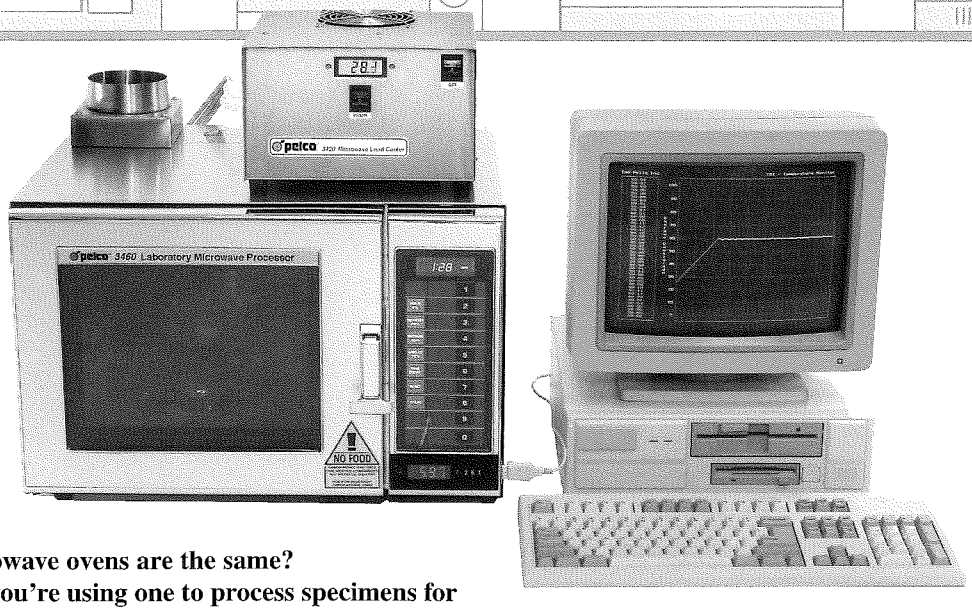

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from TSEM JOURNAL 28:2

The micrograph on the back cover of Volume 28, Number 2, P. 60, 1997, is a scanning electron micrograph of a speal from Arabidopsis thaliana. The specimen was air-dries and visualized under a high-resolution SEM. Each of the four types of floral organs (sepals, petals, stamens and carpels) of A. thaliana has a characteristic epidermal sruface morphology in terms of cell size, shape and texture. The micrograph represents a close-up of two stomata surrounded by ridged and interdigitated epidermal cells which cover the abaxial surface of the sepal. The ridges are probably cuticular thickenings, similar to those on petals. Epicuticular waxes are present as a film rather than crystalline structures on the surface of sepal epidermis.

Camelia G.-A. Maier, Plant Bioloby Division, The Samuel R. Noble Foundation

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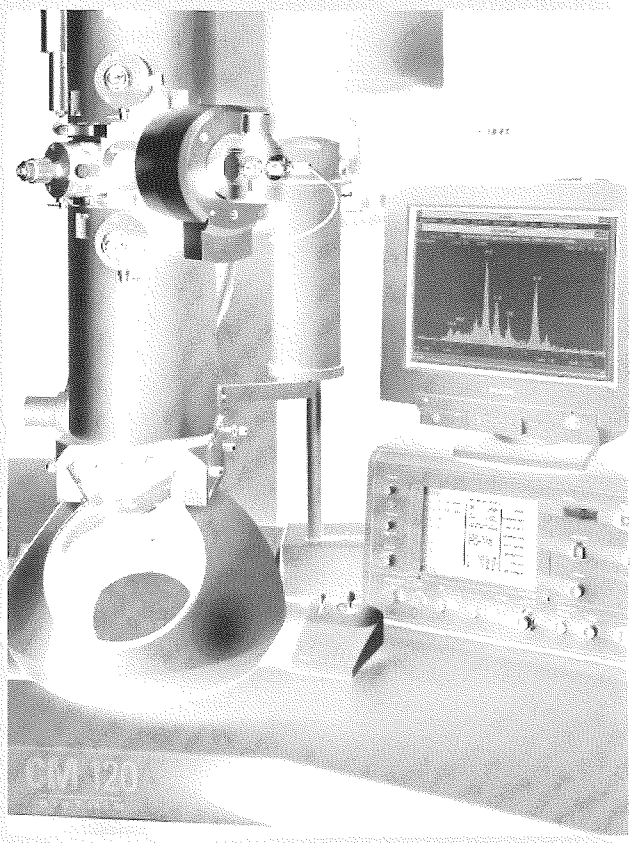

