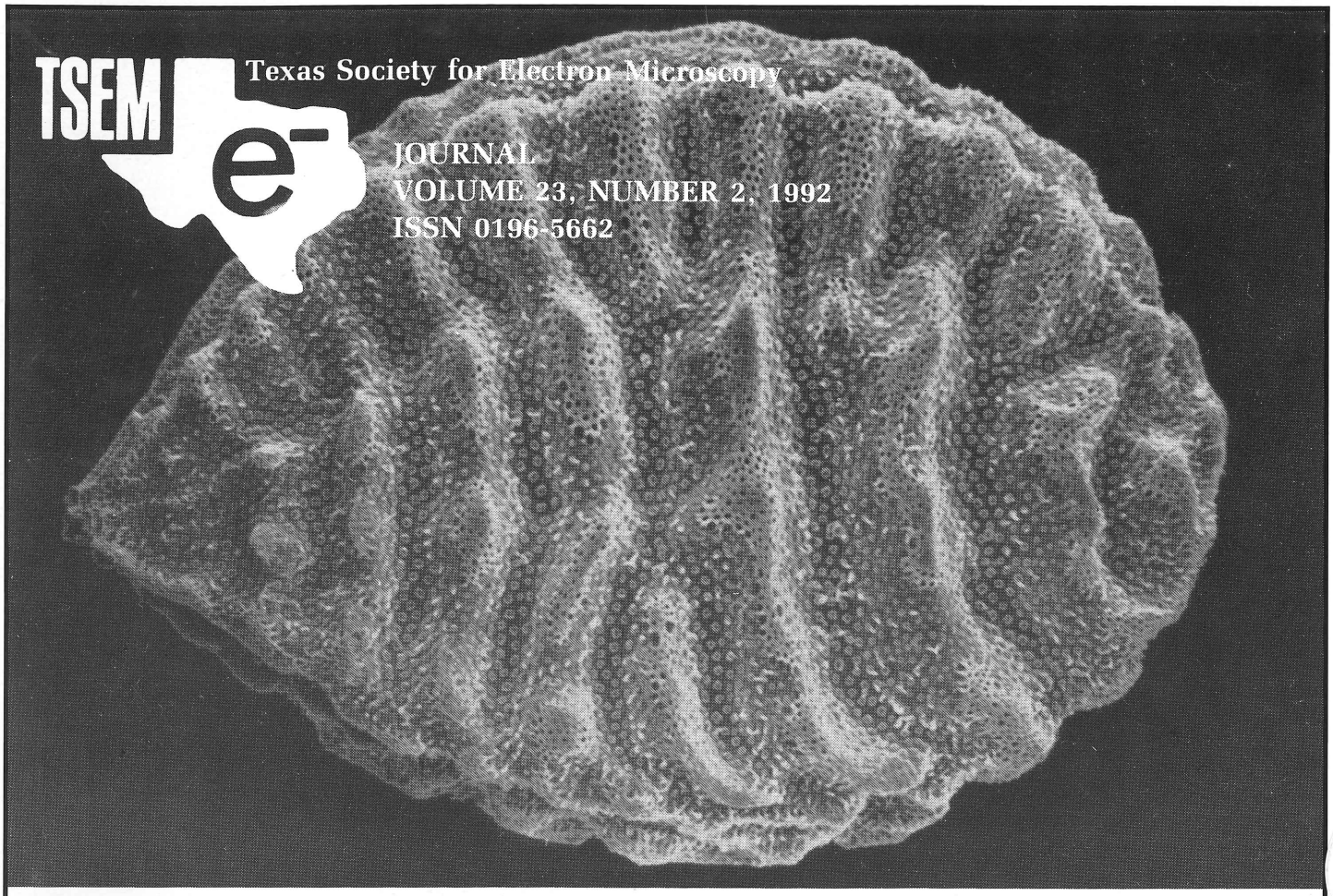
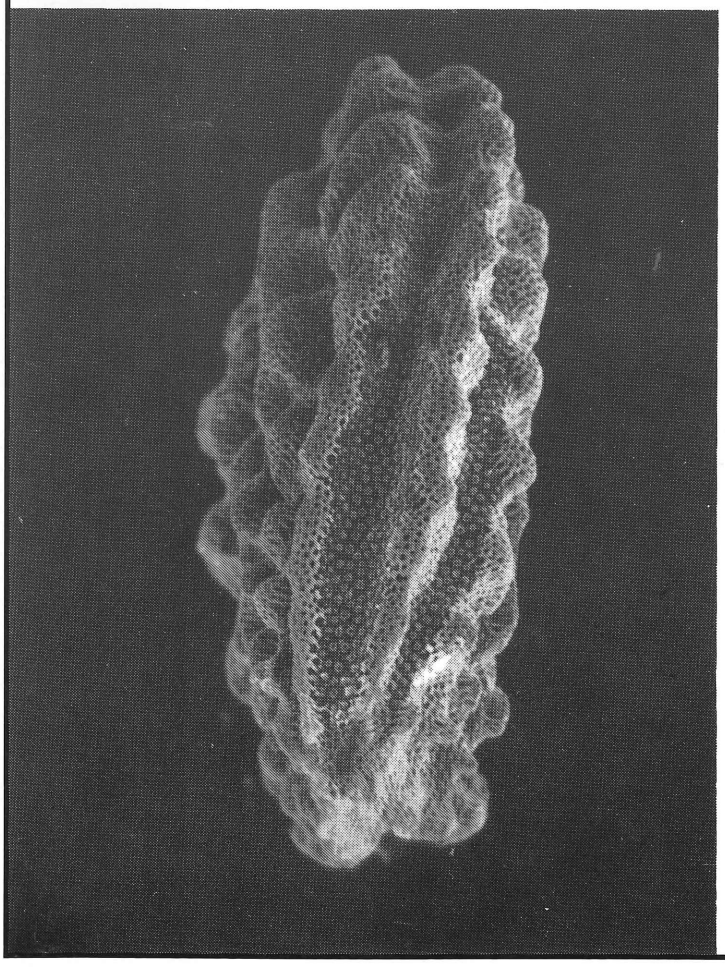
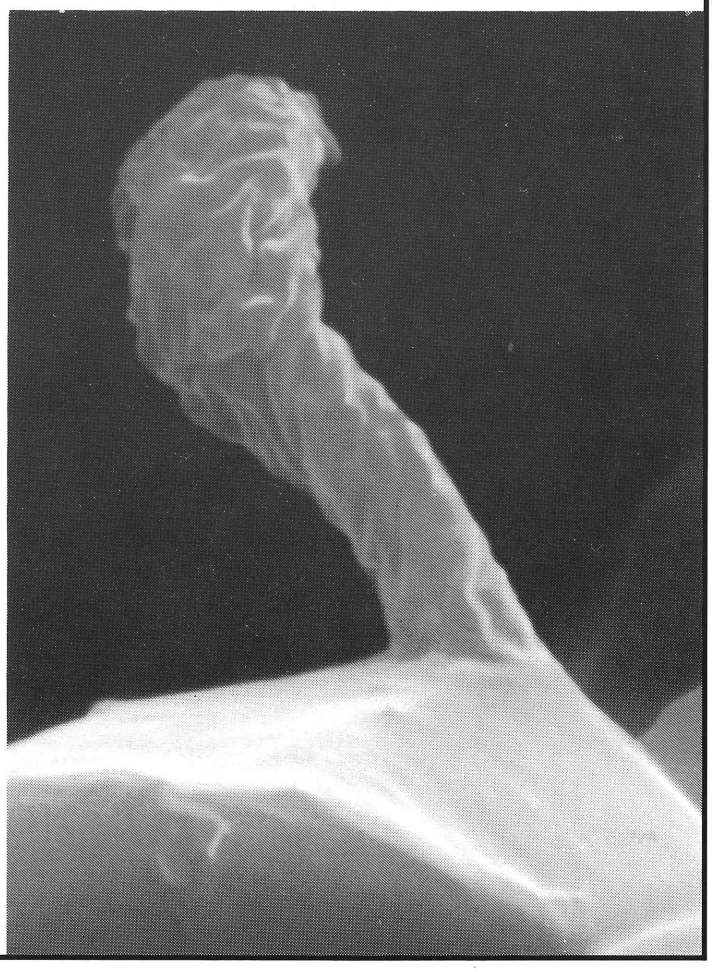


TSEM
Texas Society for Electron Microscopy
JOURNAL
VOLUME 23, NUMBER 2, 1992
ISSN 0196-5662





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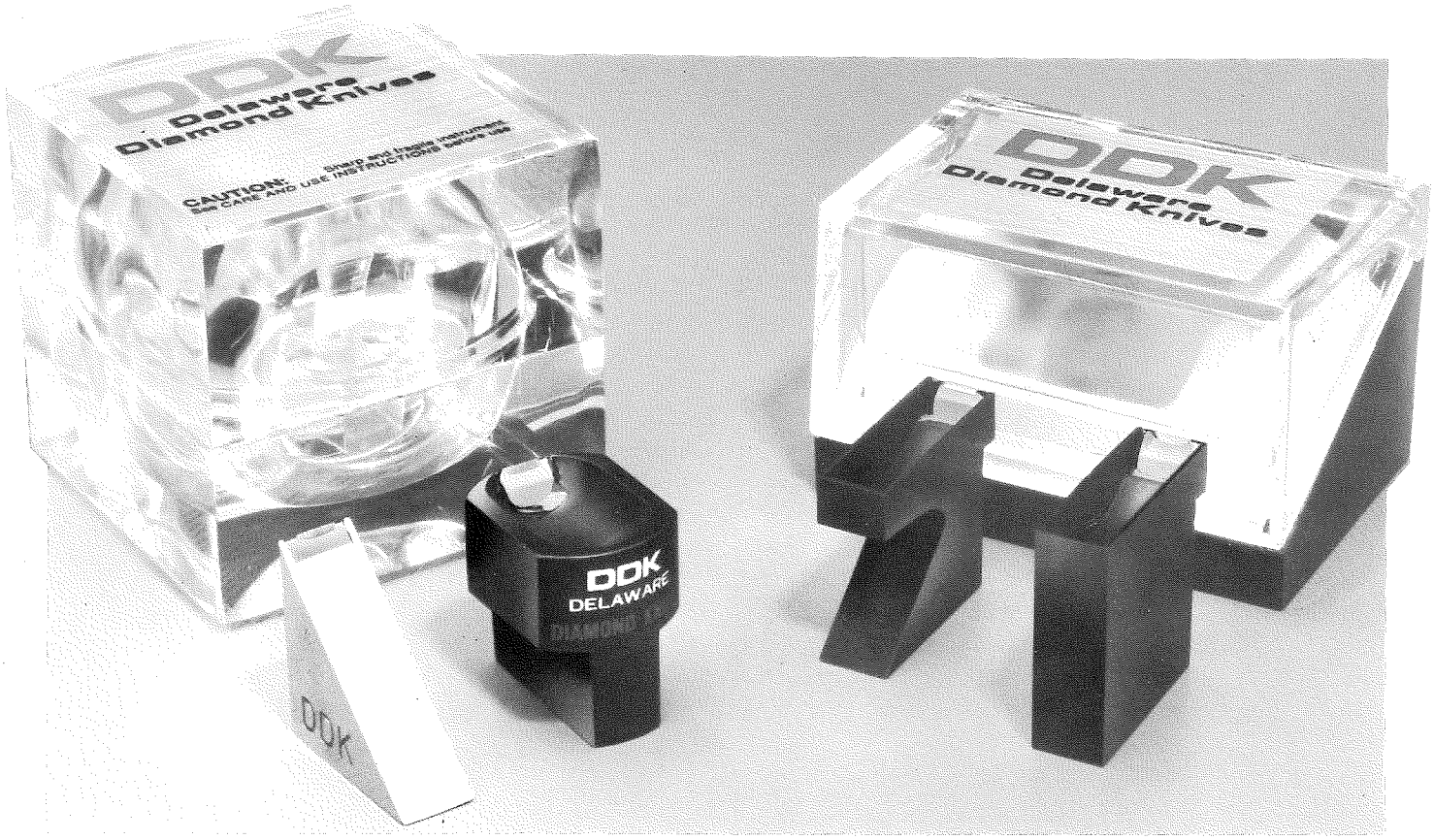
TEXAS SOCIETY FOR ELECTRON MICROSCOPY
JOURNAL
VOLUME 23, NUMBER 2, 1992
ISSN 0196-5662

Louis H. Bragg, Editor
Department of Biology, The University of Texas at Arlington, Arlington, TX 76019

Texas Society for Electron Microscopy
"For the purpose of dissemination of research with the electron microscope."

ON THE COVER
TOP: Lateral view of an *Oxalis dillenii* seed showing crystal distribution on the surface. LEFT: Dorsal view of *O. dillenii* seed. Note crystals in deep furrow. RIGHT: Increased magnification of surface crystal with its membrane extension. Photo — David C. Garrett, Department of Biological Sciences, University of North Texas, Denton, TX 76203.



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DE: (302) 999-7476 □ US: (800) 222-5143 □ CANADA: (800) 331-3370 □ FAX: (302) 999-8320

President's Message

The 1992-1993 year should be an exciting one for TSEM with meetings in Austin (Fall) and in Corpus Christi (Spring) — yes, that's right, Corpus NOT Bandera. Unfortunately, things didn't work out for the Dude Ranch for the Spring meeting so the Executive Council had to make one of those "executive" type decisions. The Society hasn't been to Corpus in a while (and the last meeting there was a good one) so we decided to try it. I hope everyone can bring their families to this one — Ann Rushing (Program Chair) is getting us some good rates and setting up a fine meeting. Details as to hotel, etc. will come as soon as finalized. As for the Fall meeting, we have a great line-up in Austin featuring the second edition of Hal Hawkin's famous colloidal gold workshop, invited speakers and generally good science. I look forward to seeing you there.

