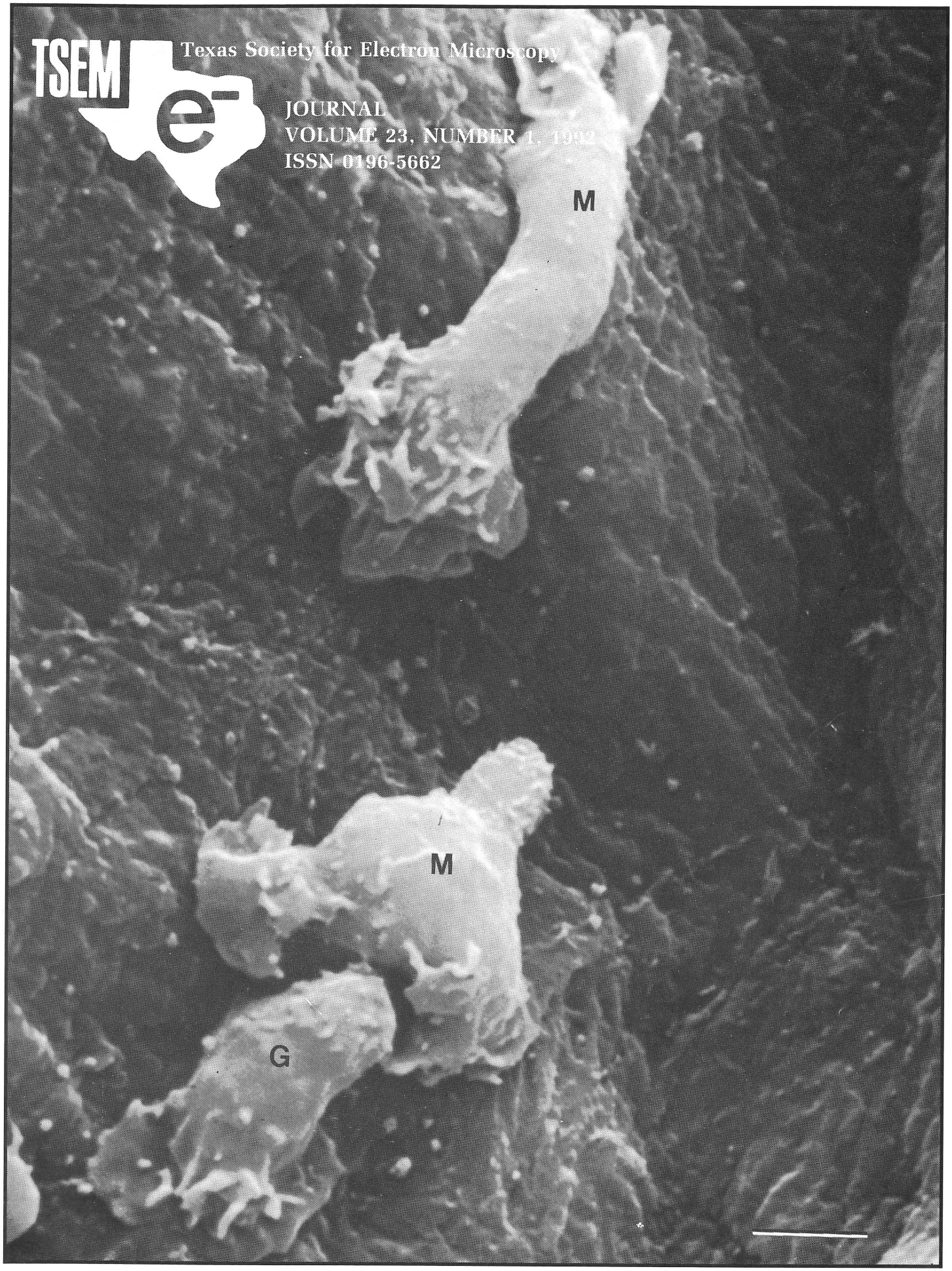
TSEM
Texas Society for Electron Microscopy
JOURNAL
VOLUME 23, NUMBER 1, 1992
ISSN 0196-5662
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Contents

TEXAS SOCIETY FOR ELECTRON MICROSCOPY
JOURNAL
VOLUME 23, NUMBER 1, 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

Scanning electron micrograph of two monocytes (M) and a granulocyte (G) on the endothelial wall of the pulmonary artery in the lung of a guinea pig. Bar = 1.5 micrometers. Photo — Lynn D. Gray, Ph.D., Dept. of Cell Biology and Environmental Sciences, The University of Texas Health Center at Tyler, Tyler, TX.

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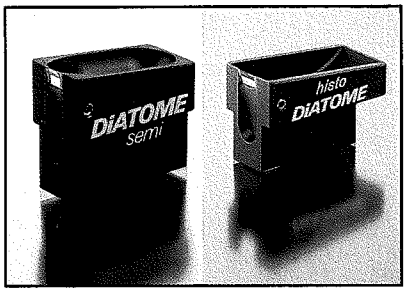

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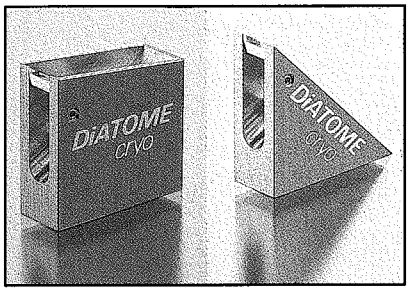

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President's Message

Rich memories of the Fall meeting at Clear Lake are still vivid in my mind, yet the Spring, 1992 meeting is nearly upon us. The symposium entitled "The Maize Root Tip: Impact of Modern Cell Biology" was a tribute to Dr. Hilton H. Mollenhauer and was a "class act" from beginning to end. Dr. James Morré deserves a special "Thank you" from the Society for his efforts in bringing the symposium speakers together. In addition, I would like to thank Dr. Hal Hawkins, Program Chairman, for coordinating the travels of the European speakers as well as coodinating the events over the entire three days. Hilton, who has contributed so much to TSEM and to the field of electron microscopy, expresses his heartfelt appreciation to the many individuals who attended and participated in that special meeting.

We are currently in the process of implementing a much needed change in the way our officers assume their new positions of responsibility. Beginning this spring, individuals elected to the two most demanding offices in TSEM (Secretary and Treasurer) will serve one year as an "-elect" to gain experience before officially taking over. The continuity from one individual to the next and their effectiveness will be greatly improved by the Secretary- and Treasurer-elect positions.

Another change that proved to be successful in Clear Lake and will therefore be continued is the use of Advanced Registration. This has enabled us to be considerably more accurate in our estimation of food expense with the hotels, thus saving the Society money.

The Spring meeting, to be held in San Marcos at the Aquarena Springs Resort, promises to be an enjoyable experience. Several distinguished investigators from around the country are invited speakers: Benjamin Trump, University of Maryland; Maximillian Buja, University of Texas Health Science Center, Houston; and Leroy Eyring, Arizona State University. In addition, Charles Mims, former President of TSEM is returning to present a workshop on Methods of Cryopreservation. Charles, currently President of the Southeastern Electron Microscopy Society (SEEMS), has been a most active participant and supporter of TSEM for many years. All of us look forward to interacting with him again.

As I approach the end of my year as President, I want to thank all of the people who have made my task easy: the participants in the meetings and especially the individuals whose efforts make TSEM function: Louis Bragg, editor of *TSEM Journal*; Lynn Gray, President-elect; Hal Hawkins, Program Chairman; Pam Neill, Treasurer; Nancy Smith, Secretary; and Mannie Steglich and Paula Williams, Local Arrangements representatives. I will end my comments by encouraging you, the members of TSEM to become directly involved in your organization. It will always be only as strong and worthwhile as you make it.

Sincerely,

Don A. Hay

Don A. Hay, Ph.D.
President, TSEM

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Certificate of Deposit No. 177576	$3,241.48	
Certificate of Deposit No. 0014483028	1,500.00	
Certificate of Deposit No. 0014483036	1,500.00	
Checking Account No. 0160041996	2,951.93	
TOTAL		**$ 9,193,41**
CHECKING ACCOUNT RECEIPTS:		
Dues	$5,109.00	
Spring 1991 Meeting Registration	1,790.00	
Workshop	185.00	
Exhibitors	1,370.00	
Donations and Grants	617.08	
EMSA	3,000.00	
Fall 1991 Meeting Registration	2,630.00	
Exhibitors	1,225.00	
Workshop	835.00	
Donations and Grants	2,213.13	
Symposium	2,691.00	
EMSA	650.00	
Journal Advertisements 22:1	2,875.00	
22:2	1,375.00	
Late	625.00	
Checking Account Interest	48.26	
Certificate of Deposit No. 2414483028 (formerly CD #0014483028)	1,581.44	
Miscellaneous	337.75	
TOTAL		**$29,157.66**
Certificate of Deposit Interest		**408.42**
EXPENSES:		
Journal, Postage	$5,185.30	
Stationary and Office Supplies	55.30	
Mailouts	1,345.00	
Poster Display Boards	104.00	
Office	417.60	
Spring 1991 Meeting	6,500.10	
Student Competition/Travel	150.00	
Refunds	60.00	
Fall 1991 Meeting	5,580.58	
Workshop	405.73	
Student Travel	272.00	
Refunds	60.00	
Symposium	5,585.34	
Miscellaneous	497.75	
Checking Account Service Charge	73.57	
TOTAL		**$26,236.97**
Certificate of Deposit No. 2414483028 (formerly CD #177576 cashed)		**1,581.44**
ASSETS AS OF DECEMBER 31, 1991:		
Certificate of Deposit No. 113515 (formerly CD #177576)	$3,455.96	
Certificate of Deposit No. 2414483036 (formerly CD #0014483036)	1,612.50	
Checking Account No. 44059412	5,872.62	
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1991 — A SPECIAL MEETING YEAR FOR TSEM

