

**PROCEEDINGS
ELECTRON MICROSCOPY
SOCIETY OF AMERICA**

**THIRTY-THIRD ANNUAL
MEETING**

1975

PROCEEDINGS

THIRTY-THIRD ANNUAL MEETING
ELECTRON MICROSCOPY SOCIETY OF AMERICA

LAS VEGAS, NEVADA

August 11 - 15, 1975

Editor

G. W. BAILEY

Associate Editor

CLAUDE J. ARCENEUX

Baton Rouge

CLAITOR'S PUBLISHING DIVISION

1975

Copyright, 1975
by
CLAITOR'S PUBLISHING DIVISION
Library of Congress Catalog Card No. 68-3947

PERMISSIONS AND INQUIRIES

Information contained in these pages may be freely quoted, provided the author and this publication are properly credited.

Inquiries regarding the individual papers should be directed to the authors.

Published and for sale by:
CLAITOR'S PUBLISHING DIVISION
3165 S. Acadian at I-10
P. O. Box 239
Baton Rouge, Louisiana 70821

P R E F A C E

This is the ninth volume of the EMSA Proceedings which was initiated in 1967 by the EMSA Executive Council and Claude J. Arceneaux, who was also serving as Program Chairman for the annual meeting that year. The success, growth and usage of these Proceedings is a tribute to our Society and to Claude who continued to serve as Editor until this year. Your current Editor hopes to be able to carry on in the tradition that has been established by the preceding eight volumes.

An appropriate step toward maintaining that tradition would be to repeat from an earlier Preface "that the main purpose of this volume is to provide EMSA members with the pre-printed Proceedings in which the papers to be presented are published in an abbreviated, but illustrated form. In that respect it is more than a collection of abstracts. The condensed papers are designed to present all pertinent experimental findings. It must be further emphasized that it is physically impossible to critically review each paper before the meeting. Therefore, we must depend largely on the scientific integrity of each individual author. However, the assurance of the true scientific validity of these papers depends on public presentation and opportunity for open discussion. Any given paper included in this volume may appear again in more complete form in an appropriate scientific journal."

Many people have assisted in preparing this year's Proceedings and to them I owe a debt of gratitude, particularly the Program Committee, the Associate Editor, my wife, Pat, for her secretarial work and Mr. Creighton Smith for his editorial assistance. I would also like to acknowledge the encouragement and assistance that I have received from the Exxon Research and Development Laboratories while serving as Proceedings Editor this year.

G. W. BAILEY

FOREWORD

GARETH THOMAS

President of the Electron Microscopy Society of America

It gives me great pleasure to serve as President this year and to welcome everyone to this, our 33rd Annual Meeting. These Proceedings reflect the high productivity and diversity in research in electron microscopy in this country, and I am pleased to see an increase in contributions to this conference from the physical sciences. Of the many invited and contributed papers, 131 are in the physical sciences and 220 in the biological sciences. We are also pleased to hold this meeting jointly with the Microbeam Analysis Society and look forward to continued collaboration, especially as the interests of both Societies continue to overlap considerably.

Amongst the currently active research areas are high resolution imaging, information retrieval and processing, applications of lattice imaging, increased activity of high voltage electron microscopy particularly in biology with emphasis on 3-D reconstruction, hydrated specimens and techniques to avoid specimen damage during preparation, handling, and examination in the beam. In spite of the fact that no high voltage electron microscopes are currently commercially produced in the USA, there are now 8 active facilities, providing international leadership in this field. The symposia have been organized to reflect all of these activities and the program committee under Ted Welton's able chairmanship have done an excellent job of covering these fields for this meeting.

I should also like to thank Bob Bills for handling most of the "local" arrangements (from several hundred miles away), and we welcome everyone to Las Vegas where we meet for the first time in our history.

I am pleased to announce the winners of this year's Presidential Student Scholarship competition viz., S. L. Hajduk (Georgia), D. C. Hixson (Houston), D. G. Howitt (Berkeley), P. J. Ives (Texas A & M), J. E. Macur (Syracuse), T. R. McKee (Texas A & M), D. Voreades (Chicago), K. Welles (Cornell) and D. R. Witlock (Georgia). I hope many more students will apply in the future.

I am particularly proud and delighted to announce that Robert D. Heindenreich and Keith R. Porter have been named as the first recipients of the new EMSA awards for distinguished contributions to electron microscopy. Their pioneering works are well known and serve as inspiration to us all. All the presentations will be made at the Awards Luncheon on August 13.

I also hope all of you will attend the annual business meeting at which several changes and innovations will be presented for your discussion and recommendations.

Finally, I wish to announce that EMSA and the Canadian Microscopy Society will co-host the next International Congress (IFSEM) to be held at the University of Toronto at the end of August 1978.

