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# Microscopy AND Microanalysis

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Four types of communications are published in the Journal. **Regular Articles** are of substantial length, and describe the findings of an original research project that satisfies the aims and scope of the Journal, described above. **Communications** are brief technical or scientific articles. **Reviews** summarize the current status of an important area within the aims and scope of the Journal. **Letters to the Editor** usually contain comments on recent articles that have appeared in the Journal.

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JOHN H. L. WATSON

This Proceedings volume is dedicated to John H. L. Watson, a pioneer in electron microscopy and a long time active member of the Microscopy Society of America. John has served the Society in many capacities, as President, Program Chair, Certification Board Chair, Placement Officer, and numerous other positions. John is responsible for initiating the Proceedings in 1967 for the 25th Annual Meeting of EMSA (MSA). John is retiring this year as MSA Placement Officer. Thanks John, for your years of service and dedication to MSA, your wise counsel and guidance, and your sincere friendship with all of us. We treasure you!

Graduating from McMaster University in 1939, John joined the pioneer *electron microscopy team at the Physics Department of the University of Toronto*, where he earned a Masters degree in 1940 and a Doctorate in 1943 in the then new field of electron optics. He served 36 years on the professional staff of the Henry Ford Hospital in Detroit. In 1990 the Medical Association of that hospital awarded him its Distinguished Career Award for, "outstanding contributions to patient care, medical teaching and scientific advancement." For 40 years he was the director and a performer with the Windsor Light Opera Association, which he founded in 1948 and which awarded him, on his retirement, the title of Founding Director Emeritus. In 1992 Dr. Watson received the degree, Doctor of Humanities, honoris causa, from the University of Windsor, in recognition of his outstanding contributions to the cultural life of Windsor and to the science of microscopy. In that same year he was made an Honorary Charter Member of the Microscopy Society of America and received its Distinguished Service Award. In 1993 he became an Honorary Member of the Canadian Microscopical Society, and in 1996 an Honorary Member of the North Carolina Society for Microscopy and Microbeam Analysis. He is particularly proud of the Special Award, presented to him in 1981 by the Electron Microscopy Society of America, during its 39<sup>th</sup> meeting in Atlanta for, "Contributions to early development of electron microscopy in North America and in appreciation for twenty-five years of dedicated service to the Society as President (1957), Placement Officer (1954–1999), Certification Board Chairman and Troubadour." As a "troubadour" he composed and sang the poem, "The EMSAN Rhapsody," set to the music of the Wiffenpoof Song, which begins: "From the latices of Robley to the Hall where Cecil dwells."

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MICROSCOPY SOCIETY OF AMERICA

1999 DISTINGUISHED SCIENTIST AWARDS



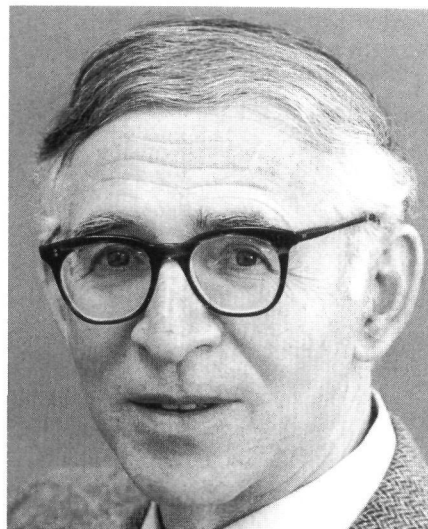
TAKEO ICHINOKAWA  
Physical Sciences

He graduated in a graduate course of Science and Engineering in Waseda University in 1954 and has held posts of associate professor and full professor in Waseda University between 1958 and 1997. He is now a professor emeritus of Waseda University.

- (1) He developed the first scanning electron probe X-ray micro-analyzer in Japan in 1958 and developed several new techniques for surface microanalysis by using backscattering and secondary electron spectroscopy between 1958 and 1970.
- (2) He developed a new electron energy analyzer of a magnetic lens type (Ichinokawa type) and analyzed microscopic structures by electron loss spectroscopy using transmission electron microscopy between 1970 and 1985.
- (3) He constructed a low voltage ultrahigh vacuum scanning electron microscope equipped with a LEED detector to take dark field images in SEM, and investigated dynamic changes of domain structures, phase transitions, reconstructed structures of metal on Si surfaces, and small metal islands on Si or SiO<sub>2</sub> by varying temperature. Furthermore, he determined the atomic arrangements of several reconstructed structures for metals on Si(100) by using a scanning tunneling microscope developed by his laboratory.

The main subjects of his studies were instrumentation of electron optical systems and microanalyses of surface structures and defects by using UHV scanning electron microscopy.

He is an advisory committee member of the Journal of Ultra-microscopy and the International Conference of X-ray Optics and Microanalysis.



SIR AARON KLUG  
Biological Sciences

Aaron Klug was educated at the Universities of Witwatersrand, Cape Town and Cambridge. He began as a medical student, transferred to science, and his PhD at the Cavendish Laboratory was in Physics. He joined the MRC Laboratory of Molecular Biology in Cambridge in 1962, was the Director of the Laboratory from 1986 to 1996, and now continues as a member of staff, leading a research group on gene expression.

His work has been on the interactions of proteins and nucleic acids and on the elucidation of the structures of large biological molecules and assemblies, including simple viruses and chromatin, by X-ray diffraction and electron microscopy and the development of new methods for their study. In particular, he invented the technique of 3-D image reconstruction from a series of tilted electron micrographs, and later the phase contrast defocusing method for "transparent" specimens. This work led to the creation of a new field, now termed electron crystallography.

In 1982 he was awarded the Nobel Prize in Chemistry, for "his development of crystallographic electron microscopy and his elucidation of the structure of protein-nucleic acid complexes of biological importance". His current research is on the structure of DNA and RNA binding proteins which regulate gene expression and in particular on the interaction with DNA of the zinc finger family of transcription factors which he discovered.

He is President of the Royal Society, a member of the Order of Merit, a Foreign Associate of the US National Academy of Sciences, and of the French Academy of Sciences, and has received many honorary degrees.

## BURTON MEDAL



ZHONG LIN WANG

Zhong Lin (ZL) Wang received his Ph.D. in Physics from Arizona State University in 1987 under the guidance of Professors J.M. Cowley and C. Colliex. After a year as a Visiting Lecturer at SUNY Stony Brook with Professor R.F. Egerton, Dr. Wang was awarded a Research Fellowship by the University of Cambridge to work with Professor A. Howie. He was then appointed as a Research Associate Professor by the University of Tennessee to work with Dr. J. Bentley. In 1993, he moved to the National Institute of Standards and Technology. He is currently a full Professor of Materials Science and Engineering and the Director of the Electron Microscopy facility at Georgia Tech. Dr. Wang is the author and co-author of three books entitled “Elastic and Inelastic Scattering in Electron Diffraction and Imaging” (Plenum Press, 1995), “Reflection Electron Microscopy and Spectroscopy for Surface Analysis” (Cambridge University Press, 1996), “Functional and Smart Materials—Structural Evolution and Structure Analysis” (Plenum Press, 1998). Dr. Wang’s research covered electron inelastic and diffuse scattering, reflection electron microscopy, and electron energy-loss spectroscopy. His current research focuses on novel TEM techniques, nanophase materials, characterization of smart materials, physical properties of carbon nanotubes, and in-situ TEM. He won the US NSF CAREER award and the 1998 China NSF Outstanding Oversea Young Scientist Award.

THE MORTON D MASER  
MSA DISTINGUISHED SERVICE AWARD



CHARLES E. LYMAN

Charles E. Lyman, Professor of Materials Science and Engineering at Lehigh University, received his B.S. from Cornell in 1968 and his Ph.D. from the Massachusetts Institute of Technology in 1974. Lyman was the 1991 president of the Microscopy Society of America. Prior to that he was program chair for the 1984 MSA annual meeting in Detroit and served on MSA Council as a physical science director, 1985–87. Since 1982 he has organized many MSA symposia concerning analytical electron microscopy and the characterization of catalysts. In 1991 Lyman explored the possibility of an MSA scientific journal by organizing a demonstration issue of the EMSA Bulletin called “Microscopy: the Key Research Tool.” Currently, Dr. Lyman is Microanalysis Editor of the society’s journal, *Microscopy and Microanalysis*, and is also president-elect of the Microbeam Analysis Society. Professor Lyman has over 30 years experience in the application of electron microscopy and microanalysis to materials problems and over 100 technical publications.

## MSA OUTSTANDING TECHNOLOGIST AWARDS



JOHN M. BASGEN  
Biological Sciences

John M. Basgen received his bachelor's degree in biology from the University of Minnesota. He has spent twenty-five years working in the Department of Pediatrics at the University of Minnesota Medical School. For the past 11 years, he has been Senior Scientist in that department's Diabetes Morphometry Laboratory where he has worked on quantifying morphological changes in kidneys from diabetics. He is a past president of the Minnesota Electron Microscopy Society and one of the founding members and past chairs of the Technologists' Forum of the Microscopy Society of America. In addition to publishing numerous papers related to the structure and function of the kidney, John has lectured and taught many workshops on the use of morphometric techniques both in this country and as part of the MSA exchange program with the Peoples Republic of China. He continues to explore new methods for efficiently measuring structural changes within the diseased kidney.



JOHN C. WHEATLEY  
Physical Sciences

John received his formal education in Arizona, graduating from Arizona State University in 1967. In the summer of 1967, he began working for the Phoenix Laboratory of the Atlanta-based Center for Disease Control and Prevention. The work there consisted of studies of viral hepatitis replication in various cell lines. In 1968 he returned to ASU to pursue graduate studies in microbiology.

John started work for the Department of Physics and Astronomy in 1970 as an electron microscope engineer. In 1981, he became the Laboratory Manager in the Center for High Resolution Electron Microscopy under the administrative umbrella of the Center for Solid State Science.

John is currently a Senior Research Professional in the Department of Physics and Astronomy and continues to manage the Center for High Resolution Electron Microscopy. His primary interest is in training students in high resolution electron microscope techniques and administering the daily activities of the laboratory.

John wishes to dedicate the award to the many students, past and present, who have utilized the microscopes in the Center for High Resolution Electron Microscopy.

