TSM e

# Texas Journal of Microscopy

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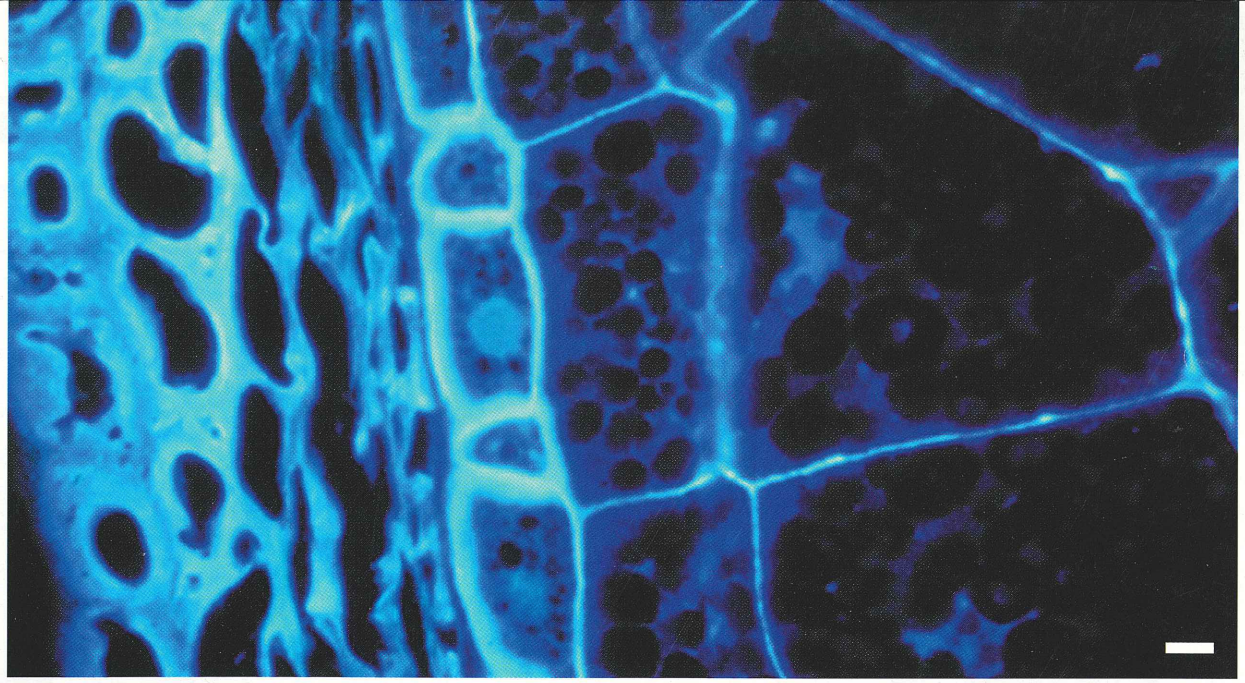

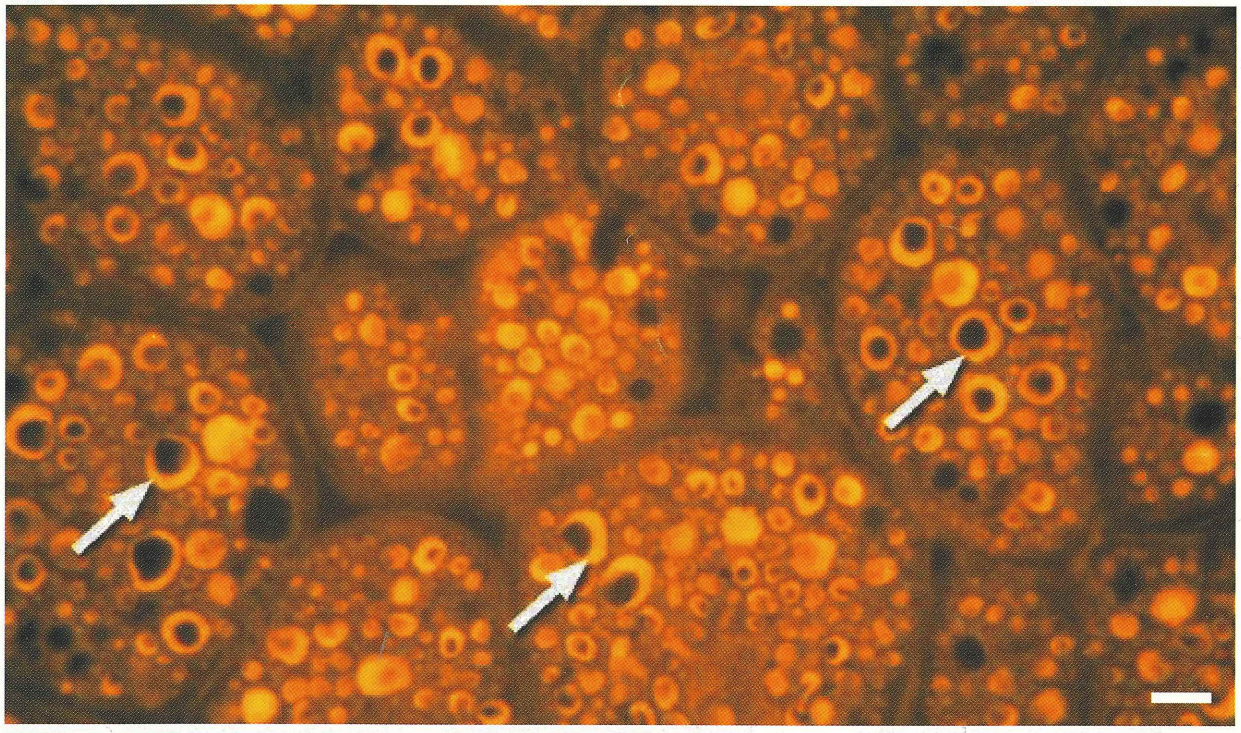

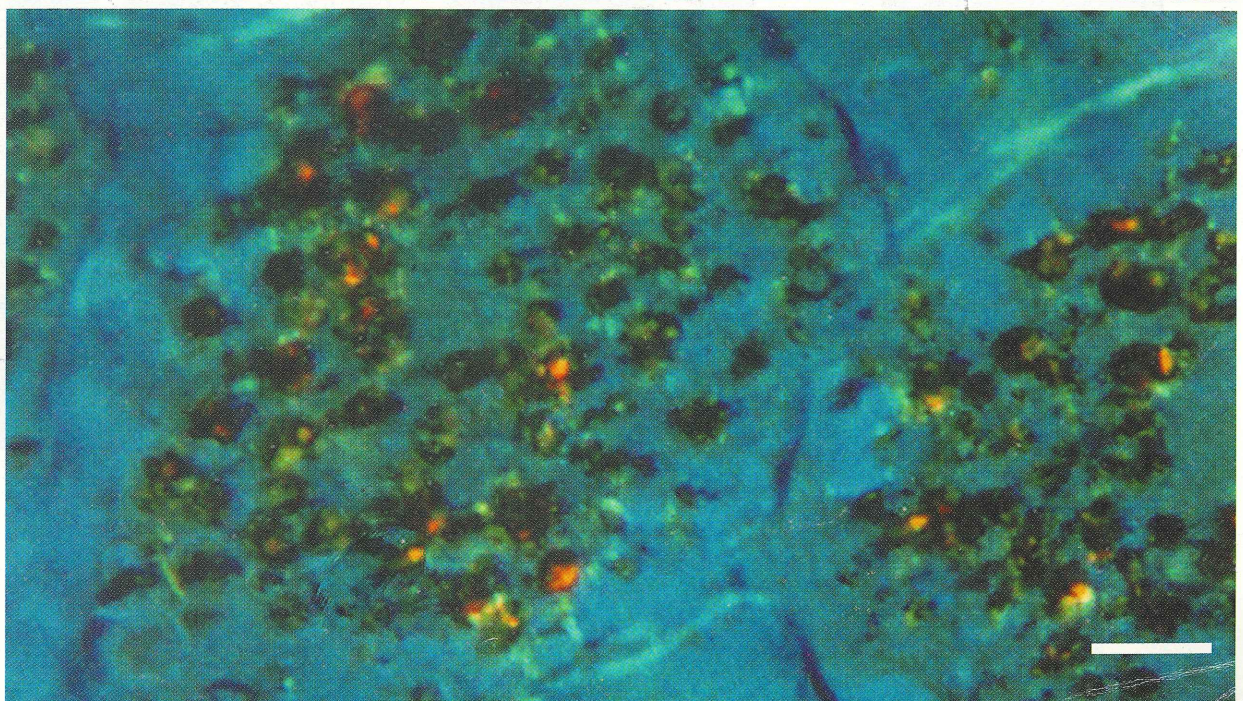

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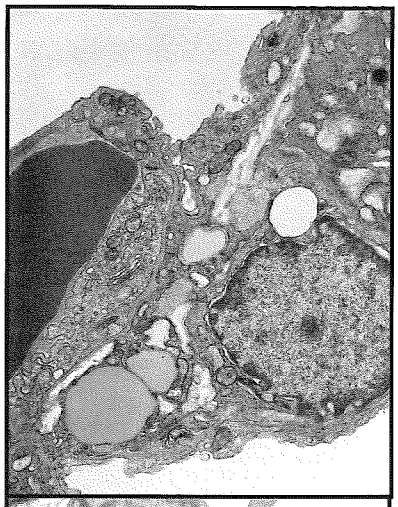

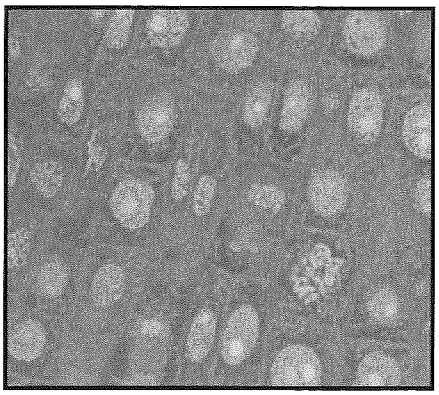

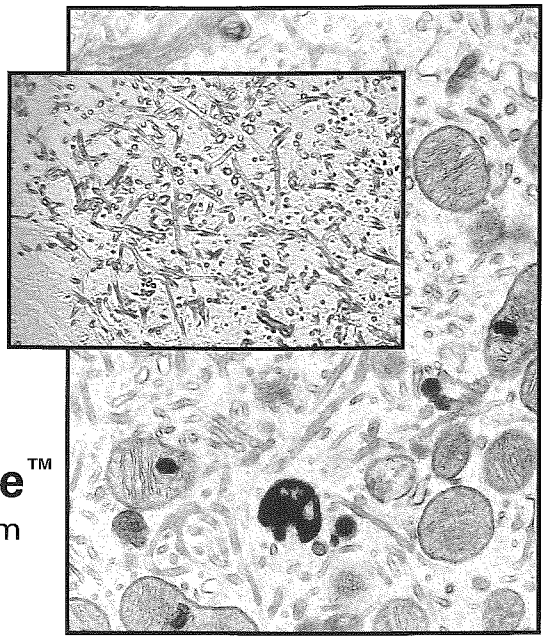

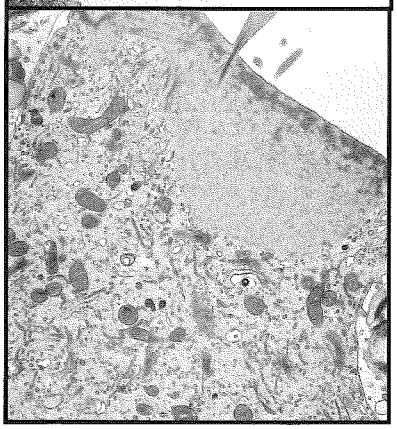

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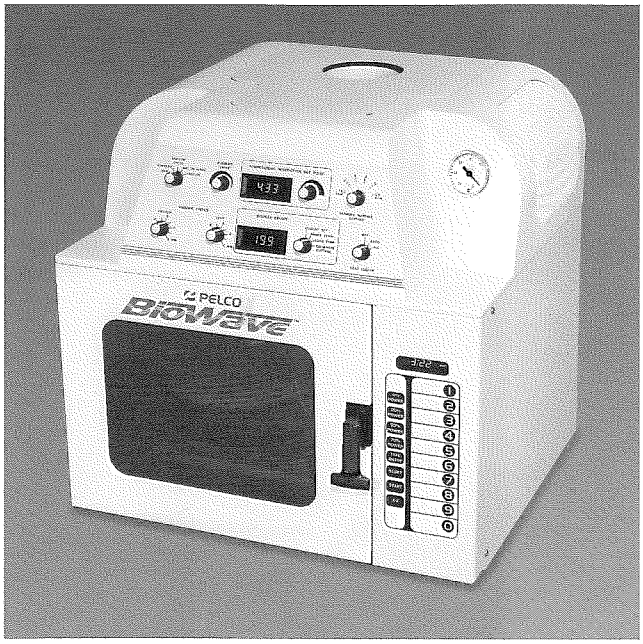