This year also marks our changing times and technology including a name change for the national E.M. society from EMSA (The Electron Microscopy Society of America) to MSA (The Microscopy Society of America) which reflects numerous advances in light microscopy as well as in electron microscopy. The new name is official in January. Having recently returned from the 50th anniversary meeting in Boston (good to see several other TSEM members there), I can tell you first hand that the new technologies on electron microscopes, confocal microscopes, video systems et al. are simply mind boggling and this meeting is the place to see it all. Along that same line, I would like to personally encourage all TSEM members to join and take an active role in EMSA. The dues are very reasonable and EMSA has been very supportive of TSEM's meetings and activities. EMSA offers speakers and financial assistance which we in TSEM have taken advantage of for recent meetings (the OkSEM/TSEM meeting for example). In other words, when you support EMSA by becoming a member and attending their meetings, you help your own society host even better quality meetings. Also, if you haven't been to an EMSA meeting in a few years, I recommend that you attend one. There is truly something for everyone and the recent meetings have indeed had "cutting edge" science in a variety of topics. The exhibits alone are worth the trip whether you are actually shopping or just want an education in what's out there. We will attempt to have EMSA materials on hand at TSEM meetings and our very own TSEM past-president Ann Goldstein from Baylor College of Medicine is an EMSA Biological Director. EMSA membership applications are published in the *TSEM Journal* for your convenience.

I would like to close this message by asking each TSEM member to consider new topics for speakers and workshops for our meetings. Your officers strive to meet the scientific needs of the Society by addressing current issues in science but WE NEED YOUR INPUT! If you think of some subject that might make a good workshop (**especially** if you know someone to teach it) or if you know of a good speaker, call one of us and let us know. Remember, we have to begin securing speakers early (usually several months to a year prior to the meeting) so help us plan ahead. Also, we usually need help at the meetings for registration and especially for slide projection. If you are interested in helping out or if you have students that could do this, please call the Program Chairman and volunteer. Your help is greatly appreciated and it helps to keep meeting costs down. Finally, I would be remiss in my duties if I didn't encourage you to publish in the *TSEM Journal*. The Journal has national — not just state-wide — circulation. Please inundate Louis with your manuscripts and support your Society. I wish all of you the very best for the coming year and I hope to see you at the meetings in Austin and Corpus Christi.

Sincerely,

Lynn D. Gray
President, 1992-1993

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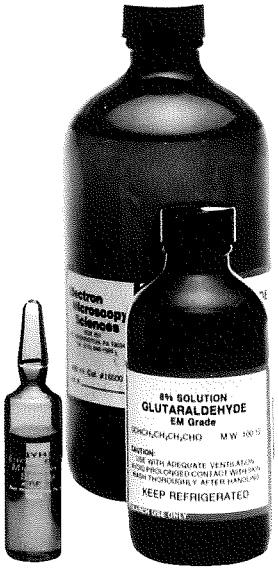

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Electron Microscopy Sciences

Treasurer's Report

TREASURER'S REPORT
For Period Ending September 24, 1992

ASSETS ON JANUARY 1, 1992:		
Certificate of Deposit No. 113515	$3,455.96	
Certificate of Deposit No. 2414483036	1,612.50	
Checking Account No. 44059412	5,872.62	
TOTAL		**$10,941.08**
CHECKING ACCOUNT RECEIPTS:		
Dues	$3,996.00	
Fall 1991 Meeting Registration	145.00	
Spring 1992 Meeting Registration	1,490.00	
Guest	320.00	
Workshop	430.00	
Exhibitors	925.00	
Donations and Grants	850.08	
Journal Advertisements 23:1	1,875.00	
TOTAL		**$10,031.00**
Certificate of Deposit Interest		**272.08**
New Certificate of Deposit No. 9005997		**4,000.00**
EXPENSES:		
Journal, Postage	$1,764.08	
Office Expenses	74.00	
Fall 1991 Meeting/Student Travel	68.00	
Symposium	130.00	
Spring 1992 Meeting	4,504.53	
Student Competition/Travel	135.00	
Workshop	513.00	
Plaque	56.10	
Fall 1992 Meeting		
General Mailouts, Printing	1,557.81	
Tax Fees	943.15	
Lawyer's Fees	674.50	
Checking Account Service Charge	54.48	
Certificate of Deposit No. 9005997	4,000.00	
TOTAL		**$14,474.65**
ASSETS AS OF SEPTEMBER 24, 1992:		
Certificate of Deposit No. 113515	$3,651.24	
Certificate of Deposit No. 2414483036	1,612.50	
Certificate of Deposit No. 9005997	4076.80	
Checking Account No. 44059412	1,428.97	
TOTAL		**$10,769.51**

ELECTRON MICROSCOPY SOCIETY OF AMERICA

Box EMSA, Woods Hole, MA 02543 • (508) 540-7639 or (800) 538-EMSA

APPLICATION FOR MEMBERSHIP

Name *(print)*:_____ Dr. ☐ Mr. ☐ Ms. ☐

Institutional Affiliation:_____

Mailing Address:_____

_____

_____

Phone *(days)*: (____) _____ Major Interest: Physical Sciences ☐ Biological Sciences ☐

Fax: (____) _____ E-Mail: (____) _____

Signature of nominating EMSA Member:_____

Signature of advisor *(for student applicants)*:_____

Signature of applicant:_____ Date:_____

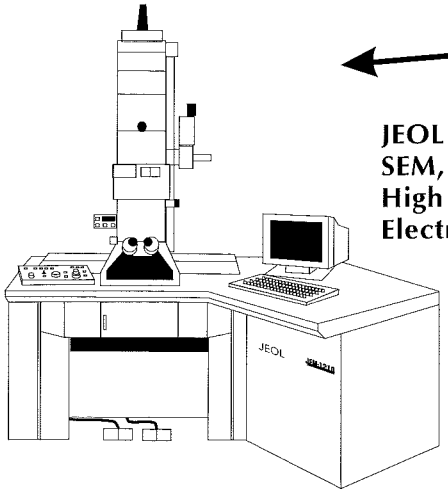
EMSA Local Affiliate Societies *(Choose one)*

☐ Alabama Electron Microscopy Society
☐ Appalachian Regional Electron Microscope Society
☐ Arizona Society for Electron Microscopy and Microbeam Analysis
☐ Central States Electron Microscopy Society
☐ Chesapeake Society for Electron Microscopy
☐ Connecticut Electron Microscopy Society
☐ Electron Microscopy Society of Northeastern Ohio
☐ Electron Microscopy Society of the Ohio River Valley
☐ Florida Society for Electron Microscopy
☐ Iowa Microbeam Society
☐ Louisiana Society for Electron Microscopy
☐ Michigan Electron Microscopy Forum
☐ Midwest Society of Electron Microscopists
☐ Minnesota Electron Microscopy Society
☐ Mountain States Society for Electron Microscopy
☐ New England Society for Electron Microscopy
☐ New York Society for Electron Microscopy
☐ Northern California Society for Electron Microscopy
☐ North Carolina Society for Electron Microscopy and Microbeam Analysis
☐ Northwestern Ohio Electron Microscopy Society
☐ Oklahoma Society for Electron Microscopy
☐ Pacific Northwest Electron Microscopy Society
☐ Philadelphia Electron Microscopy Society
☐ San Diego Society for Electron Microscopy
☐ Southern California Society for Electron Microscopy
☐ Southern California Society for Electron Microscopy Technologists
☐ South Carolina Society for Electron Microscopy
☐ Southeastern Electron Microscopy Society
☐ Texas Society for Electron Microscopy

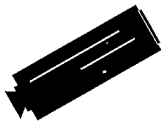
Enclose a check *(U.S. funds, drawn on a U.S. bank, or International Money Order)* for one year's dues, payable to EMSA, and a brief statement of your qualifications, experience, and/or student status.

Regular Member: $30 ☐ **Student Member: $5** ☐

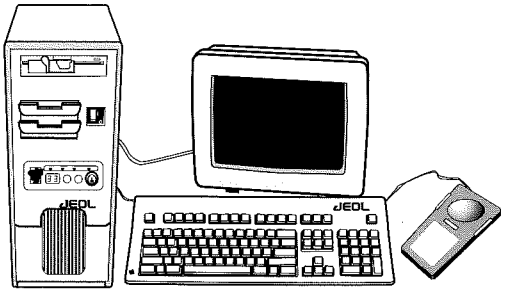
WHAT DO ALL OF THESE ITEMS HAVE IN COMMON?



JEOL TEM, STEM, SEM, STM or Other High Resolution Electron Microscope.



High Resolution (1024 X 1024), High Contrast CCD Camera.



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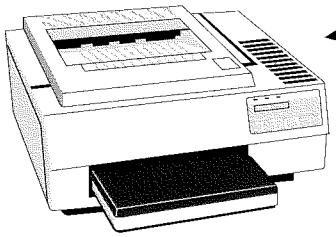

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ELECTRON MICROSCOPY TECHNOLOGIST

—(BIOLOGICAL SCIENCES)—

GENERAL ELGIBILITY REQUIREMENTS:

1. Membership in EMSA.

2. ONE of the following conditions must be met:

   — 2 years (60 credits) college or equivalent, including science and TEM (1 year laboratory) courses; science courses to include one each of chemistry, physics and biology; math through trigonometry

   — 1 year (30 credits) college or equivalent, including one course each of chemistry and physics, *and* 1 year of recent full-time work experience (within the past 5 years) in a TEM laboratory

   — high school diploma and 2 years of recent full-time work experience in a TEM laboratory

   — 3 years of recent full-time work experience in a TEM laboratory

   — 6 years full-time TEM work experience within the past 8 years.

IMPORTANT DEADLINES:

Examinations are administered twice a year (two cycles per year).

Deadlines for receipt of applications are: October 1 and April 4.

FOR APPLICATIONS AND ADDITIONAL INFORMATION:

EMSA CERTIFICATION OFFICE
CENTER FOR ELECTRON MICROSCOPY
SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE, IL 62901
TELEPHONE: (618) 453-3730

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Leading electron microscope manufacturers, such as AMRAY, Cambridge, ElectroScan, ISI, JEOL and Philips have selected DENKA LaB6 as their perfect high-resolution electron beam sources. Now, in addition to the DENKA Model 3 Cathode, which is recognized as the standard in the industry for brightness and long life, DENKA announces the introduction of the new Model 7 Cathode Hyper-Beam, which offers unsurpassed stability without sacrificing brightness.

DENKA LaB6 Cathodes are available with any of three standard tip configurations, offering the widest range of choices to the microscopist.

SHARP TIP: The sharp tip (<100> 60° cone angle, 10μ tip radius) is recommended for applications requiring the highest brightness. It is particularly effective for X-ray analysis of microscopic areas below 15A, and for many TEM applications.
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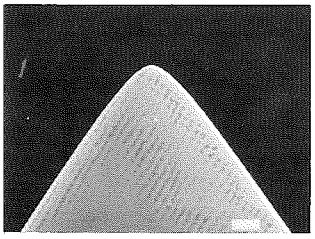
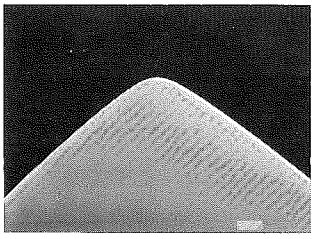
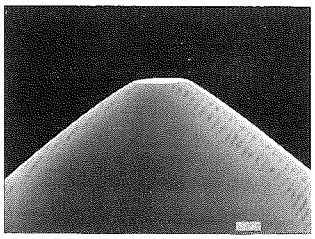
In addition to these standard tip designs, DENKA can manufacture a wide variety of custom tip shapes for your individual needs.


SHARP TIP


ROUND TIP


FLAT TIP

DENKA

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37 Avenue Pierre Premier de Serbie, 75008 Paris, FRANCE
Tel: (1) 47202761 Fax: (1) 47201908

CALENDAR OF MEETINGS

SPRING MEETING OF TSEM

March 25-27, 1993
Corpus Christi, Texas

Details To Be Given Later

SCANNING 93

April 21-23, 1993
Twin Towers Hotel & Convention Center
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Welcome Reception — April 20, 1993

FIVE MINI-SHORT COURSES WILL BE OFFERED: Colloidal Gold Labelling for LM, TEM and SEM; Basic Specimen Preparation for SEM, Materials; Basic Specimen Preparation for SEM, Biological; Introduction to Cryo SEM; and Introduction to Stereo (3-D) Microscopy.

AMONG THE WORKSHOPS ON REGULAR MEETING DAYS: Image Processing and Enhancements (3-D); Software Exchange Workshop; Multidimensional Imaging for Microscopy and Confocal Microscopy; and Bright-Field Deconvolution.

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For information contact
Mary K. Sullivan, **SCANNING 93**
P.O. Box 832, Mahwah, NJ 07430.
Phone (201) 818-1010 Fax (201) 818-0086

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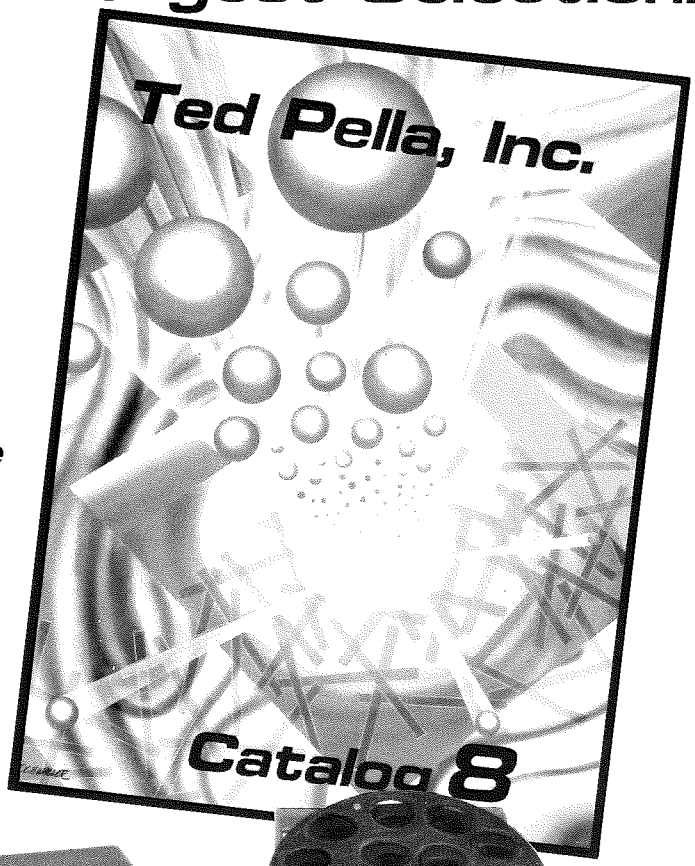

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1-800-627-3672

Yes, finally it's here! The EMSA Electronic Bulletin Board System is off the backburners and is ready to be used and hopefully not abused. Interested? Just dust off your PC's, MAC's, or whichever system you prefer, get hold of a telecommunications program and a modem and log into the EMSA BBS. Set your modem for the following:

Modem Parameters:	**1200 or 2400 Baud** **8 Data Bits** **1 Stop Bit** **No Parity**
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Lines/Times:	**One Line, Operating 24 Hours Per Day** **30 Minutes/User/Day** **1-800-627-3672**

Upon login to the system, you will be prompted/asked several questions (and please use your real name!). Next you will be shown several notices and then set free to explore. A preliminary users manual is even available on-line. Electron Mail, Discussion Forums, EMSA notices/reports, Bulletin Articles, Meeting and Program information, special LAS areas and more will all be available in due course. If you want more details of have problems then stop by the Computer Workshop at the San Jose Meeting and we will try to help. Feel free to pass this information onto your colleagues as appropriate. See you in San Jose!