1999 MSA PRESIDENTIAL SCHOLARS

N.E. Biery Carnegie Mellon University	B.W. Smith University of Pennsylvania
J.P. Buban University of Illinois–Chicago	J.M. Squirrell University of Wisconsin–Madison
A.D. Davis University of Hawaii—Manoa	W. Tian University of Michigan
E. Kisak University of California–Santa Barbara	C.A. Urbanik University of Central Florida
D.A. Meyer University of Wisconsin—Madison	W. Zhang Purdue University

1999 MSA PROFESSIONAL TECHNICAL STAFF AWARDS

Wen-An Chiou  
Northwestern University  
Department of Materials Science and Engineering

Michael Larsen  
General Electric Company  
Corporate Research and Development

Steven J. Schmitt  
Southern Illinois University at Carbondale  
Center for Electron Microscopy

## MSA DISTINGUISHED SCIENTIST AWARD

### Biological Sciences

1975	Keith Porter
1976	L.L. Marton
1977	Robley Williams
1978	Thomas Anderson
1979	Daniel Pease
1980	George Palade
1981	Sanford Palay
1982	Richard Eakin
1983	Hans Ris
1984	Cecil Hall
1985	Gaston Dupouy
1986	F.O. Schmitt
1987	Marilyn Farquhar
1988	Morris Karnovsky
1989	Don W. Fawcett
1990	Audrey M. Glauert
1991	Hugh E. Huxley
1992	Fritiof Sjöstrand
1993	Jean-Paul Revel
1994	Andrew Somlyo
1995	Shinya Inoué
1996	Myron C. Ledbetter
1997	S. J. Singer
1998	Avril V. Somlyo

### Physical Sciences

1975	Robert Heidenreich
1976	Albert Crewe
1977	James Hillier
1978	V.E. Cosslet
1979	John Cowley
1980	Gareth Thomas
1981	Vladimir Zworykin
1982	Benjamin M. Siegel
1983	Otto Scherzer
1984	Sir Charles Oatley
1985	Ernst Ruska
1986	Peter Hirsch
1987	Jan LePoole
1988	Hatsujiro Hashimoto
1989	Elmar Zeitler
1990	Gertrude F. Rempfer
1991	Archie Howie
1992	Oliver Wells
1993	Ken Smith
1994	Dennis McMullan
1995	David B. Wittry
1996	John Silcox
1997	Peter Swann
1998	Michael J. Whelan

## MSA BURTON MEDALIST

1975	James Lake
1976	Michael Isaacson
1977	Robert Sinclair
1978	David Joy
1979	Norton B. Gilula
1980	John Spence
1981	Barbara Panessa-Warren
1982	Nestor Zaluzec
1983	Ronald Gronsky
1984	David B. Williams
1985	Richard Leapman
1986	J. Murray Gibson

1987	Ronald Milligan
1988	A.D. Romig, Jr.
1989	Laurence D. Marks
1990	W. Mason Skiff
1991	Joseph R. Michael
1992	Kannan Krishnan
1993	Joseph A. N. Zasadzinski
1994	Jan M. Chabala
1995	Joanna L. Batstone
1996	Vinayak P. Dravid
1997	P. M. Ajayan
1998	Ian M. Anderson

MSA DISTINGUISHED SERVICE AWARD

1992	Ronald Anderson	1993	E. Laurence Thurston
	G.W. "Bill" Bailey	1994	Richard F.E. Crang
	Frances Ball	1995	Raymond K. Hart
	Blair Bowers	1996	José A. Mascorro
	Deborah Clayton	1997	William T. Gunning, III
	Joseph Harb	1998	Nestor J. Zaluzec
	Kenneth Lawless		
	Morton Maser		
	Caroline Schooley		
	John H.L. Watson		

MSA OUTSTANDING TECHNOLOGIST AWARD

1993	Ben O. Spurlock	1997	John P. Benedict
1994	Bernard J. Kestel		Stanley J. Klepeis
1995	Kai Chien	1998	Hilton H. Molenhauer
1996	David W. Ackland		Charles J. Echer



## MSA PAST PRESIDENTS

1942	G.L. Clark <sup>1</sup>	1971	Robert M. Fisher
1943	R. Bowling Barnes <sup>2</sup>	1972	Daniel C. Pease
1944	R. Bowling Barnes	1973	Benjamin Siegel
1945	James Hillier	1974	Russell J. Barnett
1946	David Harker	1975	Gareth Thomas
1947	William G. Kinsinger	1976	Etienne de Harven
1948	Perry C. Smith	1977	T.E. Everhart
1949	F.O. Schmitt	1978	Myron Ledbetter
1950	Ralph W.G. Wyckoff	1979	John Silcox
1951	Robley C. Williams	1980	Michael Beer
1952	R.D. Heidenreich	1981	John Hren
1953	Cecil E. Hall	1982	Lee Peachey
1954	Robert G. Picard	1983	David Wittry
1955	Thomas F. Anderson	1984	J. David Robertson
1956	William L. Grube	1985	Dale Johnson
1957	John H.L. Watson	1986	Robert Glaeser
1958	Max Swerdlow	1987	Linn W. Hobbs
1959	John H. Reisner	1988	John-Paul Revel
1960	D. Gordon Sharp	1989	Ray Carpenter
1961	D. Maxwell Teague	1990	Keith R. Porter
1962	Keith R. Porter	1991	Charles Lyman
1963	Charles Schwartz	1992	Patricia Calarco
1964	Sidney S. Breese	1993	Michael S. Isaacson
1965	Virgil G. Peck	1994	Robert R. Cardell
1966	Walter Frajola	1995	Terence E. Mitchell
1967	Joseph J. Comer	1996	Margaret Ann Goldstein
1968	John H. Luft	1997	C. Barry Carter
1969	W.C. Bigelow	1998	Ralph M. Albrecht
1970	Russell Steere		

<sup>1</sup>Chair of committee to arrange first meeting

<sup>2</sup>Temporary (pre-constitution)

1999 MICROBEAM ANALYSIS SOCIETY AWARDS  
PRESIDENTIAL SCIENCE AWARD



ROBERT A. SAREEN

Rob Sareen received a B.Sc and M.Sc from the University of Liverpool where his thesis involved a range of proton and alpha-particle detectors, silicon detectors for low energy x-rays and germanium detectors for gamma-ray measurements. In 1970, he joined Ortec Inc. in Tennessee working on position-sensitive and x-ray detectors.

In 1974, Rob returned to England establishing the detector group at Link Systems Ltd. and becoming Managing Director in 1980 responsible for the acquisitions of Laser Applications, Tennelec and X-Tech. During this period, Link became a leading supplier of x-ray analytical systems; part of this success was attributed to the pioneering of new and improved x-ray detectors.

In 1992, Rob completed a Ph.D. at the University of Manchester on polarisation measurements on gamma rays. In 1994, Rob returned to industry establishing Gresham Scientific Instruments Ltd.

Rob believes his one talent is motivating like-minded people to design, manufacture and sell state of the art detectors and is fortunate to have worked with a number of outstanding contributors to both the understanding and commercialisation of a range of interesting and challenging products.

PRESIDENTIAL SERVICE AWARD



THOMAS G. HUBER

Tom Huber has a long history of service to the Microbeam Analysis Society, serving as MAS Director (1986–1988) and as MAS President in 1993. He has served as the MAS Corporate Liaison for eight years, a position he continues to enjoy. Tom was an advisor to the organizing committee for the 12<sup>th</sup> IFSEM Meeting in Seattle and was a member of the Local Arrangements Committee for the 1992 MSA/MAS meeting in Boston. In addition to his dedicated service to MAS, Tom has also served in various advisory capacities for MSA.

Tom is currently Vice Chairman Emeritus of JEOL where “his hat has hung for 33 years working on the company’s Corporate Culture.”

K.F.J. HEINRICH AWARD



JOHN BRULEY

Dr. John Bruley currently works at IBM’s Microelectronics division where his research activities include the study of local composition, structure and bonding and how these affect properties. He has recently been active in developing methods of analytical microscopy including applications of spectrum imaging to access the nano-scale information at interfaces. Dr. Bruley obtained his Ph.D. from the University of Cambridge for his work on the analytical microscopy of diamond. He was then a post-doc at IBM’s T.J. Watson Research Center, where he made use of high energy-resolution EELS to study diamond-like carbon and silicon-enriched oxide films. Since that time he has held positions in the Max-Planck Institute for Metals Research in Stuttgart and the Materials Science Department at Lehigh University. His key publications have involved the use of EELS to study interfaces and grain boundaries in metal and ceramic systems.

## 1999 MAS DISTINGUISHED SCHOLAR AWARDS

F.M. Alamgir Lehigh University	D.A. Kossakovski California Institute of Technology
T.C. Baroni University of Western Australia	K.W. Kwon Stanford University
C.F. Blanford University of Minnesota	A. Porter Oxford University
J.D. Holbery University of Washington	S.T. Taylor University of California-Berkeley
P. Horny Université de Sherbrooke	M. Toth University of Technology-Sydney

## MAS PRESIDENTIAL AWARDS

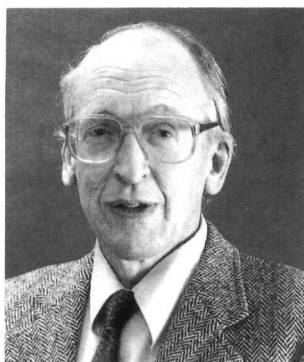
	Science		Service
1977	R. Castaing	1977	P. Lublin
1978	K.F.J. Heinrich	1978	D.R. Beaman
1979	P. Duncumb	1979	M.A. Giles
1980	D.B. Wittry	1980	A.A. Chodos
1981	S.J. Reed	1981	R. Myklebust
1982	R. Shimizu	1982	J. Doyle
1983	J. Philibert	1983	D. Newbury
1984	L.S. Birks	1984	J.I. Goldstein
1985	E. Lifshin	1985	M.C. Finn
1986	R. Myklebust	1986	V. Shull
1987	O.C. Wells	1987	D.C. Joy
1988	J.D. Brown	1988	C.G. Cleaver
1989	J. Hillier	1989	W.F. Chambers
1990	T.E. Everhart	1990	C.E. Fiori
1991	J.I. Goldstein	1991	T.G. Huber
1992	G. Lorimer	1992	E. Etz
	G. Cliff	1993	H.A. Freeman
1993	D.E. Newbury	1994	J.L. Worrall
1994	D.C. Joy	1995	R.W. Linton
1995	G. Bastin	1996	P.F. Hlava
1996	A.V. Somlyo	1997	J.A. Small
	A.P. Somlyo	1998	J.J. McCarthy
1997	D.B. Williams		
1998	F.H. Schamber		