Berkeley, California
April 10, 1975

TABLE OF CONTENTS

SYMPOSIUM:	APPLICATIONS OF LATTICE IMAGING	<i>Page</i>
	The Interpretations of Irregularities in Lattice Fringe Images—D. J. H. Cockayne	2
	Lattice Fringe Imaging Applied to Microstructural Analysis in Materials—J. B. Vander Sande and D. L. Kohlstedt	4
	Observation of Oxidation and Reduction Process of Nb Oxides at Atomic Level Resolution—S. Iijima	6
	Application of Lattice Imaging Techniques to Amorphous Films—S. R. Herd and P. Chaudhari	8
	Lattice Image Studies of Ordered Alloys—R. Sinclair and J. Dutkiewicz	10
	HIGH RESOLUTION IMAGE FORMATION AND PROCESSING	
SYMPOSIUM:	Digital Image Processing in High Resolution Electron Microscopy—J. Frank.....	12
	The Structure of Macromolecules at 5 Angstroms—F. P. Ottensmeyer, R. F. Whiting and A. P. Korn.....	14
	Processing of High Resolution Images by Analogue Methods—F. Thon.....	16
	High Resolution Scanning Microscopy—What Next?—A. V. Crewe.....	18
	PHASE TRANSFORMATION AND IDENTIFICATION	
	Copper-Beryllium Microstructures—L. E. Tanner and D. E. Laughlin	20
	Lattice Imaging of Spinodal Alloys—R. Gronsky, M. Okada, R. Sinclair and G. Thomas..	22
	Microstructures in Beta-III Titanium Alloys—S. Fujishiro.....	24
	A Transmission Electron Microscopy Study of Decomposition in the Zn-Al Eutectoid Alloy—K. Nuttall	26
	Phase Transformations in the Zirconium-Aluminum-Hydrogen System—D. Faulkner and D. J. Cameron	28
	Electron-Metallographic Identification of Retained Austenite in Steels—B. V. Narasimha Rao, J. Y. Koo and G. Thomas.....	30
	High Voltage Scanning Electron Microscopy for Observing Magnetic Domains—T. Yamamoto, K. Tsuno and H. Nishizawa.....	32
	Electron Microscopy of the Domain Structure in Ferromagnetic Metallic Glasses—H. J. Leamy, S. D. Ferris, D. C. Joy and H. S. Chen.....	34
	Hot Stage HVEM Dynamic Studies of Order-Disorder Transitions in Lithium Ferrite—O. Van der Biest, E. P. Butler and G. Thomas.....	36
	Generation of 4H and 6H Structures During the Hexagonal-Rhombohedral Transformation in Dy ₂ Co ₁₇ —C. W. Allen and D. L. Kuruzar.....	38

METALS AND ALLOYS

The Effect of Deformation Twins on the Microhardness in a Two-Phase Alloy Steel— K. P. Staudhammer and L. E. Murr	40
An Electron Microscope Study of Deformation-Strain Cycling Effects in 304 Stainless Steel—K. P. Staudhammer and L. E. Murr	42
S.E.M. Fractography of Ultrasonic Fatigue in L65 Aluminum Alloy—K. C. H. Ashley, R. W. Ditchfield and G. A. McD Downie	44
Tensile Failure of 55-Nitinol Wire—F. I. Grace	46
<i>In situ</i> Electron Microscope Study of the Oxide/Metal ($\text{Cu}_2\text{O}/\text{Cu}$) Interfacial Re- action During Annealing—K. Heinemann, D. B. Rao and D. L. Douglass	48
Critical Voltages—R. A. Ploc and M. A. Miller	50
The Development of Recrystallization Texture in Titanium—B. B. Rath, J. E. O'Neal and R. J. Lederich	52
Microstructures of Ti-1.5 w/o Ni Alloys with Mo and Al Additions—A. C. Fraker	54
Deformation Mechanisms of Aluminum at High Temperatures: <i>in situ</i> Straining Experiments in H.V.E.M.—D. Caillard, P. Muchin and J. L. Martin	56
<i>In situ</i> Tensile Experiments at Low Temperatures on Niobium Single Crystals by H.V.E.M.—F. H. Louchet and L. P. Kubin	58

CERAMICS, MINERALS, AND TEXTILES

Examination of Fracture Interfaces in Silicon Nitride—N. J. Tighe	60
Electron Microscopy of Early Stages of Precipitation in Lithium Ferrite—(LiFe_5O_8) —Spinel—R. K. Mishra	62
Transmission Electron Microscopy of the Deformation Structures in Silicon Carbide— D. R. Clarke	64
Medium Energy Electron Study of Surface Structures Formed upon Oxidation of Copper—J. D. Landry, P. E. Hojlund Nielsen, G. Hembree and J. M. Cowley....	66
Scanning Electron Microscopy of Single-Crystal NiO Energetics—L. E. Murr and C. J. Miglionico	68
SEM Study of Marine Ferromanganese Micronodules from the Atlantic Ocean— T. R. McKee*	70
Fine Structure in the Selected Area Electron Diffraction Patterns of Beidellite—N. Güven and R. W. Pease	72
Observations on the Fine Structure of Siliceous Microfossils from the Oamaru Dia- tomite (Upper Eocene, New Zealand). I. Silicoflagellates—J. P. Jendrzewski...	74
Observations on the Fine Structure of Siliceous Microfossils from the Oamaru Diatomite (Upper Eocene), II. Archaeomonads.—J. P. Jendrzewski	76
Application of Energy Dispersive X-Ray Analysis to Textile Fibers—W. R. Goynes and J. H. Carra	78
Morphology of Charred, Flame-Retardant Cotton/Polyester Fabrics—E. K. Boylston and L. L. Muller	80
A Study of Amine-Etched Poly (Ethylene Terephthalate) Filaments by HVEM and SEM—P. Tucker and R. Murray	82