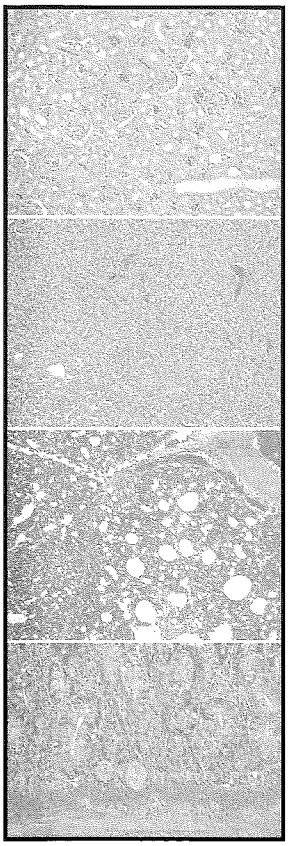

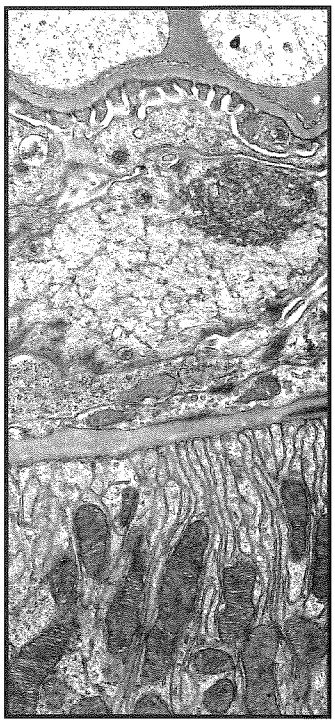

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# Contents


**TEXAS JOURNAL OF MICROSCOPY**
**VOLUME 32, NUMBER 2, 2001**
**ISSN 0196-5662**




*Camelia G.-A. Maier, Editor*
Department of Biology, Texas Woman's University, Denton, TX 76204

**Official Journal of the Texas Society for Microscopy**
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**ON THE COVER**

Top picture represents the brilliant blue of Calcofluor stain for beta glucans in the cell walls of pearl millet pericarp and aleurone cells. In the middle, cyanogen bromide stains for nicotinic acid inclusions (yellow crescents at the arrows) in the protein bodies (dark circles) of the germ in pearl millet grain. Alizarin red stains complexes with calcium crystals in the germ of an alkaline cooked corn kernel in the bottom picture. This study showed that calcium was absorbed only in a few select areas in the corn kernel- important for nutrition and organoleptic properties. Pictures were taken with a Zeiss Universal microscope equipped with a IIIRS epi-illuminating system. Filter combination were as follows: for Calcofluor - exciter filter 365 nm, barrier filter > 418 nm; for cyanogen bromide - exciter filter 450-490 nm, barrier filter > 520 nm. Alizarin red staining was viewed in bright field with a polarizing filter. Bar = 20μ for top and middle pictures, and 6μ for the bottom picture. Cassandra McDonough, Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474.

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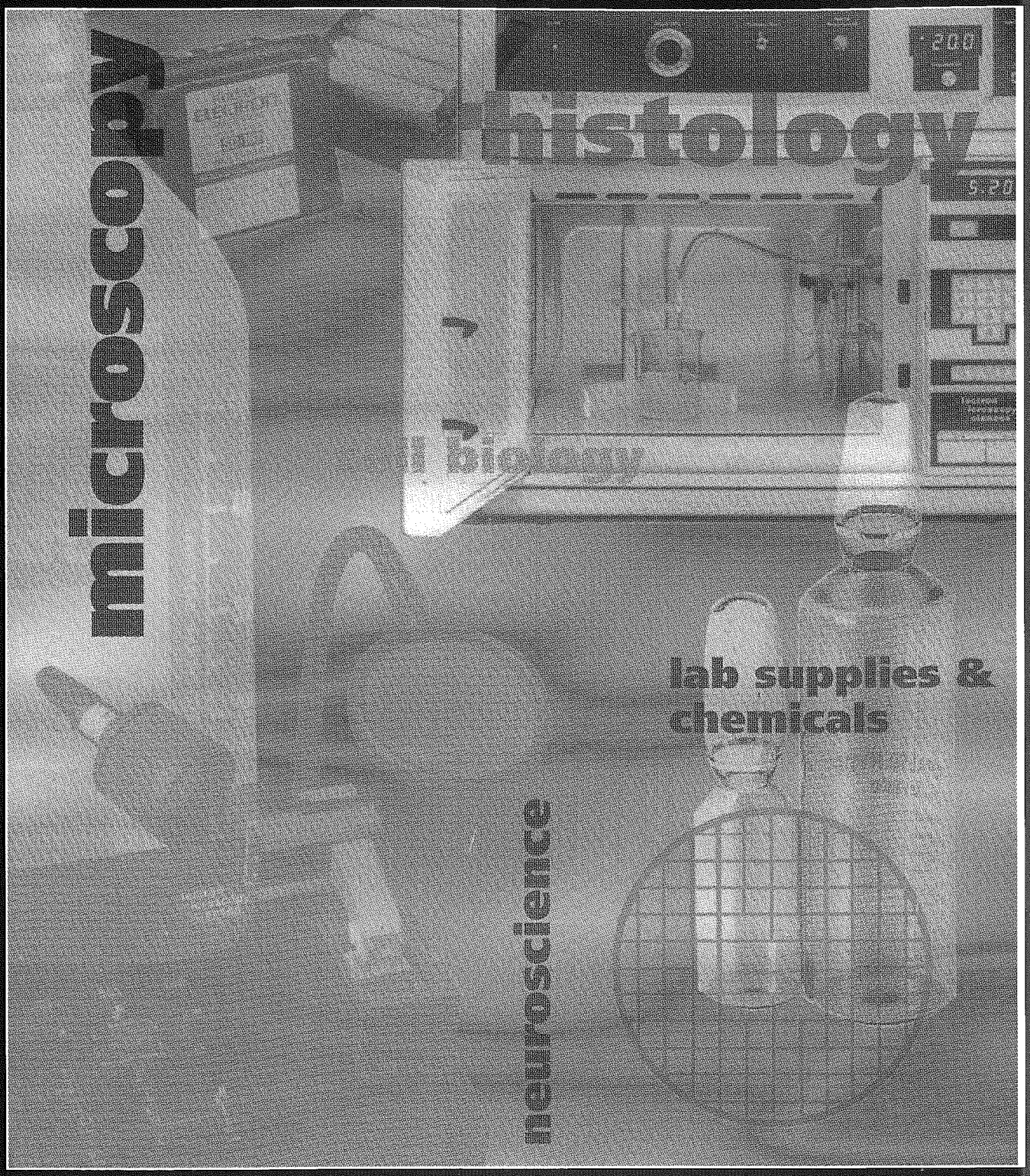


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# President's Message

All of the members of the Texas Society for Microscopy are saddened by the events that took place on September 11, 2001. We extend our deepest sympathies to the families, friends and victims of this national tragedy. We also want to thank the specialized rescue teams from the Texas area that participated in the search and rescue attempts as well as those who continue to work on behalf of the relief efforts.

I would like to extend my sincere thanks to the members both at the local level as well as those on the executive council that worked tirelessly to arrange the fall meeting of the Texas Society for Microscopy in El Paso, Texas. It became clear that there was a significant reluctance of many members to commit to traveling to El Paso due to the uncertainty associated with air travel at the time travel requests were due. Although the participation from the local area was expected to be nothing short of phenomenal there was an expected decline in participation from other sources. After discussions within the executive council and consultation with other members it was decided to cancel the meeting. Although there were differing opinions as to the need to cancel the meeting there was no descent to the actions taken.

Over the past several years there has been an ongoing debate about switching to a once a year meeting format. We will be able to use this unplanned meeting cancellation as a model to better understand the impact of such a change in format. We need to judge the effects any changes in format will have on all involved including regular, student and corporate members. We must redouble our efforts for the spring meeting in Ft. Worth, TX and make it one of the best meetings in recent times. The Ft. Worth meeting may be a joint meeting with the Oklahoma Microscopy Society but this is still to be determined. It is my hope that in the future we may once again be able to schedule a meeting for the El Paso area.

If you examine the treasure's report you will notice that the Houston, TX meeting exerted a substantial drain on the Society's funds. Although we are solvent, there is currently a serious cash flow problem. Finances have been high on the executive council's agenda and will continue to be so in the future. Your continued support and participation in the Society is critical including recruitment of new members.

Sincerely,

David C. Garrett
TSM President, 2001-2002

## Call For Papers

**Manuscripts are needed for the next edition of the Texas Journal of Microscopy. Please send your work as short communications, full articles or review articles in biological sciences, material sciences or education to:**

**Camelia G.-A. Maier**
**TSM Journal Editor**
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**Denton, Texas 76204-5799**
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***Manuscript deadline is February 1, 2002***

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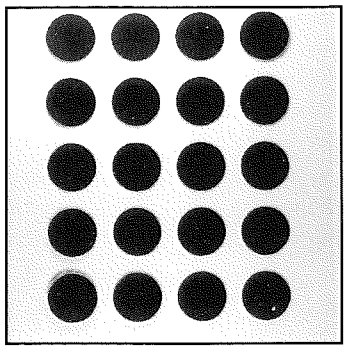

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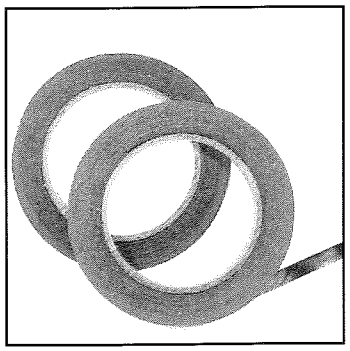

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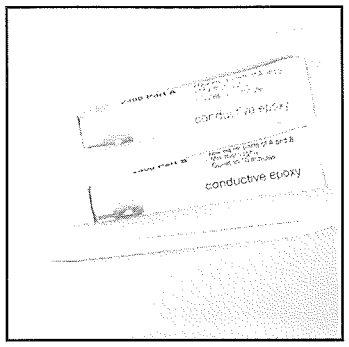


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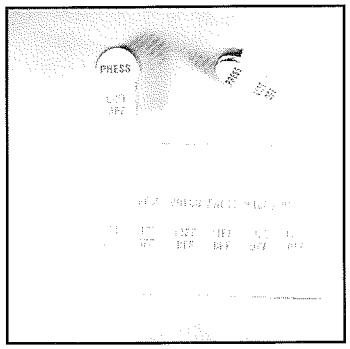