#### MAS K.F.J. HEINRICH AWARDS

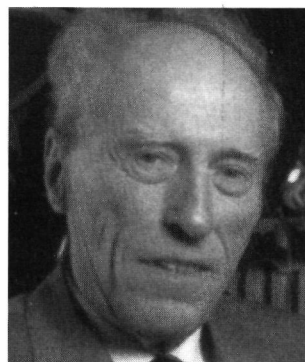
1986	P. Statham	1992	S. Pennycook
1987	J.T. Armstrong	1993	P.E. Russell
1988	D.B. Williams	1994	J.R. Michael
1989	R. Leapman	1995	N. Lewis
1990	R.W. Linton	1997	R. Gauvin
1991	A.D. Romig, Jr.	1998	V.P. Dravid

#### MAS PAST PRESIDENTS

1968	L.S. Birks	1984	D.C. Joy
1969	K.F.J. Heinrich	1985	D.E. Newbury
1970	R.E. Ogilvie	1986	C.G. Cleaver
1971	A.A. Chodos	1987	C. Fiori
1972	K. Keil	1988	W.F. Chambers
1973	D.R. Beaman	1989	D.B. Wittry
1974	P. Lublin	1990	A.D. Romig, Jr.
1975	J.W. Colby	1991	J.T. Armstrong
1976	E. Lifshin	1992	D.B. Williams
1977	J.I. Goldstein	1993	T.G. Huber
1978	J.D. Brown	1994	J. Small
1979	D.F. Kyser	1995	J. McCarthy
1980	O.C. Wells	1996	D.E. Johnson
1981	J.R. Coleman	1997	Joseph R. Michael
1982	R. Myklebust	1998	Ryna B. Marineko
1983	R. Bolon		



ARCHIE HOWIE

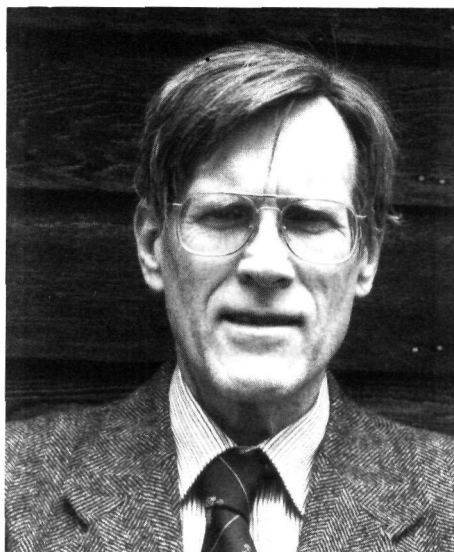


RAIMOND CASTAING

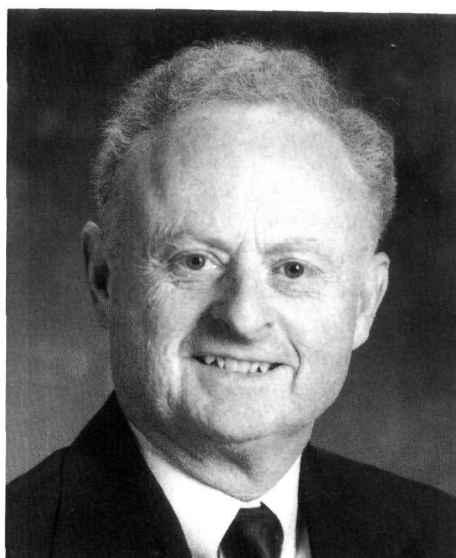
Professor Archie Howie CBE FRS is Professor of Physics, University of Cambridge and a Professorial Fellow of Churchill College, Cambridge. His early education was in Scotland at Kirkcaldy High School and then a first class B.Sc. degree in Physics from the University of Edinburgh. This was followed by an MS (summa cum laude) from the California Institute of Technology and a Ph.D. from the University of Cambridge on the subject of Electron Microscopy of Defects in Deformed Crystals. The development of the Dynamical Theory of Electron Diffraction comes from this period. From 1967 to 1989 Archie led the Metal Physics Research Group at the Cavendish Laboratory, and from 1989 to 1997 he was Head of the Cavendish Laboratory. In 1978 he became a Fellow of the Royal Society and in 1991 he was an EMSA Distinguished Scientist Awardee. In 1998 he was honored with a CBE and in January 1999 Archie became the President of the International Federation of Societies for Electron Microscopy (IFSEM).

Raimond Castaing (Dec. 28, 1921–Apr. 10, 1998) was born in Monaco, entered the Ecole Normale Supérieure in 1940, joined the French resistance during the War, and graduated in 1946 with the highest diploma for teaching the physical sciences. He then became a research engineer at Onera, working for his doctoral thesis under A. Guinier. At a meeting in 1949, they described the first microprobe, built by modifying a transmission electron microscope with electronic lenses. Castaing presented his doctoral thesis at the U. of Paris, *Application des Sondes Electroniques a une Methode d'Analyse Ponctuelle Chimique et Crystallographique*, in 1951. By 1958 two prototype instruments and the first commercial Cameca instrument had been built.

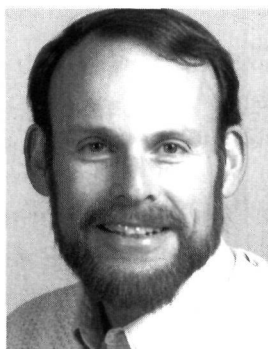
Prof. Castaing held many prestigious posts during his long career including lecturer at the U. of Toulouse (1952–6) and the U. of Paris (1956–9). With Guinier he founded the U. of Paris, Orsay where he became a professor and Director of the Laboratory of Physics of Solids up to his retirement. During this time, he developed the Secondary Ion Mass Spectrometer (SIMS) with Slodzian (1962). Concurrently, he was scientific director and then General Director of Onera (1968–73). He was elected to the French Academy of Sciences (1977) and to the Council of Nuclear Security (1982). He was also a member of the Atomic Energy Committee (1982–7), Administrator of the French Civil Research Organization, the CNRS (1983–9), a member of the Administration Committee of Usinor Steel Company (1984–7), and in 1996 he became President of the Commission on the fast breeder reactor Superphenix.



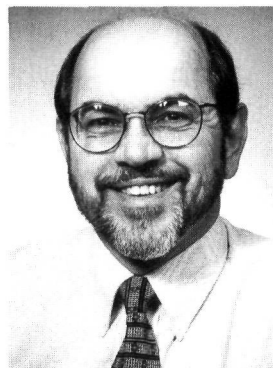
DAVID JOY  
MSA PRESIDENT



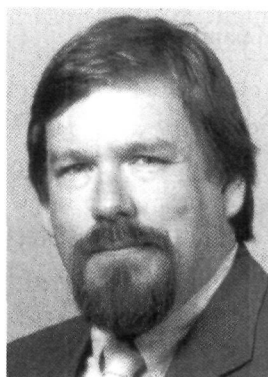
JOHN J. FRIEL  
MAS PRESIDENT



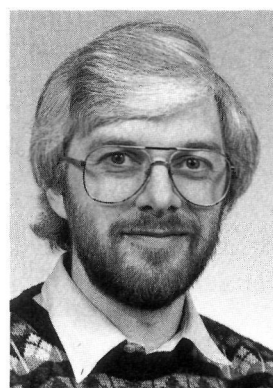
Charles Meshul  
Local Arrangements Chair



Dennis Trune  
Local Arrangements Treasurer



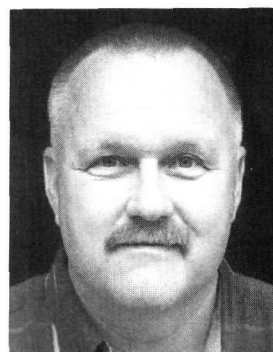
Jay Jerome  
MSA Program Chair



Stuart McKernan  
MSA Program Vice Chair



John Mansfield  
MAS Program Co Chair



Robert L. Price  
MSA Program Vice Chair Elect



MICROSCOPY AND MICROANALYSIS 1999

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John Mansfield, MAS Program Co Chair  
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John Friel	Kurt Sickafus
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Bill Gunning	John Sutliff
Brian Herman	Bryan Tracy
Fred Hossler	Christina Trivett
David Joy	Jim Turner
Ratnesh Lal	David Wokosin
Alois Lametswandtner	Yimei Zhu
Kate Luby-Phelps	

## FOREWORD

David Joy and John Friel  
President MSA and President MAS

This is the third year that the Proceedings of our joint annual meetings have been published as a supplement to our Journal "Microscopy and Microanalysis." The handsome volume that you now hold in your hand contains the full scientific content of Microscopy and Microanalysis '99, which serves both as a reference during the meeting and as a permanent archive.

Because the meeting and the Proceedings are a joint MSA/MAS effort under the direction of a single Program Committee, and a single Local Arrangements Committee, and are published as a single Proceedings, the strengths of our two societies have been combined to maximize the benefits to all our members and guests.

We wish to congratulate the Program Committee chaired by Jay Jerome and the Local Arrangements Committee chaired by Charles Meshul for their hard work in making this an outstanding meeting. Jay and co-chairs Stuart McKernan (MSA), and John Mansfield (MAS), have worked extremely hard during the past two years arranging sessions, speakers, pre-meeting workshops, and tutorials. The result is a comprehensive and wide-ranging program of platform and poster symposia complemented by a number of special offerings. Some of these include a special pre-meeting symposium on "Optical Microscopy in the Next Millenium" organized by Brian Herman, and a comprehensive series of pre-meeting short courses organized by Brian Herman and Louis Kerr. A special MAS Symposium organized by Ryna Marinenko and Jim McGee entitled "50 Years of Electron Probe Microanalysis" will be held in memory of Prof. Raimond Casting. Other highlights include a Symposium in honor of Dr. Archie Howie, the computer workshop presented by Nestor Zaluzec and John Mansfield, and the programs of the Tech Forum arranged by Bev Maleef.

The LAC under Charles Meshul has been equally effective and instrumental to the success of the meeting in arranging for a world class meeting site, some exciting social events, hotels, and even a post-conference cruise. The Microscopy and Microanalysis Meeting has been managed by the Rebedeau Group headed by Mary Beth Rebedeau in close conjunction with both the LAC and the Program Committee to ensure a streamlined production process and an outstanding exhibit and trade show.

Our thanks are due to Bill Bailey, the MSA Proceedings Editor, who over the years has been responsible for these first class Proceedings and whose tireless attention to detail keeps everything and everybody on schedule. We also wish to express our appreciation to Herb Niemirow and the extremely competent and professional staff at Springer-Verlag for their attentive efforts in publishing our journal and these Proceedings.

These 1999 Proceedings are respectfully dedicated to Dr. John Watson who was not only a Charter member of (E)MSA but who also conceived the first Proceedings for our 25th Anniversary Meeting. John is a past president of (E)MSA, and he has also been the MSA Placement Officer for many years. We are proud to take this opportunity to honor his lifetime of service and commitment to our field.