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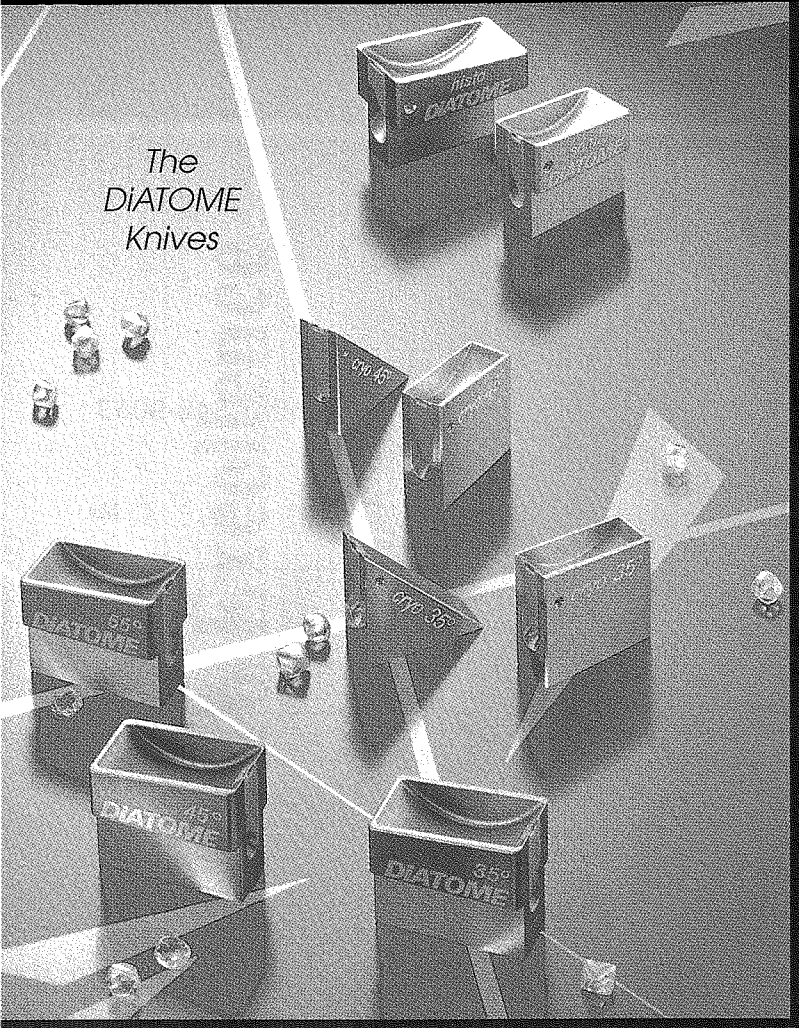

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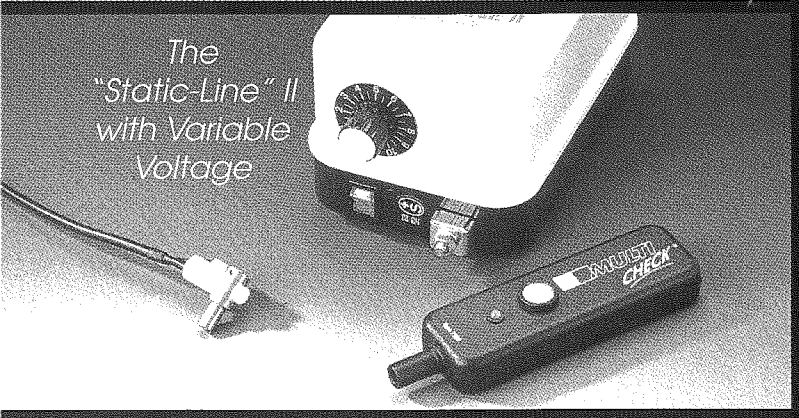