THIRTY-THIRD ANNUAL EMSA MEETING

THIN FILMS

Formation Mechanisms for Multiply Twinned Particles During Nucleation in the Au/MICA System—E. H. Lee and H. Poppa	84
Characterization of RF Sputtered ZnO Piezoelectric Films Using Transmission Electron Microscope—K. W. Yeh, R. S. Muller, W. K. Wu and J. Washburn.....	86
Electron Microscopy of Porous Silicon Films—R. M. Anderson, J. Aboaf and D. P. Cameron	88
Scanning Electron Microscopy Study of Porous Anodic Films on Aluminum—V. A. Phillips and M. Meyerhoff.....	90
The Fine-Structure, Classification, and Orientation of Small Vapor-Deposited Metal Particles—K. Heinemann	92
Electron Microscope Study of the Effect of Substrate Metal Dislocation Structure on the Structure of Electrodeposited Nickel—I. Gündiler and L. E. Murr	94
Electron Energy Analysis of Germanium and Silica Layers on Silicon Substrates—R. W. Ditchfield and A. G. Cullis.....	96
The Initial Epitaxy of Copper on (111) Gold Single Crystals—J. E. Macur*.....	98
Thickness Dependence in Secondary Electron Emission from Carbon—D. Voreades*	100
Clustering and Fluctuation Characteristics of Carbon Films Observed in Darkfield Electron Microscopy—G. J. Brakenhoff.....	102
Studies of the Adsorption and Diffusion of Single Heavy Atoms on Light Element Substrates Using the STEM—N. W. Parker, M. Isaacson and J. P. Langmore....	104
On the Feasibility of Quantitative Microchemical Analysis of Thin Metal Foils—H. L. Fraser, N. J. Zaluzec, J. B. Woodhouse and L. B. Sis.....	106

INSTRUMENTATION

Conversion of an EM-200 to a Dual-Gun Electron Microscope for TEM and SEM—A. W. Brewer, C. L. Gold and P. S. Ong.....	108
A SEM Attachment for the Corinth Electron Microscope—K. Anderson, K. A. Brookes, J. M. Watson	110
Performance and Applications of a High Resolution Field Emission STEM—J. R. Banbury, I. W. Drummond and I. L. F. Ray.....	112
A New High Resolution STEM for Biological Studies—J. W. Bittner and J. S. Wall.....	114
Factors Affecting Practical Performance of the STEM at High Voltages—A. Strojnik....	116
Fixed-Beam-Excitation Auger EM with Simulated Specimens: AEM-1—J. W. Coleman and E. H. Jacobsen	118
A 10,000 Lines/Field Scanning Electron Microscope System—G. A. C. Jones, H. Ahmed and W. C. Nixon.....	120
Reflection Electron Microscopy—P. E. Højlund Nielsen and J. M. Cowley	122
The Properties and Use of a Computer Interfaced Video System for High Resolution Microscopy—W. Goldfarb and B. M. Siegel.....	124
Inner Shell Ionization by 60 keV Electrons, Application to Microanalysis—Y. Kihn, J. Sevely and B. Jouffrey.....	126
Fringe Field Effects in a Symmetric Magnetic Spectrometer—A. Kosiara	128

An Analytical Scanning Transmission Electron Microscope—H. von Harrach, C. E. Lyman, A. R. Walker, D. C. Joy and G. R. Booker.....	130
An Improved Specimen Mount for Scanning Electron Microscopy—M. K. Lamvik and S. D. Lin.....	132
A Simple Transmission Stage for a Scanning Electron Microscope—P. S. D. Lin and M. K. Lamvik.....	134
The Double-Field Condenser Objective Lens—K. Anderson, K. A. Brookes and D. C. Fibow	136
An Application of Strongly Excited Objective Lens to Low Loss Image—Y. Kokubo, K. Ueno, M. Iwatsuki and H. Koike	138
Field Distribution of Strongly Excited Magnetic Lenses—M. Strojnik.....	140
The Unipotential Foil Lens—N. D. Wittels and E. H. Jacobsen	142
Characteristics and Application of Temperature-Field Emitters—N. Tamura, T. Goto and Y. Harada	144
The Performance of a Thermal Field Emission Gun—D. M. Maher and D. C. Joy	146
Energy Filter for High Resolution Low-Loss Scanning Electron Microscopy—A. N. Broers and J. Sokolowski	148
A High Vacuum Emission Chamber for Scanning Electron Microscopy—W. R. Bottoms, G. B. Haydon and L. J. Anderson.....	150
A Jeolco 200A Cartridge with Specimen Heating, Tilting, and Power Provisions—R. M. Anderson, J. K. Howard and P. Fullam.....	152
Liquid Helium Cryostat for the Imaging System of a High Resolution Electron Microscope—D. L. Musinski, S. T. Wang and B. M. Siegel.....	154
Design of Sensitive Photographic Materials for the High-Voltage Electron Microscope—M. V. King and D. F. Parsons.....	156
Superior 2X2 Slides—H. Schaefer and B. Wetzel.....	158

DEFECTS

Characterization of Point Defect Clusters by 2-1/2-D TEM—J. B. Mitchell and W. L. Bell	160
Diffraction Fine Structure and Contrast from Octahedral Voids in Nickel—J. A. Sprague..	162
The Formation and Growth of Crystal Defects in Nickel-Base Alloys Under Proton Irradiation—L. J. Chen and A. J. Ardell.....	164
On Distinguishing between Small Vacancy and Interstitial Dislocation Loops Using a Non-Conventional Weak Beam Dark Field Technique—W. K. Wu.....	166
Structure of Deformed Iron: Irradiation Softening and Orientation Dependence—J. Nagakawa, A. Sato and M. Meshii.....	168
A Study of Shock-Induced Point Defect Concentrations in Molybdenum by Transmission Electron and Field-Ion Microscopy—A. A. Morales, L. E. Murr and O. T. Inal	170
Effect of Thermomechanical Treatment on the Grain Boundary Structure in Pure Aluminum—E. Venkatesh and L. E. Murr	172
High Temperature Strength and Stability of Oxide Dispersion Hardened Alloys—M. S. Grewal, S. A. Sastri and N. J. Grant	174
The Formation of Fault-Pairs in F.C.C. Crystals—S. Mahajan.....	176
Applications of Through-Focus Dark Field Image Shifts to Phase Identification—P. Rao	178