We also extend our hearty congratulations to the MSA and MAS award winners. Sir Aaron Klug and Takeo Ichinokawa have been selected as recipients for the MSA Distinguished Scientist Awards in the Biological and Physical Sciences, respectively. Z.L. Wang is the MSA Burton Medalist, and Charles Lyman is the recipient of the MSA Morton D Maser Distinguished Service Award. The MSA Outstanding Technologist Awards go to John Wheatley and John Basgen for the Physical and Life Sciences respectively. The MAS Presidential Science Award winner is Rob Sareen and the recipient of the MAS Service Award is Tom Huber. This year the Heinrich Award will be given to John Bruley.

Portland is a beautiful and vibrant city with great natural beauty, outstanding restaurants and shops, and some unique attractions. We thank the City of Portland for their warm hospitality and all of the organizers and participants for making M & M 99 the premier event in the world of microscopy. We now look forward to Philadelphia, the site of Microscopy and Microanalysis 2000.



## TITLES AND ORDER OF SESSIONS

### PRESIDENTIAL HAPPENINGS

Scanning Electron Microscopy And Electron Probe Microanalysis Of Extraterrestrial Materials— J. I. Goldstein .....	2
---	---

### SHARED RESOURCES AND USER FACILITIES: ACCESS TO INSTRUMENTATION

Implementation Of A Digital Microscopy Teaching Environment—M. De Graef, N. T. Nuhfer, N. J. Cleary .....	4
Microscopy, Electron Microscopy, Elemental Analysis, Image Analysis, Digital Photography, And Telepathology Applications In Pharmaceuticals Research—G. Argenterii, P. Grosenstein, K. K. Killary .....	6
The High Temperature Materials Laboratory: A National Facility For Advanced Materials Characterization— L. F. Allard, T. Nolan, A. Pasto .....	8
The NC State Analytical Instrumentation Facility—J. R. Phillips, D. Griffis, P. Russell .....	10
Museum Applications For Scanning Electron Microscopy: From Mollusks To Meteorites—A. V. Klaus, W. Barnett .....	12
OLIS: On-Line Image Simulation And Structural Characterization For The Materials Microcharacterization Collaboratory—M. A. O'keefe, J. R. Taylor .....	14

### MAGNETIC IMAGING AND ITS APPLICATION TO MATERIALS

Switching Behaviour Of Sub-Micron Magnetic Elements Studied By TEM—J. N. Chapman, K. J. Kirk, M. Herrmann, S. McVitie, M. R. Scheinfein .....	16
Magnetic Domain Wall-Microstructure Interactions In Low-Carbon Steel—V. Radmilovic, K. M. Krishnan ...	18
In Situ TEM Dynamic Magnetizing Experiments Used To Identify The Pinning Centers In Hard Magnets RE <sub>13.75</sub> Fe <sub>80.25</sub> B <sub>6</sub> (RE=Nd, Pr)—V. V. Volkov, Y. Zhu .....	20
Recent Advances In Magnetic Force Microscopy: Imaging In The Presence Of External Fields—R. D. Gomez ..	22
Magnetism And Microstructure: Advances In Electron-Optical Characterization—K. M. Krishnan .....	24
Microstructure Of Fe-Nd-B Alloys Tailored To Approach Theoretical Coercivity Limits—K. M. Krishnan, E. Girt, E. C. Nelson, G. Thomas, F. Hofer .....	26
Magnetic Imaging Of Recording Media—R. Sinclair, K. Tang .....	28
Lorentz Microscopy Of Magnetic Fine Particles—T. Tanji, N. Aoyama, K. Yamamoto, T. Hirayama .....	30
Quantitative Electron Holography Of Magnetic Materials—M. R. McCartney .....	32
Phase Contrast Of Magnetic Cobalt Spheres—M. De Graef, N. T. Nuhfer, M. R. McCartney .....	34
Micromagnetic Simulations Of Domain Structures In Thin Films And Bulk Hard Magnets—Z.-X. Cai, Y. Zhu .....	36

Lorentz And Interference Electron Microscopy On Scanning TEM—Y. Yajima, Y. Takahashi . . . . .	38
Scanning Electron Microscopy With Polarization Analysis (SEMPA) Investigations Of Multilayer Magnetism— J. Unguris, R. J. Celotta, D. T. Pierce . . . . .	40
High Coercivity Mechanism Of The Die—Upset Hard Magnets RE <sub>13.75</sub> Fe <sub>80.25</sub> B <sub>6</sub> (RE=Nd, Pr). Possible Relation To Specific Defect Microstructure—V. Volkov, Y. Zhu . . . . .	42
Magnetic Force Microscopy Of Shape Memory Alloys: Identifying Two Magnetic Patterns—B. R. A. Neves, M. Andrade . . . . .	44
Magnetic Field Calibration Of The Novel JEOL 3000 FEG Electron Microscope. Application To Studies Of Hard Magnets Nd-Fe-B—V. V. Volkov, D. Crew, Y. Zhu, L. H. Lewis . . . . .	46

### OPTICAL MICROANALYSIS VIA MOLECULAR SPECTROSCOPY

Semiconductor Defects And Thin Films Characteriazation By High-Resolution Images And By Virbrational Spectroscopy—G. Conti, Y. S. Utirsky, C. R. Brundle, J. Xu . . . . .	48
Micro-Raman Spectroscopy In The Characterization Of Biomedical Materials—F. K. Huang . . . . .	50
The Use Of Encoder To Improve Both The Spectral And Spatial Precision In Raman Microscope Mapping Experiments—A. Whitley, B. Bennett, B. Smith . . . . .	52
Raman Microscopy As A New Failure Analysis Tool In The Thermal Inkjet Cartridge Industry— L. L. Hammond . . . . .	54
Semiconductor Thin Film Characterization Via Raman Microprobe Spectroscopy: Analysis At The Process Line—H. E. Gotts . . . . .	56
Relative Raman Intensity Calibration Through Flouorescent Glass Standards—E. S. Etz, W. Hurst, S. Choquette, D. Blackburn . . . . .	58
Evaluation Of Diseased State In Human Tissue Sections Using Infrared And Raman Imaging Microspectroscopy—E. Lewis, A. S. Haka, P. Colarusso, I. W. Levin, J. Gillespie, L. H. Kidder . . . . .	60
Infrared Microscopy As A Failure Analysis Tool In The Thermal Inkjet Cartridge Industry—M. W. Tungol . . .	62
In Situ Identification Of Automotive Paint Organic Pigments Using Infrared Microspectroscopy And Spectral Subtractions—E. M. Suzuki . . . . .	64
Attenuated Total Internal Reflection Infrared Microspectroscopy For The Analysis Of Trace Contaminants In Aqueous Solutions—A. J. Sommer, M. Hardgrove . . . . .	66
A Method For Analysis Of Clinical Tissue Samples Using FT-IR Microspectroscopic Imaging—G. M. Story, C. Marcott, R. Dukor . . . . .	68
Infrared Imaging; Performance And Applications Of An FT-IR Based Imaging System—N. A. Wright, P. Bhandare, E. Jiang . . . . .	70

### QUANTITATIVE X-RAY MICROANALYSIS

A New Model For Electron Probe Quantification—J. J. Donovan, N. Pingitore, R. Jeanloz . . . . .	72
Quantitative Electron Microprobe Analysis Of Semiconductor Materials: An Evaluation Of Accuracy— P. K. Carpenter . . . . .	74

Alternate Technique To Measure $\phi(\rho\zeta)$ Curves Of Insulator Or Compound—D. Drouin, C. Nockolds . . . . .	76
Measurement And Simulation Of X-Ray Emission From Multilayered Structures In Electron Probe Microanalysis—C. Merlet, X. Llovet, F. Salvat . . . . .	78
Parallel Monte Carlo Simulation Using Desktop Computers—J. H. Scott, R. R. Myklebust, D. Newbury . . . . .	80
Monte Carlo Simulation Of X-Ray Spectra In Absolute Units In The Energy Regime Between 1 And 50 keV— C. O. Schiebl, V. Ambrose, J. Wernisch . . . . .	82
The Disputed Discovery Of Element 43: A Re-Examination Of An Elegant Early Use Of Wavelength- Dispersive X-Ray Microanalysis—J. T. Armstrong, P. H. Van Assche . . . . .	84
Precision In X-Ray Data Computed By Monte Carlo Calculations—E. Lifshin, A. Linsebigler, R. Gauvin . . . . .	86
The New Form Of The Zeta-Factor Method For Quantitative Microanalysis In AEM-XEDS And Its Evaluation—M. Watanabe, D. Williams . . . . .	88
Compound Standards For Light Element Eds In AEM, SEM And LVSEM—E. D. BOYES . . . . .	90
Characterization By Scanning Electron Microscopy And Energy Dispersive X-Ray Spectroscopy Of Solid Solution Single Crystals Grown On Earth And In Microgravity—J. C. Cochrane, P. Carpenter, D. Gillies . . . . .	92

### ATOMIC STRUCTURE AND MICROCHEMISTRY OF INTERFACES

Structure And Composition Of Grain Boundaries In SrTiO <sub>3</sub> —M. Rühle, O. Kienzle, F. Ernst . . . . .	94
Multiprobe Studies Of Interfaces In Complex Crystals Using Advanced Electron Microscopy—Y. Zhu, L. Wu, V. Volkov . . . . .	96
Interfaces In Glass-Containing Ceramics—C. B. Carter, N. Ravishankar, C. Korte, M. Mallamaci . . . . .	98
Dynamics Of Grain Boundary Space-Charge Potential In Electroceramics—V. P. Dravid, K. D. Johnson . . . . .	100
Mapping The Valence States Of Transition Metals Across Interfaces By Energy-Filtered TEM—Z. L. Wang, J. Bentley, N. Evans . . . . .	102
Effect Of The Substrate Surface Termination On The Structure Of The Bi <sub>4</sub> Ti <sub>3</sub> O <sub>12</sub> /SrTiO <sub>3</sub> Interface— J. C. Jiang, W. Tian, C. Theis, D. Schlom, X. Pan . . . . .	104
Atomic Scale Characterization Of Interfaces And Defects In Non-Stoichiometric Multicomponent Oxides— S. Stemmer, S. K. Streiffer, A. Sane, T. J. Mazanec, N. D. Browning . . . . .	106
HREM Of General And Twist Grain Boundaries—K. L. Merkle, L. Thompson . . . . .	108
The Origin Of Electrical Activity At Grain Boundaries In Perovskites—M. Kim, N. Browning, S. J. Pennycook, K. Sohlberg, S. Pantelides . . . . .	110
Structural Determination Of A Novel Defect In SrBi <sub>2</sub> Ta <sub>2</sub> O <sub>9</sub> Using Atomic-Resolution Z-Contrast Imaging— Y. Yan, Z. Xu, X. Lu, D. Viehland, M. Al-Jassim, S. Pennycook . . . . .	112
Atomic Structure Of Epitaxial Thin Films Of The Sr <sub>n</sub> +1Ti <sub>n</sub> O <sub>3n+1</sub> Ruddlesden-Popper Homologous Series— W. Tian, J. C. Jiang, X. Q. Pan, J. H. Haeni, D. G. Schlom . . . . .	114
3D Mapping Of Light-Element Segregation In 316 Stainless Steel By Atom Probe—T. F. Kelly, D. Larson, M. Miller, J. Flinn . . . . .	116
Atom Probe Tomography Of Interfaces—M. K. Miller . . . . .	118
How Small Is Too Small? Understanding The Electronic Structure Of Atomic-Scale Transistors—D. A. Muller, T. Sorsch, S. Moccio, F. Baumann, K. K. Evans-Lutterodt, G. Timp . . . . .	120
The Si/SiO <sub>2</sub> Interface: Atomic Structures, Composition, Strain And Energetics—S. J. Pennycook . . . . .	122