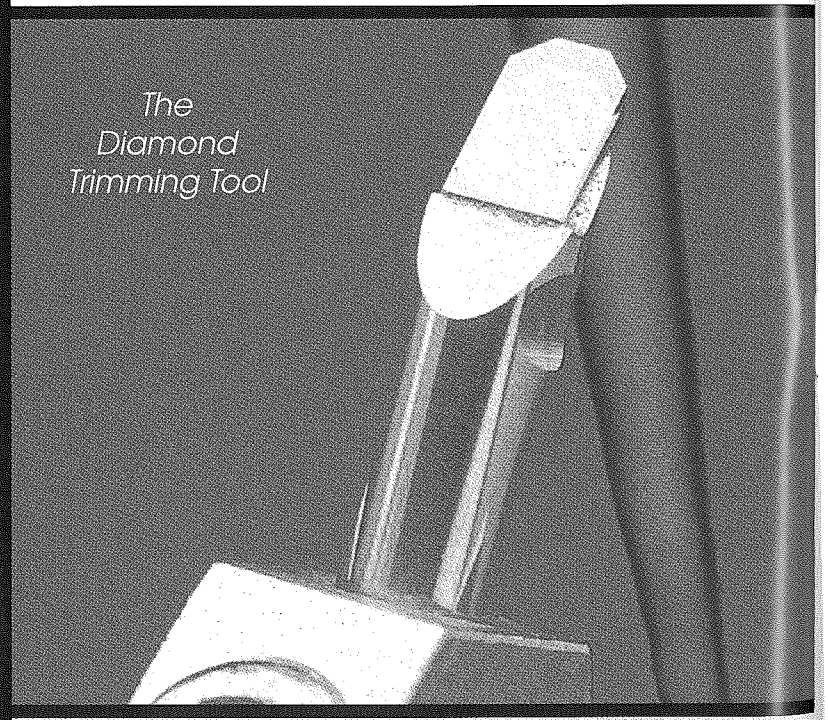

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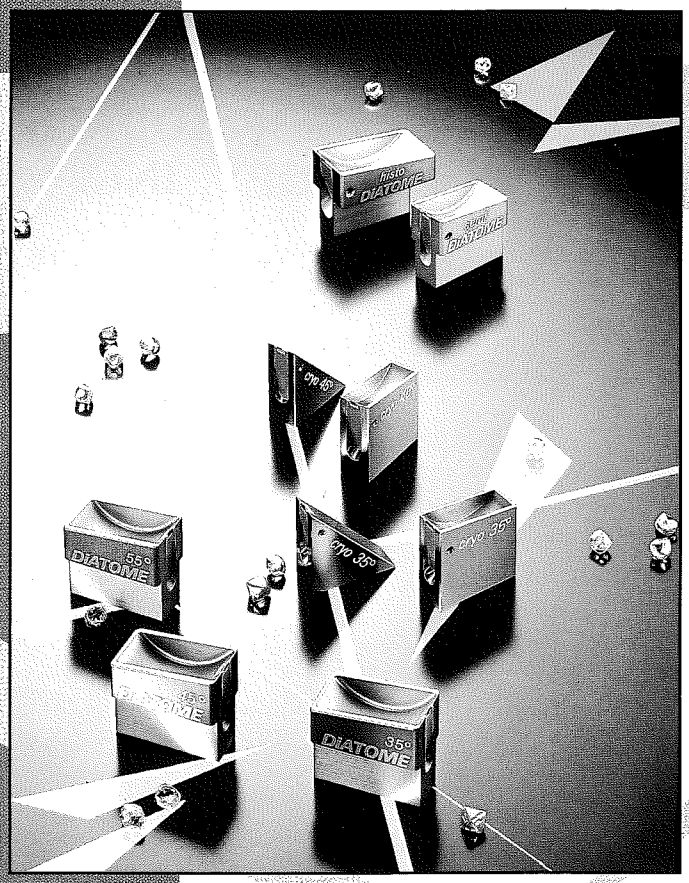
If you are a member changing your address, please attach an old mailing label to help us identify your previous record in the computer. Applicants for membership should include a check or money order for one year's dues with application (Regular: $15.00; Student: $2.00; Corporate: $75.00).