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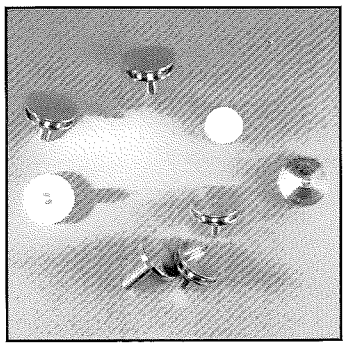

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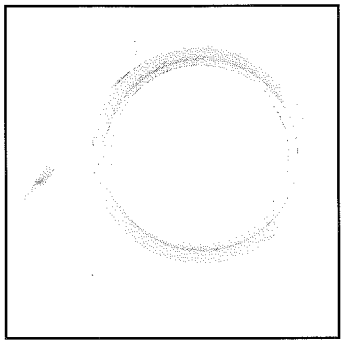

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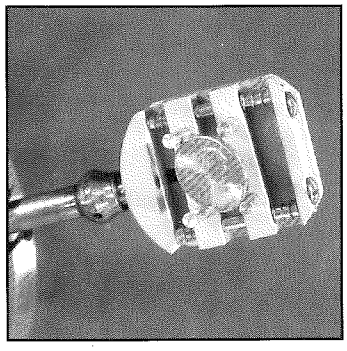

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# Treasurer's Report

**TREASURER'S 2001 YEAR REPORT**
**For Period beginning March 31st and ending September 30th, 2001**

**ASSETS AS OF MARCH 31st, 2001:**

| | |
|---|---|
| Checking Account No. 005772227833 (Bank of America) | $2,738.42 |
| Certificate of deposit No. 1882289323 | $4,079.37 |
| **TOTAL** | **$6,817.79** |

**Income:**

| | |
|---|---|
| Dues | $995.00 |
| Meeting Registration | $1,295.00 |
| Journal Advertisement: | |
| 32:1 | $1,152.50 |
| Donation | $100.00 |
| Checking Account Interest | $1.37 |
| **Total Income** | **$3,543.87** |

**Expense:**

| | |
|---|---|
| Journal Printing: | |
| 32:1 | $2,218.08 |
| Student Travel | $297.00 |
| Secretary's Account | $75.00 |
| Spring Meeting 2001 expenses | $2,683.75 |
| Hospitality Expense | $56.66 |
| Guest Speaker's Hotel Room Charge | $184.86 |
| Past President's Plaque | $67.66 |
| Postage | $47.65 |
| Postal Permit Renewal | $125.00 |
| Bond | $144.59 |
| Checking Account Service Charge | $67.13 |
| **Total Expense** | **$5,967.38** |

ASSETS AS OF SEPTEMBER 30th, 2001

| | |
|---|---|
| Checking Account No. 005772227833 (Bank of America) | $314.91 |
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# Letters To The Editor

## MSA Technologists' Forum

The Technologists' Forum is a special interest group within MSA that acts as a channel for personal growth and development of technologists. The Forum organizes a special topic presentation, a symposium, a roundtable discussion and an exhibit booth at the annual Microscopy and Microanalysis meeting. A semiannual electronic newsletter, published by the Forum, increases contact among its members and expands their participation in and contributions to MSA. The Forum also sponsors the Professional Technical Staff Awards, which is a competitive program to encourage participation of technologists at the annual meeting. Any MSA member is welcome to belong to the Technologists' Forum and contribute to its activities. For more information, please contact Technologists' Forum Chair Jeanette Killius at 330/325-6311, by e-mail at jkillius@neoucom.edu, or visit our web pages through the MSA web site at www.msa.microscopy.com.

## MSA Professional Technical Staff Awards

The Professional Technical Staff Awards (PTSA) were created to stimulate attendance at the annual meeting of MSA for professional technical staff who ordinarily might not participate in a national meeting, and to encourage employers to support their staff in professional activities. There will be up to four awards given, based on the quality of a first-authored paper submitted for presentation at the meeting. The awards consist of free full registration for the meeting including a copy of the *Proceedings* and the Sunday evening social event. MSA will reimburse awardees up to $600 for travel, lodging and other expenses. Applicants must be full paid-up members of MSA at the time of application. Abstracts will be judged by the MSA Technologists' Forum. Successful applicants must present their papers personally at Microscopy and Microanalysis 2002 in order to receive the award. They are expected to attend and participate in the entire meeting. Former winners will not be eligible for another award. Complete information about the application process, including application deadlines, will be available in the *Registration Bulletin and Call for Papers* for Microscopy and Microanalysis 2002, which will be sent to MSA members in November, 2001. For further information, contact the Chair of the Technologists' Forum: Ms. Jeanette Killius, at 330/325-6311 or by e-mail at jkillius@neoucom.edu.

**Jeanette Killins**
Technologists' Forum Chair

## Meeting Report

I had the privilege of representing TSM at the MSA Local Affiliated Society breakfast this past August at Microscopy and Microanalysis 2001 in Long Beach California. The meeting was an opportunity to share information and discuss issues that face most local affiliated microscopy societies.

Maintaining and increasing membership remains an important issue with most local affiliates. The group discussed various ways to boost interest in our local societies. Central to most of the ideas was to identify additional sources from which to locate and attract potential society members. Ideas included use of the MSA membership list, making use of websites and personal phone calls to past members who might dropped from our ranks. Community outreach was brought up as a way to increase society exposure to the general public.

We also discussed that the time is rapidly approaching to elect a new MSA-Local Affiliated Societies director. Nominations are currently being taken for the new LAS director to be elected at M&M 2002 in Quebec, Canada. Pass your good ideas to the TSM executive council.

Respectfully submitted,

**David Cantu-Crouch**
Senior Scientist, Alcon Laboratories
Fort Worth, TX
TSM member since 1989

# Educational Tips

## INTRODUCING SCIENCE STUDENTS TO PLANT WAXES

**Camelia G.-A. Maier**
Department of Biology, Texas Woman's University, Denton, Texas 76204

**Abstract**

This article introduces valuable resources for high school biology teachers and college teachers of plant biology and science laboratory courses. Instructions for simple experiments and several variations that employ observations, extraction, and re-crystallization of epicuticular waxes (EW) are presented for the purpose of introducing students to plant waxes. Leek (*Allium porrum* L., *Liliaceae*), a model plant for studying waxes is used in the proposed experiments and other plant species are suggested as well.

**Introduction**

Acquisition of protective coatings, such as cuticle, suberin, and waxes in the outer epidermal cell walls on all organs represents a very important plant adaptation to survival in a terrestrial, aerial environment. Cutin, the principal constituent of the cuticle, is found on most aboveground non-woody plant organs, while suberin is present on underground parts, woody stems, and healed wounds. Waxes are associated with both cutin and suberin and are generally defined as the lipids that are removed from plant surfaces after a brief immersion in an organic solvent, such as chloroform or hexane. They contain a wide range of organic compounds, complex mixtures of very long fatty acids, aldehydes, primary and secondary alcohols, alkanes, ketones, and esters, and may differ chemically in different organs and with age, season, and environmental conditions (Post-Beittenmiller, 1996, 1998; Mariani and Wolters-Arts, 2000).

During plant organ development, waxes are deposited within the cuticle of the epidermal cells, forming the cuticular waxes and on the surface of the cuticle as epicuticular waxes (EWs). In general, EWs are crystalline in nature but plant organ surfaces may carry only a continuous EW film depending on the species, stage in the organ development, and environmental conditions. Microcrystalline EW protrudes from the EW film when wax constituents are deposited on organ surfaces beyond a threshold concentration (Maier and Post-Beittenmiller, 1998; Jetter and Schäffer, 2001). The EW crystals give plant surfaces a glaucous appearance. By scattering light, the well-developed waxy "bloom" of most plants appears to be white to bluish in color, depending on the specific reflective characteristics of the waxes. Crystals of characteristic shapes and intricate patterns of rods, tubes, and/or plates are typical for certain plant taxa.

Both cuticular and epicuticular waxes are extremely hydrophobic, thus waterproofing plant surfaces and playing a role in regulating non-stomatal transpiration. The microcrystalline roughness renders the plant surfaces highly unwettable and water droplets running off the leaf can remove pathogen spores and dirt particles (Barthlott and Neinhuis, 1997). Beside this protective function against microorganisms, EW crystals can also exclude insects from certain parts of the plant by reducing their adhesion (Markstädter *et al.*, 2000). Light scattering and UV radiation reflectance help reduce the heat loading from sunlight, resulting in lower water use rates by plants and help protect against UV-induced injuries, respectively (Jetter and Schäffer, 2001; Post-Beittenmiller, 1996).

Many high school and college students are not familiar with the structure and functions of plant waxes. Some of them do not even realize that the aerial parts of all terrestrial and aquatic plants are covered with waxes. Demonstration of EW presence on plant surfaces can be done by using simple experiments. Several concepts regarding adaptations of plants to life on land and the ecophysiological role of waxes, as well as basic chemistry and physics concepts, can be discussed with students during these experiments. This article presents instructions for simple experiments and several variations that employ observations, extraction, and re-crystallization of EW for the purpose of introducing students to plant waxes.

**Plant Material and Equipment**

Leek plants and other plant material can be purchased from grocery stores or markets and/or collected from campus. Arabidopsis wildtype and Wisconsin Fast Plant™ (*Brassica rapa*) seeds can be obtained from Carolina Biological Supply, Co. (Burlington, NC) and Arabidopsis *eceriferum* (*cer*) mutant seeds from Lehle Seeds (Round Rock, TX) and TAIR (Carnegie Institution of Washington, Stanford, CA) (Scoll *et al.*, 2000). Chloroform for the extraction of EWs can be purchased from Carolina Biological Supply, Co. This organic solvent can be harmful if mishandled or misused, therefore it must be used under the instructor's supervision and under a ventilated hood at all times. Extraction of EWs, whenever possible, should be done directly in glass vials with caps. Glass beakers can be also used for this purpose and the chloroform extract should be transferred to tightly stoppered glass vials. Razor blades and fine-pointed forceps are needed for cutting pieces of leaf and pealing the epidermis, respectively. Q-tips, dry or dipped into chloroform, will be used to brush the EW from the surface of the leaf. Pasteur pipettes with bulbs will be used to handle and drop chloroform extract on microscopic slides (under a ventilated hood) for the re-crystallization experiments, and to drop water on leaf blades for

Correspondence: e-mail cmaier@twu.edu; fax 940-898-2382.