Characterization Of SiO <sub>2</sub> /Si Interface Using Secondary Ion Mass Spectrometry (SIMS) And Laser Post-Ionization Sputtered Neutral Mass Spectrometry (SNMS)—S.-I. Hayashi, K. Yanagihara . . . . .	124
A STEM Study Of A Germanium Island-Silicon Interface—R. R. Vanfleet, D. Basile, T. Kamins, R. Williams, J. Silcox . . . . .	126
Characterization Of Bonding At The Ni-SiO <sub>2</sub> Interface Using Electron Energy-Loss Spectrometry—S. T. Taylor, R. Gronsky . . . . .	128
Microstructure Of TiN Ohmic Contacts On n-GaN—R.-J. Liu, R. W. Carpenter, M. J. Kim . . . . .	130
In Situ UHV-TEM Oxidation And Reduction Of Metals—J. C. Yang, M. Yeadon, B. Kolasa, J. M. Gibson . . . . .	132
TEM Investigation Of Precipitate Shapes And New Interface Phenomena In Al-Pb Alloys—U. Dahmen, E. Johnson . . . . .	134
Segregation In CoCrPtTa/Cr Magnetic Recording Media Measured By EFTEM—J. Bentley, J. Wittig, T. Nolan . . . . .	136
EXELFS As A Tool For Investigating The Local Structure Of Bulk Glass-Forming Metallic Alloys—F. M. Alamgir, Y. Ito, D. Williams, H. Jain . . . . .	138
Dynamic Interfaces In Carbon Nanostructures—P. M. Ajayan, F. Banhart . . . . .	140
Study Of Single-Wall Carbon Nanotube-Supported Platinum Catalyst For Selective Hydrogenation Of The Carbonyl Function On An $\alpha,\beta$ -Unsaturated Aldehyde—V. Lordi, N. Yao, J. Wei . . . . .	142
Direct Observation Of Iodine Atomic Chains In I-Doped Carbon Nanotubes—X. Fan, E. Dickey, S. Pennycook, L. Grigorian, P. Eklund, R. Buczko, S. Pantelides . . . . .	144
Quantification Of Segregation Levels Using XEDS In The STEM—V. J. Keast, D. B. Williams . . . . .	146
Conservation Of $\sqrt{3} \times \sqrt{3}$ Superstructure At Ag/Si(111)- $\sqrt{3} \times \sqrt{3}$ -R30-Ag Interface Observed By UHV-TEM—Y. Oshima, S. Sigeki, H. Hirayama, K. Takayanagi . . . . .	148
Atom Probe Field Ion Microscopy Of Multilayer Thin Films—D. J. Larson, A. Petford-Long, A. Cerezo, T. Anthony, M. Miller . . . . .	150
Complex Layer Stacking In Muscovite: A HRTEM Study—C. Ma, G. Rossman . . . . .	152
Boundary Analysis Of SrTiO <sub>3</sub> Ceramic Condenser—M. Kawasaki, T. Yoshioka, S. Sato, K. Watanabe, M. Shiojiri . . . . .	154
The Intrinsic Formation Of Localized Electronic States At [001] Tilt Grain Boundaries In Ybco And Their Effect On J <sub>c</sub> —J. P. Buban, N. Browning . . . . .	156
Microstructural Characterization Of The Pd-Ge Ohmic Contact On GaAs By Cross-Sectional Transmission Electron Microscopy (TEM)—F. Radulescu, J. M. McCarthy . . . . .	158
Measurement Of Interfacial Segregation In Aluminum-Magnesium Alloys Using A FEG-TEM And EDS—J. S. Vetrano, C. Henager . . . . .	160
A TEM Investigation Of Nanoparticle Contact—Y. Yao, A. R. Thölen . . . . .	162
Interfacial And Surface Study Of Mo-Au And Al-Ag Bilayers For Si-Based Photodetectors—M. J. Li, S. Aslam, T. C. Chen, F. M. Finkbeiner, C. He, R. L. Kelley, D. B. Mott, C. K. Stahle, C. M. Stahle, L. Wang . . . . .	164
On The Formation Of Diffusion Layer Between Cr Film And Glass—N. Jiang, J. Silcox . . . . .	166
Al Compositional Profile In AlGaAs/GaAs Quantum Wells—D. Cai, J. Zou, D. Cockayne . . . . .	168
Transmission Electron Microscopic Study Of Heteroepitaxial Mechanism Of Cvd-Diamond Grown On Pt(111) Substrate—G. Zhou, Y. Takai, R. Shimizu . . . . .	170
Statistical Assessment Of Experimental Uncertainty In The Quantitative Analysis Of Strong-Beam Alpha-Fringe Contrast—D. Cohen, C. B. Carter . . . . .	172

Composition Distribution In Laterally Modulated InAlAs Films—R. D. Twisten, D. D. Follstaedt, J. Mirecki Millunchick, S. Lee, A. Norman, S. Arenkiel, J. Reno, E. Jones, A. Mascarenhas, Y. Zhang . . . . .	174
Thermal Stability Of Copper/Tantalum Interfaces In Advanced Microelectronic Metallization—K.-W. Kwon, H.-J. Lee, R. Sinclair . . . . .	176

## HIGH RESOLUTION ELECTRON MICROSCOPY

Determination Of Coherency Strains Around Coherent Precipitates In Ni-Al Alloys By Quantitative HREM And CBED Techniques—H. A. Calderon, B. C. Kisielowski, W. C. W. J. Chen, C. J. J. Cruz, C. L. Calzado . . . . .	178
Structure Determination Of The Al <sub>2</sub> CuMg Intermetallic Phase—V. Radmilovic, R. Kilaas, U. Dahmen . . . . .	180
Encapsulated Fullerenes Within Single Wall Carbon Nanotubes—B. Smith, D. E. Luzzi . . . . .	182
Mesostructure Of Pd And Pt Nanoclusters Chemically Stabilized With Phosphide And Phenanthroline Ligands: HRTEM And AEM Characterization—V. P. Oleshko, P. Crozier, N. Schryvers, M. Vargaftik . . . . .	184
400 KV Electron Cryo-Microscopic Imaging Of Large Icosahedral Viruses Towards Atomic Resolution— J. Jakana, W. Chiu . . . . .	186
The 3D Parameters Of A (Nano)Crystal From Lattice Images At Two Tilts—W. Qin, H. Siriwardane, P. Fraundorf . . . . .	188
Morphological Variations Of Nano-Scale Powder And Deposits Of AlN Produced By Vapor Phase Synthesis— B. C. Di Iello, F. J. Moura, I. G. Solórzano . . . . .	190
Atomic-Resolution Z-Contrast Imaging Of Decagonal Quasicrystals: A Nucleation And Growth Mechanism— Y. Yan, S. Pennycook . . . . .	192
Self-Assembling Of Ordered Mesoporous Titania Nanostructures—J. Yin, Z. L. Wang . . . . .	194
The Measurement Of Subtle Structural Changes In YBa <sub>2</sub> Cu <sub>3</sub> O <sub>7-x</sub> By Processing High Resolution TEM Images—J. C. Barry, J. Alarco . . . . .	196
Image Simulation Of Solid Xe Layers At An Interface Of A Liquid Xe Inclusion And An Al Matrix—T. Fujii, U. Dahmen, E. Johnson, R. Birtcher, S. Donnelly, C. Allen . . . . .	198
Image Simulation Of Small Pt Particles And Its Application To Lattice Spacing Measurements In Catalysts— S.-C. Tsen, P. Crozier, C. Lopez Cartes, J. Liu, J. Calvino . . . . .	200

## ELECTRON DIFFRACTION IN THE TEM

On-Line Semi-Automatic Measurement Of Individual Crystal Orientations In Heavily Deformed Materials— S. Zaefferer . . . . .	202
Orientation Imaging Microscopy In The TEM—P. Baggethun, H. Weiland . . . . .	204
A UHV Diffraction Camera With Energy Filter For Convergent Beam RHEED And TED—U. J. Weierstall, J. M. Zuo, T. Kjorsvik, J. C. H. Spence . . . . .	206
CBED Investigations Of Mesoscopic Semiconductor Structures—H. Lakner, F. Schulze-Kraasch, C. Mendorf, G. Brockt . . . . .	208
Calculation Of Absorptive Potentials Using Debye's Model Of Lattice Dynamics—G. R. Anstis . . . . .	210



Soft Phonons And Anti-Phase Domains In SrTiO <sub>3</sub> : An Electron Diffuse Scattering Study—R. Wang, Y. Zhu . . .	212
New Applications Of Electron Diffraction In Pharmaceutical Industry: Polymorph Determination Of GP IIb/IIIa Antagonist, Roxifiban, Using A Combination Of Electron Diffraction And Synchrotron X-Ray Powder Diffraction Techniques—Z. G. Li, R. Harlow, C. Foris, H. Li, P. Ma, R. Vickery, M. Maurin . . . . .	214
Electron Spectroscopic Imaging (ESI) Of Viral DNA- And RNA-Distribution Using A New Method Of Background Subtraction—C. Crucifix, J. Witz, P. Schultz, M. Pawlita, M. F. Trendelenburg, W. Probst, A. Haking, H. Troester . . . . .	216
Microtextural Characterization And Orientational Mapping Of Polycrystalline Thin Films Using TEM Dark Field Imaging Through An Annular Objective Aperture—M. J. Williamson, R. Hull, D. Dunn, J. Greene, S. Kodambaka . . . . .	218