BY: Lynn D. Gray, Ph.D., President-Elect, TSEM, 1991-92

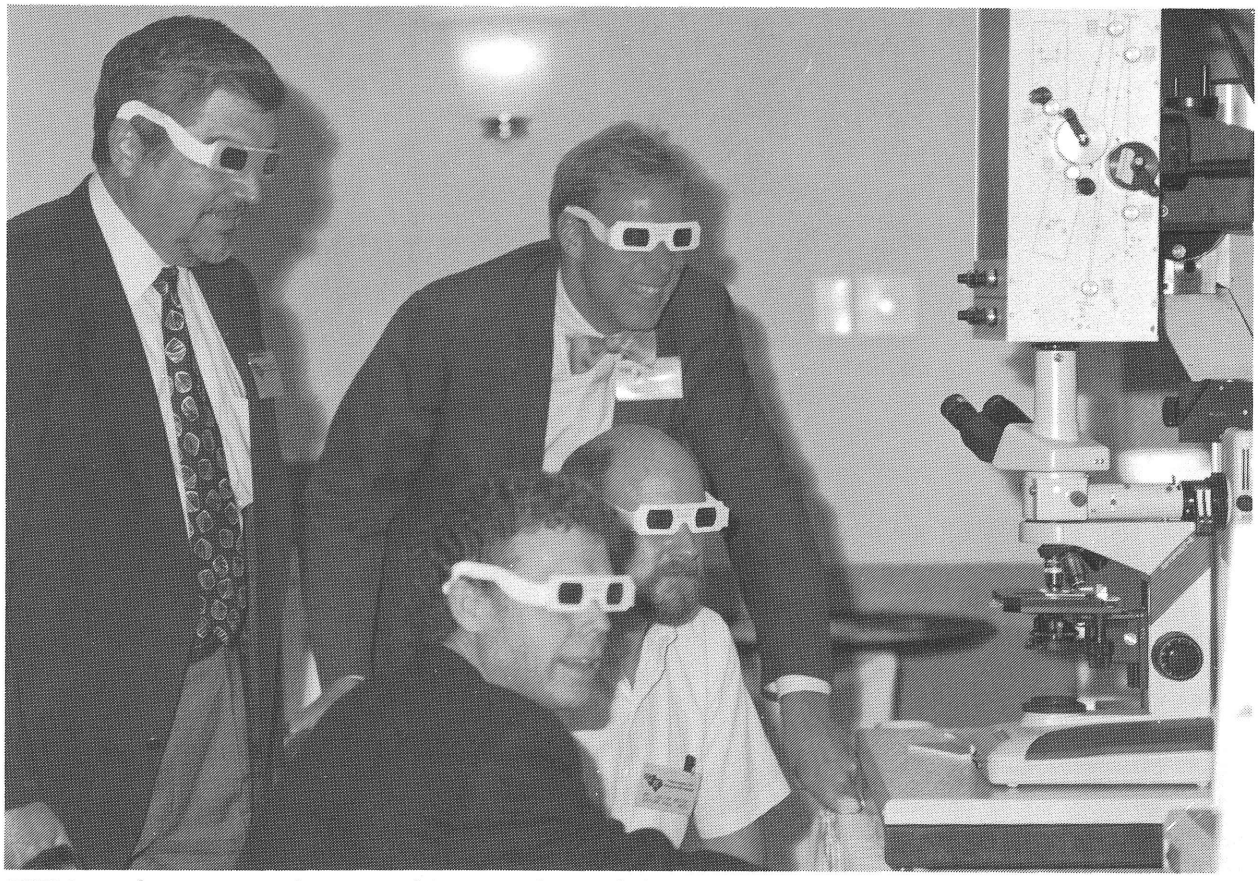
1991 was a year marked by TSEM meetings with special themes and excellent attendance. We made new friends and colleagues and saw outstanding scientific presentations. Workshops have become a regular feature of both the Fall and Spring meetings and have been well received. We benefitted from hearing nationally and internationally known speakers from both biological and materials sciences disciplines. The short synopsis that follows recaps a little bit about what we did this last year. What we do in the coming years depends on your, the membership's, wants and needs. Tell us where we should go and grow in the future. As your elected officers, we try to plan at least a year ahead on meeting locations, themes, speakers, etc. Your input is important so let us know what (and who) you want for future meetings. Here's to '92!

SPRING, 1991:

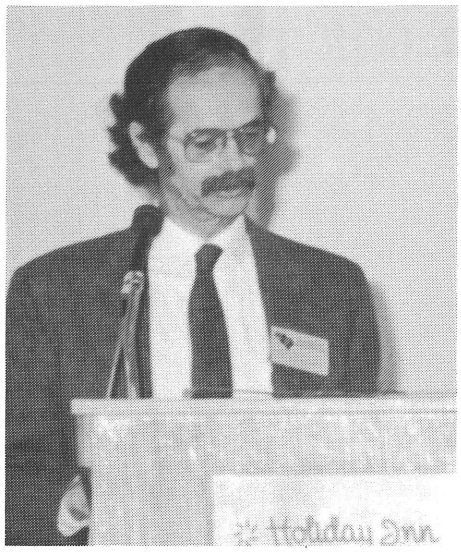
The Spring 1991 meeting was held in Arlington, TX at the Holiday Inn. This was TSEM's first Joint Meeting with the Oklahoma society (OkSEM). Because of the meeting's special nature, TSEM and OkSEM were able to secure financial support for the speakers' expenses from EMSA. We are grateful to the national society for their support.

There were just over 100 in attendance and the meeting theme was "Improving Your Image: 3D Electron Microscopy and Correlated Confocal Microscopy". Dr. Lee Peachey from the University of Pennsylvania and Dr. Mark Ellisman from the University of California Medical School at San Diego taught the Workshop on confocal microscopy and intermediate voltage electron microscopy. About 25 people attended. These scientists also presented excellent lectures to the general meeting. Two of our commerical members (Bio Rad and Molecular Dynamics) were able to bring laser confocal microscopes to exhibit. These instruments greatly enhanced the Workshop and provided meeting participants with hands-on opportunities.

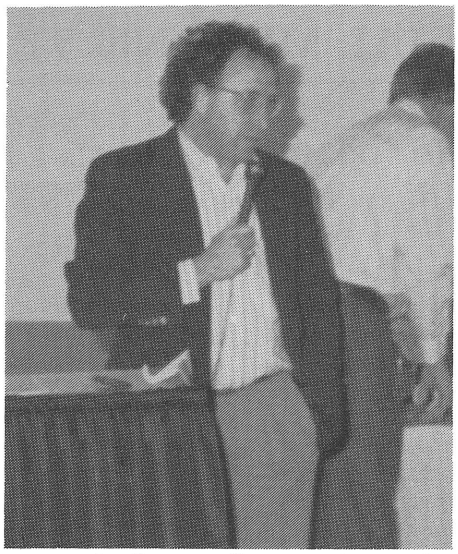
The third invited speaker was Dr. Larry Murr from the University of Texas at El Paso. Dr. Murr's presentation concerned superconductors, cold fusion and the effects of space on materials. His fascinating lecture was well received by both materials scientists and biologists. The meeting was a great success and we look forward to future



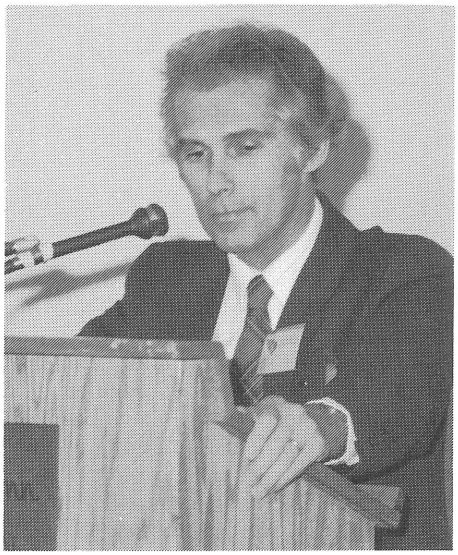
TSEM members get into the spirit of "3D" at the Workshop on confocal microscopy and 3D electron microscopy. March, 1991.



Dr. Lee Peachey speaks on applications of intermediate voltage electron microscopy. March, 1991.

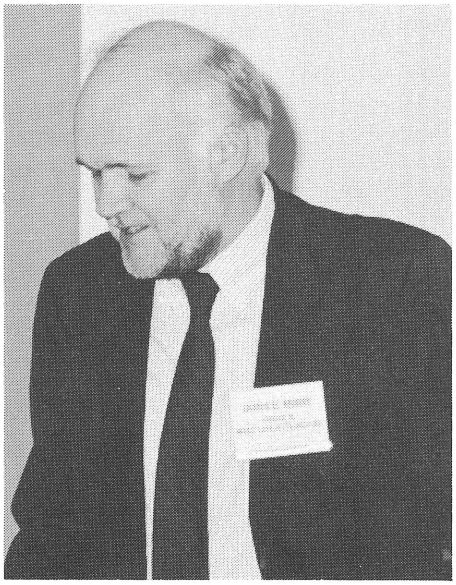


Dr. Mark Ellisman illustrates his work with neurons using 3D reconstruction and confocal microscopy. March, 1991.



Dr. Larry Murr discusses his analysis of the effects of space on various materials. March, 1991.

TSEM President Ron Davis (left) and OkSEM President Joe Wood (right) celebrate a successful 1st Joint Meeting of TSEM and OkSEM. March, 1991.



Dr. James Morré presents his section of the Symposium on ''The Maize Root Tip Impact on Modern Cell Biology''. October, 1991.

meetings with the Oklahoma society and possibly even a regional meeting including Texas, Louisiana and Oklahoma.

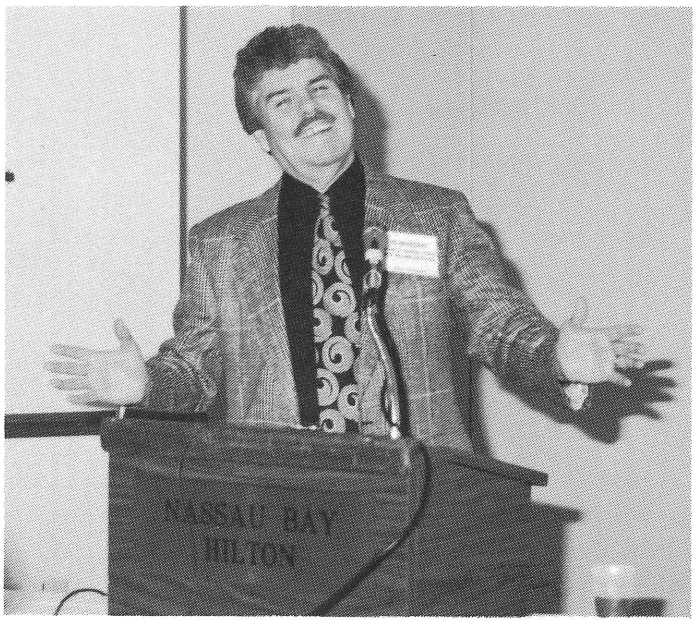
FALL, 1991:

The Fall 1991 meeting was held at the Nassau Bay Hilton overlooking Clear Lake in Houston. This was indeed a special meeting in that TSEM Past-President Hilton Mollenhauer is retiring from the USDA (in this case, ''retirement'' essentially translates to being able to do whatever research one wants to do whenever one feels like doing it). A special Symposium was held as a tribute to Dr. Mollenhauer, honoring the contributions be has made over the years to our understanding of the Golgi apparatus (among so many other things). The Symposium was entitled: ''The Maize Root Tip Impact on Modern Cell Biology'' and included some of the studies surrounding cell secretion and function of the Golgi apparatus. The cast of speakers was international and included Dr. James Morré from Purdue, Dr. Larry Griffing from Texas A&M and two German scientist, Dr. Eberhard Schnepf from Heidelberg and Dr. Andreas Sievers from Bonn. We are indebted to Dr. James Morré for his instrumental role in recruiting appropriate speakers for the Symposium. The Symposium was videotaped and the proceedings are to eventually be published in *Protoplasma*.