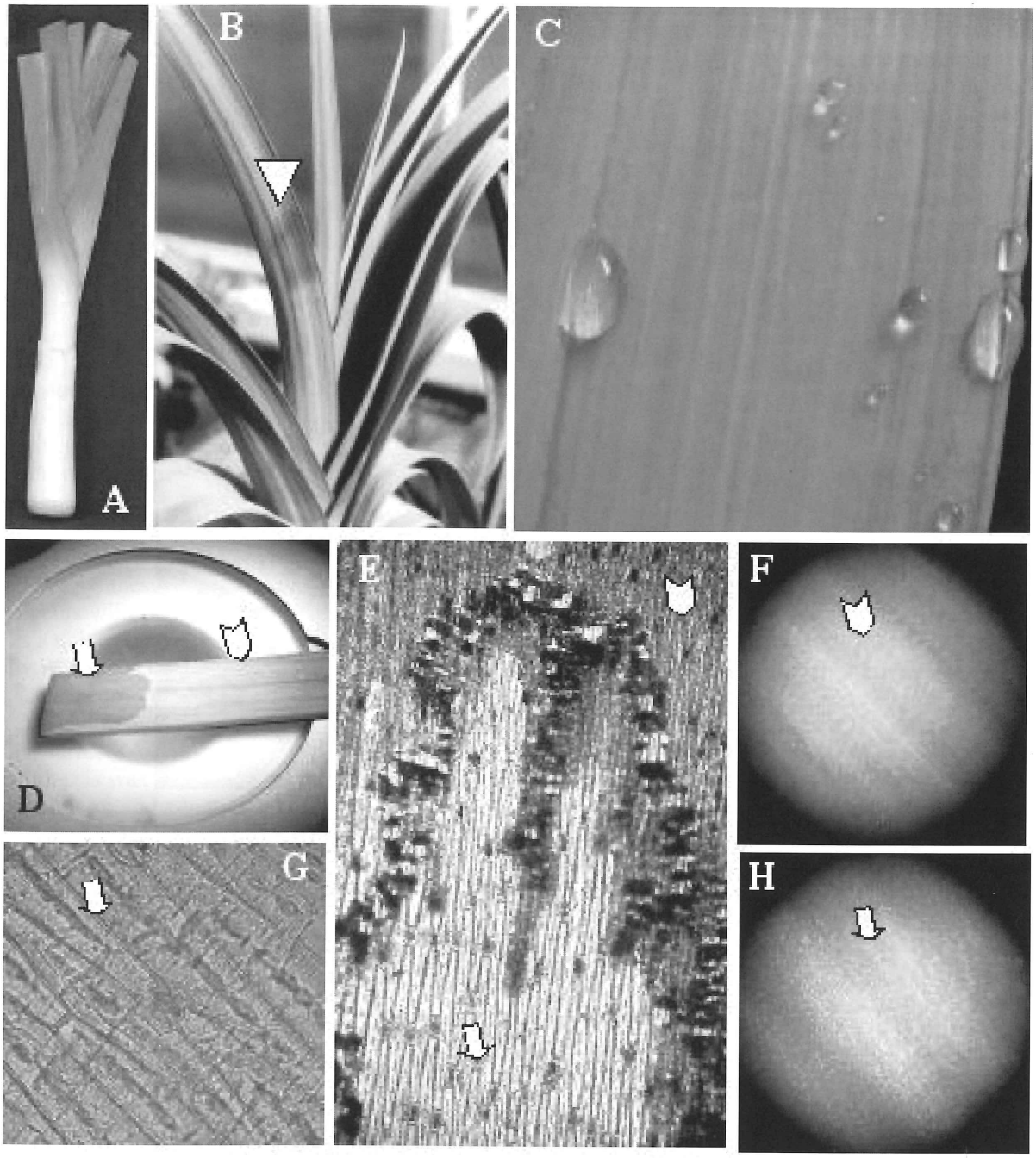


**Figure 1** – Observations of EW on leek (*Allium porrum* L.) plants. (A) Leek plant obtained from a grocery store. Observe the white culm formed by overlapping leaf sheaths and the green leaf blades. (B) Leek plant grown in the greenhouse for 2-3 months. Notice the area of the leaf where the EWs were brushed off (triangle). (C) Demonstration of the water repellent properties of EWs. Droplets form and run off leaf surfaces. (D) Piece of leaf blade with a surface area extracted with chloroform (arrow). (E) Epidermis peel of the blade piece in C under the microscope. Compare the chloroform-extracted area (arrow) to the surrounding, non-extracted blade areas (arrowhead). (F) Non-extracted blade area under the stereoscope (4X) has a glaucous appearance due to the presence of microcrystalline EWs on its surface. (G) Detail of chloroform-extracted epidermis peel. Compare to non-extracted blade peel in Fig. 2 D and sheath epidermal peel in Fig. 2 F. (H) Chloroform-extracted blade surface, under the stereoscope (4X), lost its glaucous appearance.

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**NEXT PAGE**

**Figure 2** – EWs on leek leaves at different developmental stages. (A) From top to bottom of picture - succession of a leaf primordia, totally covered by other leaves inside the culm, developing young leaf, partially inside the culm, and external, mature leaf. A mature leaf is formed of a cylindrical sheath (blue arrow) and a ribbon-like blade (red arrow); the boundary between them is established by the ligule on the adaxial surface of the leaf (not shown). (B) and (C) Details of glaucous blade surface observed with the naked eye and under stereoscope (4X), respectively. (D) Blade epidermis peel under light microscope (40X) showing EW deposition and stomata. (E) Young leaf blade surface (yellow arrows) is very shiny, similar to the sheath surface shown in (G), both under stereoscope (4X). Notice the stomata as small white dots on the young leaf surface and the lack of stomata on the sheath surface. (F) Sheath epidermis peel under light microscope (40X) with no stomata and very little EW deposition compared to D and Fig. 1 G.

**Figure 3** – Extraction and re-crystallization of leek EWs. (A) Glassware used for the extraction of blade EW with chloroform and storage of the EW extract. (B) Dry chloroform extract drops on a microscopic slide. (C), (D), (I), and (J) Details of white crystals as they appear under stereoscope. (E), (F), (G), (H), (K) Morphology of crystals under light microscopy. H-I and K-L are pair-views of the same crystalline formations, respectively. (L) Light microcopy views of a crystal formation and (M) its autoflurescence.

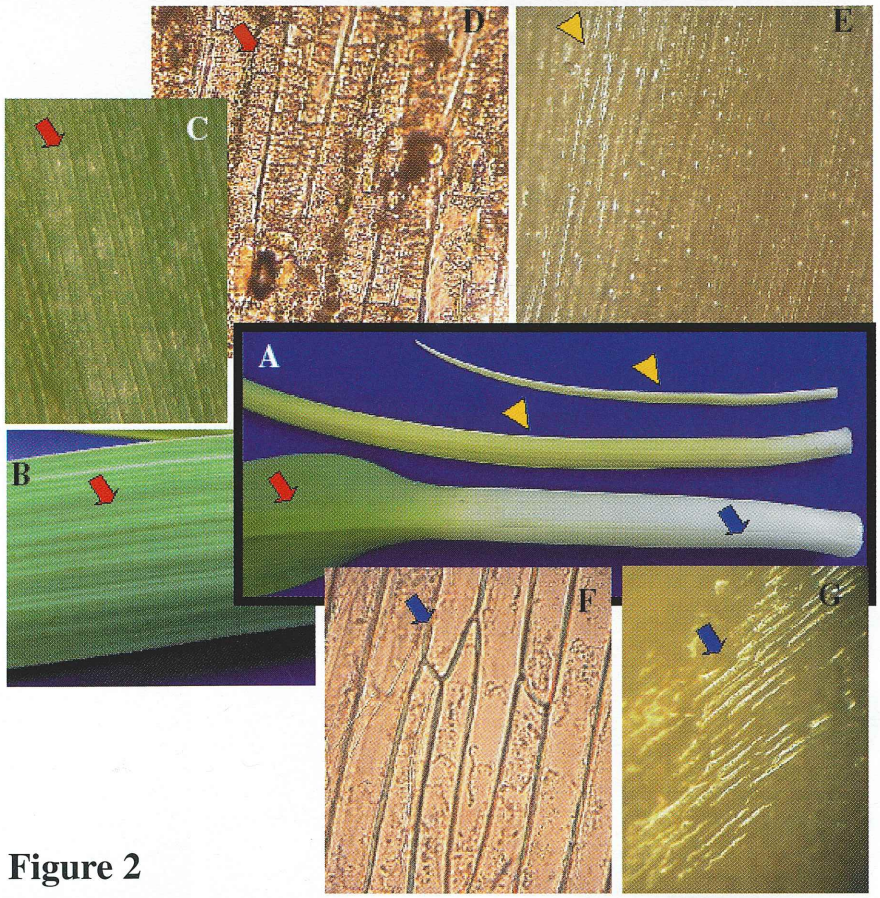


**Figure 2**

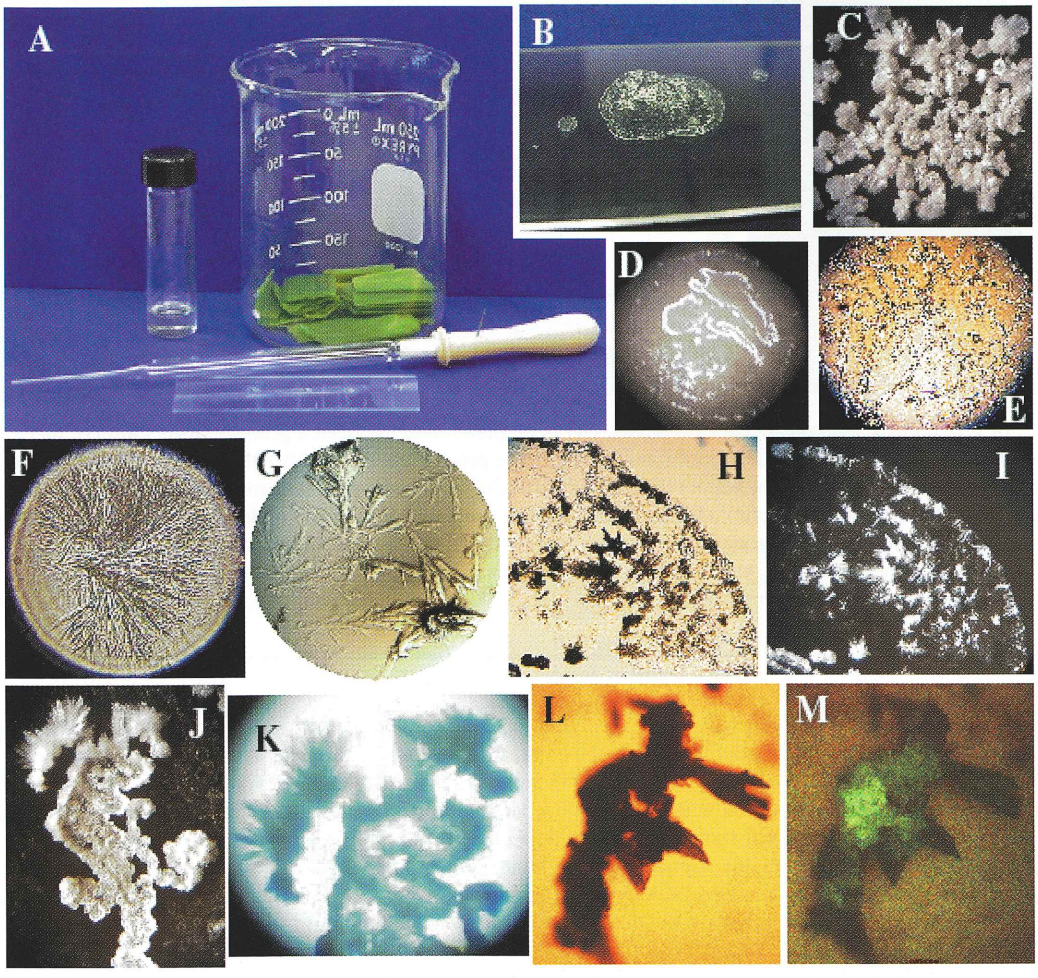


**Figure 3**

to prove the water-repelling properties of EWs. Light microscopes and stereoscopes are needed for observations.

**Suggested Projects**

For all the proposed projects, the instructor should advise students to read all instructions completely before starting the experiments and observe all safety precautions, especially in handling chloroform. Students can work individually or 2-4 in a group. Leek (*Allium porrum* L.), a model plant for biochemical analyses of EWs, is used for all the proposed laboratory projects. Leaves and stems of different other plant species, such as broccoli, cabbage, pea, Arabidopsis, and Wisconsin Fast Plant™ can be provided as well. Leek is a monocotyledonous crop, grown for its edible (false) stem, and belongs to the *Liliaceae* family, together with onion (*A. cepa*) and garlic (*A. sativum*). The advantages for using leek for these experiments are the following: availability in grocery stores, high amount of crystalline EWs for observation and re-crystallization experiments, epidermis that peals easily, and obvious environmental and microenvironmental influences on EWs synthesis and deposition.