### ELECTRON DIFFRACTION IN THE SEM: AUTOMATED EBSP AND ITS APPLICATION

Phase Identification Using EBSD. In The SEM:What Can Be Done Today And What We Hope To Do Tomorrow—J. R. Michael . . . . .	220
Investigation Of Low Symmetry Crystals Using Electron Backscatter Diffraction—D. J. Dingley . . . . .	222
Texture Determination Of Ceramic Materials By EBSD—F. Cosandey, P. Raj, W. Cannon . . . . .	224
Phase Identification Of Individual Particles By Electron Backscatter Diffraction (EBSD)—J. A. Small, J. R. Michael . . . . .	226
Texture Analysis Of Earth Materials, Comparison Of EBSD With Other Diffraction Techniques—H.-R. Wenk . . . . .	228
Extraction Of Grain Boundary Properties From Triple Junction Geometry Using EBSP—A. D. Rollett . . . . .	230
Grain Subdivision During Deformation Studied By Automated EBSP—D. Juul Jensen . . . . .	232
Characterization And Representation Of Crystallographic Texture Fields In Processed Alloys—M. P. Miller, T. Turner, J. Sutliff . . . . .	234
An Investigation Of Plastic Strain In Copper By Automated-EBSP—J. A. Sutliff . . . . .	236
A Study On The Characteristics Of The Boundaries In Low Alloy Bainitic Steels By Using Electron Back-Scatter Diffraction (EBSD) Technique—Y.-J. Oh, M.-C. Kim, J.-H. Hong . . . . .	238
EBSD with FEGSEM-Issues, Advances And Applications—F. J. Humphreys, I. Brough . . . . .	240
Development Of BKD Hardware: Accomplishments And opportunities—R. A. Schwarzer . . . . .	242
A Low Cost EBSP System: Implementation And Application—X. Pierron . . . . .	244
Adaptive Orientation Imaging Microscopy—W. Yang, C.-T. Wu, B. L. Adams, M. De Graef . . . . .	246
Grain Size Analysis Using Automated-EBSP—J. A. Sutliff . . . . .	248
Choosing An Electron Backscattering Pattern (EBSP) System.—J. A. Eades . . . . .	250
Investigation Of $\gamma/\gamma'$ Alloy By Simultaneous Eds And EBSP Analysis—J. A. Sutliff, S. D. Sitzman . . . . .	252
Epitaxial Orientation Determination Of Nanosized Particles By EBSD—F. Cosandey, L. Zhang, T. Madey . . . . .	254
Crystallographic Characterization Of Sputter Deposited Nb-Cu Thin Film Using Electron Backscatter Diffracted Patterns—R. Loloee, W. Pratt, M. Crimp . . . . .	256
Creep Deformation Microstructures In DS Nb-Hf-Ti-Si In-Situ Composites—S. D. Sitzman, B. Bewlay . . . . .	258
Mapping The Mesoscale Interface Structure In Polycrystalline Materials—C.-T. Wu, B. L. Adams, C. L. Bauer, D. Casasent, A. Morawiec, S. Ozdemir, A. Talukder . . . . .	260

Electron Backscatter Diffraction. Characterization Of Polyphase Materials—A. Medevielle, I. Hugon, O. Dugne .....	262
Orientation Relationships And Constituent Phases Determined By Electron Backscatter Diffraction—J. Gui, X. Chen, J. Liu, J. Wang, R. Wang .....	264
Comparison Of Environmental Secondary Electron Detector (ESD) Imaging And Electron Diffraction Mapping Of A Nickel Tape Using The Environmental Scanning Electron Microscope (ESEM)—R. E. Goddard, Y. Hascicek .....	266

### ENVIRONMENTAL SCANNING ELECTRON MICROSCOPY AND OTHER WET WORK

Recent Advances In Gaseous Detection Modes In The ESEM—T. A. Hardt, R. Knowles .....	268
Spatial Correlation Of Elemental Impurities And Charge Contrast Image Detail In Gibbsite—T. C. Baroni, B. J. Griffin, F. Lincoln .....	270
Review Of Electron-Gas Interactions In The Environmental SEM—B. L. Thiel .....	272
Contrast Formation Mechanisms In The Environmental Scanning Electron Microscope—M. R. Toth, M. R. Phillips .....	274
Irradiation Induced Effects In The Environmental Scanning Electron Microscope—M. A. Stevens Kalceff .....	276
Advances In Environmental Scanning Electron Microscopy: Semiconductor/Thin Film Applications, Cathodoluminescence (CL) Spectroscopy, And Detector Quantum Efficiency (DQE) Comparisons.— B. J. Griffin, J. Browne, D. Drouin, D. Scharf .....	278
Effects Of Scan Rate And Electron Dose On The Secondary Electron Contrast Of Liquids In Environmental SEM (ESEM)—D. J. Stokes, B. L. Thiel, A. M. Donald .....	280
Secondary Electron Yield Curve For Liquid Water—B. L. Thiel, D. Stokes, D. Phifer .....	282
3D Reconstructions Using Charge Contrast Imaging—T. C. Baroni, B. J. Griffin, F. Lincoln .....	284
Environmental SEM In A Multi-User Biological Sciences E.M. Unit—C. J. Gilpin, M. S. Baguneid .....	286
ESEM Imaging Of p-n Junctions Using A Gaseous Secondary Electron Detector—M. R. Phillips, M. Toth, D. Drouin .....	288
What Do We Need To Look Out For When Doing EDS In The ESEM—S. Wight .....	290
Evaluation Of The Variable Correction Technique For X-Ray Microanalysis In The ESEM—R. A. Carlton, C. Lyman, J. Roberts .....	292
A Novel Technique For Probe Intensity Profile Characterisation In The Environmental Scanning Electron Microscope—M. R. Phillips, M. R. Toth, D. Drouin .....	294
The Computation Of The skirt In VP-SEM or ESEM With Monte Carlo Simulations—R. Gauvin, P. Hovington .....	296
Accuracy Of Spatial Measurements At Elevated Temperatures In An Environmental Scanning Electron Microscope—R. L. Schalek, L. Drzal .....	298
Environmental SEM Study Of Sodium Alginate Beads—J. F. Mansfield, P. Eiselt, J. Yeh, D. Mooney .....	300

### LOW VOLTAGE (1–5 KV) X-RAY MICROANALYSIS

Physical Considerations In Low Energy Biological Analysis—D. C. Joy .....	302
---	-----

Microcalorimeter Energy Dispersive Spectrometry For Low Voltage SEM—D. A Wollman, D. Newbury, G. Hilton, K. Irwin, D. Rudman, L. Dulcie, N Bergren, J. Martinis .....	304
Low Voltage Microanalysis And Imaging: Opportunities And Limitations Of High-resolution Analysis In FE-SEM Instruments—J. Liu .....	306
On The Microanalysis Of Small Precipitates At Low Voltage With A FE-SEM—R. Gauvin, P. Hovington .....	308
High Spatial Resolution Low Energy Electron Beam X-Ray Microanalysis—I. R. Barkshire, P. Karduck, W. Rehbach, S. Richter .....	310
Low Voltage ED-X-Ray Microanalysis Of Bulk Organic Materials—P. Echlin .....	312
LVEDS For Advanced Materials And Semiconductor Technologies—E. D. Boyes .....	314
On The Contrast Of Precipitates Observed With A FE-SEM—R. Gauvin, P. Hovington .....	316
Quantitative Chemical Mapping With Low-Voltage EDS Spectrum Imaging And Multivariate Statistical Analysis (MSA)—I. M. Anderson .....	318

### SCANNING ELECTRON MICROSCOPY

NetSEM Collaborator—An Application In Telemicroscopy—B. C. Breton, G. Chand, P. Howard, N. Caldwell, D. Holburn .....	320
A Miniature Low Voltage SEM With High Resolution—J. M. Krans, T. L. van Rooy .....	322
Imaging Self-Assembled Monolayers: A Comparative Study Between AFM And Field-Emission SEM— P. E. Russell, B. Neves, M. Salmon, E. Troughton .....	324
Thermophile Endospores Have Responsive Exosporium For Attachment—B. Panessa-Warren, G. Tortora, J. Warren, R. Sabatini .....	326
Scanning Electron Microscopic Analysis Of Fossil Bone (Mosasaurs) From Marine Deposits Of Upper Cretaceous Of North America—M. A. Sheldon .....	328

### IN-SITU MICROSCOPY TECHNIQUES

In-Situ Shape Transformation And Melting Of Platinum Nanocrystals—Z. L. Wang, J. Petroski, T. Green, M. A. El-Sayed .....	330
Removal Of Contamination Deposits From Defects On Thin Film Magnetic Disks By Oxidative Cleaning Inside The SEM—S. A. Myers, R. Vane .....	332
Displacement Mapping During In-Situ Straining In The SEM—N. E. Biery, T. M. Pollock, N. T. Nuhfer, M. De Graef .....	334
In-Situ HREM Observation Of Reduction Of PdO To Pd Metal—P. A. Crozier, A. Datye .....	336
Nondestructive Imaging Of Pin-Mounted Museum Insect Specimens Using The Field-Emission Environmental Scanning Electron Microscope (ESEM-FEG)—S. J. Robinson, B. McNeill, M. Irwin .....	338
In Situ TEM Study Of DNA/Gold Nanoparticles In Liquid Environment—W.-A. Chiou, R. Mucic, A. Ishikawa, H. Konishi, K. Fukushima, C. Mirkin .....	340

## ADVANCES IN INSTRUMENTATION

TECNAI: The Concept For Modern TEM/STEM Analytical Systems—K. Nadarzynski	342
Omega Filter Design For A 200kV TEM—K. Tsuno, T. T. Kaneyama, T. Honda, Y. Ishida, E. Munro, J. Rouse	344
Modification Of An Energy Filtering Transmission Electron Microscope For Low Energy Loss Imaging And Chromophore Mapping—J. A. Davis, Y. M. Heng, M. M. G. Barfels, F. P. Ottensmeyer	346
Improving The Positional Accuracy Of The Goniometer On The Philips CM200 TEM—J. Pulokas, C. Green, N. Kisseberth, C. S. Potter, B. Carragher	348
New Slow-Scan CCD. Cameras (SSC) With Frame/Interline CCD. Architecture Avoid TEM Shutter Control, Provide Excellent Image Quality And Can Be Easily Retrofitted—S. A. Hiller, W. Probst, V. Seybold, E. Zellmann	350
Tomography On Point Projection X-Ray Microscope Using CCD Images—S. P. Newberry	352
Micro X-Ray Fluorescence Of Particles Using A Laboratory X-Ray Source And Capillary Optics—J. R. Swider, T. Jach, E. Steel	354
Design Of A Photoelectron Microscope For Integrated Circuits And Other Areas Of Surface Science— G. F. F. Rempfer, O. H. Griffith	356
Evaluation Of Low Noise Objective Lense For Detection Of Weak Fluorescence—Y. Nakano, I. Sase	358
Parallel Auger Spectroscopy With The Hyperbolic Field Analyser—M. Jacka, M. Kirk, M. El Gomati, M. Prutton	360