IMAGE AND DIFFRACTION MECHANISMS

Optical Properties of HVEM Accelerators—A. Strojnik, J. W. Scholl and V. Bevc.....	180
Determination of Energy Spread and Source Size by Optical Diffraction—J. Frank.....	182
Crystal Support Contrast—R. L. Hines.....	184
Imaging of Amorphous Objects by Tilted Beam Bright Field Illumination—W. Goldfarb, W. Krakow, D. Ast and B. M. Siegel.....	186
Theory of Topographical Image Contrast—S. Nakahara, A. G. Cullis and D. M. Maher..	188
Classical Transport Theory and the Imaging of Thick Specimens—T. Groves	190
Dynamical Scattering in Crystalline Biological Specimens. I. Criteria of Validity for Scattering Approximations—R. M. Glaeser and B. K. Jap.....	192
Dynamical Scattering in Crystalline Biological Specimens. II. The Domain of Validity for Different Approximations—B. K. Jap and R. M. Glaeser.....	194
Practical Resolution Enhancement in Bright Field Electron Microscopy by Computer Processing—T. A. Welton	196
Methods for Implementing Computer Image Processing to Obtain Heavy-Light Atom Discrimination—K. Welles*	198
Simulated Dark-Field Electron Micrographs of Point Defects and Organometallics—W. Krakow	200
Topographical Imaging in the Transmission Electron Microscope—A. G. Cullis, D. M. Maher and S. Nakahara	202
The Importance of the Detector Angle in STEM Imaging of Crystals—D. C. Joy and D. M. Maher	204
On the Contrast of High Resolution Backscattered Electron Images—P. S. D. Lin.....	206
Simultaneous Study of Both the Surface and Interior Structure of Biological Specimens in a Scanning Electron Microscope—P. S. D. Lin and A. V. Crewe.....	208
The Accurate Measurement of the Energy Dependence of Radiation Damage Rates in Organic Materials—D. G. Howitt*.....	210
Stereomicroscopy for Phase Objects by Use of Defocus Contrast—S. Nakahara.....	212
Image Analysis of Intramembrane Particles in Freeze-Fractured Biomembranes Using Computer Simulation Techniques—D. J. Benefiel and R. S. Weinstein	214
Electron Diffraction of Wet, Unstained, Unfixed Rat Hemoglobin—B. C. Dobbs, W. A. Pangborn and D. F. Parsons.....	216
STEM Electron Diffraction from Areas less than 30°A; Application to Amorphous Films—R. H. Geiss	218
Fresnel Diffraction and Lattice Plane Images in a Conventional STEM—R. H. Geiss, D. G. Howitt and H. Arnal.....	220
Computer-Aided Indexing and Simulation of Transmission Electron Diffraction Patterns—P. Rao and R. P. Goehner.....	222

ANALYTICAL TECHNIQUES AND PROCESSES

A New Method for Single Atom Specimen Preparation—W. Chiu, R. M. Glaeser and S. Prussip	224
Etching Techniques and the Surface Morphology of the Gunflint Chert—A. H. Johnson..	226

The Preparation of Tungsten Coil Filaments for Transmission Electron Microscopy—E. F. Koch	228
Jet-Polishing Iridium for TEM—D. N. Braski and G. A. Potter	230
Replication of Water Droplets—S. Basu and D. F. Parsons	232
The Wet Replication Technique—D. F. Parsons and S. Basu	234
The Detection of Transmitted Energy Loss Electrons for Elemental Analysis—D. E. Johnson and M. Isaacson.....	236
Electron Energy Loss Microanalysis of an Internally Oxidised Ni-Al Alloy—R. W. Ditchfield, A. Fourdeux and M. J. Whelan.....	238
Mass Determination by Direct Measurement of Electron Scattering—M. K. Lamvik and A. V. Crewe	240
Determination of Crystal Thickness from Relative Transmission Measurements—D. C. Joy and D. M. Maher.....	242
Molecular Degradation in the Electron Microscope: A Tunneling Spectroscopy Study—M. Parikh	244
The Energy Dependence of Radiation Damage in L-Valine—D. G. Howitt, R. M. Glaeser and G. Thomas	246
Energy Dispersive X-Ray Analysis of Picoliter Samples of Physiological Fluids—P. M. Quinton	248

SEMI CONDUCTORS

Characterization of Ion Migration in MOS Systems by Internal Interface Imaging—W. R. Bottoms, D. Guterman and P. Roitman.....	250
Generation and Dislocations at the Interface Between Oxygen Precipitates and Silicon—T. Y. Tan and W. K. Tice	252
Cathodoluminescence-Mode Scanning Electron Microscopy of GaAs Alloys and Diodes—E. R. Levin and M. Ettenberg.....	254
Boron Precipitates in Ion Implanted Silicon—W. K. Wu and J. Washburn.....	256
The Microstructure of Xe Implanted GaAs—C. R. Hills, G. J. Thomas and H. J. Stein..	258
Characterization of Si Single Crystals by Conductivity Mode Scanning Electron Microscopy—H. J. Leamy, A. J. R. de Kock, L. C. Kimerling and S. D. Ferris	260
Scanning Electron Microscope Facility for <i>in situ</i> Observations of Ion Implanted Surfaces—G. J. Thomas and W. Bauer.....	262