All experiments with plant waxes presented here can be performed as a unit during the 2-3 h time period for regular plant biology or science laboratory courses, or selected experiments can be incorporated in other laboratory topics such as the plant cell and tissues, plant-water relations, ecophysiology of plant surfaces, or plant defenses. Experiments employing Arabidopsis wax (*cer*) mutants can be used for advanced plant biology and genetics laboratories, as well as for undergraduate research.

**A. Getting Acquainted to Leek Epicuticular Waxes**

1. The students will be asked to observe the morphology of leek plants and compare the appearances of the leaf sheaths and blades. They will notice the white and shiny culm or false stem formed by the leaf sheaths, covering one another, and the glaucous green leaf blades covered with waxy blooms (Fig. 1 A).
2. To demonstrate the hydrophobic qualities of EW and therefore the waterproofing functions, students will drop water on a leek leaf blade and observe the droplets running down the blade (Fig. 1 C).
3. Brush the EWs off leek leaf blade by using fingers or Q-tips, and compare the appearances of non-brushed and brushed areas. The brushed areas become greener and shinier as the microcrystalline EWs are wiped off (Fig. 1 B) as compared to the non-brushed leaf areas.
4. Using a Pasteur pipette, place 3-5 drops of chloroform on a slanted leek leaf blade, let dry and observe the chloroform-extracted area loosing its glaucous appearance (Fig. 1 D).
5. Observe and compare the EWs on leek leaves at different developmental stages. Cabbage heads (huge buds) can also be used for this purpose. Successively older leaves are found at the surface of the culm in leek. Get access to and observe EWs on younger leaves by peeling several external leek leaves (Fig. 2 A). Students are encouraged to discuss the influences of both developmental stage and environmental cues on EW synthesis and deposition in leek. The younger leaves (Fig. 2 A, yellow arrowhead) do not show the waxy bloom of the mature leaves (Fig. 2 A, red arrow). Beside the developmental stage of the leaves, the microenvironment of low light and higher relative humidity inside the culm contribute to low EW synthesis and deposition. On the other hand, sheaths and blades are exposing their surfaces to different environments. Sheaths are found underground, far from light and under high relative humidity, therefore they practically do not have a microcrystalline wax bloom. Leaf blades, however are fully exposed to the atmosphere and sunlight, environmental conditions that increase EW synthesis and deposition, therefore the blade's glaucous appearance.

**B. Microscopic Observations of Leek EW**

1. Observe different surfaces of leek leaf with a stereoscope. Young leaf surfaces (Fig. 2 E) look shiny, similar to the leaf sheath surfaces (Fig. 2 G). By contrast, the leaf blade surfaces show the bluish waxy bloom (Fig. 2 B, C).
2. Using a stereoscope, observe the brushed and non-brushed areas of the leek blades, as well as those extracted with chloroform. The brushed and chloroform-extracted blade surfaces appear shiny (Fig. 1 F) while the non-brushed and non-extracted surfaces are glaucous (Fig. 1 B and H, respectively).
3. Peel the blade epidermis and observe under the microscope. To obtain an epidermal peel from the leek leaf, make a shallow transversal incision with a razor blade on the surface of the leaf. Grab the edge of the incision with fine-pointed forceps and pull along the long axis of the leaf. Place the epidermal peel on a slide in a drop of water under a cover slip and observe with a light microscope. Notice the presence and high abundance of EW formations on the blade epidermal surface (Fig. 2 D) and compare to the less abundant EW deposition on the sheath epidermis (Fig. 2 F). The same difference on EW deposition can be observed between the chloroform-extracted and non-extracted epidermal surfaces (Fig. 1 E, red arrow and blue arrow, respectively; Fig. 1 G represents a detail of the chloroform-extracted area).

**C. Extraction and Recrystallization of Leek Waxes**

1. Cut a portion of leek leaf blade in small pieces and extract them with chloroform in a beaker or vial for 45-60 seconds. Transfer the wax extract into a clean vial tightly stoppered (Fig. 3 A).
2. Use a Pasteur pipette to place 1-3 drops of the chloroform extract on a clean microscopic slide and allow to dry under a ventilated hood before using it for microscopic observations (Fig. 3 B).
3. Observe under stereoscope and light microscope without cover slip. The cover slip will flatten the crystals if used. White, three-dimensional crystals are observed under the stereoscope, as in Figs. 3 C, D, I, and J, and fine, lacy crystalline structures under light microscope as in Figs. 3 E, F, G, H, and K. The pairs of figures H-I and J-K compare the stereoscopic to light microscopic views of the same wax crystals, respectively.

### D. Observations on the Autofluorescence of Plant Waxes

Epidermal peels and re-crystallized waxes can be observed under a microscope equipped with fluorescence capabilities. Wax autofluoresces light greenish-blue (Figs. 3 L and M) when excited with UV wavelengths. Autofluorenscence originates from endogenous constituents such as aromatic compounds in plant waxes (Post-Beittenmiller, 1998; Dubis *et al.*, 2001).

### E. Projects Involving Arabidopsis Wax Mutants

1. Students can grow wildtype and *cer* mutant plants and observe the differences in wax deposition appearance, especially on such organs as stems and fruits (siliques). In general, Arabidopsis leaf surfaces are not covered with microcrystalline EWs (Post-Beittenmiller, 1998).
2. Populations of seedlings can be obtained from seeds mutagenized by chemicals or radiation and students can observe and identify stem and silique wax mutants.
3. Students can use these mutants for genetics analyses, by crossing the mutants with wildtype plants or among themselves and following the traits in the progeny.

### Acknowledgements

The author acknowledges Dusty Post-Beittenmiller for introducing her to the wonderful world of plant waxes, the Samuel R. Noble Foundation, Inc. for providing the means for plant wax research, and TWU for support in teaching the above projects.

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### Useful Web Sites

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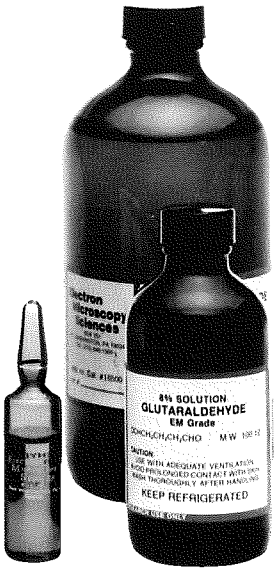


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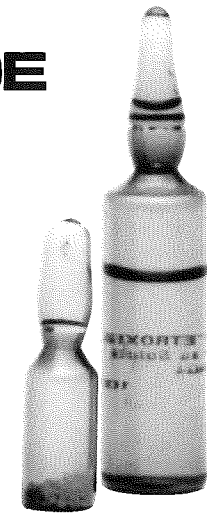

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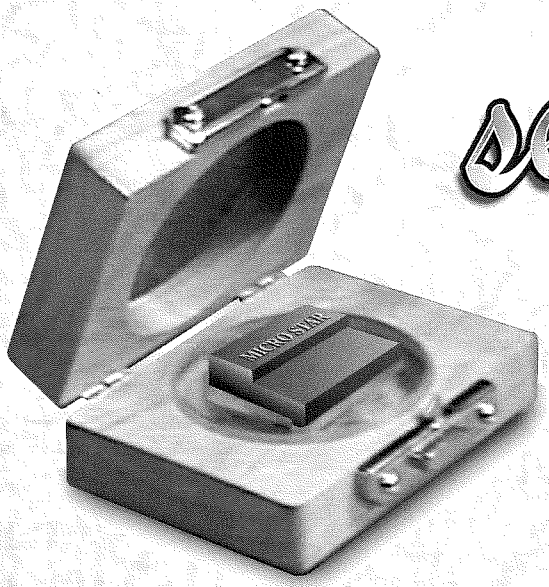


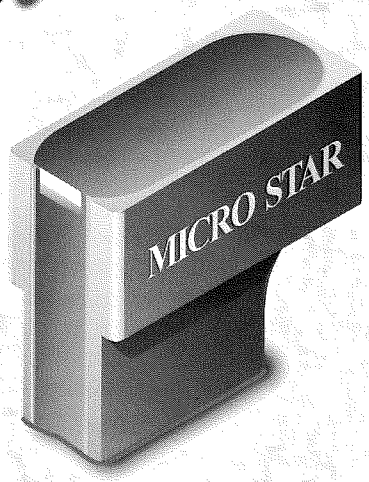


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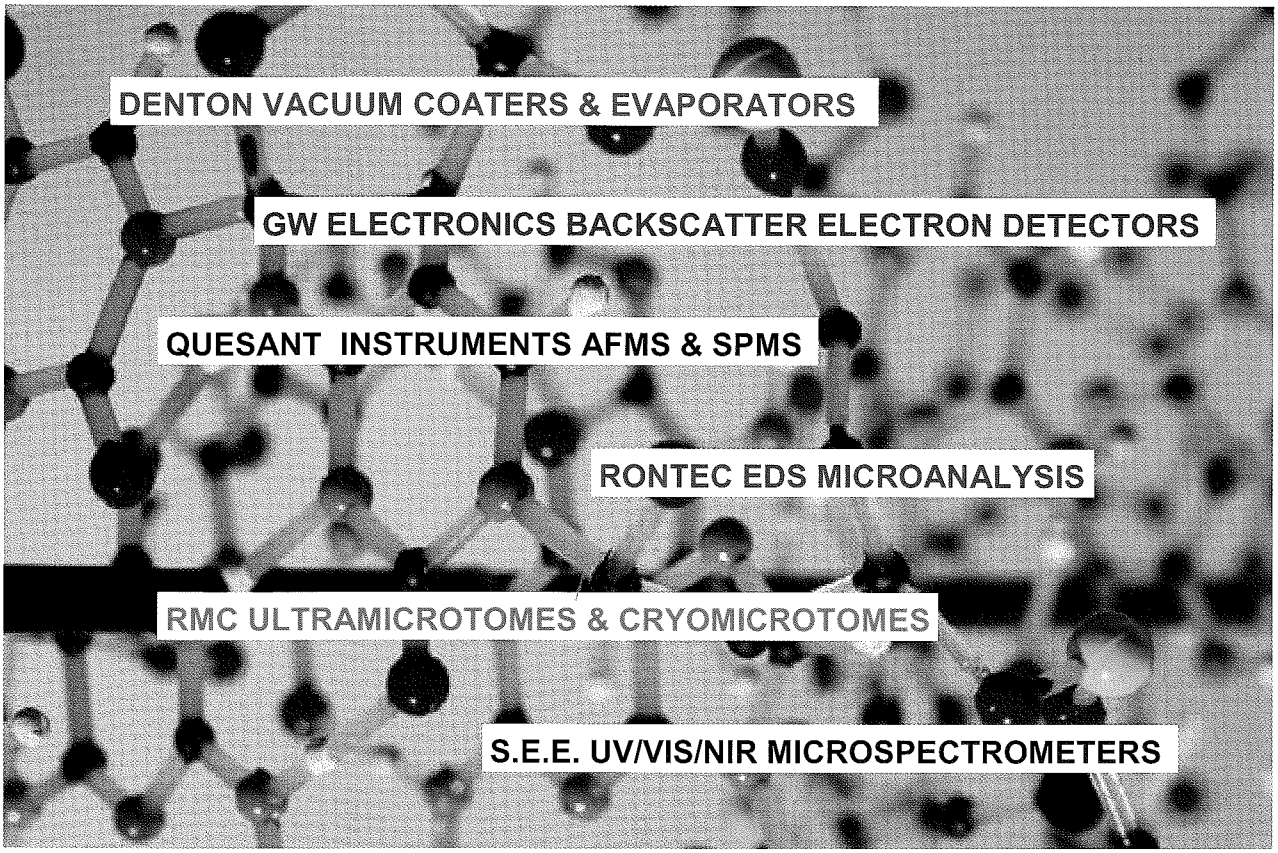