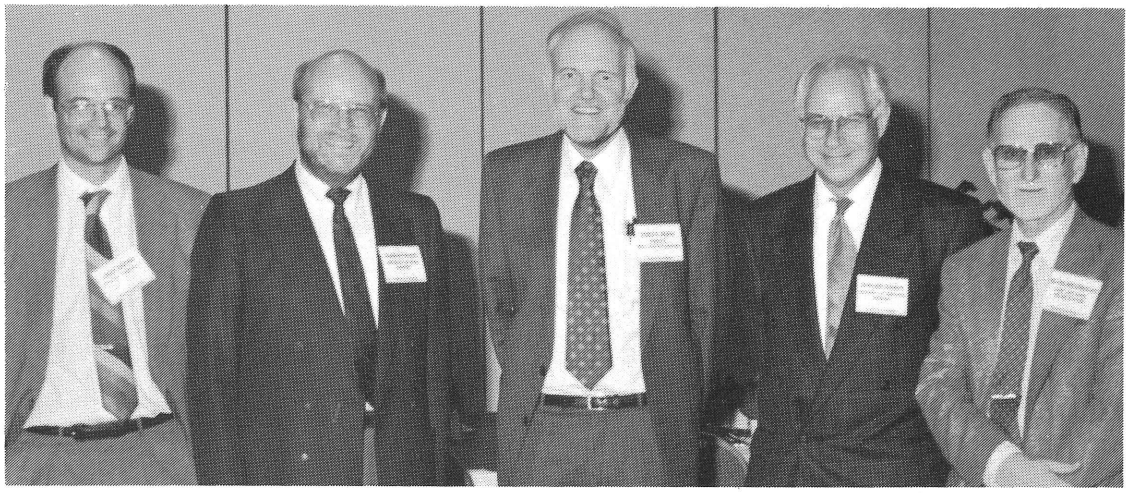
Other meeting highlights included two invited lectures. Dr. Ronald Bernhard from Lockheed Engineering and Science Company spoke on the analysis of micrometeroid impacts on the LDEF satellite. Joe Mascorro from Tulane Medical School presented an invited talk on safety in the

EM laboratory and potential long term effects of the hazardous chemicals we handle. Both of these invited speakers gave excellent presentations which were well attended. The Workshop for this meeting centered around photographic techniques used in and around the EM lab. Mannie Steglich (M.D. Anderson) coordinated the workshop and the speakers included Rob Meyer from Meyer Instruments, Brian Mann from Leica, R. Corl Brooks from Polaroid and Dr. Lynn Gray from the U.T. Health Center at Tyler. Topics included computerized slide makers, instant films, alignment of light microscopes for photography, copy stand techniques and films/techniques for slide making. Again, the Workshop was full and attended by more than 25 people.

The Banquet served as a roast in Hilton Mollenhauer's honor. TSEM members were treated to testimonials and letters from friends and colleagues plus slides and a video. Thanks to some sneaky arrangements made through Barbara Mollenhauer, the Mollenhauer's three sons were able to come to the meeting to surprise their Dad. I think I can safely speak for all of the members of TSEM in wishing Hilton Mollenhauer the VERY BEST in his retirement. Since Dr. Mollenhauer is one of my former mentors, I'll take this personal opportunity to put it in writing: Thanks for everything! (Somehow, I think that sentiment is shared by a lot of other folks as well.)



Joe Mascorro sums it up: 1991 was a great year for TSEM! October, 1991.



Dr. Hilton Mollenhauer (far right) poses with Symposium speakers (left to right) Dr. Larry Griffing, Dr. Andreas Sievers, Dr. James Morré, and Dr. Eberhard Schnepf. October, 1991.

The Mollenhauer family: (left to right) Hilton (with the banana), Paul, David, John and Barbara. October, 1991.

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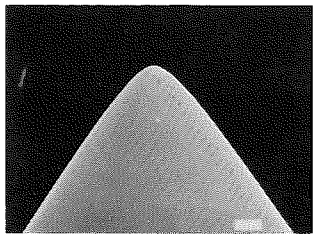
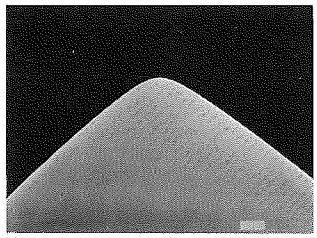
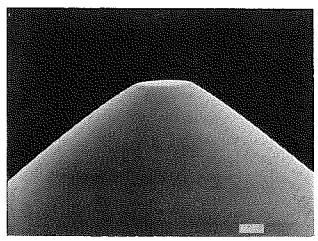

SHARP TIP


ROUND TIP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In Memorium

Elizabeth J. Root

Dr. Elizabeth J. Root, Lecturer in the Division of Nutrition and Foods at the University of Texas at Austin since 1980, died September 15, 1991 in Austin at the age of 59.

Beth had been a member of TSEM since 1977 and served as Secretary from 1982 to 1984.

Her research concentrated on the effects of nutrient deficiencies on the microscopic structure of tissues with emphasis on the brain. She had long been interested in the effect of deficiencies in Vitamins B_6 and B_{12} on the fine structure of the brain. Recently she had been studying a possible nutritional component of Alzheimer's Disease.

Beth is survived by two sons and two daughters. Her friends will miss her.

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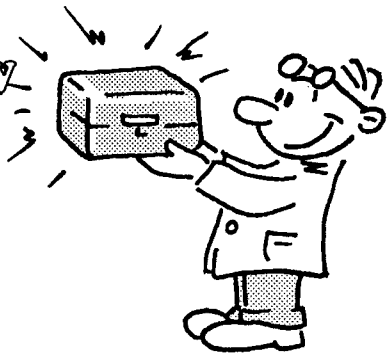

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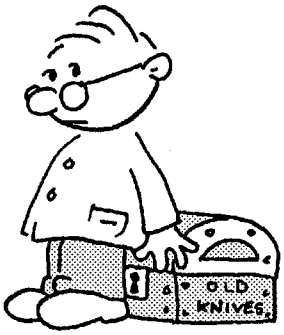

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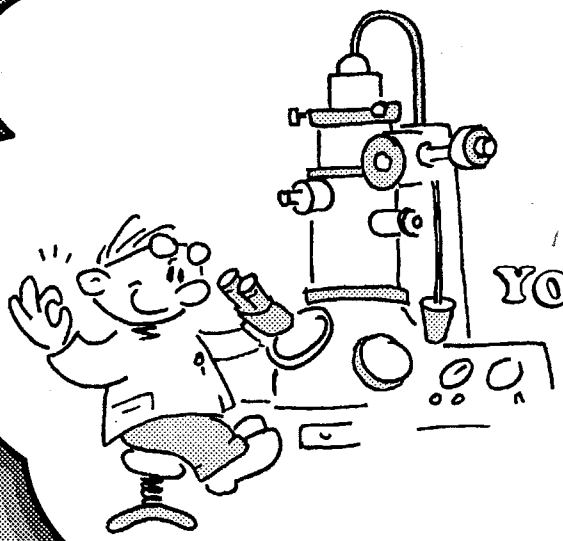

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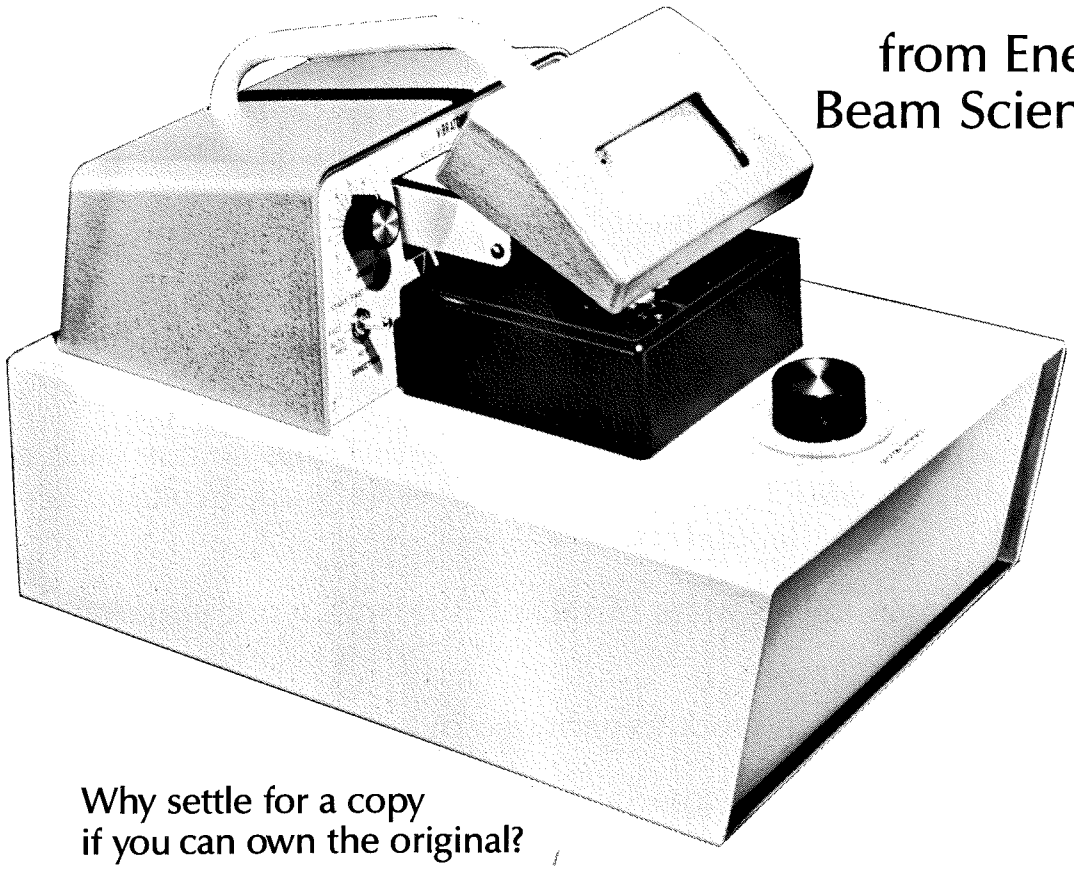

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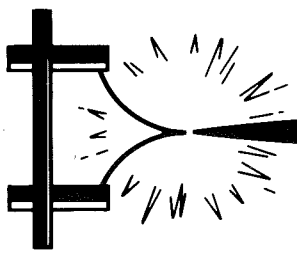

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Organized by John C. Russ, North Carolina State University.