Applications for new membership, or for upgrading of membership category from STUDENT to REGULAR, will be presented to the Executive Council at their next meeting for their approval (majority vote). The applicants will then be presented by the council to the membership at the next general business meeting for their approval (majority vote). Applicants will be added to the membership rolls at that time.

Please Return To: Josephine Taylor
Department of Biology
P.O. Box 13003, SFASU
Nacogdoches, TX 75962-3303



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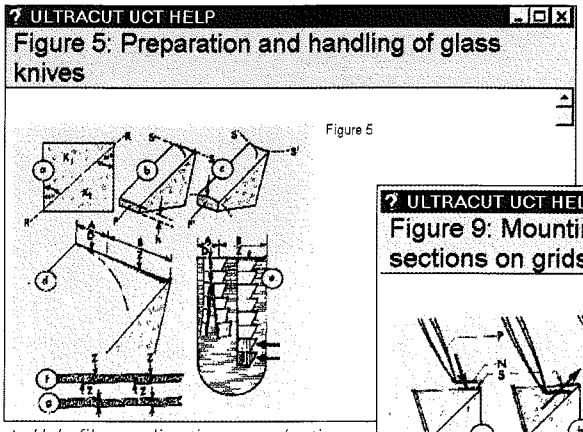

▲ *Help file supplies tips on evaluating the quality of glass knives.*

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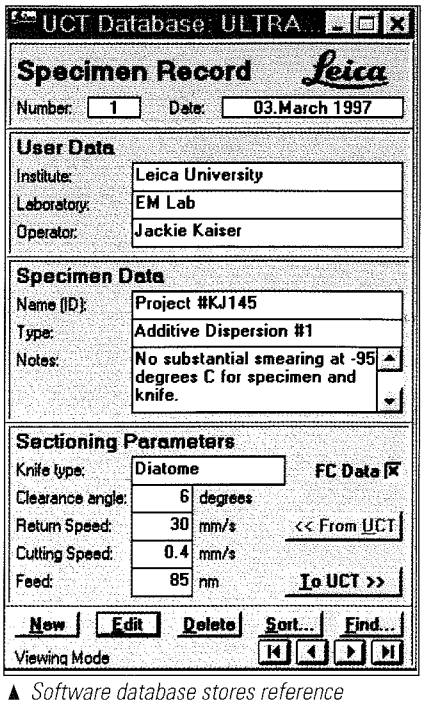

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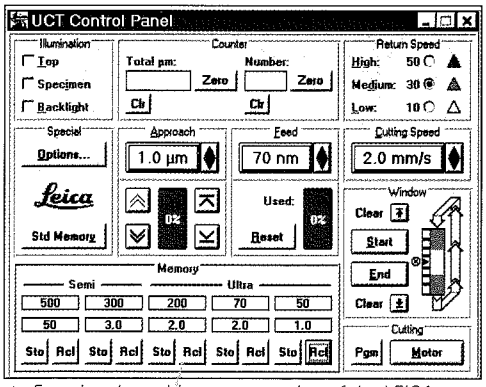
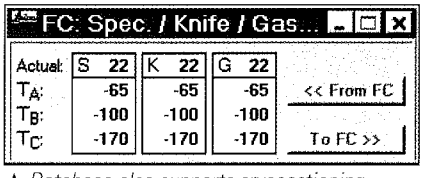


▲ *Functional graphic representation of the LEICA Ultracut UCT control panel.*



▲ *Database also supports cryosectioning.*

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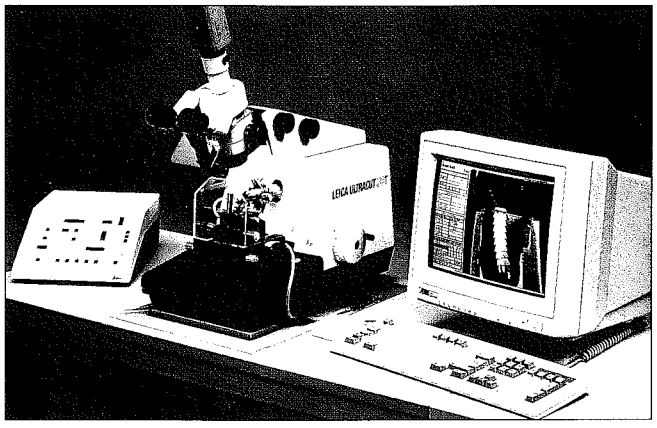