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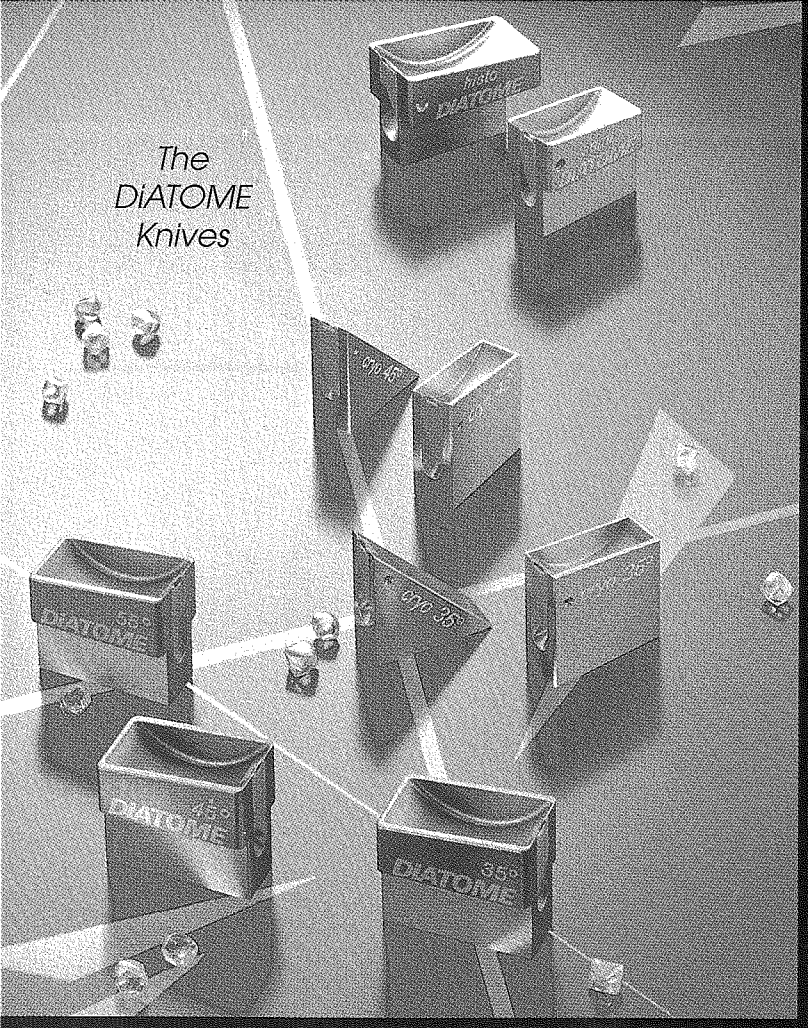


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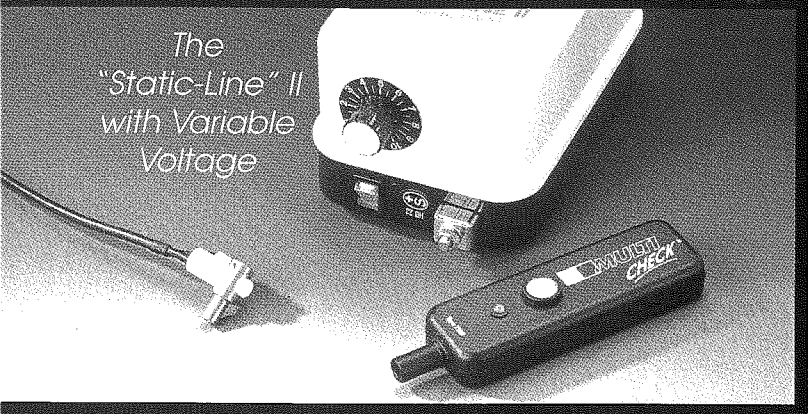


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# Helpful Hints

## EASILY FABRICATED MOUNTS

**Michael W. Pendleton[1], Bonnie B. Pendleton[2], and Dale Newton[3],**

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[2]Division of Agriculture, West Texas A&M University, Canyon, TX 79016,
[3]College of Education, Texas A&M University, College Station, TX 77845

After decades of service, our Hummer® sputter coater was vibrating so much during operation that coating had become difficult. After inspection it was determined that the rubber motor mounts located between the sputter coater's case and the vacuum pump had deteriorated allowing the pump to shake inside the case during use. Because motor mounts are not readily available it was decided to fabricate four new mounts from materials commonly available with a minimum of modification to the sputter coater. The new motor mounts described in this brief report are constructed using only four size 13 neoprene flask stoppers (modified using a hacksaw and an electric drill), eight one-quarter inch thick hex-head bolts three-fourths of an inch long, eight (or optionally sixteen) one-quarter inch nuts, and eight one-quarter inch flat washers. Notches were cut using a hacksaw (24 teeth per inch) on opposite sides of each neoprene flask stopper and two one-quarter inch diameter holes were drilled into each modified stopper as shown in Figure 1. The four modified stoppers were positioned in the same place as the original pump motor mounts but the attachment bolts in the stoppers allowed the pump to fit in a slightly offset position within the case. The case is sufficiently large to allow the pump to operate in several alternate offset locations within the case. After the fabricated motor mounts are in position and the nuts on the bolts are installed, a drop of Loctite® high strength threadlocker may be applied to the bolts or (as an option) an additional nut may be tightened against each installed nut to prevent vibration from loosening the mounts. The stoppers, bolts, nuts, and washers are inexpensive and the neoprene rubber of the stoppers is resistant to any oil which may accumulate under the pump during operation. These fabricated motor mounts would also be suitable for use for other types of motors and pumps common in laboratories.

ACKNOWLEDGEMENT: M. Pendleton developed these motor mounts in his spare time during his employment with the U.S.D.A.

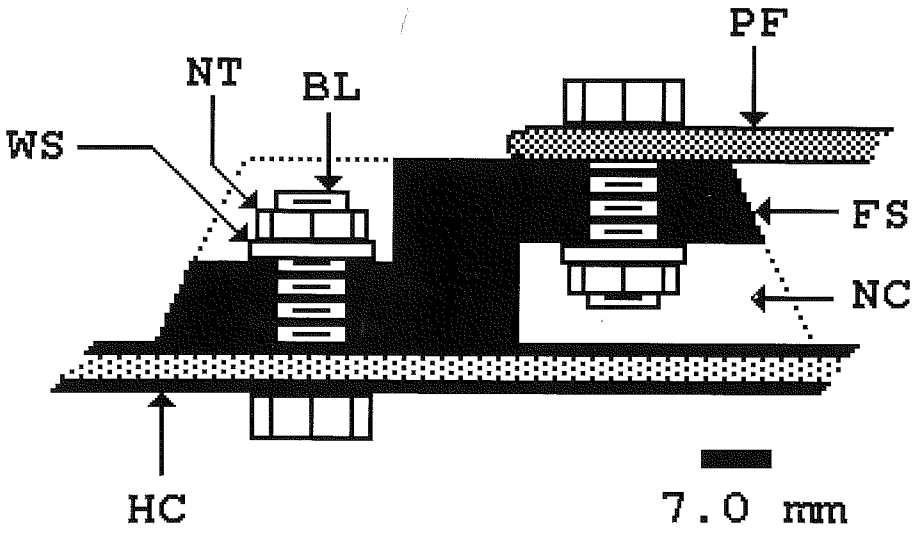
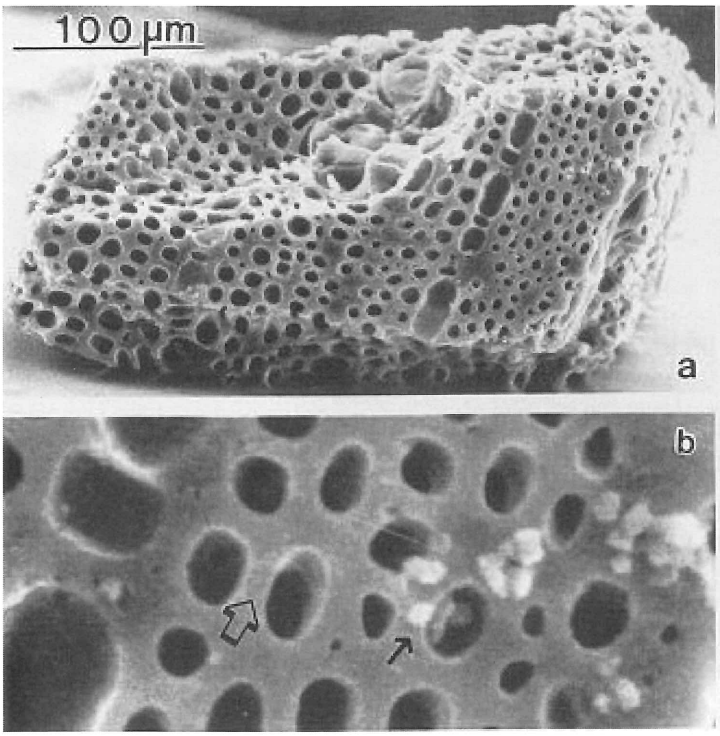



Figure 1. Cross section of one vacuum pump motor mount.
FS = flask stopper, NC = notch cut away from stopper, PF = pump motor flange, HC = base plate of hummer case, BL = bolt, NT = nut, WS = washer.

# Answer to "What Is It"

## *from Texas Journal of Microscopy 32:1*




Charcoal is produced by pyrolysis of plant material that is converted to almost pure carbon. It can persist in soils for millennia and is utilized as a means of dating soils. Soil age data are important in understanding soil formation and longevity and in estimating the length of time we expect soils to sustain the World's population. A relatively new method of analyzing the carbon in charcoal has been developed that requires only milligram quantities of charcoal to date a soil. The pictures on the back cover of Volume 32, Number 1 of the journal represent subsamples of Brazilian soil which have been dated at 5200 years before present (BP) (+/-60) and 4800 years BP (+/-50). The charcoal is black, with a silky luster, hard and unreactive with hydrogen peroxide. It represents mature wood (secondary xylem) from a hardwood angiosperm species. The open arrow denotes fused cell wall material (b). Some mineral grains, such as hematite and quartz (solid arrow), are encrusted in the charcoal. More information on charcoal can be obtained from the book titled 'Soil Mineralogy with Environmental Applications' edited by J.B. Dixon and D.G. Schulze to be published by the Soil Science Society of America early in 2002 (www.soils.org).

SEM (~800x) picture of a nymph jumping spider balloon silk (*Phiddipus audax,* Salticidae) showing the dendritic crystals surrounded by silk matrix. These crystals are unique to the balloon silk and appear to align themselves to catch air thermals thus allowing nymphs to disperse (*ala* E.B. White's 'Charlotte's Web'). Ballooning is the term used for the paragliding of spider nymphs on air thermals. The protein matrix of balloon silk, unlike the other six kinds of silk these spiders can produce, is very large and dissolves with time when exposed to natural solvents, such as water, leaving behind the remnants of the crystal matrix that aids in ballooning. The composition of these dendritic structures is yet unknown. The dendritic crystals are white within a darker protein silk matrix and are oriented to help the spiderling (young of a spider) to disperse. Sometimes they can ride air currents for hundreds of miles. In the Greek mythology, 'Phiddipus' was a grandson of Haracles (Hercules in Latin), and *audax* (Lat.) stands for these spiders' audaciously fearless behavior. These arachnids have the largest brains per body volume of any other creature on earth. They are beneficial hunting predators as they diminish pest populations.