Nestor Zaluzec: EMSA BBS SysOp • Ron Anderson: EMSA BBS Chairman

Our ad agency said we should promote our image.

Good idea, we said. After all, in electron microscopy, image is critical. And nobody, we told them, beats Hitachi when it comes to high-resolution images. Like the 7Å achieved with our cold field emission technology, for example.

But, we added, image isn't everything. SEMs and TEMs should be easy to use. So even non-experts always get top performance. And we explained how our computer control automates key functions and settings. How we use ergonomics to place controls conveniently, logically.

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And what about choice, we asked. Applications vary. Budgets vary. But a good supplier can respond to any need, can offer a wide choice even in integrated imaging/microanalysis systems. Then we sent them out to count our systems—all 22 of them.

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ADVERTISERS INDEX

EDITORIAL POLICY

LETTERS TO THE EDITOR

Letters to the editor are printed as they are received in the order of their arrival. These letters reflect the opinion of the individual TSEM member and do not necessarily reflect the opinions of the editor or the society. The content of the letters should be concerned with the philosophical or operational aspects of the TSEM, the Journal and its contents, academic or national policies as they apply to TSEM and/or its members and electron microscopy in general. Editorial privilege may be evoked to insure that the LETTERS SECTION will neither be used as a political forum nor violate the memberships' trust.

ELECTRON MICROGRAPHS AND COVER PHOTOS

Micrographs submitted for cover photos should be marked as such. The choice of photographs will be made by the editor. Photograph receipt and/or dispensation will not be acknowledged. Photographs will not be returned. Electron micrographs to be used for cover photos and text fillers are welcome and should be selected with some attention to aesthetic appeal as well as excellence both in technique and in scientific information content.

REGIONAL NEWS

News items should be submitted through the regional editor in your area and made to conform to the standard format used by the regional news section. Regional contributions should be sent to the Regional News Editor. Editorial privilege may be executed for the sake of brevity or to preserve the philisophical nature of the TSEM Journal.

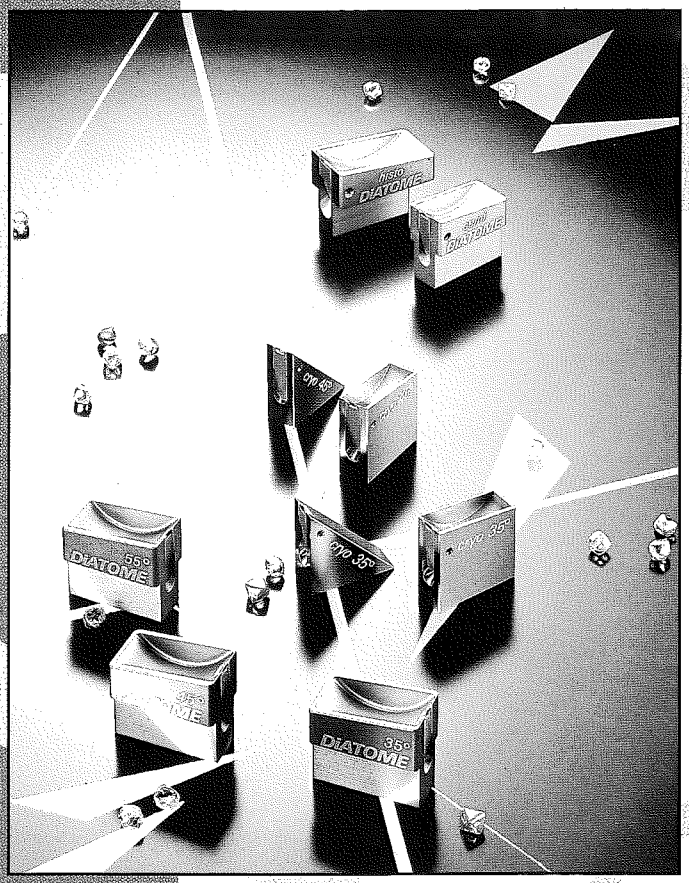
The JOB OPPORTUNITIES section will be comprised of a "Jobs Available" and a "Jobs Wanted" sub-section. Anonymity of individuals listing in the Jobs Wanted or Jobs Available sub-sections may be maintained by correspondence routed through the Regional News Editor's office.

TECHNICAL SECTION

The Technical Section will publish TECHNIQUES PAPERS, HELPFUL HINTS, and JOB OPPORTUNITIES. The TECHNICAL PAPERS will describe new or improved methods for existing techniques and give examples of the results obtained with methods. The format of the Technique Papers will be the same as that used for regular research reports. HELPFUL HINTS will be in the form of a brief report with an accompanying illustration, if required for clarity. Helpful Hints should embody techniques which will improve or expedite processes and/or procedures used in EM.

PUBLICATION PRIVILEGES

The right to publish in the TSEMJ is restricted to TSEM members or to those whose membership is pending. A membership application form can usually be found in each issue of the TSEMJ. Membership dues are as follows: student $2.00; regular members $15.00; Corporate members $75.00. Individuals who belong to TSEM by virtue of a corporate membership are invited to participate in Journal submissions as are our regular or student members. However, papers of a commercial nature, either stated or implied, will not be accepted for publication as a Research Report or Techniques Paper. Such papers may be acceptable as advertising copy.



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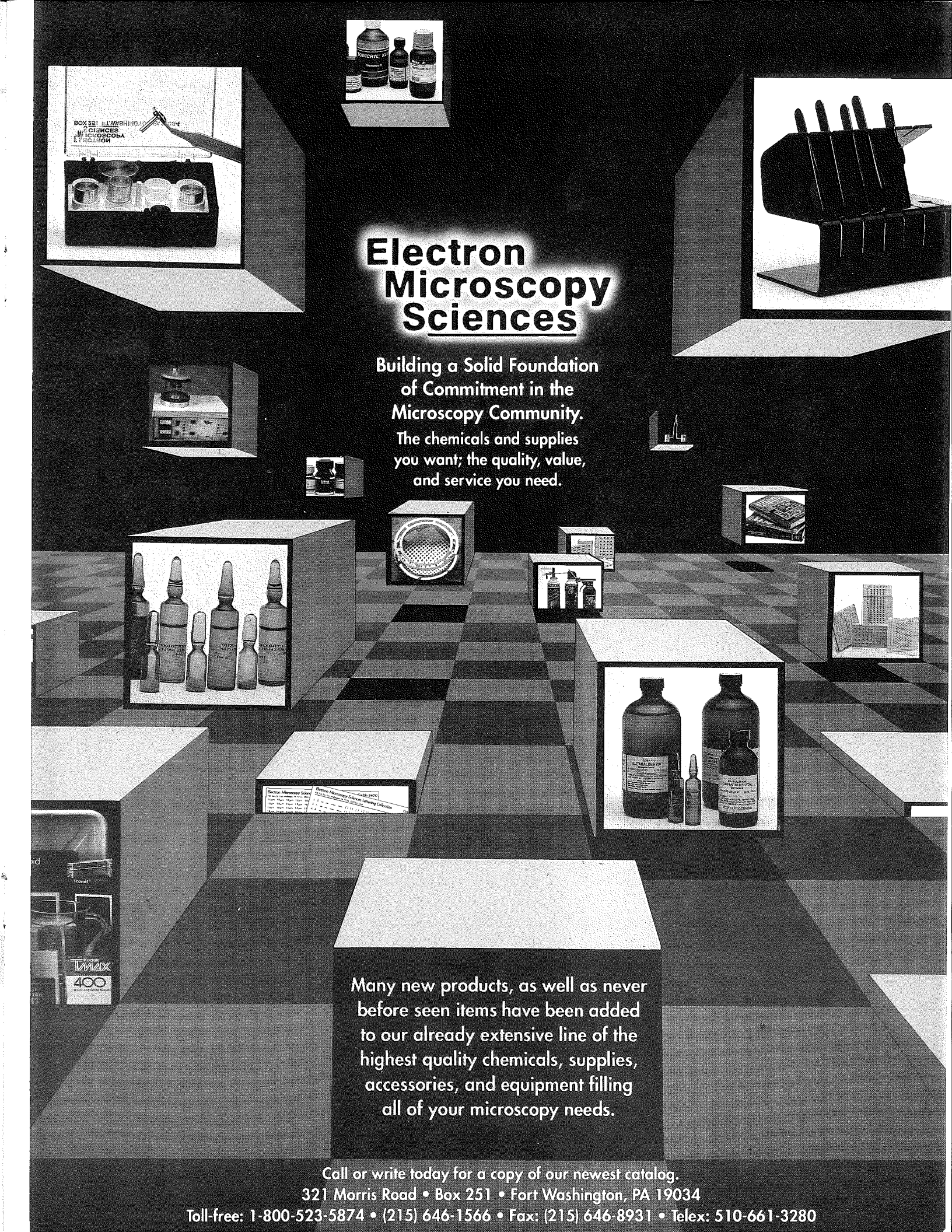
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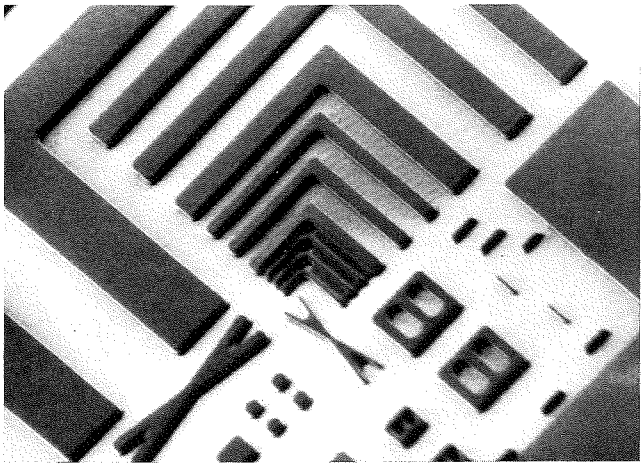

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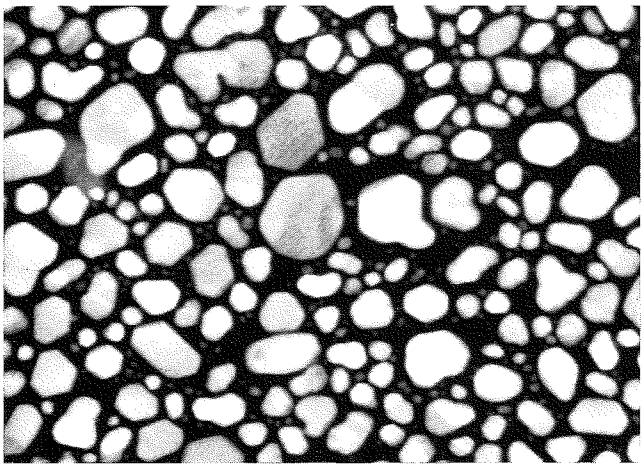

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TSEM STUDENT COMPETITION

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ELIGIBILITY:
Competition is open to all student members of T.S.E.M. who are actively seeking a degree at an accredited institution. The term student member will also include those students with a membership application pending. To be eligible to compete, all competition requirements must be fulfilled by the designated deadlines given in the first call for papers preceding the Fall meeting. In addition, to be considered for the top award you must, (1) be a student at the time of the next EMSA meeting, (2) apply for a Presidential Student Award, and (3) present your paper at that meeting.

REQUIREMENTS:
You must be the sole author, personally present your paper from the platform, and submit a student competition application signed by a regular T.S.E.M. member, if possible your supervising professor. Two abstracts must be submitted by the designated deadlines; a regular T.S.E.M. abstract following normal procedures submitted to the current *Journal* editor, and an EMSA style two page abstract with an application for student travel submitted to the current secretary. Since it is assumed that your professor has supervised your work and others may have contributed in various ways, you must acknowledge these contributions on your application as well as in your platform presentation.

SPECIAL ABSTRACT FORMAT

1. The paper must be two pages each 8½″ by 11″. Margins should be 1″ top and bottom and ¾″ left to right. Text should be 12 characters per inch IBM LETTER GOTHIC or 11 point TIMES ROMAN with 12 point spacing each font at 6 lines per vertical inch.
2. The first page will have text only. Title on first line in all capitals except chemical symbols, single spaced if more than one line is needed. Leave one line of space; then your name and address skipping one line between each. Leave one line blank and start text with no indentions and skip one line between paragraphs. Group all references at the end on the text before illustrations.
3. Page two will include pictures and text. Micrographs should be numbered, have an appropriate scale marker, and be trimmed to form a retangle with no gaps. Figure captions should follow the micrographs and come last.
4. Examples and additional guidelines may be found by consulting an EMSA call for papers.

AWARDS:
Up to 3 awards (0-3) may be given at each Fall meeting. These awards may be cash or prizes as determined by the Executive Council. The top award that can be given is substanial support towards competing in EMSA's Presidential Student Award program. This award can only be given if you meet EMSA qualifications and compete at the next EMSA meeting.

JUDGING:
Judging will be by a panel of regular T.S.E.M. members. You will be judged 50% on the quality of your special abstract and 50% on the quality of your presentation, including how well you answer questions from the audience. The regular abstract you submit for publication in the *Journal* will not be judged. Because of additional demands of disclosure each entrant will be given an additional 5 minutes of podium time.