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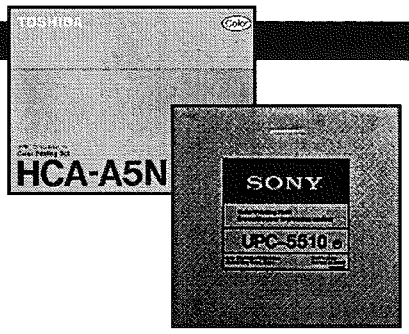

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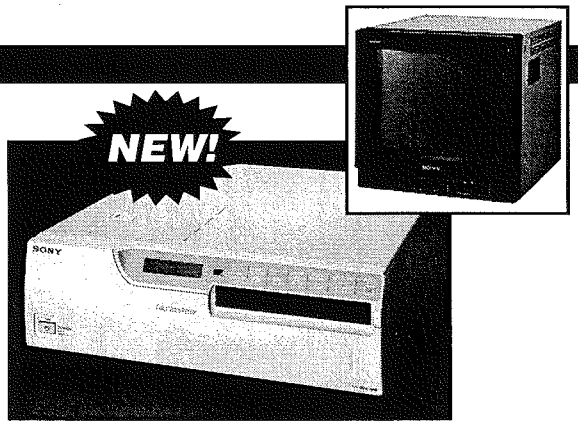

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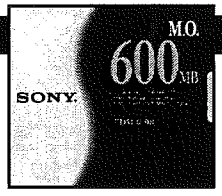

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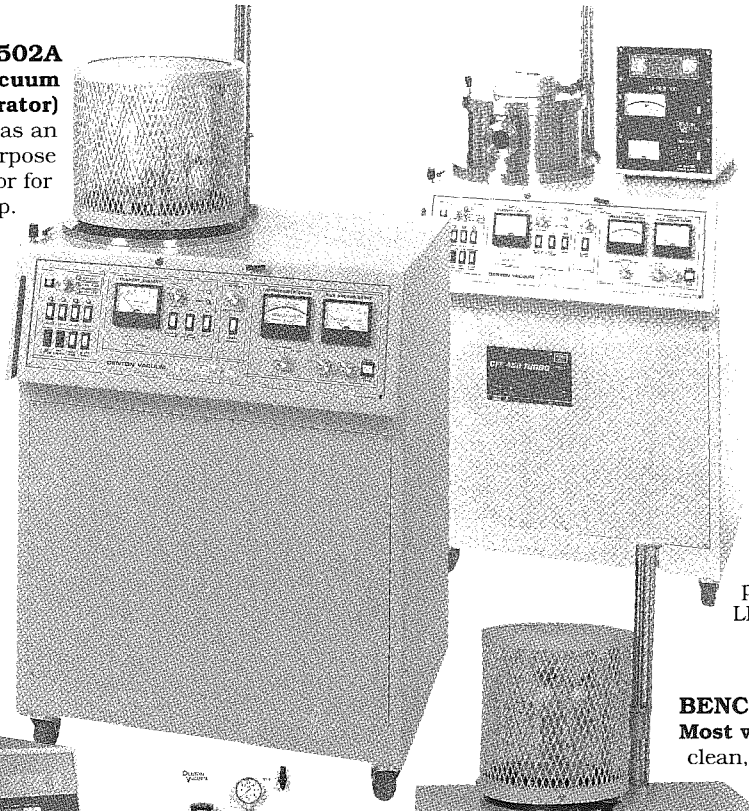

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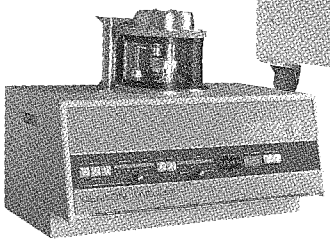

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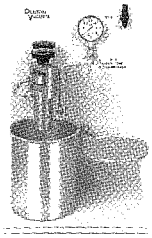

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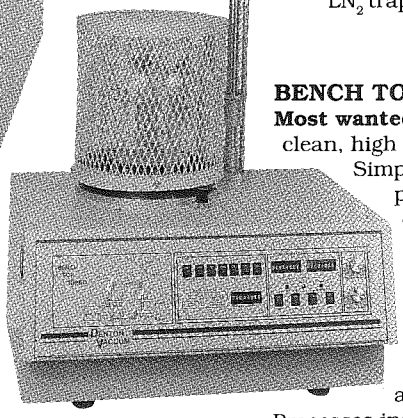