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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

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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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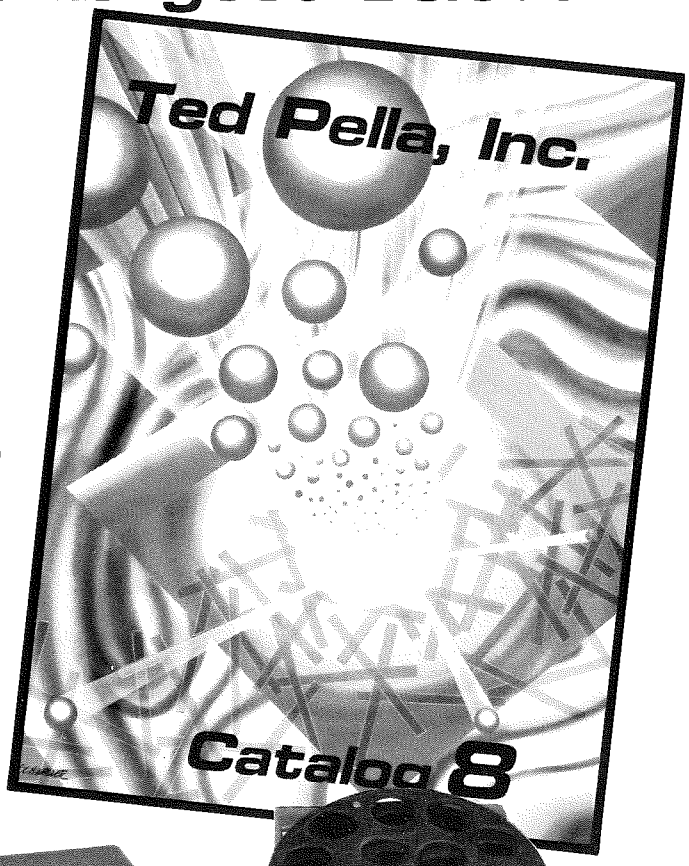

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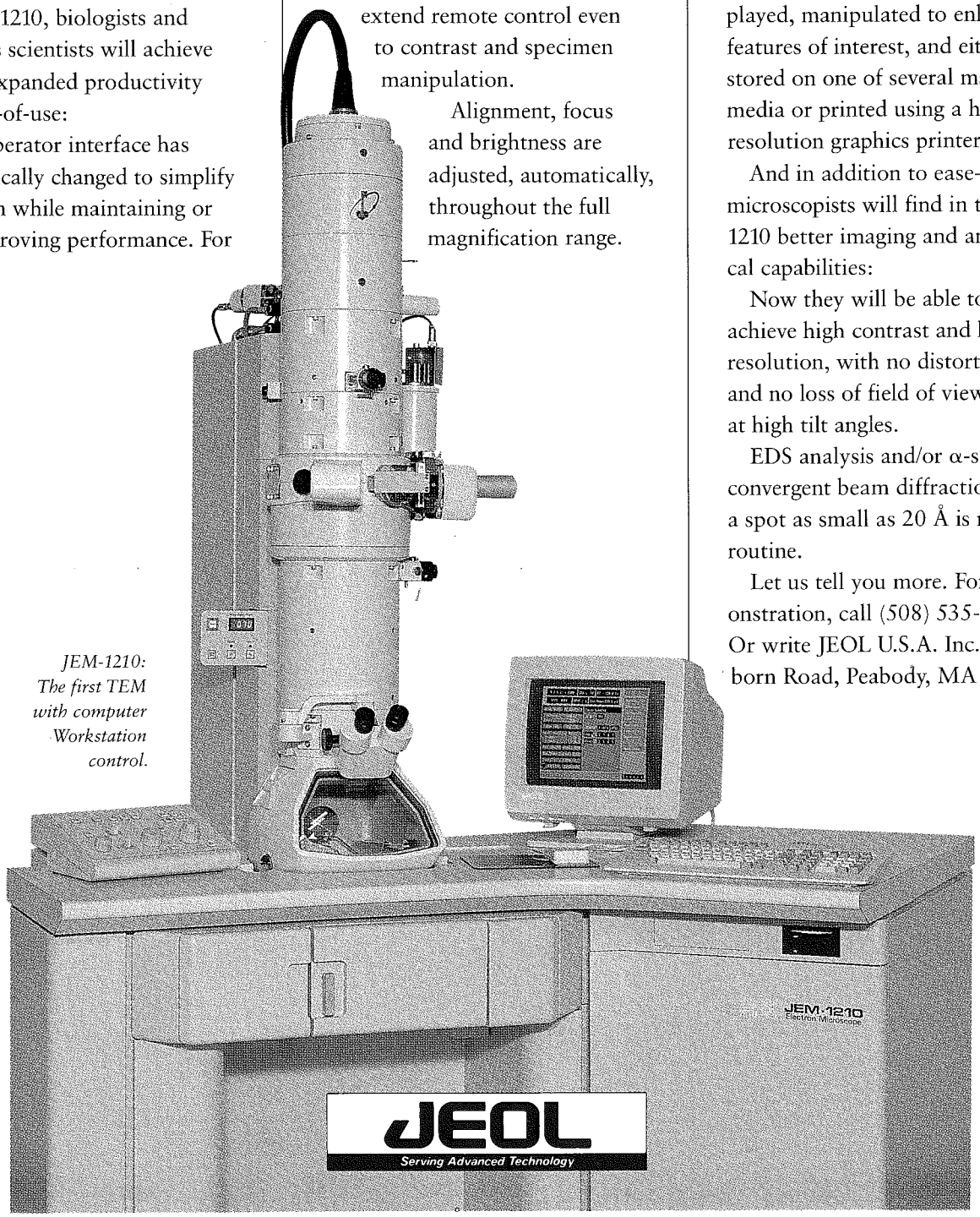

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TSEM STUDENT COMPETITION

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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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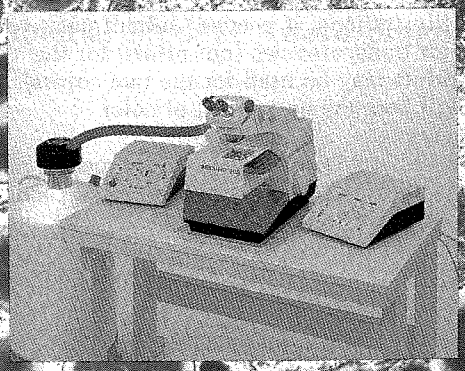

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TSEM By-laws

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.

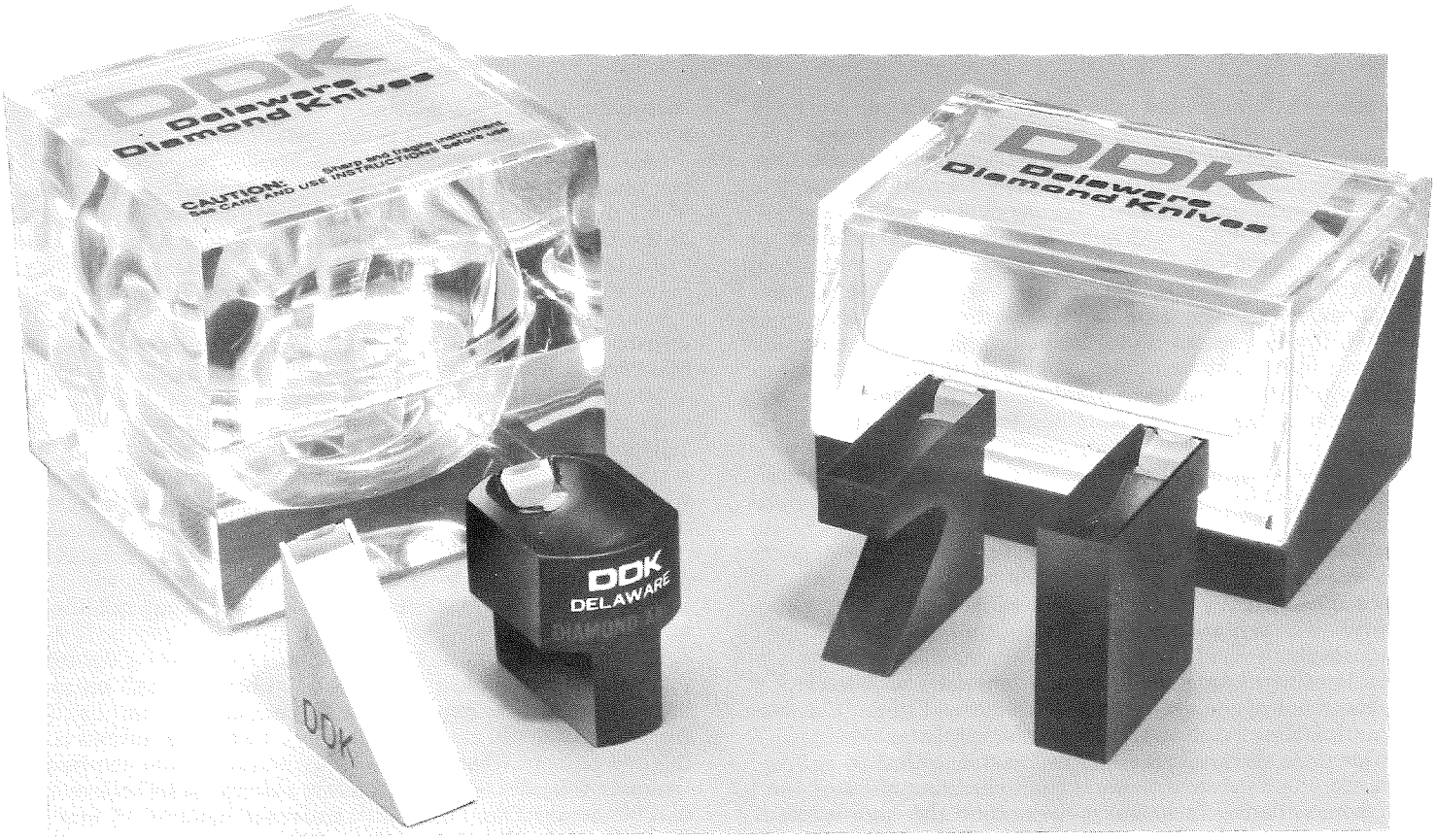
The termination of any action, suit or proceeding upon a plea of *nolo contendere* or its legal equivalent, shall not, of itself, create a presumption that any member of the Executive Council, director, officer or employee did not act in good faith in what he reasonably believed to be the best interest 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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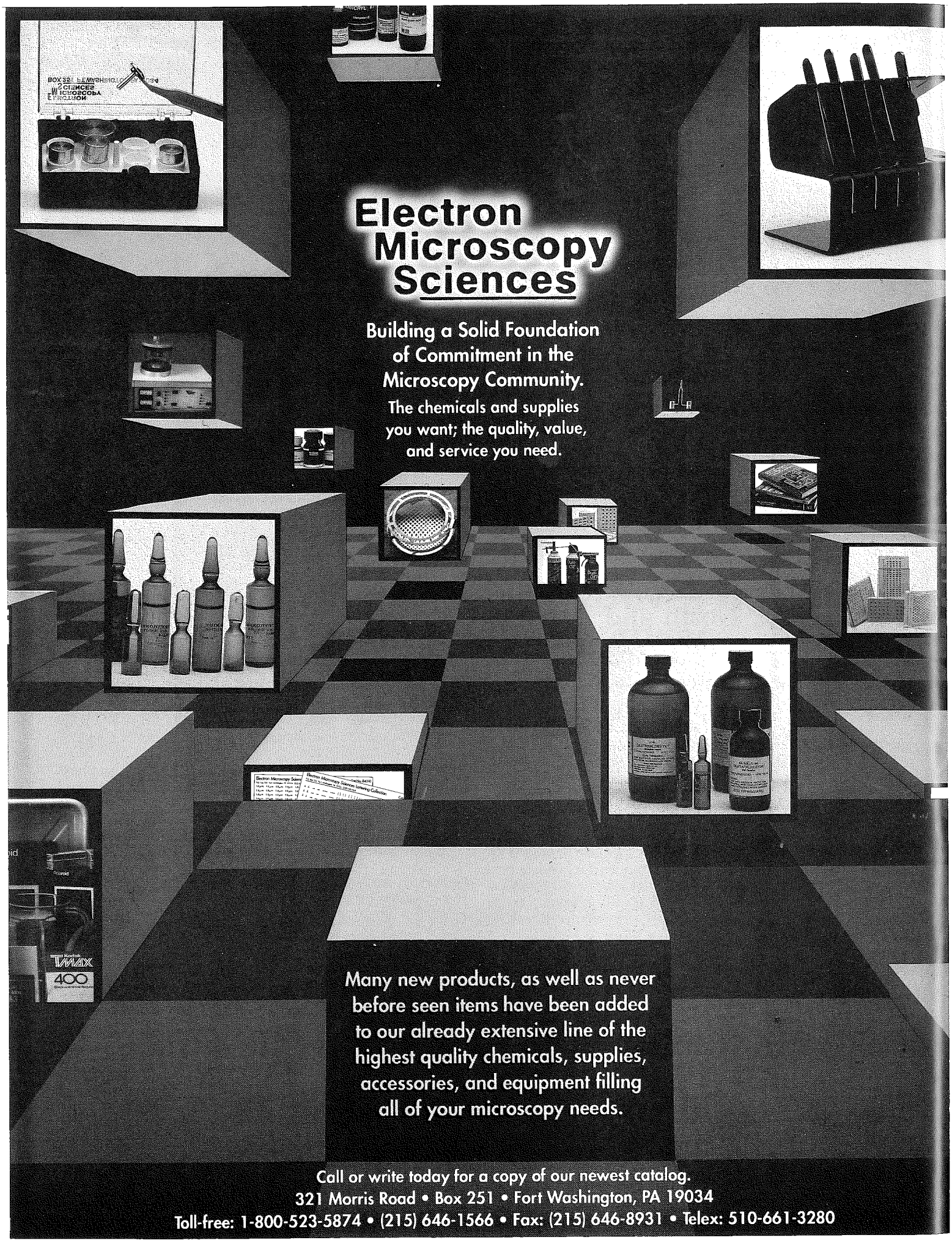
ANSWER TO "WHAT IS IT"