TSEM STUDENT COMPETITION APPLICATION

Student's Name: _____

Mailing Address: _____

_____

Phone: _____

University: _____

Department: _____ Supervising Professor: _____

Degree Program: _____ Anticipated Date of Degree: _____

Title of Paper: _____

_____

Contributions from Others: _____

_____

_____

_____

_____

Do you wish to be considered for travel support to the next EMSA meeting? By answering "YES", you agree to meet EMSA guidelines pertaining to the Presidential Student Award program. YES ____ NO ____

I certify that the work being reported is my own.

Student's Signature _____

I certify that the work being reported is that of the student.

Professor's Signature _____

Information for Authors

GENERAL INFORMATION

PURPOSE: The goal of the TSEM Journal is to inform members of the society and the Journal's readers of significant advances in electron microscopy, research, education, and technology. Original articles on any aspect of electron microscopy are invited for publication. Guidelines for submission of articles are given below. The views expressed in the articles, editorials and letters represent the opinions of the author(s) and do not reflect the official policy of the institution with which the author is affiliated or the Texas Society for Electron Microscopy. Acceptance by this Journal of advertisements for products or services does not imply endorsement. Manuscripts and related correspondence should be addressed to Louis H. Bragg, Editor, TEXAS SOCIETY FOR ELECTRON MICROSCOPY JOURNAL, Department of Biology, The University of Texas at Arlington, Box 19498, Arlington, Texas 76019.

GUIDELINES: Manuscripts written in English will be considered for publication in the form of original articles, historical and current reviews, case reports and descriptions of new and innovative EM techniques. It is understood that the submitted papers will not have been previously published. Accepted manuscripts become property of the TEXAS SOCIETY FOR ELECTRON MICROSCOPY JOURNAL and may not be published elsewhere without written consent of the Editor. The author should retain one complete copy of the manuscript. The JOURNAL is not responsible for manuscripts lost in the mail.

PAGE PROOFS/REPRINTS: The editor will be responsible for proof-reading the type-set article. Reprints may be ordered from the printer.

MANUSCRIPT PREPARATION: Manuscripts should conform with the following guidelines:

FORMAT: Submit an original and two copies of the entire manuscript, typed, double-spaced, on 8½ x 11 white paper, leaving ample margins. Number each page and identify the article by placing, at the top left of the page, a shortened form of the title, followed by the last name of the first author.

TITLE PAGE: Include:

a. Full title of the article
b. Initials and last names of all authors
c. Current positions of each author (department, institution, city)
d. Full name, telephone number and address of the author to whom reprint requests are to be sent.

SECTIONS: The text of each original article and technical report should be divided into four major sections entitled INTRODUCTION; METHODS AND MATERIALS; RESULTS; AND DISCUSSION.

Historical and current reviews and case reports do not need to be divided into the aforementioned sections.

ABSTRACT: Summarize the article in no more than 150 words. This takes the place of a final summary paragraph.

REFERENCES to other work should be consecutively numbered in the text using parentheses and listed at the end, as in the following examples:

(1) A. Glauert, Practical Methods in Electron Microscopy. Vol. 2 (North-Holland. Amsterdam, 1974) 82-88.
(2) P.S. Baur, Jr., G.F. Barratt, G.M. Brown and D.H. Parks. Ultrastructural Evidence for the Presence of "Fibroclasts" and "myofibroclasts" in Wound Healing Tissues. J. of Trauma. 19 (1979) 774-756.
(3) D. Gabor. Information Theory in Electron Microscopy, in: Quantitative Electron Microscopy. Eds. G.F. Bahr and E. Zeitler (Williams and Wilkins, Baltimore, 1956) 63-68.

(NOTE: Authors are responsible for the accuracy of references.)

TABLES:

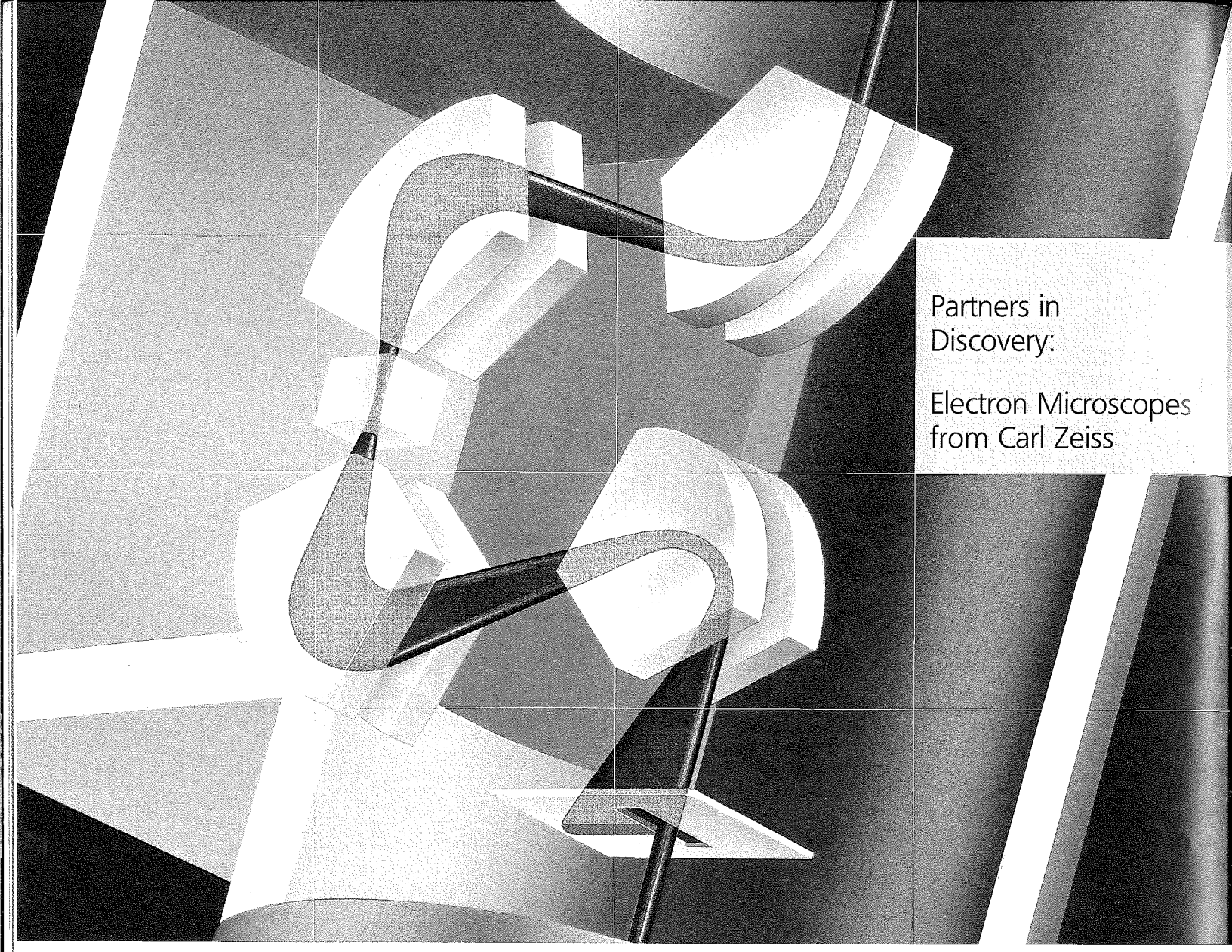
a. Type double-spaced each table on a separate sheet.
b. Number in order in which they are referred to in the text.

ILLUSTRATIONS:

A. Submit three complete sets of illustrations. Copy machine reproductions of photographs will not be accepted. Indicate which set is the original photograph or illustration.
B. Number the figures in the order in which they are referred to in the text.
C. For black and white illustrations, submit sharply focused, glossy prints, or line drawings, 1.5 times larger than they are to appear in print (1/4 or 1/2 page). Scale should be drawn on the photograph itself, not below.
D. For color illustrations, if needed, submit positive 35-mm color transparencies (not prints) for the original (prints may be used for the two copies). Authors will bear the entire cost of color reproductions.
E. Identify all illustrations (author, title of paper, and number) by a gummed label on the back of each. Do not mount the illustrations, write on the back of them, clip them, or staple them.
F. Illustrations taken from other publications require reprint permission and must be submitted in the form described above.

NOMENCLATURE AND ABBREVIATIONS: Journal abbreviations used should be those listed by the "Index Medicus." Nomenclature abbreviations should be similarly standardized.

ACKNOWLEDGEMENTS should appear as a footnote which will appear at the top of the first page of the article.



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TSEM By-laws

ARTICLE I - NAME

The name of the Corporation shall be the Texas Society for Electron Microscopy.

ARTICLE II - PURPOSE

This Corporation, henceforth referred to as the Society, is organized exclusively as a scientific and educational organization. The purpose of this Society shall be: (a) to increase and disseminate knowledge concerning the biological and physical applications of electron microscopy and related instrumentation, and (b) to promote free exchange of ideas and information among electron microscopists and interested participants. Not withstanding any other provision of these articles, this Society shall not, except to an insubstantial degree, engage in any activities, or exercise any powers that are not in furtherance of the purposes of this Society. No substantial part of the activities of the Society shall be the carrying on of propaganda, or otherwise attempting to influence legislation; and the Society shall not participate in, or intervene in (including the publishing or distribution of statements) any political campaign on behalf of any candidate for public office.

ARTICLE III - MEMBERSHIP

Membership in the Society shall be open to individuals who share the stated purpose of the Society. The Society shall consist of regular members, student members, corporate members, and honorary members.

An applicant, other than a corporate organization, having an interest in electron microscopy, may be considered for regular membership. An applicant enrolled in an undergraduate or graduate academic program and who is working toward an academic degree will be considered for student membership. Students wishing to become more involved in the Society may elect to apply for regular membership. Any applying commercial organization having an interest in electron microscopy shall be considered for corporate membership. A corporate membership shall entitle that corporation to designate one representative who shall receive membership benefits as a regular member. Other representatives of the same organization may apply for regular membership to receive Society privileges. Honorary membership shall be restricted to: (a) distinguished scientists who are not members of the Society, but who have made significant contributions to this Society, (b) to Society members for extended and outstanding service to this Society, or (c) members who have completed a term as President of the Society.

Application for regular, student, and corporate membership shall be made to the Secretary who, with the approval of the Executive Council, shall report same at the next business meeting of the Society. A two-thirds vote of the regular members present shall elect applicants to membership.

Nominations for honorary membership may be made by any member of the Society. Nominations shall be made in writing to any member of the Executive Council and must be accompanied by written evidence of the nominee's eligibility. The member of the Executive Council shall present the nomination for consideration at the next meeting of the Executive Council. The Executive Council shall act upon the nomination within one year of its presentation and shall notify the nominator of the final action taken on the nomination.

Only members shall have the right to vote and to serve on committees. The right to hold elective office is restricted to regular members. Corporate members may exhibit at the Society's meetings (additional exhibition charges may be levied by the Executive Council). An honorary member shall be exempt from dues and shall be entitled to all privileges of regular membership. All members shall receive Society mailouts.

Membership dues for regular, student, and corporate members will be set by the Executive Council. Changes in dues shall be made by the Executive Council and notification of such shall be made by announcement at the fall meeting immediately prior to the year they go into effect. Dues shall become payable on January 1 of each year. Members whose dues remain unpaid by the spring meeting will be dropped from membership.

ARTICLE IV - OFFICERS

(A) Elected Officers

The elected officers of the Society shall be President, President-Elect, Immediate Past President, Secretary, Secretary-Elect, Treasurer, Treasurer-Elect, Program Chairman, and Program Chairman-Elect. The President-Elect shall serve one year as such, the following year as President, and the following year as Immediate Past President. The Secretary-Elect shall be elected in odd-numbered years and serve one year as such followed by a two year term as Secretary. The Secretary-Elect will serve as a nonvoting member of the Executive Council. The Secretary will have full voting privileges on the Council. The Treasurer-Elect shall be elected in even-numbered years and serve one year as such followed by a two year term as Treasurer. The Treasurer-Elect will serve as a nonvoting member of the Executive Council. The Treasurer will have full voting privileges on the Council. The Program Chairman-Elect shall serve one year as such, followed by one year as Program Chairman. The installation of incoming officers shall be at the spring meeting. All officers shall arrange for the orderly and timely transition of their offices within 30 days after the installation of officers. However, all officers shall continue until relieved by their successors. The duties of the officers shall be:

(1) PRESIDENT: shall preside at all business meetings of the Society and at meetings of the Executive Council. The President, or his designee may represent the Society at the annual meeting of the Electron Microscopy Society of America. The President shall conduct the business of the Society between Executive Council meetings.

(2) PRESIDENT-ELECT: shall assist the President, and substitute for him in his absence, and perform such duties as assigned by the President.

(3) IMMEDIATE PAST PRESIDENT: shall assist the President and the Executive Council, and shall keep those statistics of the Society as deemed necessary by the Executive Council.

(4) SECRETARY: shall maintain the records of the Society, other than financial, and distribute announcements to the membership.

(5) SECRETARY-ELECT: shall assist the Secretary and substitute for him in his absence. The Secretary-Elect shall achieve a working knowledge of the office of Secretary in order to effect an orderly transition when he takes over that office.

(6) TREASURER: shall be custodian of the Society funds and shall account for them in accordance with accepted business practice. The Treasurer shall be bonded, and the cost of such shall be borne by the Society. The Treasurer shall have his records examined annually by an internal audit committee chosen by the Executive Council at the fall meeting. A written report of the internal audit shall be presented to the Executive Council at the spring meeting.

(7) TREASURER-ELECT: shall assist the Treasurer and substitute for him in his absence. The Treasurer-Elect shall achieve a working knowledge of the office of Treasurer in order to effect an orderly transition when he takes over than office. The Treasurer-Elect will have no power for the disbursement of Society funds unless prior approval is granted by the Executive Council.

(8) PROGRAM CHAIRMAN: shall be responsible for organizing the various scientific activities of the Society with the advice of the President. The Program Chairman shall not commit any funds of the Society unless authorized by the Executive Council or as authorized by the President and Treasurer.

(9) PROGRAM CHAIRMAN-ELECT: shall assist the Program Chairman and substitute for him in his absence and, additionally, extend the planning of programs into his own term of office as Program Chairman.