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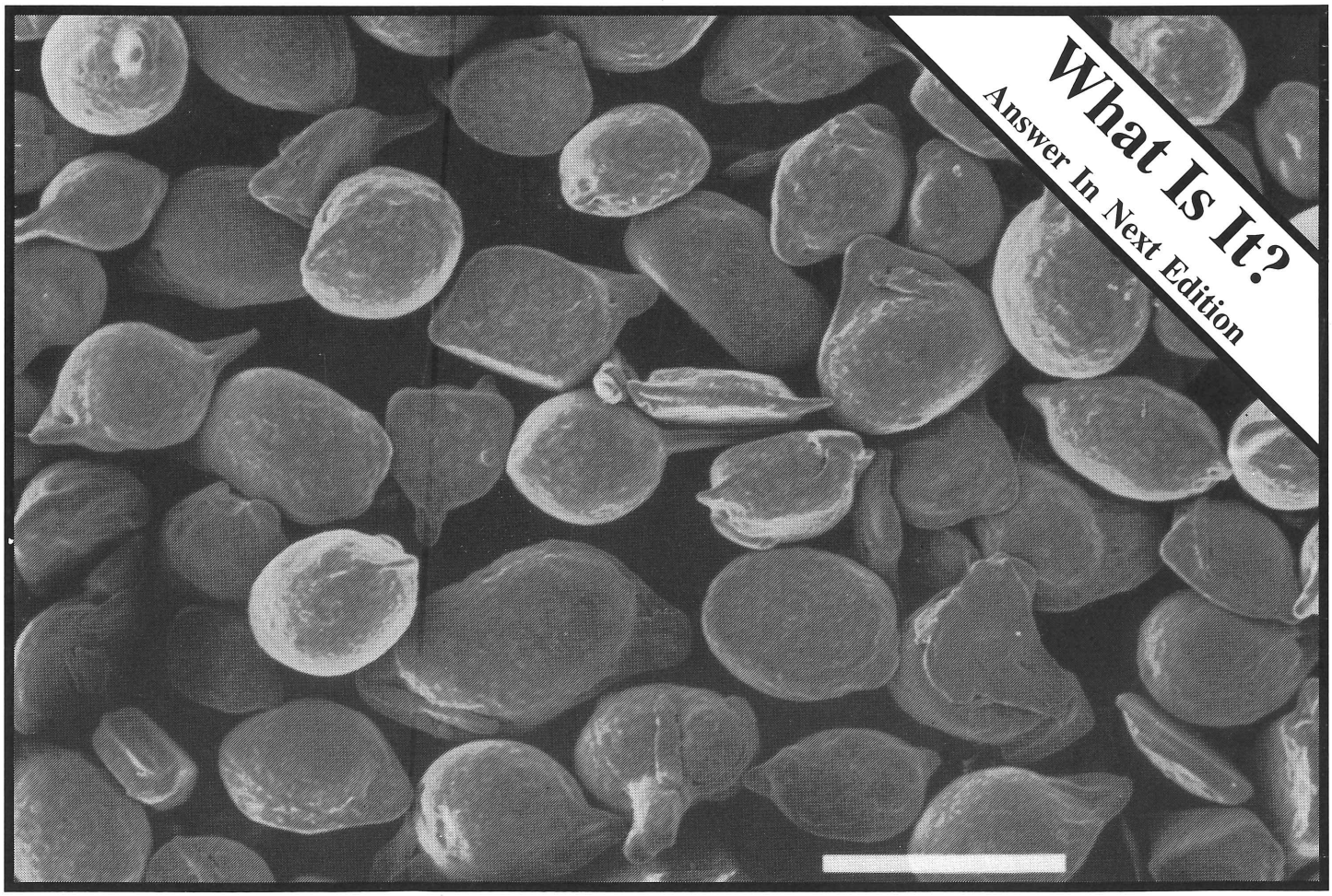

Micrograph by Alice M. Stacey. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019. Bar=1000μm.