PRECIPITATES AND PARTICULATES

Cellular Precipitation of Gamma Prime in Iron-Nickel Based Alloys—D. S. Gelles.....	264
Direct Observation of Radiation Induced Precipitation in High Voltage Electron Microscope—W. K. Wu and J. Washburn.....	266
Electron Microscopy of U-6.3 wt% Nb Alloy—A. O. Ehlinger, K. P. Staudhammer and A. R. Miller.....	268
Gamma-Irradiation Induced Coarsening of the γ' Precipitate in a Nickel-Aluminum Alloy—C. W. Allen and N. F. Fiore	270
Lattice Images at Θ' Precipitates in Al-3%Cu Alloy—V. A. Phillips.....	272
Identification of Asbestos Fibres in a Water Sample by X-Ray Microanalysis—K. A. Brookes, D. Finbow and M. Samuel.....	274

Asbestos Background Levels in Three Filter Media Used for Environmental Monitoring—E. J. Chatfield	276
Charging of Small Particles in the Scanning Electron Microscope—W. Krakow and W. C. Nixon	278
Dynamic Scanning Electron Microscopy of Small Particles—W. Krakow and W. C. Nixon	280
The Platinum-Carbon Shadow Width Increase as a Function of Known Particle Size on Non-Planar Surfaces—G. C. Ruben and J. N. Telford.....	282

3-DIMENSIONAL RECONSTRUCTION IN ELECTRON MICROSCOPY

SYMPOSIUM:

Computer Reconstruction of the Cellular Architecture of the Daphnia Magna Optic Ganglion—E. R. Macagno and C. Levinthal.....	284
Mitochondrial Reconstructions Based on Serial Thick Sections and HVEM—J. J. Paulin	286
Three-Dimensional Structure Reconstruction by High Voltage Electron Microscopy of Biological Specimens—L. D. Peachey.....	288
Improved Resolution in Three-Dimensional Image Reconstruction of Helical Structures—L. A. Amos	290
An Image Reconstruction System Applied to High Voltage Microscopy—D. E. Johnson..	292
Stereoscopic Methods in TEM—L. E. Thomas	294

HYDRATED SPECIMENS AND EQUIVALENT TECHNIQUES

SYMPOSIUM:

What Improvement in Electron Microscopy and Electron Diffraction Results from Using Wet Biological Materials?—D. F. Parsons.....	296
High Resolution Structure Determination of Unstained Biological Molecules—P. N. T. Unwin and R. Henderson.....	298
Electron Microscopy of Frozen, Hydrated Biological Specimens—K. A. Taylor.....	300

CYTOPLASMIC ORGANELLES

Observations on the Nucleus of "Stripped" He La Cells—J. H. L. Watson, J. L. Swedo and R. H. Page.....	302
Metaphase Chromosomes in the Scanning Proton Microscope—W. H. Escovitz, T. R. Fox and R. Levi-Setti	304
Enucleation of Colchicine Treated Mammalian Cells—J. W. Shay and M. A. Clark....	306
Ultrastructure of Persisting Mitotic Nucleoli of Mung Beans—J. P. Braselton.....	308
Giant Mitochondria in Hepatocytes Following Concanavalin A Administration—W. Nopanitaya and M. L. Tyan.....	310
Ribosomal Associations with Glycogen Bodies in Rabbit Extraocular Muscle—J. Davidowitz, G. H. Philips, B. R. Pachter and G. M. Breinin.....	312
Autophagy Involves the Golgi Complex in a Two Step Process—M. Locke and A. K. Sykes	314
Membrane Organelles in Developing Hamster Frontal Cortex—M. T. Buschmann	316
Morphological Observations on the Granule Types in Rabbit Extra-Adrenal Chromaffin Cells—J. A. Mascorro and R. D. Yates.....	318

Surfactant Bodies: The New Look of the Lamellar Inclusions from Type II Alveolar Pneumocytes—R. M. Wagner and K. Miyai.....	320
Quantitative Electron Microprobe Studies of Human-Platelet Dense Bodies—Y. Tanaka, J. L. Costa, K. D. Pettigrew, Y. Yoda and R. J. Cushing.....	322
Studies of the Crystalline Yolk Complex from <i>Xenopus Laevis</i> —M. L. Collins, D. H. Ohlendorf and L. J. Banaszak.....	324

VIRUSES

Lectin Binding Studies on RNA Tumor Virus-Infected Cells—D. C. Hixson*.....	326
Propagation of JC Virus in Glia Cells in PML (Progressive Multifocal Leukoencephalopathy)—S. Preskorn, J. Kepes, W. J. Bopp and I. Watanabe.....	328
Insect Virus Infection of a Poikilothermic Vertebrate Cell Line: Electron Microscopy—M. Kimura, A. H. McIntosh and K. Maramorosch.....	330
Electron Microprobe Analysis of Particles in the Insect Vector of Maize Streak—M. Kimura, L. Seveus and K. Maramorosch.....	332
Replicative Forms of a MSV (FELV) Pseudotype Virus—R. A. Al-Adhami and A. L. Chapman	334
Fine Structural and Pathologic Evaluation of Moloney Sarcoma Virus (MSV)-Induced Osteosarcoma in the Rat—H. M. Olson and C. C. Capen.....	336
Cytomegalovirus in Wild Mice—R. Rongey, J. E. Officer, J. D. Estes, G. Coffey and M. B. Gardner	338
Hepatitis A Antigen in Liver, Bile and Stool—D. R. Jackson, J. H. Hoofnagle, A. N. Schulman, J. L. Dienstag, R. H. Purcell, D. Lorenz, and L. F. Barker.....	340
Studies of Epstein-Barr Virus Antigens Using Immunoperoxidase and Immunofluorescence Techniques—R. Stephens, K. Traul, D. Woolf and P. Gaudreau.....	342
Immunoferritin Studies on Naturally Occurring Antibodies in Mouse Sera Against the Mouse Mammary Tumor Virus (MMTV)—M. F. Miller, L. Dmochowski, J. M. Bowen, M. Scanlon, J. Chesner and R. Kenny	344
Stereo Electron Microscopy of Freeze-Fractured Cells Reveals the Three-Dimensional Continuity of Tobacco Mosaic Virus Crystals—R. L. Steere and E. F. Erbe	346
Detection of Reovirus-Like Particles in HeLa Cells—W. D. Holder, Jr. and G. W. Peer	348