This scanning electron micrograph shows the proboscis and specifically, the slashing mouth parts of the "Buffalo Gnat", a type of black fly relatively new to Texas. These flies currently occur on the Sabine River drainage but may be moving south. This new introduction from the north is becoming a serious pest for livestock in North and East Texas.

Micrograph — Robert Shane Simmons of the Department of Cell Biology and Environmental Sciences, The University of Texas Health Center at Tyler, Tyler, TX.
(Bar = 65 micrometers)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Abstracts

BIOLOGICAL SCIENCES

PLATFORM PRESENTATION — SPRING 1992

CALCIUM SPHERES ASSOCIATED WITH CALCIUM OXALATE LITTER FUNGI FROM NEW MEXICO. HOWARD J. ARNOTT, VIRGINIAE BLACKMON and LINDA LOPEZ, Dept. of Biology, Univ. of Texas Arlington, Arlington, TX 76019-0498.

Scanning electron microscope observations of plant litter collected in central New Mexico (Arnott-429) revealed spherical bodies associated with calcium oxalate crystals produced by litter fungi. The spheres were reminiscent of silicon-containing spheres associated with the surface of *Geastrum pectinatum* Pers. (See Arnott and Whitney TSEMJ 19:23, 1988) collected in Europe, which were subsequently determined to be silicon-containing soil particles which had been pressed into the basidiocarp surface during development. The current spheres represent an isolated observation unique in our survey of thirty sites in four states. Thus we felt compelled to understand the origin and possible relationship of these spheres to the litter fungi. The spheres average 2.4 μm in diameter with a range of 1.5 to 2.8 μm. Many spheres exhibit an "attachment scar" or pore. In some cases the spheres were found in clumps of several hundred agglomerated spheres. EDX analysis showed a strong peak for calcium with smaller but significant peaks for C, O, P, K. Using a dissecting microscope we were able to find several small fragments which have been tentatively determined to be a slime mold (similar to the genus *Physarum*). The fragments have similar spheres, therefore we are considering the hypothesis that the spheres associated with the calcium oxalate-producing litter fungi have their origin in a slime mold and could represent either a natural distribution pattern or a collecting artifact.

COMPUTER AIDED THREE DIMENSIONAL VISUALIZATION OF LIGHT AND ELECTRON MICROSCOPE IMAGES. D.V. BLYSTONE AND R.V. BLYSTONE, Dept. of Biology, Trinity University, San Antonio, TX 78212

New computer software can produce three dimensional projections from recorded two dimensional images. 2-D features captured by light and electron microscopy are made more obvious by computer enhanced reconstructed 3-D. The purpose of this study was to compare the 3-D transformation ability of five different, inexpensive software packages.

Digital images were created either by framegrabbing sections seen through the light microscope or by optical scanning of electron micrographs. These images were visualized with an Apple Macintosh Quadra 700 using the following software packages: NIH Image 1.43, Otter Solution MacPhase 1.0.0T©, Spyglass™ suite, DeltaPoint DeltaGraph® Professional 2.0, and Strata Stratavision™ 3D 2.0.

The simplest approach for 2-D to 3-D computer visualization is based on gray scale manipulation of pixels. A digital image consists of Cartesian arrayed points called pixels, each of which has an assigned numerical value ranging from 0 (black) to 255 (white) that corresponds to the gray value for that point. The identified software packages have various algorithms that manipulate gray scale values as the Z plane to different advantages.

3-D output from each software package will be demonstrated. The comparison will make apparent the situation in which a particular visualization approach might be most appropriate. (This research was supported in part by the National Science Foundation and by RDL/Air Force Office for Scientific Research.)

LOCALIZATION AND CHARACTERIZATION OF A NEW EXOSARCOMERIC CYTOSKELETAL PROTEIN IN SKELETAL AND CARDIAC MUSCLE. Kellous Price, Joseph Koke, and S. K. Malhotra*. Dept. Biology, Southwest Texas State University, San Marcos, and *Dept. Zoology, University of Alberta, Edmonton.

We used a monoclonal antibody (IgM) designated G3.5, which recognizes a cytoskeletal protein in astrocytes, to test for antigen presence in other cell types. Standard methods of immunofluorescence and gold-linked localization were applied to formaldehyde fixed samples of skeletal and cardiac muscle. We also immobilized G3.5 on sepharose, and used it to isolate its antigen from 100,000g supernatants of skeletal muscle homogenates. The retentant was subjected to PAGE, and the antigen identified by western blot analysis. In longitudinal sections of skeletal and cardiac muscle, the antigen was localized appropriately for Z lines. In some locations, fainter lines of fluorescence were visible between stronger staining lines, and appeared much like "M" lines between the Z lines of the sarcomere. However, in cross sections of skeletal muscle, a reticular network was apparent. The size of the areas included within individual sections of the network appeared uniform, and was consistent with the size of myofibrils in skeletal muscle. In cross sections of cardiac muscle, a similar reticular network was apparent but its fluorescence was less intense, and its organization irregular. In both cardiac and skeletal muscle, specific association of gold particles was observed in association with unidentifiable filamentous structures on either side of sarcomeres, near but not adjacent to the Z line. The gold particles were most frequently present in clusters, suggesting a filamentous structure oriented perpendicular to the plane of the myofilaments. This appearance is consistent with the exosarcomeric cytoskeleton described by Price (Adv. Structural Biology, Vol 1, pg 181), and the appearance of anti-desmin fluorescence (Lazarides and Granger, Nature 283:251). However, the molecular weight of the G3.5 antigen (~103,000) we determined by western blot analysis is not similar to the molecular weight of desmin (52,000). Therefore, G3.5 may recognize a previously unknown desmin-associated protein.

ANALYSIS OF FRAGMENTS OF A BRONZE AGE WOODEN DIPTYCH USING SCANNING ELECTRON MICROSCOPY. M.W. PENDLETON, Department of Anthropology, Texas A & M University, College Station, TX 77843 and P. WARNOCK, Department of Anthropology, University of Missouri, Columbia, MO 65203

Archeologists occasionally must analyze minute wood samples taken from priceless objects. Because fine surface details of small fragments of wooden artifacts are not easily observed by light microscopy, a scanning electron microscope (SEM) can be utilized to obtain high resolution images of minute artifacts. When a 14th century (B.C.) submerged shipwreck off Ulu Burun, Turkey, was excavated in 1984, a fragmented wooden diptych (folding wooden tablet) was recovered. Because artifacts recovered from the wreck must remain in Turkey, only minute fragments (1 by 2 mm or smaller) not fitted to the diptych during its reconstruction were available for examination. Scanning electron microscopy was utilized to obtain detailed images of these fragments. Features observed on the diptych fragments compared favorably with features found in modern boxwood (Buxus). Previously, the earliest known diptychs, considered the oldest books in existence, were constructed of walnut wood.

OBSERVATIONS OF THE SEED COAT AND ENDOSPERM OF OXALIS DILLENII (JACQ.). D.C. GARRETT and L.H. BRAGG, Department of Biology, The University of Texas at Arlington, Arlington, TX 76019-0498.

Earlier studies with the seeds of Oxalis dillenii, using light (LM) and scanning electron (SEM) microscopy, has emphasized the occurrence of crystals on the seed coat and during seedling development. The present observations have been made on sectioned dormant seeds utilizing LM, SEM, and transmission electron microscopy (TEM) which revealed different cell types and cellular inclusions. Examination of transectioned seed coat crystals gives a better understanding of the relationship of the crystals to the individual cells in which they occur. The content of the cells of the endosperm reveals an abundance of protein bodies and globoids.

ULTRASTRUCTURE OF CONIDIA OF THE PLANT PATHOGENIC FUNGI COLLETOTRICHUM TRUNCATUM AND C. GRAMINICOLA. C.W. MIMS, Dept. Plant Pathology, University of Georgia, Athens GA 30602.

Cryofixation and TEM were used to elucidate the fine structure of the conidia (asexual spores) of two species of plant pathogenic fungi belonging to the genus Colletotrichum. Conidia of the two species were morphologically quite similar. Conidia were single-celled, slender and slightly curved structures with tapered ends. In both species the conidium wall consisted of an approximately 0.1 μm thick electron transparent layer covered by a thin coating of fine, short, electron dense fibers. The transparent layer could be labeled with gold-conjugated wheat germ agglutinin and also stained using a modified Thiéry stain. This latter procedure also stained the outer fibrillar coating on spore surfaces as well as glycogen deposits inside spores. Conidia were surrounded by copious amounts of a finely fibrillar, extracellular matrix that was well preserved by cryofixation. Conidia were typically uninucleate and contained a complement of cellular organelles including ribosomes, lipid droplets, mitochondria, Woronin bodies, microbodies, spherical to elongated vacuoles with finely granular contents, microtubules, strands of rough ER and interconnected tubules of smooth ER.

PREPARATION OF BACTERIA FOR ELECTRON MICROSCOPY: A BRIEF METHOD. ANNE-MARIE BRUN-ZINKERNAGEL, MIN GONG AND TONY ROMEO. Department of Anatomy and Cell Biology, and Department of Microbiology and Immunology, Texas College of Osteopathic Medicine, Fort Worth, Texas 76107.