## ADVANCES IN DIGITAL IMAGING

Digital Holographic Microscopy—T. Zhang, I. Yamaguchi, H. Morgan	362
Multiport-Readout Frame-Transfer 5 Megapixel CCD. Digital System For IVEM Applications—G. Fan, S. Peltier, S. Lamont, S. Young, D. Dunkelberger, M. Ellisman	364
Digital Stereo Display And Projection Systems—G. N. Case, J. M. Mackenzie, Jr.	366
Real-Time Full Motion Stereo Microscopy Over Internet—G. Case, M. A. Vouk, J. M. Mackenzie, Jr.	368
A Stacked CMOS Active Pixel Image Sensor For Charge Particle Detection And The Application To SIMS— H. Yurimoto, K. Nagashima, T. Kunihiro, I. Takayanagi, J. Nakamura, K. Kosaka	370
Image Analysis: Converting From Manual To Automated Metrology—S. Cooper, E. Saul, J. A. Hunt	372
3-D. Reconstruction Of Thick IVEM Samples Using Tuned Aperture Computed Tomography—W. G. Jerome, K. Grant, A. M. Al Gailany, P. G. Yancey, W. Betterman, R. Webber	374
Automated Acquisition Of Cryo Electron Micrographs Using Legikon—B. O. Carragher, N. Jojic, R. A. Milligan, N. Kisseberth, J. Pulokas, C. S. Potter, A. Reilein	376

## BIOMATERIALS

Development Of Cartilage And Bone During Formation Of Phalanges By Tissue Engineering—W. J. Landis, N. Isogai, J. Vacanti	378
--	-----

Novel High Resolution Measurement Of Bone Mineralite Size And Shape—S. J. Eppell, W. Tong, J. L. Katz, L. Kuhn-Spearing, M. J. Glimcher .....	380
Fabrication Of Organic Supramolecular Micro-Structures: Epitaxial Surface Recognition, Directed Nucleation And Controlled Growth As A Model System For Biomimetics—S. Childs, R. P. Apkarian, K. Hagen .....	382
Early Stages Of Bone Bonding To HA-Coated Prostheses—A. Porter, V. Benezra, M. Spector, L. W. Hobbs ...	384
An In Vitro System For The Simulation Of Enamel Growth—D. Heidel, B. Burman, H. Fong, M. Sarikaya ...	386
Characterization And Analysis Of Highly Hydrated, Three-Dimensional Cell-Matrix Constructs— R. V. Bellamkonda, A. Balgude, X. Yu .....	388
Imaging Cells In Liquid With A Near-Field Scanning Optical Microscope—Problems And Solutions— L. A. Gheber, M. Edidin .....	390
Cationic Peptide Mediated Oligonucleotide Delivery To Du145 Prostate Cancer Cells—Cell Surface Binding Detected By High Resolution SEM—J. F. Karr, R. P. Apkarian, J. Petros .....	392
Multimodal Imaging Of Biomaterials: Correlative Nano-Indentation And Elasticity Measurement With An AFM—A. Parbhu, W. Bryson, R. Lal .....	394
Elastin-Mimetic Covalently Crosslinked Synthetic Protein Networks: Solvent And Temperature Dependent Morphological Features Imaged By SEM—R. P. McMillan, R. Apkarian, V. Conticello .....	396
Production And Analysis Of High Resolution Polymer Replicas Of Fibrillar Collagen—P. Sims, B. Todd, S. Eppell, T. Li, K. Park, R. Albrecht .....	398
High Resolution Microanalysis Of Particles From The Human Lung—D. C. Bell, L. Rainey, J. J. Vander Sande .....	400
Characterization Of Pacemaker Electrode Surfaces Utilizing Scanning Electron Microscopy (SEM) And In-Vitro Electrochemical Analysis—S. Brabec, B. Schindeldecker, K. Brennen, S. J. Okerstrom, K. Pham .....	402

**CRYOTECHNIQUES, IMMUNOCYTOCHEMISTRY, AND ELECTRON MICROSCOPY I.  
MOLECULAR APPROACH**

Use Of Single Particle Methods To Reconstruct Helical RecA And F-Actin Filaments—E. Egelman, A. Orlova, X. Yu .....	404
Tubulin Structure And The Development Of Electron Crystallography—K. H. Downing .....	406
Insulin Receptor: 3D Reconstruction From Darkfield STEM Images, Structural Interpretation And Functional Model—F. P. Ottensmeyer, R. Luo, A. Fernandes, D. Beniac, C. Yip .....	408
The Potential Of Cryo-Electron Tomography As Assessed By Reconstruction Of Sea Urchin Axonemes— B. F. McEwen, M. M. Marko, C. Hsieh, J. Frank .....	410
High-Resolution Analysis Of Rapidly Frozen Biological Specimens: Capabilities And Limitations—B. Andrews, N. Pivovarova, J. Hongpaisan, R. Leapman .....	412
Imaging Considerations For Cryo-Tomography Of Organelles And Whole Cells At High Accelerating Voltage— M. Marko, C. Hsieh, C. Mannella, B. McEwen .....	414
Electron Microscopic Tomography Of Whole Frozen-Hydrated Rat-Liver Mitochondria At 400kV— C. A. Mannella, C. Hsieh, M. Marko .....	416
Ultravibratotomy Applied In Ultrathin Sectioning Results In Sections Without Distortions And Compression— D. Studer, H. Gnägi .....	418

FESEM And Cryo-Techniques In The Study Of Marine Diatom <i>A. longipes</i> —Y. Chen, Y. Wang, M. Gretz . . . .	420
High Pressure Freezing And Freeze Substitution Maintain Structural Details And Protein Antigenicity In Protein-Storing Plant Cells—J. E. Lonsdale, R. Jones, K. McDonald . . . . .	422
A Versatile High-Vacuum Cryo-Transfer For Cryo-FESEM, Cryo-SPM And Other Imaging Techniques—M. Ritter, D. Henry, S. Wiesner, S. Pfeiffer, R. Wepf . . . . .	424

**CRYOTECHNIQUES, IMMUNOCYTOCHEMISTRY, AND  
ELECTRON MICROSCOPY II. CELLS AND TISSUES**

High Pressure Freezing Has Come Of Age—But Is It Mature?—K. L. McDonald . . . . .	426
Preservation Of Biomembranes By High Pressure Freezing?—M. Mueller, J. Listemann, E. Shimoni, P. P. Walther . . . . .	428
Micro- And Cryo-Techniques Prevent The Loss Of Structural Information. EM-Studies On High-Pressure Frozen Tissues, Suspensions And Cell Monolayer—H. Hohenberg . . . . .	430
A New Concept And Machine For High Pressure Freezing—D. Studer . . . . .	432
High Pressure Freezing/Freeze Substitution: Comparison Of Chemical Fixation Versus Cryoimmobilization Of <i>Candida Albicans</i> Cultured In Cellulose Tubing—S. L. Erlandsen, A. Holzer, M. Gavin, C. Frethem, C. Wells . . . . .	434
Using High Pressure Freezing And Freeze Substitution To Investigate Kinetochore Ultrastructure In Vertebrate Somatic Cells—B. F. McEwen, C. Hsieh, R. Barnard, C. Rieder . . . . .	436
Nuclear Envelope And Nuclear Pore Complex Dynamics In Vitro, Visualised By FEISEM.—T. D. Allen, L. A. Cotter, J. M. Cronshaw, K. L. Wilson, M. W. Goldberg . . . . .	438
High-Pressure Frozen Mouse Lung: Cryo Scanning Electron Microscopy—J. Bastacky, P. Walther, J. Goerke, E. Clausnitzer, C. Lee, M. Müller . . . . .	440
Time-Dependent Structural Changes In Porcine Stratum Corneum Following An Electroporating Pulse—S. Gallo, A. Sen, M. Hensen, B. Chow, S.-W. Hui . . . . .	442

**CRYOTECHNIQUES, IMMUNOCYTOCHEMISTRY, AND ELECTRON MICROSCOPY**

A Pumping Station For Cryo-Transfer Specimen Holders—G. M. Melvin, T. Talbot . . . . .	444
Freeze Substitution Of Porcine Heart Valves—F. G. Lightfoot, M. Taylor, K. Brockbank . . . . .	446
Use Of Freeze Substitution With Ultrarapid And Controlled-Rate Freezing To Determine Quality Of Cryopreservation—C. L. Hastings, F. Lightfoot . . . . .	448
Freeze Substitution For EM-Studies Time Measuring—R. Migunova, A. Todrin, A. Kaprelyants . . . . .	450
Three-Dimensional Structure Of <i>Neurospora</i> Mitochondria: New Insights Provided By Electron Tomography Of The Frozen-Hydrated Organelles—D. Nicastro, A. S. Frangakis, S. Nickell, W. Baumeister . . . . .	452
Automatic Recording Of Low Dose Images With Slow Scan CCD. Cameras—E. Zellmann, W. Probst, V. SeV Seybold, S. Hiller . . . . .	454
Comparative TEM Of Freeze-Fractured Colloidal Liquid Aphrons And Conventional Emulsions—J. W. Heckman . . . . .	456

## RECENT ADVANCES IN CONFOCAL MICROSCOPY

The Dual Nipkow Disk Confocal Microscope And High Speed Confocal Imaging: New Designs, New Cameras, And New Capabilities—G. A. Peeters, M. P. Buchin . . . . .	458
A Confocal Microscope With Spectrophotometric Detection—C. B. Calloway . . . . .	460
Imaging Dynamic Events In Living Tissue Using Water Immersion Objectives—M. Brenner . . . . .	462
Optimization And The Evaluation Of Confocal System Performance To Quantify Fluorescence—R. M. Zucker, O. Price . . . . .	464
A New Generation, Fast 3D Fluorescence Microscope Using Wavefront-Encoding Optics—C. J. Cogswell, M. Arnison, E. Dowski, S. Bradburn-Tucker, W. Cathey . . . . .	466
Quenching Or Misalignment? Confocal Microscopy Of Onset Of The Mitochondrial Permeability Transition In Cultured Hepatocytes—T. Qian, L. Trost, J. L. Lemasters . . . . .	468
Video-Confocal Microscopy: An “Electronic-Pinhole” Method Using Narrow-Field Illumination And Wide-Field Image Detection—P. A. Benedetti, V. Evangelista, D. Guidarini, S. Vestri . . . . .	470
A Multicolor Femtosecond Lightsource For (Multiphoton) Confocal Fluorescence Microscopy—E. O. Potma, N. Kahya, W. de Boeij, D. D. Wiersma . . . . .	472