(B) Appointed Officers

The appointed officers of the Society shall be the Journal Editor, the Student Representative, and the Corporate Representative, who shall be appointed by the Executive Council.

(1) JOURNAL EDITOR: shall publish a Journal twice a year promoting the purpose of the Society, unless otherwise ordered by the Executive Council. The term of appointment shall be for two years and may be renewed.

(2) STUDENT REPRESENTATIVE: shall represent the student membership of the Society on the Executive Council. The term of appointment shall be for one year during which he is a student member in good standing.

(3) CORPORATE REPRESENTATIVE: shall represent the corporate membership of the Society on the Executive Council. The term of appointment shall be for one year.

Additionally, the officers of the Society shall perform the duties prescribed by the bylaws and, as appropriate, by the parliamentary authority adopted by the Society. No part of the net earnings of the Society shall incur to the benefit of, or be distributed to, its members, trustees, officers, or other private persons, except that the Society shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of the purposes set forth in Article Two hereof.

ARTICLE V - MEETINGS

There shall be two scientific meetings per year: fall and spring, unless otherwise ordered by the Executive Council. Exact times and places of these meetings shall be designated by the Executive Council. A business meeting will be held at each scientific meeting of the Society. Parliamentary procedures to be followed in the business meeting shall be those specified in the current edition of *Robert's Rules of Order Newly Revised*. Ten percent of the regular members, or 35 members, whichever is smaller, shall constitute a quorum at a business meeting. The Secretary shall determine if a quorum exist and inform the President at the meeting, prior to actions requiring a vote. The presence or lack of a quorum shall be noted in the minutes.

ARTICLE VI- EXECUTIVE COUNCIL

The Executive Council shall be responsible for the scientific and administrative obligations of the Society. It shall determine policies for the good of the Society in accordance with these bylaws; it shall plan scientific and business meetings; it shall authorize the expenditure of Society funds; and it shall conduct other duties as required for the benefit of the Society. The Executive Council shall meet prior to the business meeting at each scientific meeting of the Society. Special meetings of the Executive Council can be called by the President, and shall be called upon the written request of three elected members of the Executive Council.

At each fall meeting, the Executive Council shall appoint a Student Representative and a Corporate Representative, who shall represent the student and corporate membership respectively, the following year as voting members. The Executive Council shall also appoint Local Arrangements Chairman for each of the various meetings and in so doing shall duly consider the recommendations of the Program Chairman and the President. Local Arrangements Chairmen are ad-hoc, nonvoting members of the Executive Council. The Secretary-Elect and the Treasurer-Elect shall also serve as nonvoting members of the Executive Council. These individuals will have full voting privileges when they assume the offices of Secretary and Treasurer, respectively.

Any member of the Society may attend the regular meeting of the Executive Council upon prior approval of the President or presiding officer.

The elected and appointed officers shall constitute the Executive Council. The President and three other voting elected officers, or the President-Elect and three other voting elected officers, shall constitute a quorum.

ARTICLE VII - FISCAL YEAR

The fiscal year of the Society shall run from January 1 to December 31 of each calendar year.

ARTICLE VIII - COMMITTEES

Standing or special committees shall be appointed by the President as directed by these bylaws, or as the Society, or the Executive Council, shall from time to time deem necessary to carry on the work of the Society. The President may appoint advisory committees at any time without prior consultation with the Executive Council. The President shall be an ex-officio member of committees except the Nominating Committee.

ARTICLE IX - ELECTIONS AND INTERIM VACANCIES

At the spring meeting each year the Executive Council shall appoint three regular members to serve on the Nominating Committee with the newly elected President-Elect and the Secretary. The Secretary shall serve as chairman of the Nominating Committee. The Nominating Committee shall nominate two candidates for each officer position becoming vacant that year. In preparing the slate of nominees, due consideration shall be given to the geographical area and fields of interest represented by the membership of the Society and to the nominee's previous participation in the Society's affairs. The Nominating Committee shall also ascertain the willingness of each nominee to serve if elected. The report of the Nominating Committee shall be announced to the Executive Council at the fall meeting of the Executive Council and then to the membership with the first announcement and call for abstracts for the spring meeting.

Additional nominations may be initiated by the membership by a petition to the Secretary, signed by a minimum of ten members. Such petitions must be received by the Secretary by eleven weeks prior to the spring meeting.

Ballots shall be mailed to members at least seven weeks prior to the spring meeting, and completed ballots shall be accepted by the President until 21 days prior to the meeting of the Executive Council during the spring meeting. The Secretary and President shall independently count the ballots prior to the Executive Council Meeting, announce the results at the Executive Council Meeting, and at the spring business meeting, and in the next general mailout to the membership. The results of the election shall be released to the *Journal* Editor immediately after they are known so they may be published as part of the list of officers in the immediately subsequent *TSEM Journal*. Any member may examine the ballots at the spring business meeting.

The candidate receiving the largest number of votes shall be the winner. In the event of a tie vote, the Executive Council shall decide the winner. The ballots may be examined by the Executive Council at the spring meeting.

A two-thirds vote of the entire membership of the Executive Council shall remove any officer or appointee derelict in their duties. The Executive Council shall accept resignations in good faith.

An interim vacancy in the presidency shall be filled by advancement of the President-Elect, who will go on to serve his anticipated terms as President and Immediate Past President. In the event there is no President-Elect to advance, the Executive Council shall elect one of its members as acting President to serve until the completion of the next regular election. An interim vacancy in the office of Program Chairman shall be filled by the Program Chairman-Elect, who will go on the serve his anticipated term as Program Chairman. If there is no Program Chairman-Elect to advance, the Executive Council shall appoint a Program Chairman to serve until the completion of the next regular election. Interim vacancies in the offices of Secretary or Treasurer shall be filled by the Secretary-Elect or the Treasurer-Elect, respectively, who will go on to serve his anticipated term as Secretary or Treasurer. If there is no Secretary-Elect or Treasurer-Elect to advance, the Executive Council shall appointment a Secretary or Treasurer to serve until the completion of the next regular election. Interim vacancies in the officers of Journal Editor, Student Representative, or Corporate Representative shall be filled by an appointment made by the Executive Council.

ARTICLE X - DISSOLUTION

Upon the dissolution of the Society, the Executive Council shall, after paying or making provision for payment of all the liabilities of the Society, dispose of all the assets of the Society to an organization exempt from taxes under Internal Revenue Code Section 501 (c) (3) to be used exclusively for the purposes of the Society in such manner, or to the Electron Microscopy Soceity of America. Any such assets, not so disposed, shall be disposed of by the Court of Common Pleas of the county in which the principal office of the Society is then located, exclusively for such purposes, or to such organization, as said court shall determine, which are organized and operated for such purposes.

ARTICLE XI- INDEMNIFICATION BY THE SOCIETY

The Society shall indemnify each member of the Executive Council, director, officer, person who is serving or has served at its request as a director, officer, or employee of another corporation, against expenses, in connection with the defense of any pending or threatened action, suit, proceeding, criminal or civil, to which he is or may be made a party by reason of being or having been such a member of the Executive Council, director, officer, or employee, provided that a determination is made:

(A) That he was not and has not been adjudicated to have been negligent or guilty of misconduct in the performance of his duty to the Society of which he is or was a member of the Executive Council, director, officer or employee;

(B) That he acted in good faith in what he reasonably believed to be in the best interest of the Society; and

(C) That, in any matter the subject of criminal action, suit or proceeding, he had no reasonable cause to believe that his conduct was unlawful.

The determination as to the foregoing matters with respect to each action, suit or proceeding shall be made:

(i) By a majority of the Executive Council of the Society acting at a meeting at which a quorum consisting of officers who are not parties to or threatened with such action, such officers vote; or

(ii) By independent legal counsel in written opinion, if such quorum cannot be obtained to vote on such indemnification, or even if obtainable, the officers qualified to vote so direct.

The termination of any action, suit or proceeding upon a plea of *nolo contendere* or its legal equivalent, shall not, of itself, create a presumption that any member of the Executive Council, director, officer or employee did not act in good faith in what he reasonably believed to be the best interest of the Society or had reasonable cause to believe that his conduct was unlawful. Expenses incurred by any person in defending any action, suit or proceeding may be paid by the Society in advance of the final disposition of such action, suit or proceeding as authorized by the Executive Council in the specific case upon receipt of an undertaking by or on behalf of such person to repay such amount unless it shall ultimately be determined that he is entitled to be indemnified by the Society. The indemnification provided in this Article shall not be deemed exclusive of any rights to which those seeking indemnification may be entitled under any regulation, bylaw, agreement, insurance policy purchased by the Society, vote of the members or otherwise, or of any other indemnification which may be granted to any person who has ceased to be a member of the Executive Council, director, officer or employee of the Society, and shall insure to the benefit of the heirs, executors, successors and administrators of such a person.

ARTICLE XII - AMENDMENTS AND PERIODIC REVIEW

Amendments to these bylaws may be initiated by individual members of the Executive Council, or by petition to the Secretary, signed by ten regular members of the Society. Amendments must be approved by a two-thirds majority of the Executive Council. The Secretary shall then promptly, by mail, submit the proposed changes in the Bylaws to the membership for approval, with statements of support and/or opposition by the Executive Council. The ballots shall be accepted by the Executive Council for one month after the date of mailing. The Executive Council shall count the ballots; the amendment(s) shall be ratified if it received a favorable two-thirds majority of the votes cast. Any member may, if he so desires, be present at the counting of the ballots.

These bylaws shall be reviewed for amendment at regular intervals, not to exceed three years, by a committee of voting members of the Executive Council appointed by the President. The date of the latest review and/or amendment shall be stated in the last paragraph.

These bylaws were last reviewed and/or amended by vote of the Executive Council on 24 October, 1991.

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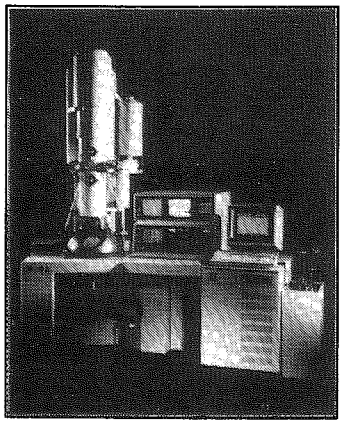

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This is a scanning electron micrograph of the surface of the seed of *Bauhinia variegata* showing the presence of stomatal cells of various sizes. The function of these stomata is unclear but in transectional view there are large areas for gaseous exchange.

Micrograph — Louis H. Bragg, Department of Biology, The University of Texas at Arlington, 76019. (Bar = 10 micrometers)

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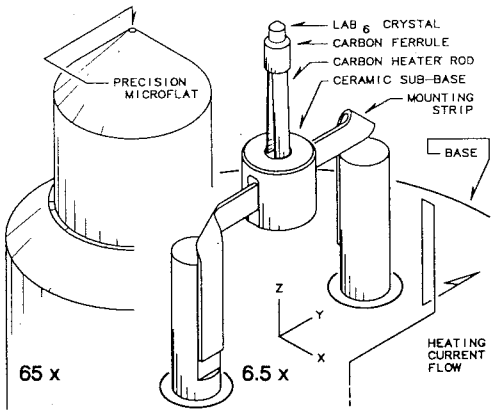

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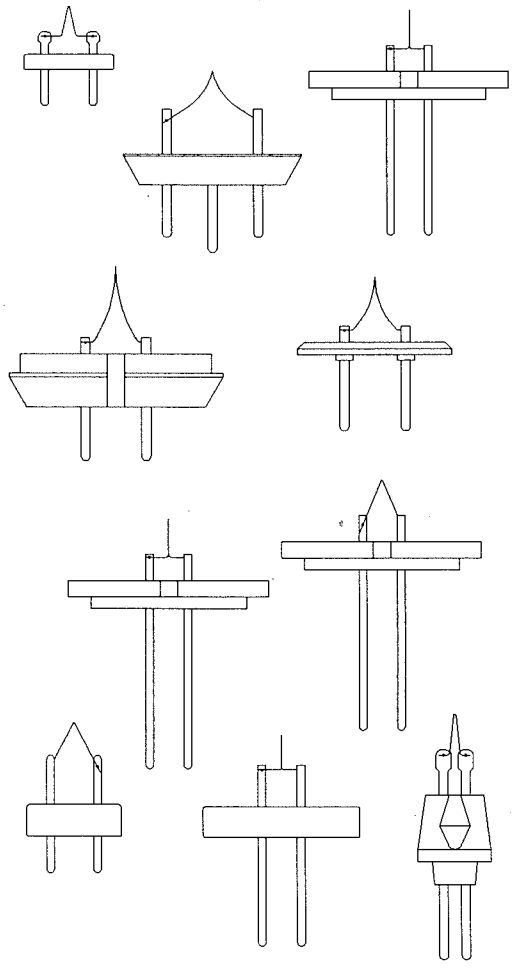

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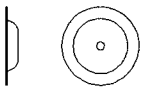

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Abstracts

BIOLOGICAL SCIENCES

PLATFORM PRESENTATION — FALL 1992

INVESTIGATION OF THE MECHANISM OF EXOGENOUS DNA ENTRY INTO SKELETAL AND CARDIAC MYOCYTES. Camille Graham and Joseph Koke, Department of Biology, Southwest Texas State University, San Marcos.

We have developed cytochemical methods for visualizing biotinylated DNA (bDNA) in tissue by electron microscopy, using modified streptavidin (Extravidin, from Sigma) conjugated to 10 nm colloidal gold. We and others have shown direct gene transfer and stable expression in skeletal and cardiac muscle resulting from simple injection of DNA into muscle tissue. This DNA is not incorporated into the genome and expression appears to occur episomally in the nucleus, although the mitochondrion may be a possible site. In order to investigate the mechanism of DNA uptake by myocytes, and the location of exogenous DNA in myocytes, plasmid DNA (pCH110) was biotinylated by the method of Hidetoshi et al., (1989) or by use of a photo-active derivative of biotin (Photoprobe Long Arm Biotin, from Vector Labs). bDNA prepared this way had normal sensitivity to DNAse I.