The method was developed to measure the shapes of *Escherichia coli* cells. The cells were prepared for EM as follows: The cell density was adjusted to approximately $5x10^9$ cells/ml in a 0.06 M potassium phosphate buffer, pH 6.8. One drop (10μl) of this suspension was transferred on to a 150 mesh grid that had been Formvar/carbon coated and glow discharged . After 1 min. the excess fluid was drawn off using a filter paper. A drop of 4% glutaraldehyde in the same buffer was placed on the grid for 10 min, followed by post fixation with 2 % aqueous osmium tetroxide, for 10 min. The grid was rinsed three times on drops of distilled water and then transferred into a drop of methyl-cellulose, containing 2 % uranyl-acetate, for 10 min. The grid was removed from the drop by using a loop. The excess methyl-cellulose was removed by sliding the loop over a filter paper, leaving the grids suspended in a thin layer of methyl-cellulose, which dried in about 10 min. The grid was then removed from the loop with a thin needle. The method yielded cells that are stained positively. Cells were photographed at a magnification of 5000X. The bacteria were measured either directly on the prints or after inputting the shapes into a McINTOSH ci for image analyses. The method allowed rapid, accurate documentation of cell dimensions throughout the growth curve in wild-type and mutant strains of *E. coli.*

FIBROSARCOMA: A STUDY OF THE FINE STRUCTURE. Bruce Mackay and Nelson G. Ordonez, Department of Pathology, The University of Texas M.D. Anderson Cancer Center, Houston TX 77030.

The relative incidence of fibrosarcoma among the soft tissue sarcomas is lower than one would expect for a malignant tumor of the ubiquitous fibroblast. In part, this can be attributed to the current practice of giving tumors of fibroblasts various names depending on their light microscopic appearance. Thus, the fibromatoses are proliferative disorders of fibroblasts which infiltrate but do not metastasize, and the fibrous histiocytomas which may be benign or malignant are characterized by a storiform arrangement of their cells. We have selected 30 soft tissue sarcomas which on light microscopy fulfilled the accepted light microscopic criteria for fibrosarcoma, being made up of a uniform population of spindle cells forming interlacing fascicles. The tumors were studied using electron microscopy and selected immunostaining methods. The findings confirm the suspected overlap in the fine structure of fibrosarcoma with the fibromatoses and fibrous histiocytomas, and indicate that tumors of fibroblasts form a morphologic spectrum within which the cells have similar fine structural features regardless of the architectural pattern.

TUMORS OF THE ADRENAL CORTEX. B. MACKAY, J. SALTER, N. G. ORDONEZ, A. K. EL NAGGAR, Dept. Pathology, M. D. Anderson Cancer Center, Houston, TX 77030.

Adenomas and carcinomas of the adrenal cortex are uncommon tumors, and the carcinomas in particular can be difficult to diagnose by routine light microscopy. Immunocytochemistry is useful to narrow the differential diagnosis but there is no specific marker for adrenocortical cells. Certain ultrastructural features are exclusively or predominantly seen in endocrine cells engaged in the formation of steroid products, and it may consequently be possible to establish the diagnosis of a tumor of the adrenal cortex by electron microscopy. We have examined a series of 70 adrenocortical tumors to document the fine structure and determine the frequency with which distinctive features are present in adenomas (10 cases) and carcinomas (60 cases). Specimens of normal adrenal cortex and adrenocortical hyperplasia provided a basis for comparison with the tumors. Gland formation was not evident in the tumors and microvilli were sparse and often absent. Typically the neoplastic cells had considerable amounts of cytoplasm and many organelles, even in metastatic carcinomas. Tubular cristae in mitochondria were a common finding, and in a number of the adenomas and carcinomas, some mitochondria contained large round, dense matrical inclusions. Oncocytic transformation was seen in an adenoma and two carcinomas. The quantity of smooth endoplasmic reticulum varied considerably among the different tumors and among cells of individual tumors. When abundant, it occupied discrete zones of the cytoplasm which could be recognized even at low magnifications. The study demonstrates that while the specific ultrastructural features of adrenocortical cells are not present in every carcinoma, they are seen with sufficient frequency for electron microscopy to play a useful role in the diagnostic process.

ALTERNATIVES FOR LOW VISCOSITY EMBEDDING. J.A. Mascorro and G.S. Kirby, Department of Anatomy, Tulane Medical School, New Orleans, LA

Embedding media formulated with Epon or Araldite resins together with dodecynyl succinic anhydride (DDSA), nadic methyl anhydride (NMA) and catalyzed with 2,4,6-Tri(dimethylaminomethyl) phenol (DMP-30) are well-known and have been used for many years. Nevertheless, these media possess a high viscous character that could compromise total infiltration or cause infiltration-wave damage to delicate specimens. Many new epoxy resins have been introduced in recent years and several demonstrate lower viscosity, particularly when combined with nonenyl succinic anhydride (NSA) in place of the more viscous DDSA and the alternative catalysts dimethylaminoethanol (DMAE) or benzyldimethylamine (BDMA), both of which are considerably less viscous than the more traditional DMP-30. Embedding media were prepared with low viscosity resins such as Embed 812 or LX 112 in combination with NSA, NMA, and either BDMA, DMAE, or DMP-30 as the accelerator. The Flow Time (FT), Volume Flow Rate (VFR) and Viscosity (cp) of embedding media were measured as a function of time. Embed 812, when combined with NSA, NMA, and BDMA produced the fastest FT (time necessary for 9 ml of media to exit from a viscocimeter), largest VFR (amount of media flowing per unit of time; ml/sec) and the lowest overall cp at all time periods of any tested combination (22.5 cp @ 60 min). When DMP-30 was substituted for BDMA, the viscosity of this same medium increased by approximately 25%, ie., from 22.5 cp (with BMDA) to 30.0 cp (with DMP-30). LX 112/NSA/NMA with BDMA registered a viscosity of 60.7 cp after 60 minutes, while the same combination with DMP-30 increased to 160.7 cp (ie., > 60%) at the same time span. Similar testing of the catalysts revealed that both BDMA (@ 0.84 cp) and DMAE (@ 0.96 cp) were many times lower in viscosity than the often-used DMP-30 (@25.0 cp). These results suggest strongly that manipulating the basic choice of resin, anhydride, and catalyst can produce complete embedding media with low or intermediate viscosity. Higher viscosity mixtures can be achieved easily by utilizing resins such as Polybed 812, Eponate 12, or Epon 812 (if still available), thus providing a spectrum of characteristics that would satisfy specific needs.

CARDIAC MORPHOLOGY AFTER CONDITIONS OF MICROGRAVITY DURING A U.S.-SOVIET SPACE MISSION. M.A. Goldstein, R.J. Edwards, and J.P. Schroeter, Dept. of Medicine, Baylor College of Medicine, Houston, TX 77030.

Studies of human and animal hearts after space travel suggest some mass loss. We have directly assessed one parameter of heart cell size in rat hearts exposed to microgravity. Light and electron microscope studies were performed on cardiac muscle from rats flown on COSMOS 2044, an unmanned Soviet Biosatellite and from 4 control groups. Average cross-sectional area (CSA) of myofibers was measured by video analysis of the light microscope images of both papillary and ventricular muscle samples from all animals. A significant decrease in this CSA in flight rats ($p = 0.03$) compared to synchronous controls was measured. At the EM level general features were similar to those seen in the previous COSMOS flight. Stereological analysis of papillary muscle samples revealed normal mitochondrial volume density values for the vivarium group, slightly higher values for the tail suspension and flight groups, and markedly decreased values for the synchronous group. Mitochondrial to myofibril ratios showed the same trend. Filament lattice spacings measured by optical diffraction were normal. The observed decrease in CSA of 19% in the present study of heart may be close to the limit of compensated adaptation. If further mass decrease is accompanied by increasing necrosis, the irreversible loss of heart cells could have profound effects for animals and humans in prolonged flights.

PINEAL PARENCHYMAL NEOPLASMS (PINEALOMAS): ELECTRON MICROSCOPY (TEM) AND IMMUNOHISTOCHEMISTRY IN ASSESSING DIFFERENTIATION AND BEHAVIOR.
S.C. BAUSERMAN, Dept of Pathology, Scott & White Clinic and Texas A&M University, Temple, TX 76508.

Neoplasms from the parenchymal cells of the pineal gland are rare (less than 1% of intracranial tumors). Recent advances in neuro-imaging and neurosurgery have permitted a more aggressive approach in this area with gross total resection of pineal tumors often possible. The primitive neuroectodermal tumors are designated Pineoblastoma or Pineocytoma based on morphologic evidence of differentiation. Predicting biologic behavior is extremely difficult in many cases and requires a full range of adjunctive studies including TEM and immunohistochemistry. We present three recent cases which demonstrate a spectrum of differentiation and clinical manifestations. These neoplasms are composed of pluriopotential cells some of which demonstrate the relationship of the pineal gland to components of the visual system. CONCLUSIONS: Pinealomas are rare brain tumors obstructing the flow of cerebrospinal fluid (CSF) through the posterior third ventricle and cerebral aqueduct. Pineoblastomas in infants show a high rate of recurrence in spite of differentiation. Electron microscopy (TEM) and immunohistochemistry are helpful adjuncts in assessing the biology of such neoplasms.

RATHKE'S GLAND OF KEMP'S RIDLEY SEA TURTLE (LEPIDOCHELYS KEMPI) M. S. CANNON and P. J. WELDON, Depts. Anatomy and Neurobiology and Biology, Texas A&M University, College Station, TX 77843

Rathke's glands are located in the interior of the inframarginal scutes deeply embedded in adipose and dense connective tissue. Each gland consists of numerous lobules surrounded by thin to moderate amounts of collagenous and reticular connective tissue. Each lobule is lined by one or rarely two layers of epithelium in various stages of degeneration, suggesting a holocrine-type of secretion. Venules are observed beneath the epithelial lining cells; arterioles are rare, while nerves are not observed within gland lobules. Erythrocytes and leukocytes are seen within the secretory product.

Acid phosphatase and beta-glucuronidase show little to no activity in gland lobules. The oxidative enzymes, succinate, lactate and glucose-6-phosphate dehydrogenases and cytochrome oxidase demonstrate considerable reactivity in the lining cells and secretory product. Periodic-acid-Schiff reactivity, not reduced with diastase, occurs in the lining cells and secretory product. Also, lipid droplets are seen in epithelial cells shed from lobules and within the secretory product. It is hypothesized that Rathke's turtle gland may produce predator repellants, pheromones and/or is involved in metabolite excretion. Their exact function is unknown. Appreciation to the National Marine Fish Service, S. E. Laboratory, Galveston, TX for the turtles.

BIOLOGICAL SCIENCES

POSTER PRESENTATION — SPRING 1992

TAGOE, C.N.B., AYETTEY, A.S. and YATES, R.D., Department of Anatomy, Tulane University School of Medicine, New Orleans, Louisiana. COMPARATIVE ULTRASTRUCTURAL MORPHOMETRIC ANALYSIS OF ATRIAL SPECIFIC GRANULES IN THE BAT, MOUSE AND RAT.

Size, incidence and volume density of atrial specific granules (ASG) in right atrial cells from 5 animals each of the rat (av. wt. 210g), mouse (av. wt. 28g), the fruit-eating bat Megaloglossus woermanni (BMW -av. wt. 35g) and the insect-eating bat Pipistrellus pipistrellus (BPP -av. wt. 6g) have been compared by ultrastructural morphometry. The distribution of granules by size was unimodal in all species, with the mode at 100-150nm for the bats and at 150-200 for the rodents. 67% of granules in the BPP and 78% in the BMW measured less than 150nm. In contrast, 70% of granules in the rat and 60% in the mouse were more than 150nm in diameter. The incidence of granules was nearly three times higher in the rodents than in the bats. Volume density difference was even more striking, being about four times as much in the rodents as in the bats. Differences in the various measurements of atrial granules were significant between rodents and bats but not between the rat and the mouse or between the BPP and BMW.