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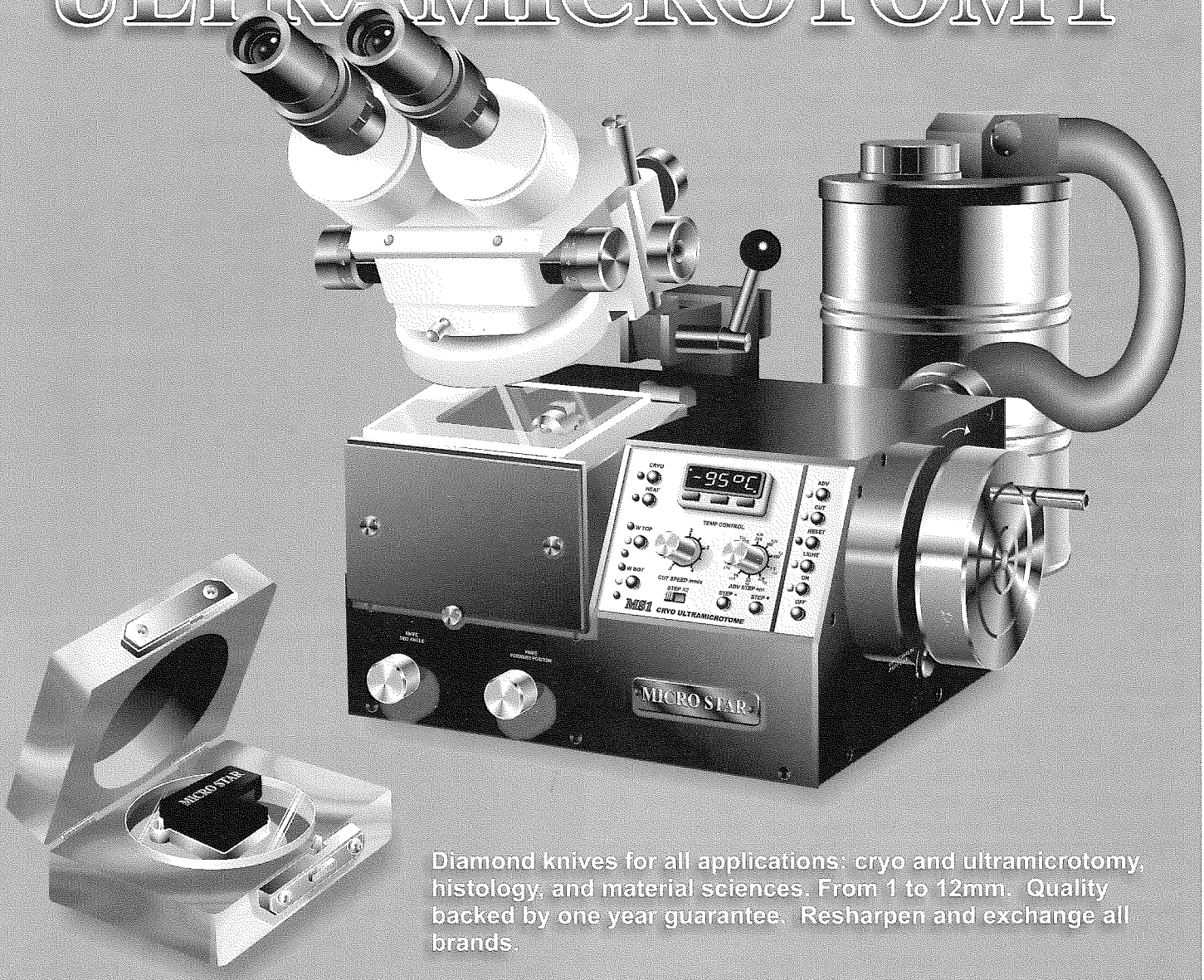





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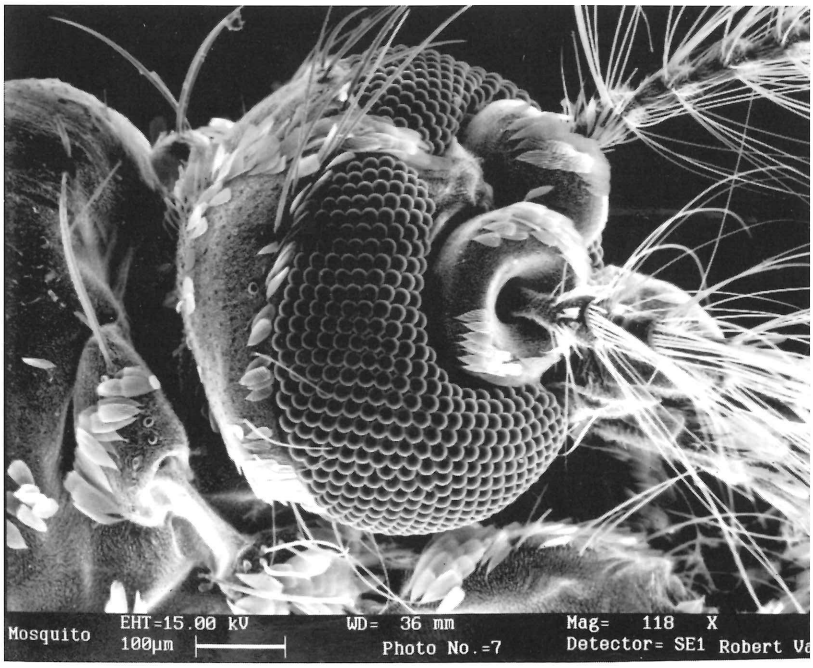


The common house mosquito, *Culex pipiens* is a dipterous insect of the family Culicidae. It is a carrier of encephalitis, filarial worms or threadworms, and viruses. Other species of mosquitoes are responsible for the spread of yellow fever and several species of a related *Anopheles* group, transmit malaria. The mosquito head in the picture shows a set of compound eyes and long, filamentous antennae with 14 or 15 segments that function as sensory receptors. Whorls of hairs on the antennae are quite plumose in males of most mosquito species. Photographed with a LEO 435VP SEM by **Roberto Valdez**, biology student at the **University of Texas-Pan American**, Edinburg, TX.

# APPLICATION FOR MEMBERSHIP OR CHANGE OF ADDRESS
# TEXAS SOCIETY FOR MICROSCOPY, INC.

Date _____

Please type or print legibly. Fill out completely. The numbers in parentheses are the maximum number of characters and spaces the computer can accommodate for that blank. Though we will mail to your home address, we prefer to have your work address. Please note that membership is for Jan. - Dec. for each year.

Check One:
- ☐ I am applying for new membership in T.S.M.
- ☐ I am a member and wish to change my address.
- ☐ I am a STUDENT and wish to upgrade to REGULAR membership.

Are you a member of MSA? ☐ Yes ☐ No

Name (last name first) _____ (35)

Institution _____ (35)
(Please write out completely. We'll abbreviate it.)

Department _____ (35)
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Category of Membership (circle only one): **Regular** **Corporate** **Honorary** **Library**

**Student:** _____ Degree Program _____ Signature of faculty sponsor

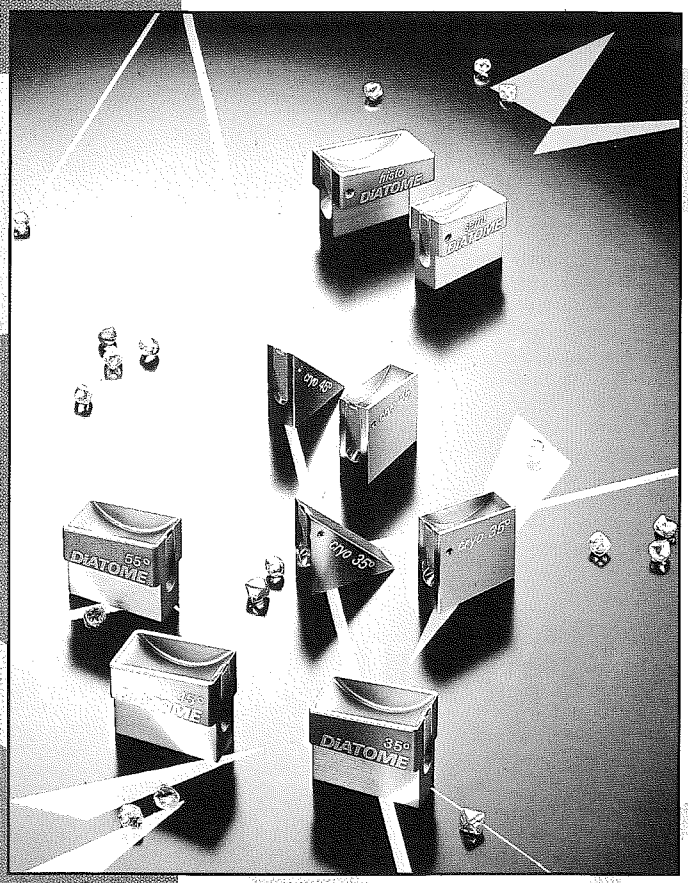
Broad field of interest in which you utilize Microscopy (Circle only one):

| | | | | |
|---|---|---|---|---|
| **Zoology** | **Botany** | **Microbiology** | **Cell Biology** | **Biochemistry** |
| **Medicine** | **Vet. Medicine** | **Chemistry** | **Sales** | **Service/Repair** |
| **Materials** | **Petroleum** | **Semiconductor** | **Environment** | **Minerals** |

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: Sandra Westmoreland
Texas Society for Microscopy
University of Texas at Arlington
P.O. Box 19498
Arlington, Texas 76019

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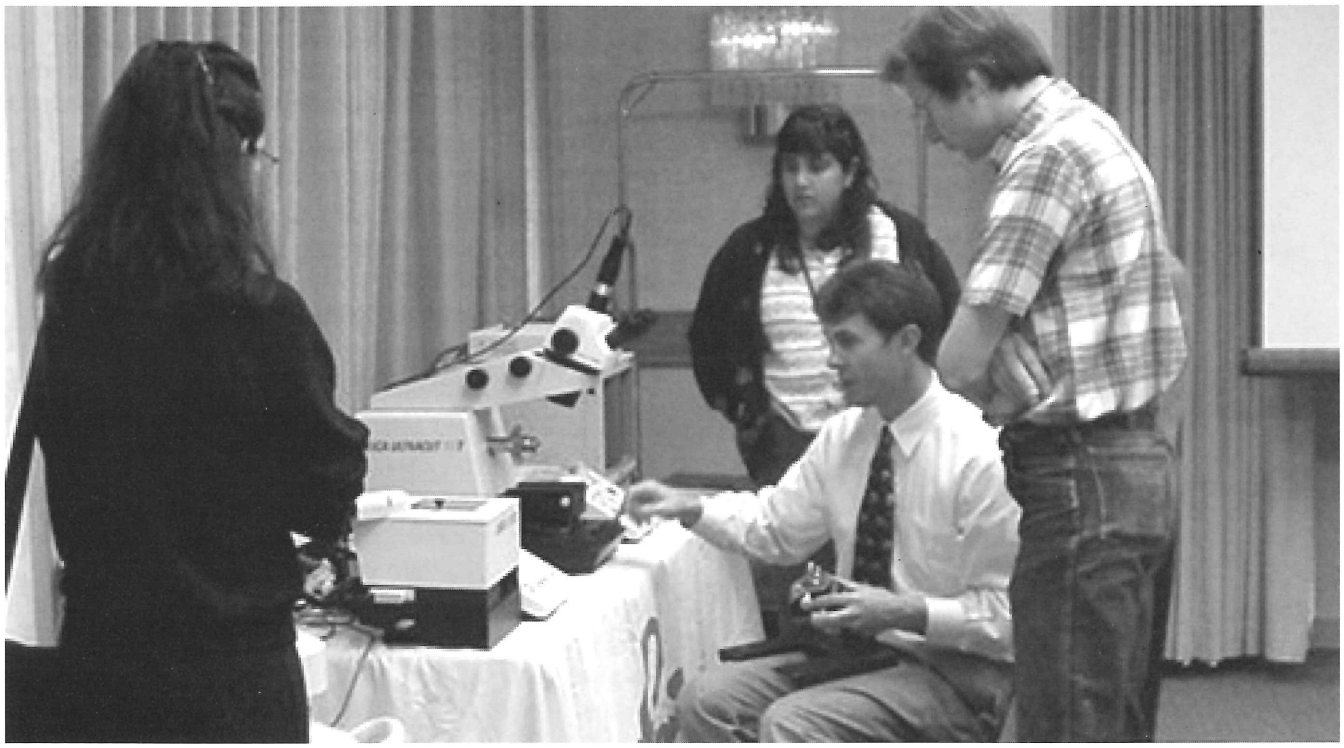
# Meeting Memories