We injected this bDNA into skeletal and cardiac muscle of rats, and we have been successful in locating bDNA in thin sections of skeletal muscle by electron microscopy. Tissue containing the bDNA injection site was removed after intervals and fixed in paraformaldehyde. The tissue cube was then cut into 50 µm sections using a vibratome. After blocking to prevent non-specific binding, the vibratome sections were incubated in Extravidin-gold, re-fixed, then embedded to provide transverse ultra-thin sections of the vibratome sections. In the samples thus far examined, bDNA injected 6 days prior to fixation and tissue processing was found intracellularly in myocytes, just inside the sarcolemma. In each case where we felt confident bDNA was visualized, it was associated with the outer surface of membranous vesicles that were located immediately inside the sarcolemma. We have not observed bDNA in nuclei or in mitochondria. On the basis of these limited results, it appears that exogenous DNA enters myocytes by a vesicle dependent mechanism and remains in the sub-sarcolemmal space. We have no hypothesis as to how expression could occur in this location in the myocyte.

Supported by the Texas Advanced Technology Program, grant # 003615007.

VESICULAR TRANSPORT OF MATERNAL IMMUNOGLOBULINS IN THE SMALL INTESTINE OF SUCKLING NEWBORN PIGLETS László G. Kőműves and Julian P. Heath, Microscopy Laboratory, Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, Texas 77030

It has been recognized that the transcytosis of proteins such as hormones (prolactin), growth factors (EGF, IGF) and other biologically active macromolecules (IgG, lactoferrin) across the small intestinal mucosa is vital for neonatal growth and development, but very little is known about the intracellular mechanism of this process. We have studied the absorption and transport of maternal IgG (MIgG) in the jejunum of suckling newborn piglets as a model system to identify those intracellular compartments which are participating in the transcytotic vesicular traffic. MIgGs were detected by immuno-gold or streptavidin-biotin bridge gold methods in newborn suckled piglets. Endocytosis was also studied in isolated jejunal loops of non-suckled piglets. The lumen of the loops was filled either with colostrum and analysed by immunocytochemistry or with horseradish peroxidase (HRP). Smaller endocytic vesicles and large apical electron-dense granules (AGrs) which developed during suckling contained MIgGs. The uptake of HRP revealed that AGrs were connected to tubular vesicles. The fusion of AGrs gave rise to the formation of a large basal granule (LBG). LGBs were highly enriched in MIgGs. We observed an intimate relationship between LBG and the Golgi apparatus which also contained MIgGs. This investigation showed that trancytosis of MIgGs across the mucosa involves several vesicular compartments.

Supported by USDA/ARS Cooperative Agreement 50-6250-1-003.

THE MUSCULAR DYSTROPHIES: THE CHANGING ROLE OF DIAGNOSTIC ELECTRON MICROSCOPY

S.C. BAUSERMAN and R.T. King, Dept. Pathology, Scott and White Clinic and Texas A&M University Health Sciences Center, Temple, TX 76508

Although morphologic classification, including ultrastructural features of the various forms of muscular dystrophy continue to play a role in the assessment of patients with certain neuromuscular diseases which are often hereditary, the advent of new biochemical probes, genetic analyses and certain other marker studies have shifted the emphasis and in some instances resulted in reclassification of certain neuromuscular disease states. DYSTROPHIN is a relatively newly identified protein, the product of a gene that is affected in Duchenne's muscular dystrophy (DMD). Its expression in skeletal muscle from patient's with DMD and in Becker's muscular dystrophy (BMD) defines certain phenotypes with quite divergent clinical behavior. In addition, certain female carriers of this X-linked disorder show abnormal expression of dystrophin as well. Applications of these new probes has resulted in a complementary role for diagnostic electron microscopy (TEM) in certain forms of neuromuscular disease. Examples of some of these entities are shown with often striking ultrastructural features including MITOCHONDRIAL MYOPATHIES; GLYCOGEN STORAGE DISEASES; NEMALINE (ROD-BODY) MYOPATHY; and MYOTONIC DYSTROPHY.

DETECTION AND LOCALIZATION OF HUMAN SUPEROXIDE DISMUTASE IN RAT MYOCARDIUM INDUCED BY INJECTION OF DNA. Tracy Toliver, Rhonda Rolig, Ronald Walter, and Joseph Koke. Department of Biology, Southwest Texas State University, San Marcos.

We and others have shown direct gene transfer and stable expression in skeletal and cardiac muscle resulting from simple injection of DNA into muscle tissue. This DNA is not incorporated into the genome and expression appears to occur episomally in the nucleus, although the mitochondrion may be a possible site. We constructed a plasmid ($pMTSOD_1$) from pCW8, which contains an ampicillin resistance gene and a sheep metallothionine promoter, and from pBRM which contains the cDNA for human CuZn SOD. Using asymmetric restriction site analysis, we confirmed that the SOD cDNA was inserted in $pMTSOD_1$ in the correct orientation.

We tested $pMTSOD_1$ for ability to transform rat heart myocytes by injecting it into rat myocardium. A monoclonal anti-human CuZn SOD was used to probe the rat heart tissue for human SOD from 4 to 11 days after injection. In sections of rat heart that had not been exposed to exogenous DNA, weak binding of anti-SOD occurred indicating some cross reaction between the anti-human SOD and endogenous rat heart SOD. However, in sections of hearts injected with 400 µg $pMTSOD_1$, strong binding of anti-human CuZn SOD was observed on the surface and in the interior of myocytes near the injection site. In a 1 mm^2 area centered on the injection site, transformation efficiency was ~4%. We localized anti-human SOD binding ultrastructurally by demounting the cryotome sections and treating them with gold conjugated protein-G. The sections were then processed and embedded for electron microscopy. Using the immunofluorescence results as a guide for block trimming, thin sections were cut from the embedded cryotome section and examined in the electron microscope. Specific localization of gold was observed associated with the sarcolemma and myofibrils of myocytes. Localization did not occur in mitochondria. These results therefore do not support a mitochondrial location for expression of proteins induced by direct gene transfer in myocytes.

Supported by the Texas Advanced Technology Program, grant # 003615007.

FINE STRUCTURE OF A WILDLIFE RUMINANT BABESIA. R.E. DROLESKEY, P.J. HOLMAN*, K.A. WALDRUP*, W.L. GOFF**, D.E. CORRIER, AND G.G. WAGNER*, USDA/ARS, Food Animal Protection Laboratory, College Station, Texas; *Dept. Vet. Pathobiology, Texas A&M University, College Station, Texas; **USDA/ARS, Hemoparasite Disease Laboratory, Pullman, Washington.

A babesia was isolated from a bighorn sheep (*Ovis canadensis nelsoni*) and inoculated into a white-tailed deer (*Odocoileus virginianus texanus*) for further studies. Babesia cultures were established from the experimentally infected deer. Blood from the infected deer and cultured babesia were subsequently processed for TEM and SEM. A close association of the parasite with the host erythrocyte membrane was clearly evident by both TEM and SEM. All stages of the parasite were found in this positioning. The parasites possessed a single nucleus, ribosomes, RER, mitochondrion-like structures, and an inner membrane complex, and were bound by a single limiting membrane. Unlike reports for other *Babesia* spp., the inner membrane complex did not extend the entire length of the organism. Membranous whorls resembling Maurer's clefts were observed within the cytoplasm of the host erythrocyte.

ANGIOTENSIN II (A2) AND CARDIAC MYOCYTES. Sheila Jeffcoat, *Neville Bittar, and Joseph Koke. *Department of Medicine, University of Wisconsin-Madison, and Department of Biology, Southwest Texas State University, San Marcos

Evidence exists indicating the cardiac renin-angiotensin system is an autocrine system that regulates normal and pathological hypertrophy of the mammalian left ventricle. Angiotensin converting enzyme inhibitors and the specific A2 inhibitor, losartan, both minimize cardiac stunning and improve function during reperfusion following brief episodes of myocardial ischemia. This suggests ischemia activates the local renin-angiotensin system and that A2 has negative effects on contractility during reperfusion after ischemia.

We investigated the physiological and ultrastructural effect of A2 and losartan in an open chest dog preparation by infusion of A2, losartan, or A2 followed by losartan into the coronary circulation of dogs under conditions of normal flow, ischemia, and reperfusion after ischemia. A2 increased systemic pressure and decreased contractility and preload, but had surprisingly little effect on coronary flow. Infusion of losartan alone decreased afterload and caused an increase in contractility, and losartan promptly reversed the effects of A2 when infused after A2. In dogs subjected to regional myocardial ischemia for 15 minutes followed by 3 hours of reperfusion, we found A2 to increase reperfusion arrhythmias and strongly inhibit recovery of contractility following ischemia. Losartan had the opposite effect; reperfusion arrhythmias were reduced and recovery of contractility following ischemia was accelerated. Losartan after A2 reversed the effects of A2. We also examined the effect of A2 on the ultrastructure of cardiac myocytes, and found that infusion of A2 caused ischemic-like ultrastructural changes. In addition, we found A2 to amplify the morphological effects of ischemia and ischemia-reperfusion. Infusion of losartan alone had no morphological effect and infusion of losartan after A2 blocked both the effects of A2 alone and A2 with ischemia-reperfusion.

These results support a role for cardiac generation of A2 in reperfusion injury or myocardial stunning, which is an important clinical manifestation of a heart attack.

ELECTRON MICROSCOPIC OBSERVATIONS OF BORON-DEFICIENT LYCOPERSICON ESCULENTUM MILL. (TOMATO) CALLUS. C.G.A. MAIER, D.C. GARRETT, A.S. KESTER AND D.W. SMITH, Biological Sciences Dept., University of North Texas, Denton, TX 76203.

The responses of dark grown tomato callus obtained from leaf explants to conditions of boron deficiency versus boron sufficiency have been investigated by transmission (TEM) and scanning electron microscopy (SEM). Boron-deficient callus was composed of larger, more rounded and loosely attached cells than the control. Macroscopically, calli on boron deficient medium are larger than those grown in sufficient boron. Surface cells of fixed, critical point dried calli, from both boron-deficient and boron-sufficient (control) tissues exhibited an extracellular matrix in the form of a conspicuous network of coarse strands between cells, and acellular, spherical bodies. Air-dried calli do not show the fibrillar network linking the surface cells, but instead have a wrinkled, brain-like appearance, consisting of shrunken cells. The fibrillar network may be made of pectin strands since it is continuous with the middle lamella between two adjacent cells. TEM examination of cell walls of boron-deficient and boron-sufficient calli showed the cell wall of boron-deficient callus to be much thinner than that of the control. Middle lamella is present in the boron-deficient callus but it is more developed in the control. Vesicles at the wall-plasmalemma interface, similar to paramural bodies, are more numerous in boron-deficient than in boron-sufficient callus. In general, the structures of cell walls in both boron-deficient and boron-sufficient calli seem to be compatible with the multinet theory of cell wall growth. Myelin sheath-like structures were observed only in boron-deficient callus. Energy Dispersive Spectrophotometry (EDS) was used to analyze the elemental composition of the air-dried calli. The amount of calcium was shown to be higher in boron-deficient callus than in controls, while the amount of potassium was less than in controls. The possible significance of these data will be discussed. Our results indicate that the effects of boron deficiency are manifest in callus cells primarily at the level of cell wall formation and growth.

THE MORPHOLOGY OF THE MALE SECONDARY GENITALIA OF SELECTED ISCHNURAN SPECIES (ODONATA: COENAGRIONIDAE). KIMBERLY L. NOVAK, Department of Biology, University of Texas, Arlington, Tx 76019.

Male odonates have specialized structures; including spines, sponges, and scoops to remove a rival's sperm before depositing their own. Kennedy (1917) drew general schematics of penes of many Ischnuran species using the light microscope. Using SEM technology the minutia is described here. This will be useful as a species identifier and as a potential prediction of species reproductive behavior.

EARLY FOOT DEVELOPMENT IN THE SPOROPHYTE OF THE MOSS ACAULON TRIQUETRUM (SPRUCE) C.M. W.B. ROSSER and A.E. RUSHING, Department of Biology, Baylor University, Waco, TX 76798.

The foot region of the young embryo of Acaulon triquetrum, at a stage before differentiation of the capsule and seta, is comprised of a large basal cell approximately 25-30 μm in width and 30-35 μm in length, a layer of smaller cells adjacent to the basal cell, and several epidermal cells extending upward. These cells, along with a single layer of gametophyte cells and the space between, form the placental region of the sporophyte-gametophyte junction. The basal cell has extensive wall ingrowths on its walls adjacent to the gametophyte but not on its wall adjoining the remainder of the sporophyte. Mitochondria, plastids, ribosomes, dictyosomes, and rough endoplasmic reticulum are characteristic of this cell. At this stage, the layer of small cells adjacent to the basal cell is nearly identical in total diameter to that of the basal cell. The cells of this layer have ingrowths on their walls in contact with the basal cell and on their outer tangential walls. Several additional epidermal cells may have small ingrowths on their outer tangential walls. Gametophyte cells adjacent to the foot region may have many layers of rough endoplasmic reticulum at this stage but they generally have few, if any, wall ingrowths. As development proceeds, the basal cell retains nearly its original diameter although it may become slightly crushed as the sporophyte extends downward into the gametophyte. The cell layer above it, however, expands so that the total diameter of this layer now exceeds that of the basal cell. The entire foot region eventually becomes rounded with the single large cell remaining below. Wall ingrowths are characteristic of the outer tangential walls of the foot cells and are less extensive on the radial walls. More ingrowths are found in the basal and middle cells of the rounded foot than in the cells of the upper region. Wall ingrowths are not as extensive in cells of the gametophyte and usually are confined to the inner tangential walls although some ingrowths may develop on radial walls. The upper region of the sporophyte is covered by a thin electron-opaque layer presumed to be a protective covering. This layer becomes disrupted in the lower regions of the sporophyte and is almost entirely absent on the walls of cells that possess wall ingrowths.

IMMUNOLABELING OF SECRETED POLYSACCHARIDES IN PLANT CELLS. D. JANINE SHERRIER AND KATHRYN A. VANDENBOSCH, Dept. of Biology, Texas A&M University, College Station, TX 77843-3258.