PATHOLOGY — INTEGUMENT AND NEUROPATHOLOGY

Skin Vascular Ultrastructure During Thermal Injury, Hypertrophic Scarring and its Resolution—C. W. Kischer	350
Electron Microscopy of Wound Healing in Patients with Hernia—C. N. Sun, H. J. White and R. C. Read	352
Ultrastructure of Epidermal Cells in Prostaglandin-Treated and Wounded Rats—A. Lupulescu, J. E. Habowsky, J. Milkintas and D. Birmingham.....	354
Scanning Electron Microscopy of Non-Mechanical Cryofractured and Paraffin Sectioned Root Sheath of Epilated Human Hair—G. Uptgraft	356
Ultrastructural Features of Normal and Diseased Hair Revealed by Ion Beam Etching and Freeze Fracture—M. Spector and A. C. Brown.....	358
Ultrastructural Variations in the Congenital Hair Defect Monilethrix—H. West.....	360

THIRTY-THIRD ANNUAL EMSA MEETING

SEM Study on the Etiology of Pseudofolliculitis Barbae—E. O. Bernstein and E. Kairinen	362
Regeneration of Peripheral Nervous System (PNS), in Rats Under Dietary and/or Endogenous Cholesterol Variations—F. A. Rawlins.....	364
The Effect of Experimental Endolymphatic Hydrops (ELH) on the Endolymphatic Sac (ELS) in the Lemon Shark: An SEM Study—I. K. Arenberg, E. Raubach, J. P. Murray and G. J. Spector	366
Fluorocitrate Neural Dystrophy of the Guinea Pig Cochlea—G. J. Spector, C. D. Carr, I. K. Arenberg and R. H. Maisel.....	368
The Production of Neuroaxonal Dystrophy in the Lateral Vestibular Nucleus of Rats by Centrifugation—J. E. Johnson, Jr.....	370
The Role of Mitochondria in the Genesis of Neuroaxonal Dystrophy in the Brains of Aging Mice—J. E. Johnson, Jr.....	372
Fine Structural Features of Neurosarcomas—B. Mackay, J. Valenzuela and J. J. Butler..	374

PATHOLOGY — TUMORS

Formation of Centrioles in Some Endocrine Adenomas—E. Horvath and K. Kovacs	376
Fine Structural Classification of Chromophobe Adenomas of the Human Pituitary Gland—K. Kovacs and E. Horvath	378
Transmission Electron Microscopy of the Brenner Tumor. Contribution to the Histopathogenesis—I. M. Baccarini.....	380
Viruslike Particles in Human Prostate Cancer and Virus Particles in Normal Prostate of Mice—Y. Ohtsuki, G. Seman, J. M. Bowen and L. Dmochowski	382
Morphologic and Biochemical Characteristics of H-411-E Rat Hepatoma Clones—C. A. Lovig, R. E. Nordquist, H. Muragishi and R. H. Bottomley.....	384
Morphology and Transplantability of Tumors Derived from Clones of the H-411-E Rat Hepatoma Cell Line—C. A. Lovig, R. E. Nordquist, H. Muragishi and R. H. Bottomley.....	386
A New Human Breast Tumor Cell Line—R. E. Nordquist, R. M. Wasik, P. J. Riggs, P. L. Munson and F. B. Schafer	388
Unlabeled Antibody Immunocytochemistry Applied to Murine Mammary Tumor Cells—W. J. Arnold, J. Russo, H. D. Soule and M. A. Rich.....	390
Ultrastructural Study of Human Mammary Carcinoma Cells (MCF-7) Grown in Collagen-Coated Sponge—J. Russo, R. Bradley and H. D. Soule.....	392
<i>cis</i> —Dichlorodiammineplatinum (II) and its Effect on Microfilaments in Mammalian Cells—S. K. Aggarwal and P. McAllister.....	394
Ultrastructural Acridine Orange and Autoradiographic Studies in Acute Leukemia Bone Marrow Cells—M. J. Ahearn and J. M. Trujillo.....	396

PATHOLOGY — VASCULAR AND GASTROINTESTINAL

Vasogenic Edema in the Injured Spinal Cord: Possible Role of Microtubules in Endothelial Vesicular Transport of HRP—J. L. Beggs, J. D. Waggenger and W. Miller	398
Middle Cerebral Artery Response Following Occlusion with a Surgical Clamp—R. F. Dodson, Y. Tagashira, L. W. F. Chu and R. W. Scates.....	400
Acute Response of Cerebral Tissue Following Periods of Ischemic Insult—R. F. Dodson, Y. Tagashira, L. W. F. Chu and R. W. Scates.....	402
Pericytic Alterations in Cerebral Infarction—R. F. Dodson, Y. Tagashira, L. W. F. Chu and R. W. Scates	404