**Caught on camera is the unique moment when the President Elect becomes President and the President becomes Past President. David C. Garrett (at right), TSM President, offers a plaque to Don W. Smith, TSM Past President at the Spring Meeting 2001 in Houston.**



**Cryoultramicrotomy for immunocytochemistry workshop conducted by Greg Becker with RMC Microscopy Products, at the Spring Meeting 2001 in Houston. Robert Seiler (seated), with Leica Microsystems also provided hands-on equipment exposure to the workshop participants.**

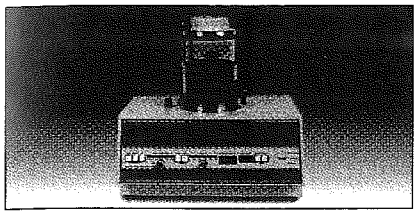
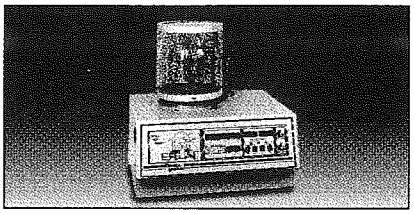


**Table Top Turbomolecular Sputter/Etch System**

Desk II TSC System offers manual or automatic operation and includes a mechanical pump, turbomolecular pump for ultra-high $10^{-6}$ vacuum, and starter target for Pt coating. Ready to operate in minutes, the system provides ultra-thin, fine-grained, continuous films and sputters Au/AuPd, Cr, and Pt materials.



**Bench Top Turbo System**

Bench Top Turbo System is a compact, turbo-pumped high vacuum $10^{-6}$ torr evaporator for carbon or metal evaporation and general TEM/SEM sample prep. A large 10" diameter x 12" high Pyrex bell jar and stainless steel base plate with eight available feed-throughs enhance flexibility of the system by permitting installation of multiple evaporation accessories, specimen holders, and substrate handling fixtures.

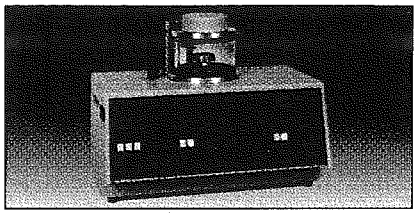
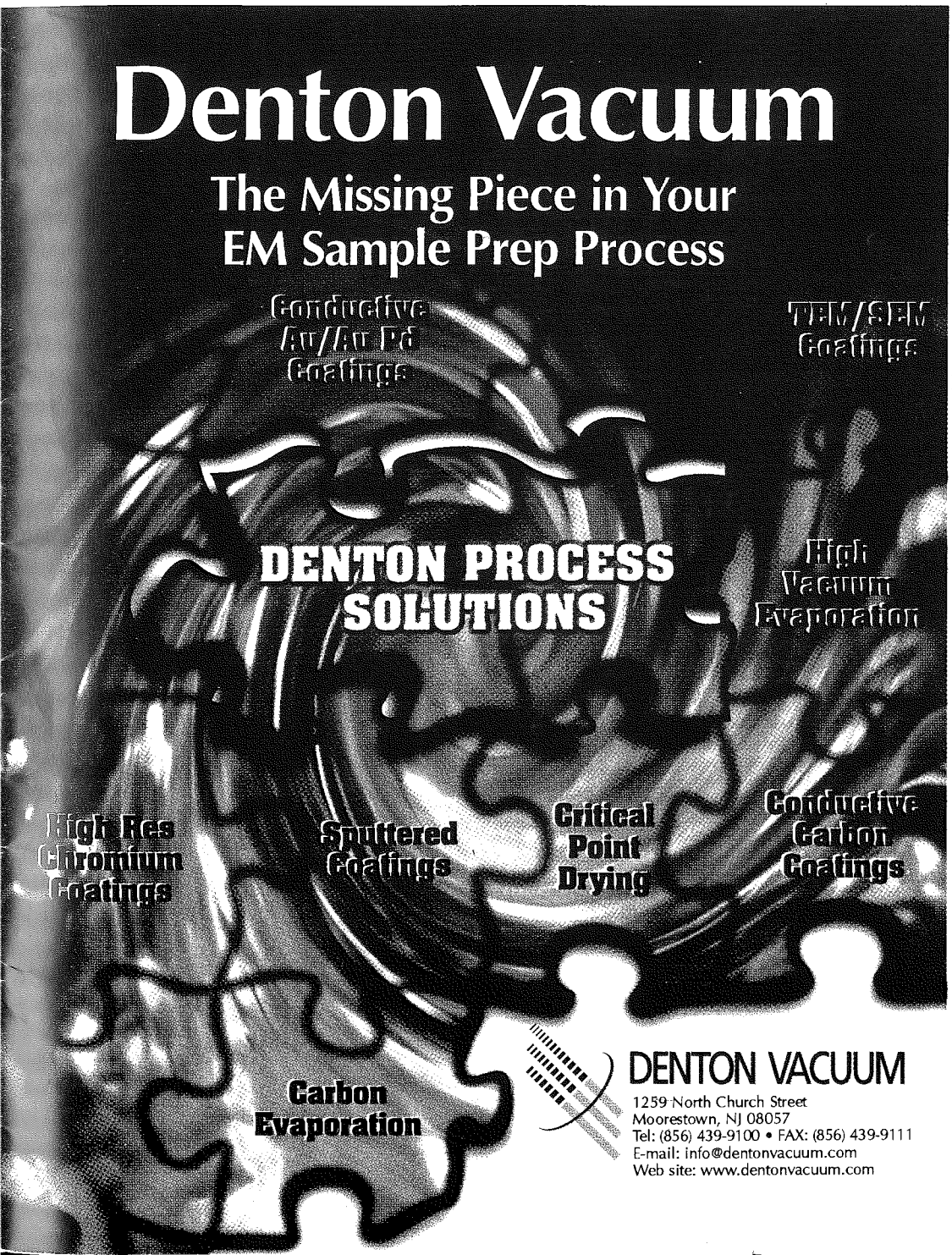


**Table Top Cold Sputter/Etch System**

Desk II System offers manual or automatic operation and includes a mechanical pump and starter target for Au/Au Pd coating and routine preparation of SEM specimens. It is available in three models to accommodate wafers up to 8.0" diameter, provides a uniform, conductive, fine-grained 100Å coating in less than 5 minutes from pump down through venting and utilizes an etch mode to clean nondelicate, contaminated specimens prior to coating.

# Denton Vacuum

## The Missing Piece in Your EM Sample Prep Process





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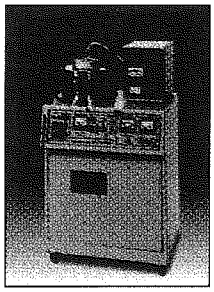
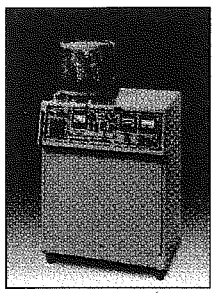


**Hi-Res 100 Chromium Coating System**

Hi-Res 100 Chromium Coating System provides fast pumping and cycle times with excellent cleanliness for high resolution FESEM sample prep. A patented Anode Grid® and low deposition rate allow controlled ultra-thin 10Å high purity Cr films on substrates to 8.0" diameter. High vacuum $10^{-7}$ torr and high water vapor pumping speed prevent sample and film contamination while a quartz crystal monitor and shutter provide automatic deposition for thickness repeatability.



**DV-502A High Vacuum Evaporator**

DV-502A System is a general purpose, high vacuum evaporator for the preparation of TEM Support films and conductive carbon coatings for X-ray microanalysis. Diffusion, turbo or cryo pumped, the system utilizes state-of-the-art electronics and an advanced mechanical vacuum design to rapidly and repeatedly cycle from atmosphere to high vacuum. The DV-502A is ideally suited for a wide range of EM and R&D lab applications, and can also be used for various other applications in the compact disc, microelectronic, and semiconductor industries.

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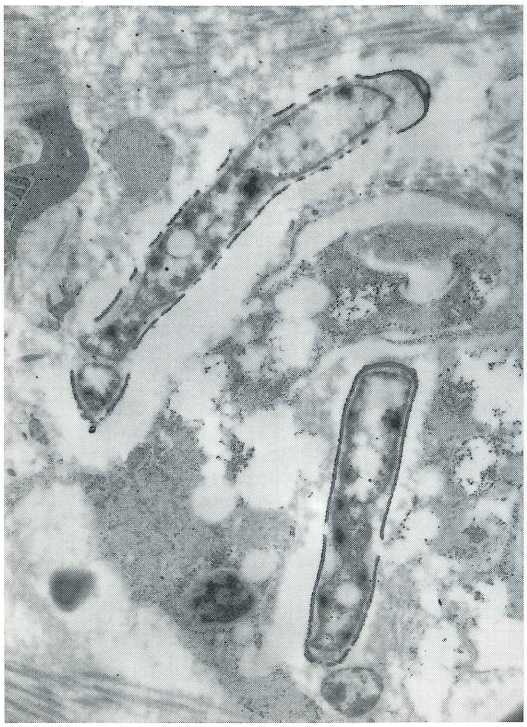
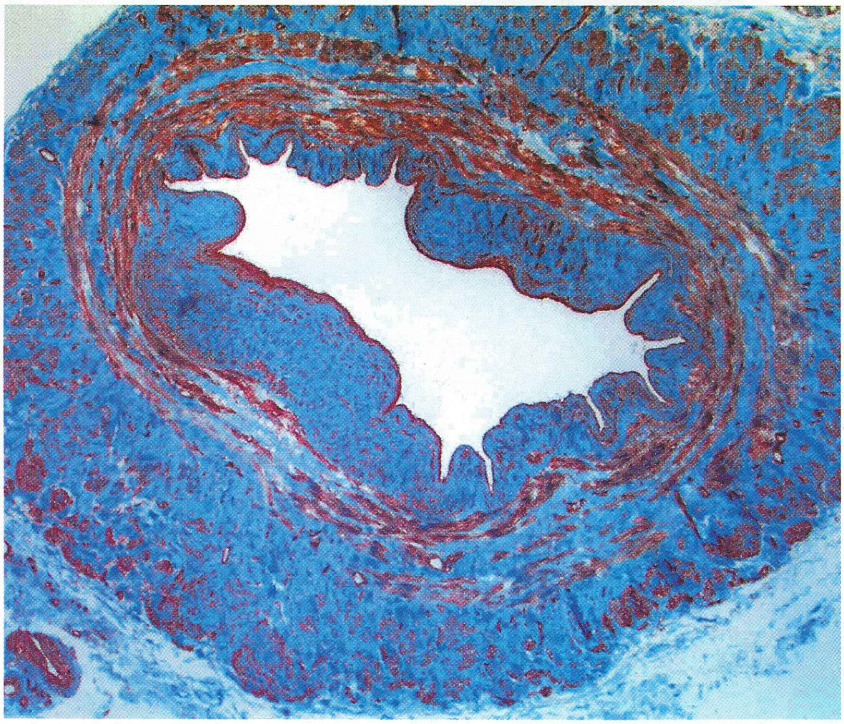
# What Is It?

## *Answers In Next Edition*





TEM on left by V.N. Popov and D.H. Walker; Department of Pathology, University of Texas Medical Branch, Galveston, TX. LM on right by Ann Burke; EM Lab, Shriners Hospital for Children, Galveston, TX 77550.