These results do not support the prevalent view that number and size of granules decrease with an increase in the size of the animal. The low content of granules in the bats indicates low demand for the natriuretic hormone in these animals in which also conservation of fluid is of paramount importance. This therefore suggests that, as would be expected, the concentration of granules, hence of the natriuretic hormone, is related to the fluid and electrolyte requirement of the animal.

We also observed ASG-like structures in endothelial cells of some capillaries in bat but not rodent atria. It is not clear from these studies what relationship exists, if any, between these structures and the ASG. (Presented in abstract form at AAA meeting, N.Y. 1992.)

WEAR OF TOOTH SCRATCHES DUE TO BRUXING. NANCY K.R. SMITH*, RYAN L. LINDNER*, AND JOHN D. RUGH**, *Dept. Cellular and Structural Biology, **Dept. Orthodontics, University of Texas Health Science Center at San Antonio TX 78284.

At present there is not a quick diagnostic tool to ascertain whether or not a patient is actively bruxing (grinding). Night-time EMG monitoring is cumbersome, time-consuming, and of questionable reliability. It was toward the goal of designing a relatively quick clinical diagnostic tool that the present pilot studies were undertaken to observe the effect of grinding on tooth scratches, using scanning electron microscopy. No pronounced difference was observed in the scratches (approximately 5μm width) naturally present on the upper right canine of a severe bruxer versus a nonbruxer. In one subject with wear facets on his canines, scratches were made lightly on the wear facet of the upper right canine with 240 grit emory paper (approximately 3μm scratches). Impression replicas of the tooth surface were prepared using 3M Express vinyl polysiloxane before grinding and after 10, 20, 40, and 70 grinds. The impressions of the wear facets were prepared for SEM and photographed at 10 kV. Counting of scratches showed a reduction of scratches to 80% after 20 grinds, without further decrease for 40 and 70 grinds. In an attempt to gain better sensitivity, finer (approximately 1μm) scratches were made with 600 grit emory paper on the wear facet of the upper left canine of the same subject. Scratches were reduced to 83% after 10 grinds, without further significant decline after 20 and 40 grinds. Followup measurement of both samples in a subsequent clinic visit showed that normal wear had led to total disappearance of the scratches on both teeth (16 days for the 3μm scratches, 9 days for the 1μm scratches). Further work needs to be done to design a clinical test for active bruxism.

MELANOCYTIC TUMORS IN EXTRACUTANEOUS SITES.
B. MACKAY, N. G. ORDONEZ, L. SHANKS, M. C. STEGLICH, Dept. Pathology, M. D. Anderson Cancer Center, Houston, TX 77030.

Malignant melanoma in soft tissues or viscera generally represents a metastasis from a cutaneous primary. Since a melanoma of the skin may regress spontaneously, it can be difficult to rule out a metastasis even in the absence of a current or previous primary configuration lesion. Melanocytic tumors do nevertheless arise de novo in tissues other than skin. Four illustrative cases are presented to demonstrate the importance of integration of clinical studies with diagnostic imaging, routine light microscopy, immunocytochemistry and electron microscopy in establishing the diagnosis. Case 1: a malignant melanoma of the small intestine which formed multiple umbilicated nodules in the duodenum and jejunum. Case 2: a malignant melanoma of the urinary bladder in which an initial biopsy showed predominantly spindle cells whereas the resection specimen revealed an infiltrating tumor composed largely of glycogen-rich clear cells. Case 3: a malignant melanoma of the soft tissues of the foot with spindle cells and multinucleated giant cells. Case 4: a pigmented lesion of the spinal meninges in which the biologic behavior favored a diagnosis of nevus rather than malignant melanoma.

MATERIALS SCIENCES

PLATFORM PRESENTATION — SPRING 1992

CROSS-SECTIONAL TEM STUDIES OF BARIUM STRONTIUM TITANATE DEPOSITED ON SILICON BY PULSED LASER ABLATION, E.G.JACOBS, R.F.PINIZZOTTO, H.YANG, S.R.SUMMERFELT* AND B.E.GNADE* Center for Materials Characterization, University of North Texas, P.O. Box 5308, Denton, TX 76203-5308 *Materials Science Laboratory, Texas Instruments Inc., Dallas, TX 75243.

Barium strontium titanate films were deposited onto silicon substrates using pulsed laser ablation deposition. The films were characterized using conventional and high resolution cross-sectional TEM. It was found that the grains were columnar with an average width of approximately 23 nm. An amorphous interfacial layer formed between the Si and BST in all cases. The interfacial layer thickness increased as the sample exposure to O_2 increased. $TiSi_2$ was also observed in all the films, although its location at the interface was not directly verified. There are no systematic effects of O_2 overpressure on either the film thickness or film microstructure. However, the film which was fabricated with the greatest exposure to O_2 may contain Ti_xO_y, and contains more equiaxed grains that the other samples. An interfacial layer was also observed at the Au-Pd/BST interface in a metal/ferroelectric/ silicon capacitor. The significance of the results is the observation that BST may never come in direct contact with either capacitor electrode, which may explain why the fatigue behavior and electrical characteristics of ferroelectric capacitors depend so strongly on the interfaces.

STUDIES OF INTERMETALLIC INTERFACES IN COMPOSITE SOLDERS. Y.WU, L.A.FOSTER, E.G.JACOBS and R.F.PINIZZOTTO, Center for Materials Characterization, University of North Texas, Denton, TX.

A systematic study is presented on the effects of metallic particle additions on the formation of intermetallic interfaces between solder and Cu substrates, and between solder and the added particles. The particle additions dramatically affect the thicknesses and morphologies of the intermetallic interface layers. The Cu_6Sn_5 for the Cu, Cu_3Sn and Cu_6Sn_5 composite solders is slightly thinner than in pure solder, but the Cu_3Sn is slightly thicker. The opposite effects occur for Ag, Au and Ni composite solders. SEM and XEDS revealed that in the unaged state, Cu_6Sn_5 and Ni_3Sn_4 form around the Cu, Cu_3Sn and Ni particles. Ag, Ag_3Sn and Ag_4Sn particles form in the Ag composite solder; $AuSn_4$ particles form in the Au composite solder. After long time aging (140°C, up to 16 days), Cu_6Sn_5 is the final product for the Cu, Cu_3Sn and Cu_6Sn_5 particle additions, and Ag_3Sn, $AuSn_4$ and Ni_3Sn_4 are the final products for the Ag, Au and Ni composite solders, respectively. We have used XTEM to study the interfaces of solder/Cu joints, and all of the phases in the solder including the added particles and their interfaces. Both Cu_6Sn_5 and Cu_3Sn are visible at the solder/Cu interface. They were positively identified using SADP in the TEM and XEDS in the SEM. The interfaces around the particles, the Pb-rich and the Sn-rich phases of the solders, and the intermetallics at the solder/Cu interface have been observed simultaneously by TEM for the first time. With annealing, the Pb-rich phase changes. We have observed an amorphous Pb-rich phase, a recrystallized Pb-rich phase, and amorphous Pb-rich regions with embedded Sn precipitates.

QUANTUM-CONFINED 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 S.R.BIGHAM, Department of Chemistry, Texas Christian University, Fort Worth, Texas, 76129.

Cadmium sulfide nanoparticles (Q-CdS) were fabricated by stabilization with biopolymer calf thymus deoxyribonucleic acid (DNA) or calixarene. The clusters show an absorption edge blue-shifted from that of the bulk, illustrating quantum confinement. Transmission electron microscopy samples were prepared by centrifugal concentration. One or two drop aliquots of the denser material were allowed to air dry on amorphous carbon films supported by standard copper TEM grids. Observations were performed using a Hitachi H-9000 high resolution TEM operating at 300 kV. The particles were analyzed using lattice imaging and selected area electron diffraction patterns. The Q-CdS nanoparticles formed using DNA had an average diameter of 5.9 nm, while the Q-CdS formed using calixarene had an average diameter of 3.5 nm. Approximately 15% of the particles formed using DNA had a unique microstructure consistent with either a "hollow sphere" or "mushroom cap" morphology; this morphology did not occur for calixarene material. Both size distributions were lognormal. The TEM and spectroscopy results are in good agreement.

SITE-SPECIFIC NATURE OF TRANSGRANULAR AND TWIN BOUNDARY CARBIDE PRECIPITATION AND CHROMIUM-DEPLETION IN STAINLESS STEELS A. ADVANI, L. MURR, J. MALDANADO, R. ROMERO, C. CEDILLO, D. MATLOCK, W. FISHER, P. TARIN, C. RAMOS, AND R. MILLER, Dept. of Metallurgical and Materials Engg. and Institute for Manufacturing and Materials Management, University of Texas at El Paso, El Paso, TX 79968.

Carbide precipitation in deformed 304 and 316 stainless steels (SS) has been observed to be site-specific, preferring transgranular (TG) and twin boundary sites, in addition to intergranular (IG) locations where the precipitate is typically observed. Below 20% strain, carbides precipitate primarily along grain boundaries and twin boundaries, and the carbide density is a direct function of the strain in the material. Above 20% strain, carbides also form at high energy TG locations, which include twin-faults and their intersections in 316 SS, and may also include ε- and α'-martensite in 304 SS. This indicates a thermodynamic-threshold energy requirement for site-specific carbide precipitation in SS. The site-specific precipitation also affects the development of chromium depletion which occurs in the vicinity of the chromium-rich carbides. Preliminary measurements of depletion profiles using high resolution STEM-EDS techniques indicates varying chromium-minimums and chromium-depletion widths at IG, TG and twin boundary locations, which may depend on the energetics of the site, and also be controlled by the kinetics of chromium-diffusion at the site where the precipitation develops. Ultimately, the characteristics of chromium-depletion control the susceptibility of the SS to IG corrosion and IG stress corrosion cracking in nuclear and other toxic waste environments. The work was funded by a NSF (RIMI) Grant HRD-9105065 and EPA Cooperative Agreement CR-818296-01-0 through the Southwest Center for Environmental Research and Policy; and in part by DOD Grant DN-009, Directorate of Stockpile Management and GSA grant PF90-018 administered by the Institute for Manufacturing and Materials Management.

IMAGING OF CHEMICAL REACTIONS IN BINARY ALLOYS BY HIGH-RESOLUTION TEM. D.C. DUFNER, Electron Microscopy Center, Texas A&M University, College Station TX 77843.

Intermetallic phases formed by interdiffusion have been identified by conventional techniques such as X-ray diffraction, Rutherford backscattering, and Auger electron spectroscopy. These techniques often fail to elucidate structural mechanisms for the formation of these phases at the onset of inter-diffusion. High-resolution TEM (HRTEM) has provided a means for directly observing such chemical reactions by recording structural and compositional changes during the course of the reactions.

One of the components in the binary alloy systems involved in this study is Sn, which has a body-centered tetragonal (bct) structure. This unusual structure makes it ideal for HRTEM studies, because structural changes due to combination with metals having fcc, bcc, or hcp structures can be readily observed. Identification of the phases is carried out by electron diffraction, EDS, and lattice imaging.