Tissue Response to Vascular Prosthetic Materials—R. J. Narconis, J. W. Spindler, L. J. Billy and S. Rana.....	406
Sclerosing Glomerulonephritis—A. Mandal, K. Chrysant, J. Nordquist, S. Kraikit- panitch, D. Xoung and R. Lindeman.....	408
Influence of Vagotomy on Duodenal Fat Absorption—J. C. Lamb, IV, W. Nopani- taya and B. A. Shinoda.....	410
Ultrastructure of Proliferative Ileitis in Hamsters-Intestinal Amyloidosis—M. G. Jourden, J. C. S. Kim and C. S. F. Williams.....	412
Mucosal Response to Acetylsalicylic Acid—F. G. Lightfoot and M. M. Cassidy	414
Scanning Electron Microscopy of Carcinoma and Precancerous Lesions of the Colon —S. Siew	416
A Low Power S.E.M. Study of Normal and Colitic Human Large Bowel—R. H. Rid- dell, L. Eisenstat, H. Golomb, R. Brynes and B. Levin.....	418

PATHOLOGY — TISSUES AND ORGAN SYSTEMS

Effects of Asbestos Fibers on Mammalian Cells in Culture—B. E. Barry and H. W. Fisher	420
Ultrastructural Fiber Typing in Normal and Diseased Human Muscle—C. M. Payne, L. Z. Stern, R. G. Curless and L. K. Hannapel.....	422
Fine Structural Analysis of Muscle Degeneration Caused by Amyloid Infiltration— O. G. Rodgers, T. Shirahama and A. S. Cohen.....	424
Ultrastructural Pathology of Ischemic Myocardium as Revealed by the Freeze- Fracture Technique—M. Ashraf and W. Mayr.....	426
Ultrastructural Studies of Bovine Respiratory Disease Complex—J. C. S. Kim.....	428
Light and Electron Microscopic Findings after Acute Lung Injury—M. Trant, R. Jamison, D. Palmer, R. Light and R. George.....	430
A Comparative Study of the Effects of Cyclocytidine and Fluorocyclocytidine on Murine Submaxillary Salivary Glands—R. H. Liss, M. C. Charest and J. A. R. Mead	432
An Ultrastructural and Cytochemical Study of Aging in the Thyroid of the Domestic Cat—P. J. Ives*	434
Ultrastructural Changes in Dog Thyroid Follicular Cells Induced by Chronic Thy- rotropin Administration—J. A. Fernandez-Pol and M. T. Hays	436
Fine Structural and Biochemical Investigations of Pheochromocytomas in Bulls with C-Cell (Ultimobranchial) Neoplasms of the Thyroid (UBT)—J. T. Yarrington and C. C. Capen	438
The Location of Vitamin A-Storing Cells in Hepatic Fibrosis Induced by Carbon Tetrachloride—O. T. Minick, R. M. Bahu, H. W. Lyon, R. W. Tiecke, T. Inouye and G. Kent	440
Ultrastructural Evaluation of Bone, Parathyroid and Ultimobranchial Glands in Lizards with Nutritional Osteodystrophy—M. P. Anderson and C. C. Capen	442

CYTOCHEMISTRY AND ELECTRON MICROSCOPY

Stereoscopic Visualization of Selectively Stained Neuromuscular Junctions Using High Voltage Electron Microscopy—J. A. Westfall, M. H. Ellisman and K. R. Porter..	444
Cytochemical Localization of Acid Phosphatase in WI-38 Cells Observed by High Voltage Electron Microscopy—J. J. Wolosewick and K. R. Porter.....	446

THIRTY-THIRD ANNUAL EMSA MEETING

Biogenic Amine Identification by Analytical Electron Microscopy—J. G. Wood and D. Harling	448
Prostatic Acid Phosphatase (PAP) Differentiated Ultracytochemically from Lysosomal Acid Phosphate in the Rat with a PAP/Specific Substrate, Phosphorylcholine—W. A. Shannon, Jr., J. A. Serrano, H. L. Wasserkrug, A. A. Serrano and A. M. Seligman	450
Ultracytochemical Localization of Potassium-Dependent NPPase in Rat Choroid Plexus—D. A. Davis, T. H. Milhorat and M. K. Hammock.....	452
Na+K+ Dependent Atpase as a Specific Marker for Myoepithelial Cells: An Ultra-structural Study—J. Russo and P. Wells.....	454
Nonvolatile Octavalent Osmium Compounds as Sources of Osmium Tetroxide for Electron Microscopic Cytochemistry—J. S. Hanker, D. K. Romanovicz and M. A. Crenshaw.....	456
Mitochondrial Oxidation of ρ -N, N-Dimethylamino- β -Phenethylamine (DAPA) — W. A. Shannon, Jr., H. L. Wasserkrug and A. M. Seligman	458
A Cytochemical Study of Glucose-6-Phosphatase (G-6-PASE) in Cells Participating in Atherogenesis of Rabbit Aorta—S. D. Kobernick, E. A. Elfont and N. L. Brooks ..	460
Cytochemical Specializations on the Luminal Surface of Blood Vessels in the Developing Rat Central Nervous System—R. S. Hannah and T. H. Rosenquist.....	462
High Resolution Cytochemical Demonstration of Electrical Charges in Synaptosome Surface Coat—A. Feria-Velasco, S. Sanchez and V. Magdaleno.....	464
Quantitation of Fluorophosphate - Reactive Esterase Sites in Rat Liver Using Electron Microscope Autoradiography—G. C. Budd.....	466
Ultrastructure and Fluorescence Histochemistry of Secondary Cells in the Eye of <i>Aplysia Californica</i> —J. L. Luborsky-Moore.....	468