Newly emerging root hair cells are the susceptible site for establishment of the symbiosis between vetch and rhizobia. These tip-growing cells are secreting new wall components at the apex, and the biogenesis of this region may provide material needed to establish a successful infection. To characterize the distribution of some of the components in the root hair wall, we have combined freeze-substitution and immunogold electron microscopy. Cryofixation and freeze-substitution provide an excellent means for preserving transient events in the exocytic pathway as well as the epitopes of components destined for the cell wall. Monoclonal antibodies which recognize methyl-esterified pectin (JIM 7) and de-esterified polygalacturonic acid (JIM 5) epitopes of were used to locate these epitopes within the exocytic pathway and in the cell wall. A monoclonal antibody which recognizes xyloglucan (CCRC-M1) was used to locate this cell wall component. We found that pectin is secreted in the methyl-esterified form, and de-esterified in muro. Xyloglucan co-localizes with methyl-esterified pectin in Golgi bodies, secretory vesicles, and in the cell wall.

MYOFILAMENTS IN SARCOMA CELLS. BRUCE MACKAY and NELSON G. ORDONEZ, University of Texas M. D. Anderson Cancer Center, Department of Pathology, Houston TX 77031

Cytoplasmic filaments can be found in the cells of most soft tissue sarcomas, sometimes in considerable amounts, but they are commonly non-specific in appearance and of limited value in diagnosis. In contrast, the distinctive structural features of myofilaments permit their identification in tumor cells with the electron microscope even when they are present in small numbers, and it is generally possible to recognize whether they are of smooth muscle or skeletal muscle type. The patterns of the myofilaments in tumor cells may be quite different from those seen in normal muscle cells. Myofilaments can also be demonstrated using immunoperoxidase techniques. Since skeletal muscle and smooth muscle myofilaments each occur in several different types of tumors, it is necessary to take other ultrastructural criteria into consideration in order to identify the cell type, and before a firm diagnosis is rendered, the findings from immunocytochemistry and electron microscopy must be correlated with those from routine light microscopy and evaluated in the context of the clinical findings.

IDIOBLAST DEVELOPMENT AND TESTA ANATOMY IN DEVELOPING SEEDS OF *OXALIS DILLENII* (JACQ.). D.C. Garrett and L.H. Bragg, Department of Biology, University of Texas at Arlington, Arlington, TX 76019.

Mature seeds of *Oxalis dillenii* exhibit a ridged appearance with the crests displaying white cellular debris. The testa also possesses numerous crystals of calcium oxalate. Previous studies have dealt with crystal occurrence in developing seedlings as well as in the testa of mature seeds. In this preliminary study, we have attempted to define the developmental sequence for seed coat crystal idioblast cells as well as further elucidate information on testa anatomy.

The testa of *Oxalis dillenii* is composed of five distinct cell layers and an acellular protective covering. The idioblast cells develop in the central layers of the testa with coalescing vacuoles forming the crystal vacuole. The crystals form early in seed development when the fruit has elongated to a length of 8 to 9 mm. The nucleus is usually centrally located in early cell development but migrates to the outer periphery during maturation. During seed dispersal the outer periphery separates during ejection of the seed. Previously unreported idioblast cells, occurring at low frequency, are found in the parenchymal layer of the testa.

BIOLOGICAL SCIENCES

POSTER PRESENTATION — FALL 1992

A FLAT EMBEDDING METHOD FOR LR WHITE AND LR GOLD RESINS László G. Kőműves, Microscopy Laboratory, Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston Texas 77030

The majority of intracellular antigens can be localized by various immunocytochemical methods only after embedding into acrylic resins such as Lowicryl, LR White, and LR Gold, which were formulated to prevent, or at least decrease, the loss of antigenicity. Because oxygen inhibits the polymerization of these resins, samples are usually embedded in Beem or gelatin capsules. This procedure, however, makes proper orientation of the tissues pieces difficult. A simple procedure for flat embedding of large tissue pieces into LR White or LR Gold resins is presented here. For the embedding of the tissue pieces, plastic cryomolds (Miles Labs) were used in two sizes: intermediate (15 x 15 x 5 mm) and biopsy (10 x 10 x 5 mm), respectively. The samples were placed into the bottom of the cryomold and carefully oriented. The chamber was then filled with the resin and covered with a 22 mm square glass coverslip. LR White resin was polymerized in an oven at 60 °C overnight, whereas LR Gold resin was polymerized by UV light at -20 °C in a cryobox for 12 hr. After polymerization the the cryomolds were peeled off from the blocks. Different tissues, including jejunum and ileum of newborn suckling piglets and rats, and small intestine, kidney and diaphragm from adult rat were succesfully embedded with the method described here for the first time.

Supported by USDA/ARS Cooperative Agreement 50-6250-1-003.

PRE-COLUMBIAN PATHOGEN OF GRASSES IDENTIFIED USING SCANNING ELECTRON MICROSCOPY. M.W. Pendleton, Electron Microscopy Center, Texas A&M University, College Station, TX 77843

A high concentration level of spores of a plant pathogen (Tilletia muhlenbergiae G.P. Clint) which attacks grasses (and modern crops such as wheat) has been obtained from soil samples taken from the floor surface of a room within the NAN Ranch Ruin (LA 15049), a Mimbres archeological site located in south-central New Mexico. Pollen grains were also recovered from this room and other rooms at the NAN Ranch Ruin, but T. muhlenbergiae G.P. Clint was only found in one room. This room was one of the last rooms occupied before a massive abandonment of this early agricultural site and the surrounding area occurred during the twelfth century (A.D.). Scanning electron microscopy provided the resolution required for the identification of these spores. T. muhlenbergiae G.P. Clint spores posses an unusual hexagonal reticulate surface pattern and have an unusually large diameter (forty micrometers). While spores are utilized in archeological interpretations in Europe, their potential has not been realized in North American studies. Graham (J. Palaeontology 36:60-68) listed the advantages of fungal related paleo-ecological analysis as early as 1962 but little work has been accomplished in this area. It is hoped that this study will motivate archeologists to pay more attention to fungal evidence to establish possible roles played by plant pathogens in the widespread abandonment of an area previously occupied for many centuries.

IMMUNOLOCALIZATION OF LACTASE IN JEJUNAL ENTEROCYTES OF NEWBORN PIGLETS Rhonda G. Harrell, László G. Kőműves and Julian P. Heath, Microscopy Laboratory, Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston Texas 77030

We have used immunofluorescence and immunogold electron microscopy to study the distribution and biosynthetic pathway of the brush border hydrolase, lactase, in the enterocytes of neonatal pig jejunum. Tissue was fixed in 4% formaldehyde, cryoprotected in 2.3 M sucrose containing 20% polyvinylpyrrolidone and frozen in liq. N_2. For light microscopy, 1 μm thick sections were cut on a RMC MT7 CR21 cryoultramicrotome. Sections were collected on poly-l-lysine coated coverslips. For EM, 0.1 μm sections were collected on formvar and carbon-coated grids. Sections were incubated in mouse monoclonal anti-pig lactase (PBB 3/7/3/2) followed by either fluorescein- or 10 nm gold-conjugated anti-mouse IgG. In newborns, there was strong staining for lactase on the brush border of crypt and villar enterocytes. In both cell types, weak to moderate staining was also present in perinuclear vesicles. In suckling animals, lactase was detected not only in the brush border, but also in apical and basal endocytotic granules that contained absorbed colostral protein. Staining in these organelles was confined to their periphery and was punctate. We conclude that there may be intersections of the secretory, endocytotic and degradative pathways involved in vesicular traffic in enterocytes at the time of colostral protein absorption.

Supported by USDA/ARS Cooperative Agreement 50-6250-1-003.

THE MATURE SPOROPHYTE FOOT OF THE MOSS LORENTZIELLA IMBRICATA (MITT.) BROTH. A. E. RUSHING, Department of Biology, Baylor University, Waco, TX 76798.

The mature sporophyte foot of Lorentziella imbricata, at the stage of early spore maturation in the capsule, is globose in shape and approximately 0.2-0.3 mm in diameter. The placental region of the sporophyte-gametophyte junction is comprised of the epidermal cells of the foot, the adjacent cells of the gametophyte, and the space between which often contains remnants of crushed gametophyte cells. Many cells in the placental region have characteristics of transfer cells. The cells of the innermost layer or two of the gametophyte possess wall ingrowths on their inner tangential walls adjacent to the foot. The radial walls of these cells also may have ingrowths but these usually are not as well developed as those of the tangential walls. These cells contain rough endoplasmic reticulum, often forming extensive layers, and numerous mitochondria, plastids, and dictyosomes. The epidermal cells of the foot possess extensive wall ingrowths on their outer tangential walls adjacent to the gametophyte. The radial walls of these cells also have ingrowths, decreasing in density inward. The inner tangential walls usually also have some elaborations. The cells of the second layer of the foot may have ingrowths on their outer tangential walls but these are not as extensive as those of the epidermal cells. The central strand of the seta extends into the foot. The central strand cells are more elongated and less densely staining than the other cells of the foot and their basal walls may have well developed wall ingrowths. The epidermal cells of the foot have numerous mitochondria, small vacuoles, plastids that may contain starch, dictyosomes, ribosomes, and rough endoplasmic reticulum. Wall ingrowths are more extensive in the epidermal cells of the basal and middle region of the foot but are found even in the upper region of the foot at its junction with the seta or stalk of the sporophyte. At this stage of development, the outer tangential walls of the epidermal cells may already have begun to thicken as a result of the deposition of addition wall material characteristic of the latest stages of development in mosses. This may obscure the original distribution of wall ingrowths.

MATERIALS SCIENCES

PLATFORM PRESENTATION — FALL 1992

ELECTRON MICROSCOPY OF THE $BaTiO_3$/Ge INTERFACE Y.G. RHO, E.G. JACOBS, and R.F. PINIZZOTTO, Center for Materials Characterization, University of North Texas, Denton, TX 76203; S.R. SUMMERFELT and B.E. GNADE, Texas Instruments, Dallas, TX.

Thin films of $BaTiO_3$ (BT) approximately 2000 to 2200 Å thick were deposited using pulsed laser ablation onto substrates of either (100) Si or (100) Si plus 0.3 μm Ge. One goal of this study was to examine the effect of a Ge barrier layer on the formation of interfacial layers between the substrate and the ferroelectric thin film. The effect of processing conditions on film microstructure was also examined. Two sets of samples were made. For one set of samples, BT was deposited at 700°C either in vacuum or with a partial pressure of 1 mT or 10 mT of O_2. For the second set, 200Å of BT was deposited at 450°C followed by a 5 minute anneal and deposition of an additional 2000 Å at 750°C either in vacuum or with 1 mT O_2. This gave an overall sample matrix of 10 samples. Cross-sectional TEM indicated that the BT grains were columnar with an average grain width of about 20 nm. HREM studies of the BT/Ge interface indicated that no interfacial layers were formed during deposition. Furthermore, observations made using HREM and selected area electron diffraction indicated that limited epitaxial growth had occurred across the BT/Ge interface. Observations made using bright field TEM suggest that an interfacial layer was formed at the BT/Si interface during deposition.

TIME DEPENDENCE OF THE SIZE DISTRIBUTION OF CADMIUM SULFIDE NANOPARTICLES, R.F.PINIZZOTTO AND H.YANG, Center for Materials Characterization, University of North Texas, Denton, Texas, 76203-5308 and J.L.COFFER AND R.R.CHANDLER, Department of Chemistry, Texas Christian University, Fort Worth, Texas, 76129.

We have performed quantitative high resolution transmission electron microscopy (HREM) of CdS nanoparticles in the quantum-confined size regime. The material was fabricated using an aminocalixarene stabilization scheme which limits the particle size to approximately 4 nm. The size distributions were determined within 24 hours after synthesis, after storage for one week at 10 °C, and after storage for three months at room temperature. A minimum of 220 individual diameters per sample were manually encoded from HREM micrographs. Statistical analyses were performed using both a BASIC program and SPSS/PC+.

The median diameter was found to increase from 3.5 to 3.8 to 4.2 nm over time. Student's t-tests indicate that these differences are statistically significant with confidence limits exceeding 99.9% The changes in the size distribution histograms are consistent with a diffusion controlled growth mechanism. The evolution of the nanoparticle size distribution with time may explain the unusual time-dependent behavior of the optical properties of this material.

IN SITU TRANSMISSION ELECTRON MICROSCOPY OF SN/CU INTERMETALLIC FORMATION, C.POURAGHABAGHER, E.G.JACOBS AND R.F.PINIZZOTTO, University of North Texas, Center for Materials Characterization, P.O.Box 5308, Denton, TX 76203-5308.

Growth of intermetallics at tin/copper interfaces was examined *in situ* using a Gatan heating stage in a JEOL 100 CX TEM. The substrates consisted of amorphous carbon thin films supported by standard TEM grids. The substrates were placed in an evaporating chamber and a continuous layer of Cu was deposited. Sn was then deposited on the Cu using another TEM grid as a mask. This results in square Sn islands on top of a continuous Cu film. The samples were heated in a hot stage to temperatures of 150 to 350 °C. Intermetallic growth occurs laterally at the Sn/Cu edges.

Intermetallic formation was studied as a function of time and temperature. In general, two intermetallic layers form at the Sn/Cu boundaries. The Cu undergoes an initial rapid structural change. The Sn layer becomes substantially thinner with time. In addition, void formation occurs near the intermetallic/Cu interface.

The presentation will include a 5 minute video demonstrating Sn/Cu intermetallic formation.

OBSERVATIONS OF CHEMICAL REACTIONS IN Pt-Sn FILMS HEATED IN-SITU. D. C. DUFNER, Electron Microscopy Center, Texas A&M University, College Station, Texas 77843.

Intermetallic phases formed by interdiffusion have been identified by a number of techniques including high-resolution TEM (HRTEM), which provides a means for directly observing chemical reactions at the atomic level. In previous investigations, chemical reactions occurring in binary-alloy thin films were observed as a result of ex-situ heating, which was often done by heating specimen grids containing the metal films at 150-200° C in vacuo before transferring the grids to a TEM for HRTEM observations. The major disadvantage of ex-situ heating was that many of the initial reactions had already taken place during the heating process by the time the grids were observed in the TEM. In order to observe such initial reaction products at the onset of interdiffusion, one would have to use a heated specimen stage in a TEM to perform in-situ heating.

This presentation focuses on the initial observations of chemical reactions in the Pt-Sn system as a result of in-situ heating. In-situ heating is done with a Gatan model 628 single-tilt heated stage fitted for the JEOL 2010 200kV TEM. Real-time TV images are collected on a Gatan model 622 Mark II TV camera system and recorded on a conventional VCR. TV images of the melting of Sn films and the conversion of Sn into $PtSn_4$ will be shown. This work is partially supported by the Center for Energy and Mineral Resources at Texas A&M University.