This work currently focuses on the study of the Pt-Sn system, which utilizes a combination of fcc and bct metals. Samples are prepared in the form of thin films according to the two-film method introduced by Shiojiri, et al. (J. Crystal Growth 52, 883 (1981)). TEM of the thin-film samples is carried out on the JEOL 2010 operating at 200kV with an analytical polepiece.

The presentation will describe the advantages and drawbacks of sample preparation and HRTEM techniques encountered in the study of the Pt-Sn thin film system.

TEM ANALYSES OF ENVIRONMENTAL PROCESSES INFLUENCING THE MICROFABRIC OF SELECTED FINE-GRAINED MARINE SEDIMENTS P. J. BURKETT, Oceanography Dept., Texas A&M University, College Station, TX 77843-3416

Transmission electron microscope (TEM) analyses of the microfabric of relatively undisturbed fine-grained clayey sediments reveals signatures indicative of formation processes and subsequent diagenesis. Microfabric is defined as the expression of the 3-D spatial arrangement, orientation, and particle-to-particle relationship of clay size (<4 μm) particles and domains. Relatively undisturbed cored sediments were laboratory prepared for TEM analysis by fluid substitution, critical point drying, epoxy impregnation, and ultrathin sectioning. Mosaics of consecutive micrographs were constructed to provide a field of view of >2000 μm^2, yet allowing resolution of submicron-sized particle-to-particle associations culminating from environmental processes preserved in the microfabric. Three sedimentological factors controlling the geotechnical properties of a particular sediment can be resolved using TEM. These significant factors include grain size, mineralogy, and the microfabric.

Diagenetic processes forming signatures visualized from TEM analyses include authigenic crystallization (neoformation), recrystallization (dissolution and precipitation), transformation, and consolidation. Other examples of depositional and post-depositional processes are seen in the microfabric of sediments from various marine environments. The Nares Abyssal Plains sediment shows evidence of turbidity currents as the forcing agent. The microfabric of the Alaskan Bootlegger Cove Formation reveals features indicative of remolding and ice loading of the glaciomarine sediment. Sediments collected from within the Barbados Accretionary Complex during Ocean Drilling Program (ODP) Leg 110 Site 671 depict microfabric signatures resulting from lateral tectonic stresses originating within a subduction zone. The ODP samples also demonstrate diagenesis of biologically-derived carbonate minerals within the clay matrix.

SYNTHETIC IRON AND MANGANESE OXIDES AS MODELS FOR MINERALS IN SOILS: ELECTRON MICROSCOPY PERSPECTIVE. J. B. DIXON, Soil and Crop Sciences Dept., Texas A&M Univ., College Station, TX 77843

Iron and Mn oxides occur in small amounts in soils yet they influence soil chemical and physical properties appreciably. These oxides occur as aggregates or nodules with silicate minerals and the crystals are frequently below one micron in size. Thus it is difficult to concentrate them for analysis. Synthetic Fe and Mn oxides can be prepared as pure and uniform crystals of the desired size. Thus they are ideal for investigation by transmission electron microscopy. A series of goethite specimens substituted with Al decreased in particle size as the Al content increased and the finer particles were more prone to aggregate than the coarser ones. The synthesis of todorokite from birnessite was shown by the growth of fibers of todorokite from birnessite plates and by the development of lattice fringes. With the advent of energy dispersive x-ray analysis synthetic oxides of known composition should be a convenient reference for chemical analysis of these oxides in mixed systems. The distinctive morphology of the synthetic crystals may permit using them as internal standards in natural mixtures such as soil clays. Synthetic oxide mineral samples are much more uniform in particle size and composition than crushed natural specimens even those from the National Museum. Synthetic Fe and Mn oxide specimens characterized by TEM should provide advantages over natural specimens for several types of investigations.

ELECTRON BEAM DAMAGE IN CRYSTALS OF CALCIUM OXALATE PRODUCED IN THE LEAVES OF *VITIS VULPINA*. HOWARD J. ARNOTT[1], LINDA E. LOPEZ[1] AND MARY ALICE WEBB[2], [1]Dept. of Biology, University of Texas Arlington, Arlington, TX 76019-0498 and [2]Dept. of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907.

Crystals of calcium oxalate monohydrate (COM) and calcium oxalate dihydrate (COD) show damage from the electron beam. Transmission electron microscopy and electron diffraction change the appearance of the crystals. Even brief exposures to the electron beam may cause changes in the electron diffraction patterns as the crystals undergo decomposition. Thin sections of calcium oxalate crystals produced in plants are especially prone to damage (See Arnott and Pautard, page 417 in *Biological Calcification*, Ed H. Schraer, Appleton Century & Crofts, 1970). However, observations with scanning or scanning transmission electron microscopy appear to cause much less damage, and even thin sections can be examined by STEM. We have been studying the isolated crystal (COM) packets of *Vitis vulpina* using plastic embedded sections. When attempting X-ray mapping of crystal sections we noted consistent and regular beam damage patterns in the sections. The patterns are related to the format of the digital scan dictated by the computer during mapping. Using this observation we have been able to change the beam damage experimentally such that we can show the relationship between dwell time and beam damage. Because the COD crystals of *Vitis* are twins, we have also been able to show that the character of beam damage is related to the incident angle of the beam, with respect to the internal molecular structure of each twin crystal.

STRAIN EFFECTS ON CARBIDE PRECIPITATION AND SENSITIZATION IN 304 STAINLESS STEELS D. MATLOCK, C. CEDILLO, A. ADVANI, L. MURR, W. FISHER, P. TARIN, R. ROMERO, J. MALDANADO, R. MILLER AND C. RAMOS, Dept. of Metallurgical and Materials Engg. and Institute for Manufacturing and Materials Management, University of Texas at El Paso, El Paso, TX 79968.

Strain accelerates the development of grain boundary carbide precipitation and chromium depletion (sensitization) in stainless steels (SS). This was observed in a study on deformation effects on sensitization in 304 SS. Samples of 304 SS were deformed to 0 - 33% and heat treated at 625 and 670°C to examine the effects of strain on carbide precipitation and sensitization in SS. Carbide precipitation was examined using transmission electron microscopy (TEM), while sensitization susceptibility was measured indirectly, using the electrochemical potentiokinetic reactivation (EPR) test and scanning electron microscopy (SEM). The EPR test indicated that a systematic increase in strain produced a continuous increase in sensitization to 20% strain, though beyond 20% strain also produced transgranular (TG) attack. This agreed well with observations of increasing grain boundary and TG carbide precipitation in strained versus unstrained material using TEM. Changes in the widths and depths of attack also occurred during the EPR test, and were measured using SEM. Simple mechanisms relating the effects of deformation to changes in interfacial and TG carbide precipitation characteristics, and sensitization, will be discussed. The work was funded by a NSF (RIMI) Grant HRD-9105065 and EPA Cooperative Agreement CR-818296-01-0 through the Southwest Center for Environmental Research and Policy; and in part by DOD Grant DN-009, Directorate of Stockpile Management and GSA Grant PF90-018 administered by the Institute for Manufacturing and Materials Management.

MATERIALS SCIENCES

POSTER PRESENTATION — SPRING 1992

TEM STUDIES ON DYNAMICALLY RECRYSTALLIZING SUPERPLASTIC ALUMINUM-LITHIUM ALLOYS. M.N. SRINIVASAN and R.E. GOFORTH, Dept. of Mech. Engg., Texas A&M University, College Station, Texas 77843

The microstructures of three dynamically recrystallizing aluminum-lithium alloys, viz., ALCOA 2090-OE16, Reynolds 8090 and Weldalite 049 were studied using a transmission electron microscope, after superplastically deforming the specimens. The studies indicate that unlike in the case of statically recrystallized aluminum alloys like 7475 significantly greater dislocation activity occurs within the grains. Dynamic changes occur in the subgrain activity throughout the superplastic deformation process, as evidenced by changes in the electron diffraction pattern. It is postulated that these activities are conducive to higher elongations during superplastic deformation.

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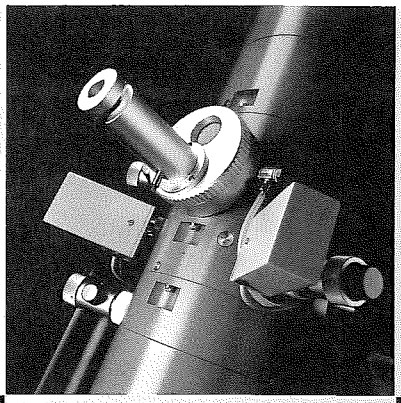

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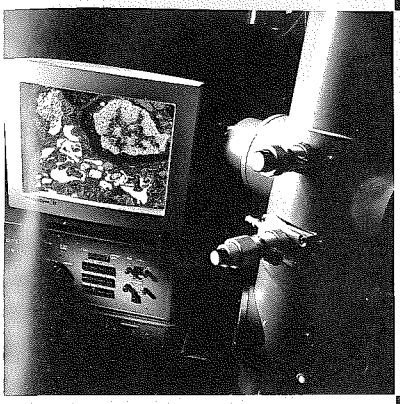

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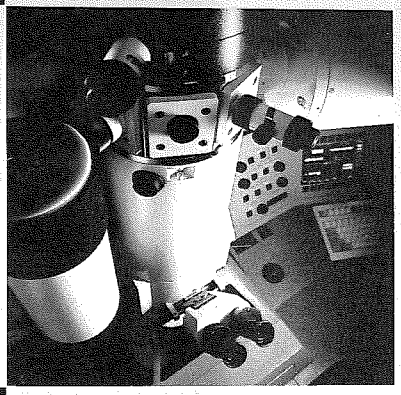

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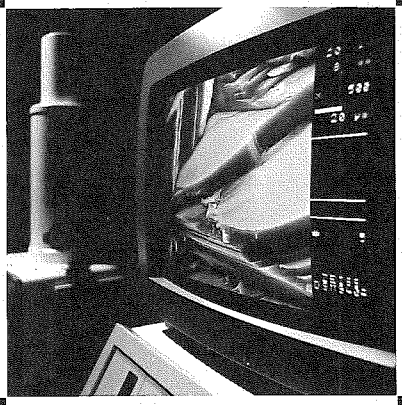

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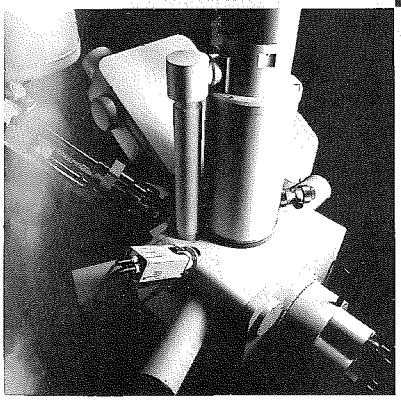

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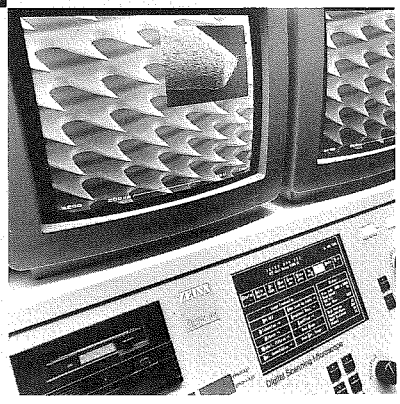

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