ANIMAL CELL STRUCTURE AND FUNCTION

Some Observations on the Ultrastructure of the Surface of Normal Human Stomach Mucosa—J. H. L. Watson, J. Goodwin and E. Fard.....	470
Stereological Analysis of Endoplasmic Reticulum and Golgi Apparatus of Intestinal Enterocytes during Lipid Absorption—D. J. Manke and R. J. Buschmann.....	472
Epithelialization of the Anterior Chamber: An Ultrastructural Study—W. Nopanitaya, W. D. Purnell and S. D. McPherson, Jr.....	474
Morphological Basis for the Photomechanical Response in the Photoreceptors of the Vertebrate Retina—G. E. Adomian and F. S. Sjöstrand.....	476
The Basal Apparatus of Bovine Retinal Rods—D. Raveed and D. Fleischman.....	478
Ultrastructural Changes in Hamster Retina Following Injection of 5-Hydroxy-Tryptophan—R. Taylor, M. Gerodetti, R. V. Blystone and P. Smith	480
A Fine Structural Study of Mineralization Foci in Antler and Growth Plate Cartilage —J. W. Newbrey and W. J. Banks.....	482
Morphological Observations on Anterior Endoderm in Cardiac Mutant Mexican Salamanders (<i>Ambystoma Mexicanum</i>)—L. F. Lemanski and B. S. Marx	484
The Use of Transmission Electron Microscopy to Characterize Differentiated Rat Lung Cells Cultured <i>in Vitro</i> —R. W. Teel and W. H. J. Douglas	486
Electron Microscopic Study of Tissues from Precolumbian Americans—A. J. Martinez, D. Fultz, M. J. Allison, E. Gerszten and D. C. Stanley.....	488
Aspects of Myocardial Regeneration in <i>Notoophthalmus Viridescens</i> —D. Philpott, R. Corbett, P. Person and R. Becker.....	490

BIOLOGICAL MEMBRANES

Direct Visualization of the Hydrophobic Portion of <i>Acholeoplasma Laidlawii</i> Membranes—C. A. Heckman and R. J. Barnett.....	492
The Identification of Phospholipid Micelles in Glutaraldehyde-Urea Embedded Tissue—D. C. Pease.....	494
Observation of Domains and Phase Separation in Hydrated Lipid Bilayers—S. W. Hui and D. F. Parsons.....	496
Potassium-Osmium-Cyanide Complex (POCC) to Replace Osmium Tetroxide in Cytochemistry and Staining of Biological Membranes—W. A. Shannon, Jr., Y. Hoshino and A. M. Seligman.....	498
Fusion of Sarcoplasmic Reticulum with Ruthenium Red—N. Wallace and J. R. Sommer ..	500
Photoelectron Microscopy of Biomembranes: Observation of External Photoemission from Spinach Chloroplasts—R. J. Dam, G. H. Lesch, D. W. Deamer and O. H. Griffith	502
Structure of Freeze Etched Reconstituted Liposomes Revealed in the Absence of Cryoprotectants—G. C. Ruben and J. N. Telford.....	504
Electron Energy Loss in Membrane Components: Possibilities of Contrast and Identification in the STEM—J. Hainfeld and M. Isaacson.....	506
Reversible Opening of Junctional Complexes in the Kidney Tubule by Action of Small Concentrations of Urea—E. Gonzalez, M. Perez-Gonzalez, F. A. Rawlins and G. Whittembury	508

CELL SURFACE

Scanning Electron Microscopy of Elliptocytes in Man and Llama—M. Pardo, R. C. Grauer, J. H. Swart and R. J. Hartsock.....	510
Relationship of the Discocyte—Echinocyte Shape Transformation to Red Cell Surface Charge—Y. Marikovsky, C. S. Brown, R. S. Weinstein and H. H. Wortis....	512
Expression of HeLa Cell Surface Alkaline Phosphatase During Attachment to Glass—A. M. Fiskin, G. Melnykovich and G. Peterson	514
Dynamic Surface Features of Cultured Cells Visualized by Combining Cinephotomicrography and SEM—B. Wetzel, G. Jones, E. Westbrook, C. Fox and K. Sanford ..	516
SEM of the Cecal Morphology in the Domestic Chicken—D. R. Witlock*.....	518
Scanning Electron Microscopy of the Normal Rabbit Hepatocyte—W. Nopanitaya and J. W. Grisham.....	520
Scanning Electron Microscopy of Endocardial Surface of Right Atrium in Mice—M. Gonzalez-del-Pliego, M. Salazar and A. Feria-Velasco.....	522
Scanning Electron Microscopy (SEM) of the Endothelium of Canine Vein Segments Prepared for Surgery—J. S. Mitchener, N. B. Ratliff and J. C. Fuchs.....	524
SEM Evaluation of Canine Middle Cerebral Artery Endothelium Following Microvascular Surgery—M. Dujovny, C. P. Osgood, P. J. Barrionuevo, E. Z. Longa and R. Matta	526
Human Stapes Crura: Normal Ultrastructure. Scanning Electron Microscopic Findings—M. D. Graham	528
Scanning Electron Microscopy of the Taste Bud of the Mudpuppy, <i>Necturus Maculosus</i> —D. W. Samanen and R. A. Bernard	530

MUSCLE

Electron Probe Analysis and Cryoultramicrotomy of Cardiac Muscle: Mitochondrial Granules—A. V. Somlyo, J. Silcox and A. P. Somlyo.....	532
--	-----