MATERIALS SCIENCES

POSTER PRESENTATION — FALL 1992

TEM SPECIMEN PREPARATION FOR SEMICONDUCTOR DEVICES. M.D. Coviello, L.D. Palmer and H.L. Tsai, Texas Instruments, P.O. Box 655936, M/S 147, Dallas, TX 75265

In the semiconductor industry, sample preparation is extremely important in providing timely support for process development. To make this possible, both precise information about each sample and complete knowledge of techniques on TEM sample preparation are critical. It is often necessary to prepare a TEM sample to intersect different device elements or a specific metal contact or transistor. Depending on the problem being solved, either a TEM cross section or a planar specimen is prepared.

Our laboratory routinely uses an improved multi-layer "sandwich" technique to prepare TEM cross sections of submicron Si devices. This technique allows us to examine many interfaces simultaneously in the microscope, thus improving the chance to find typical areas in devices. In order to study defects near the substrate surface, we prepare TEM samples by carefully ion-milling from the top to the surface.

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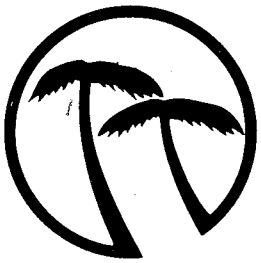

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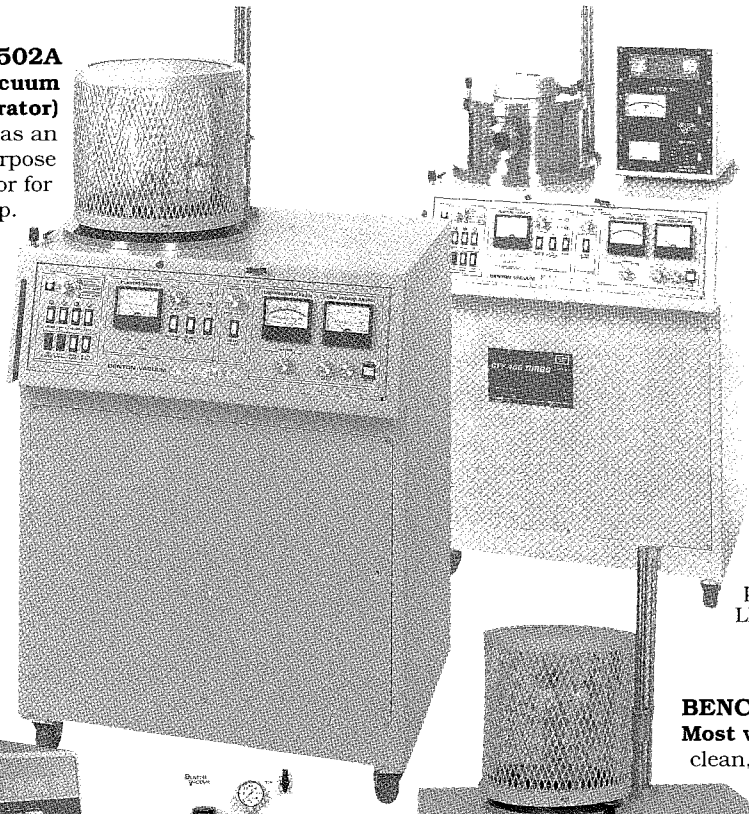

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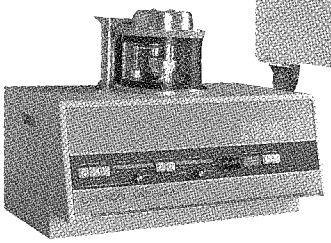

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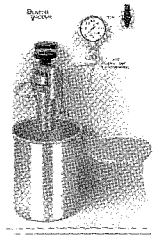

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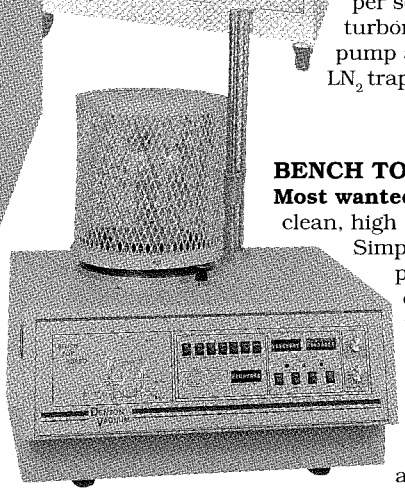

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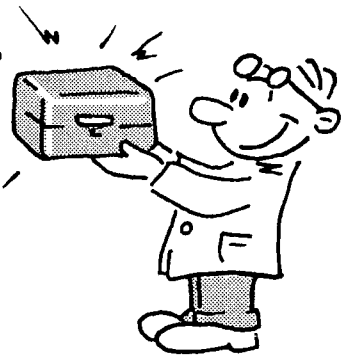

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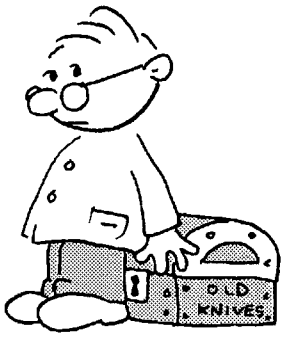

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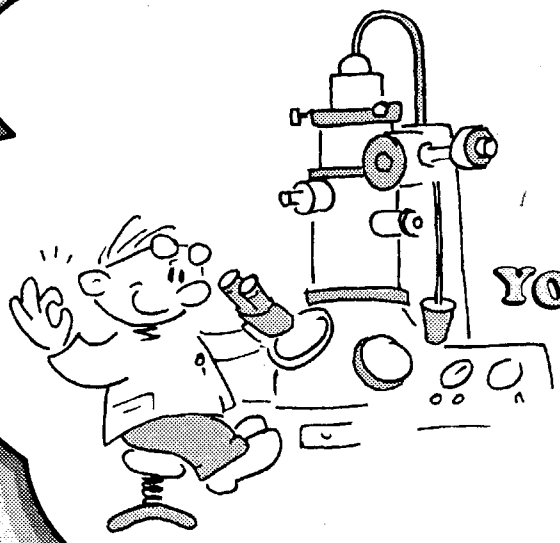

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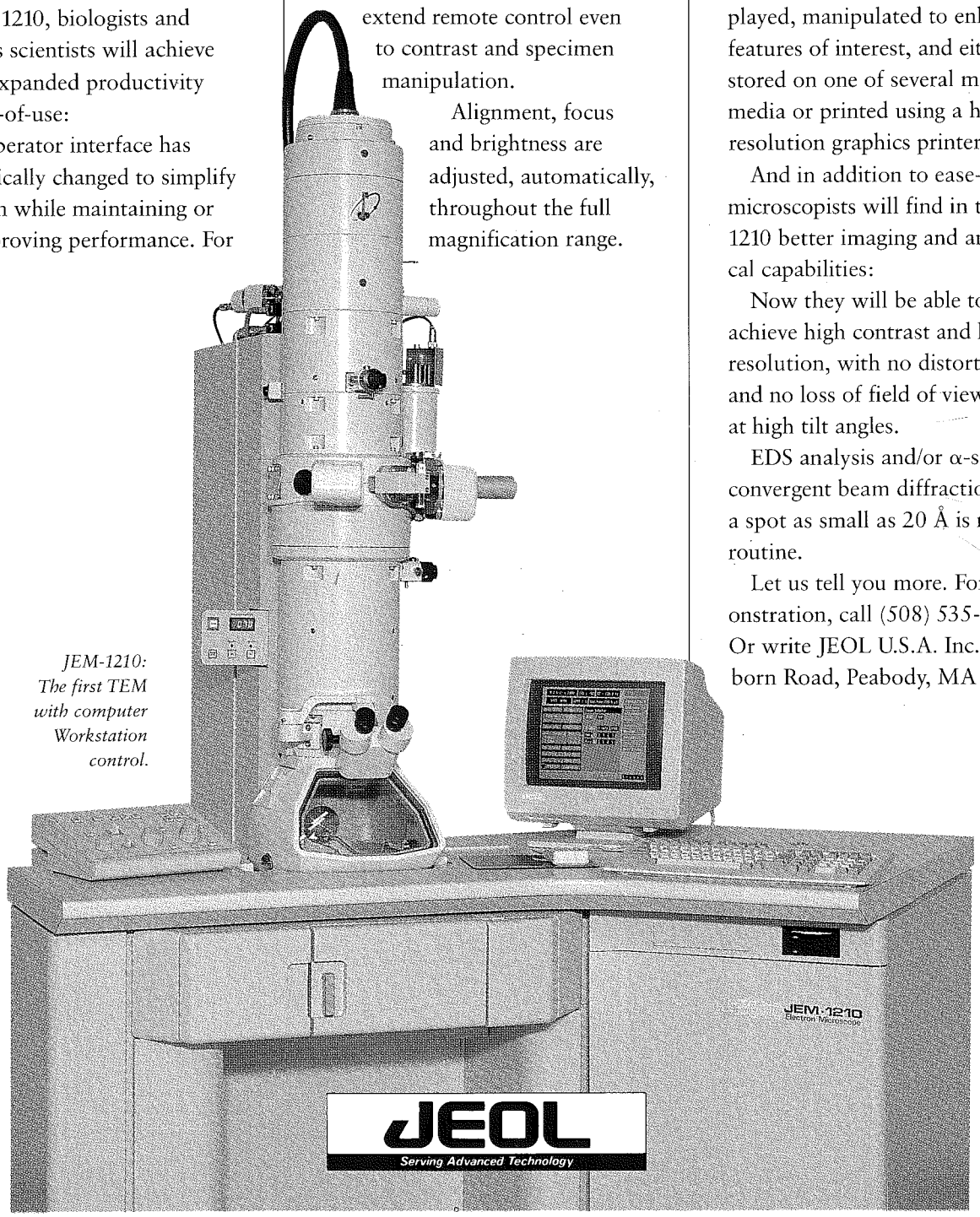

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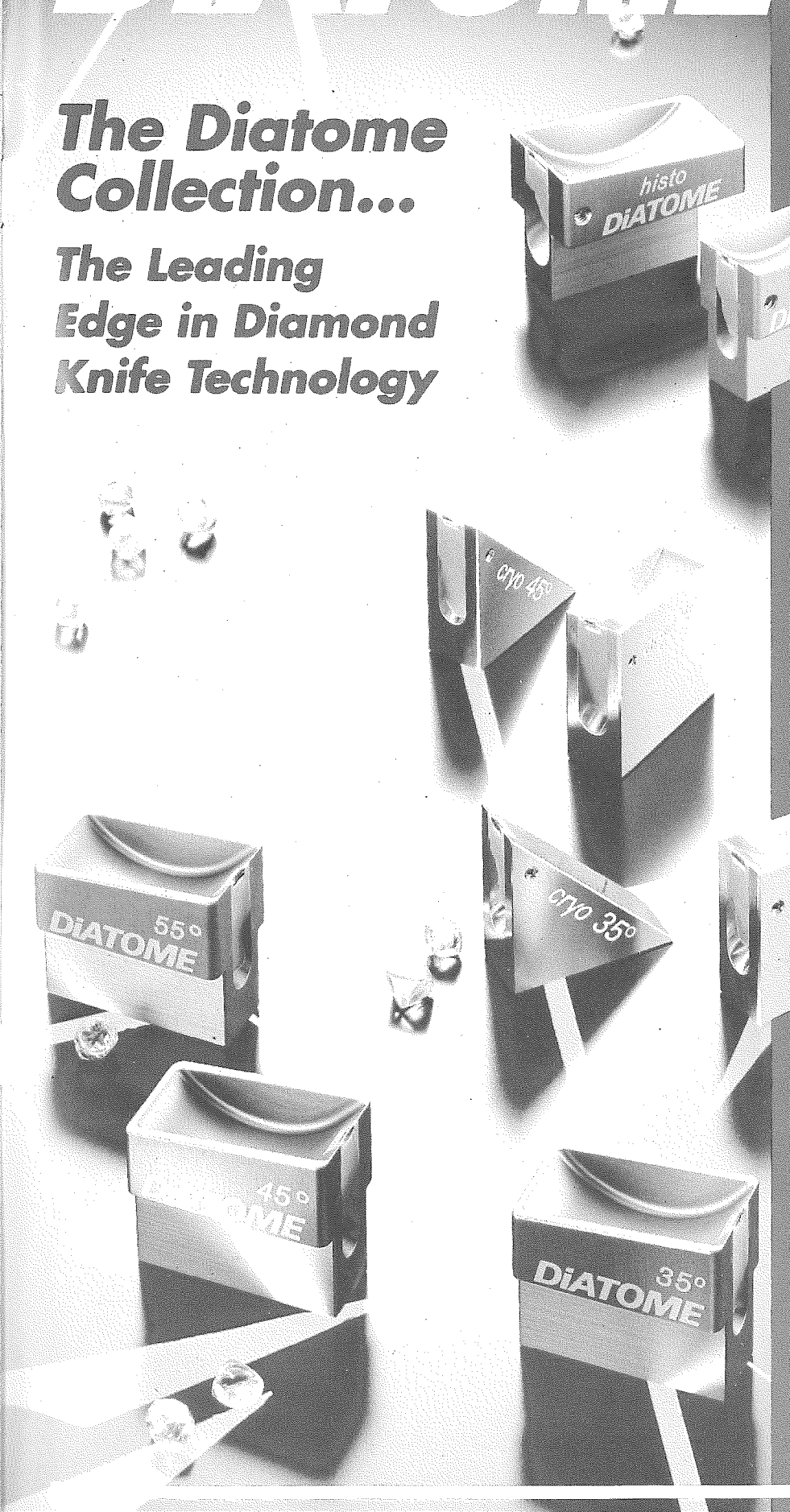

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Diatome is committed to your satisfaction. If you have any special requirements, or need assistance in choosing a knife for your special application just contact us with your needs. Our technical staff, upon receipt of your sample block, will do all necessary testing and make their recommendations to you. Custom boats (color and shape) and custom knives for special applications are available as well.

All new knives are shipped within 4 weeks if they are not immediately available from stock (we do keep an extensive stock of knives on hand for immediate delivery).

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