## BIOLOGICAL LABELING AND CORRELATIVE MICROSCOPY

Biological Labeling And Correlative Microscopy—J. Robinson, T. Takizawa . . . . .	474
Fluorogold As A Probe For High Resolution Correlation Between Immunofluorescence And Electron Microscopy—T. Takizawa, J. Robinson . . . . .	476
Combined CY3/Nanogold Conjugates For Immunocytochemistry And In Situ Hybridization—R. D. Powell, V. Joshi, C. Halsey, J. Hainfeld, G. Hacker, C. Hauser-Kronberger, W. Muss, P. Takvorian . . . . .	478
Colocalization Of mRNAs By Fluorescence In Situ Hybridization—D. G. Baskin, J. J. Breininger . . . . .	480
Oxidative Injury By Oxygen And Nitrogen Radicals In Diabetic Retinopathy In The Bbz/Wor Rat: Cytochemical And Immunocytochemical Studies—E. A. Ellis, M. B. Grant, D. L. Guberski . . . . .	482
Correlative LM/TEM Studies Are Essential In Evaluating The Effectiveness Of Liposome Mediated Delivery Of The Cystic Fibrosis Transmembrane Regulator (CFTR) As A Corrective Therapy In A CFTR. Knockout Mouse That Develops Lung Disease—C. A. Ackerley, A. Tilups, C. E. Bear, L. E. Becker . . . . .	484
Gold-Based Autometallography—J. Hainfeld, R. D. Powell, J. Stein, G. Hacker, C. Hauser-Kronberger, A. Cheung, C. Schöfer . . . . .	486
Multiple Labeling For EM Using Particles Of Different Shape And Metal Composition—D. A. Meyer, R. M. Albrecht . . . . .	488
Non-Imaging Microscopies: Flow Cytometry As A Correlative Analytical Tool In The Quantification Of Cell Structure, Autofluorescence, Fluorescent Probes And Cell Populations—R. W. Smith . . . . .	490
Changes In F-Actin Organization Induced By Hard Metal Particle Exposure In Rat Pulmonary Epithelial Cells As Observed By Laser Scanning Confocal Microscopy—J. M. Antonini, K. StaK Starks, L. Millecchi, J. Roberts, K. Rao . . . . .	492
Retinoic Acid Synthesizing Astrocytes Within The Developing Spinal Cord: A Correlative Microscopic Study—E. Rosa-Molinar, V. Frolich, R. L. Vaughn, P. J. McCaffery, B. Fritsch . . . . .	494

Immunohistochemical And Morphometric Characterization Of Blood Vessels In Brain Metastasis In Nude Mice—C. D. Bucana, S. Yano, D. Reynolds, K. Dunner, Jr., I. Fidler . . . . .	496
Localization Of Actin Filaments In The Central Nervous System Using Phalloidin And Correlative Light And Electron Microscopy—F. Capani, M. Martone, T. Deerinck, M. H. Ellisman . . . . .	498
Up-Conversion And Two-Photon Excitation Fluorescence Properties Of Phloxine B—H. Malak . . . . .	500

**MOLECULAR OPTICAL SPECTROSCOPY IN BIOLOGY**

Two-Photon Excitation Imaging Of Biofilm—H C. Gerritsen, C. J. de Grauw . . . . .	502
Breaking The Resolution Limit Of Far Field Optical Microscopy: Imaging Molecular And Cellular Interaction On The Nanometer Scale—P. T. So, G. Cragg, H. Kwon, C. Dong . . . . .	504
Novel Methods In Fluorescence Sensing—J. R. Lakowicz, I. Gryczynski, Z. Gryczynski, L. Tolosa, G. Rao, J. Dattelbaum, L. Eichorn . . . . .	506
Analysis Of PKA Binding To A-Kinase Anchoring Proteins Using Fluorescence Resonance Energy Transfer—M. L. Ruehr, M. Bond . . . . .	508
Pattern Analysis Meets Cell Biology—R. F. Murphy, M. V. Boland . . . . .	510

**EDUCATION OUTREACH TOOLS**

A Compilation Of Biological SEM Sample Preparation Techniques For Application To Outreach Programs—N. R. Smith, E. Duarte, C. Morgan, R. A. Quinta . . . . .	512
Bugscope: A Sustainable Web-Based Telemicroscopy Project For K–12 Classrooms—C. S. Potter, B. Carragher, D. Stone, U. Thakkar, B. Grosser, J. Hanlon, C. Hoyer, N. Kisseberth, S. Robinson, D. Weber . . . . .	514

**FOCUSSED ION BEAM**

A Tutorial Of The Fib Lift-Out Technique For Tem Specimen Preparation—L. A. Giannuzzi . . . . .	516
---	-----

**EDS MAPPING, THE RIGHT WAY AND THE WRONG WAY**

X-Ray Mapping With Energy-Dispersive And Wavelength-Dispersive X-Ray Spectrometry In The Scanning Electron Microscope: A Tutorial—D. E. Newbury, D. S. Bright . . . . .	518
---	-----

**ELECTRONIC DOCUMENT SUBMISSION**

An Introduction To Electronic Document Preparation For Future Microscopy And Microanalysis Meetings—J. F. Mansfield . . . . .	520
---	-----



## FROM 3-D LIGHT MICROSCOPIC IMAGES TO QUANTITATIVE INSIGHT

Three Dimensional Light Microscopy: Imaging & Corrections For Quantitative Analysis—J. N. Turner, W. Shain, D. H. Szarowski, S. Lasek, L. Kam, A. Can, K. Al-Kofahi, B. Roysam . . . . .	522
From 3-D Light Microscopic Images To Quantitative Insight—B. Roysam, A. Can, H. Shen, K. Al-Kofahi, J. N. Turner . . . . .	524
Bridging The Resolution Gap: Correlated 3D Light And Electron Microscopic Analysis Of Large Biological Structures—M. E. Martone . . . . .	526

## SCANNING ELECTRON MICROSCOPY AT A DISTANCE: A NUTS-AND-BOLTS DISCUSSION

Scanning Electron Microscopy At A Distance: A Nuts-And-Bolts Discussion—S. B. Barlow . . . . .	528
--	-----

## GEOLOGY/MINERALOGY

Electron Beam Induced Phase Transformations From Metakaolinite To Mullite—Y. J. Kim, S. Lee . . . . .	530
Application Of Electron Microprobe Scanning Techniques To Resolve Trace Element Variations In Biogenic Aragonite—D. W. Haywick, M. Bersch . . . . .	532
Study Of Olivine Morphology, Spinifex-Textured Komatiite, By Atomic Force Microscopy—L. Couto, C. E. Vallet . . . . .	534
The Hunt For Red Corrosion: A Study Of Microbial Rock Corrosion In Caves—M. N. Spilde, D. Northup, P. Boston . . . . .	536
Electron Microprobe Dating Of Uraninite From The McAllister Pegmatite, Alabama—M. G. Bersch . . . . .	538
Microstructural Characterization Of Water-Rich Boehmite (AlO(OH)): TEM Correlation Of Apparently Divergent XRD And TGA Results—L. M. Anovitz, L. F. Allard, W. Porter, D. Coffey, P. Benezeth, D. Palmer, D. Wesolowski . . . . .	540

## MAS CELEBRATES: FIFTY YEARS OF ELECTRON PROBE MICROANALYSIS

Keynote Lecture: The Time Of Pioneers—J. Philibert . . . . .	542
Microprobe Design In The 1950's—Some Examples In Europe—P. Duncumb . . . . .	544
The Golden Age Of Microanalysis—K. F. J. Heinrich . . . . .	546
Development Of Electron Probe Instrumentation During Those Early Days When Professor Castaing Visited Japan—R. Shimizu . . . . .	548
Crystal Spectrometers And Monochromators In Microanalysis—D. B. Wittry . . . . .	550
Advances In WDS Crystal Performance—C. Nielsen, K. Kawabe, H. Yamada, T. Okumura, M. Saito . . . . .	552
50 Years Of EPMA/Today's And Tomorrow's Instruments—C. C. Conty . . . . .	554
EDS And WDS Automation: Past Development And Future Technology—J. J. McCarthy, J. J. Friel . . . . .	556
Castaing's Electron Microprobe And Its Impact On Materials Science—D. E. Newbury . . . . .	558

Quantitative Electron Probe Microanalysis: Fifty Years Of Developments In The Application Of Casting's "Z" And "a" Corrections—J. T. Armstrong .....	560
Characteristic And Continuum Fluorescence In Electron Beam X-Ray Microanalysis—C. E. Nockolds .....	562
Physical Constants For Quantitative X-Ray Microanalysis—D. C. Joy .....	564
Selecting Standards To Optimize Electron Microprobe Analysis—E. J. Essene, C. Henderson .....	566
Minimizing Errors In Electron Microprobe Analysis—E. Lifshin .....	568
A Few Examples Of Electron Microanalysis Of Art Objects At The Boston Museum Of Fine Arts— R. E. Ogilvie .....	570
Application Of The EPM To The Analysis Of Planetary And Geological Materials—K. Keil .....	572
Minimally Invasive (Energy) Dispersive Analytical Spectroscopy (MIDAS). The Golden Touch For In-Situ X-Ray Microanalysis Of Bulk Bio-Organic—P. Echlin .....	574
Electron Probe Microanalysis Of Bi-Sr-Ca-Cu Superconductors With Transition Metal Substitutions— J. J. McGee, J. Obien, R. Wilson, J. Payne .....	576
On The Phi-Ro-Z Curves Of Heterogeneous Materials—R. Gauvin, E. Lifshin .....	578
Status Report On Corning Standard Glasses 95IRV, 95IRW, And 95IRX—P. K. Carpenter .....	580
Angle-Resolved X-Ray Depth Profiling: Interpretation Of Angle-Resolved Profiles Using A Monte Carlo Approach—D. K. Wilkinson, M. Prutton, D. A. Loveday .....	582
Relative Variation Of K- And L-Shell Ionization Cross Sections By Electron Impact—X. Llovet, C. Merlet, J. Fernandez-Varea, F. Salvat .....	584
Quantitative Elemental Analysis Of Heavy Metal Exposed Cells Of <i>Synechococcus leopoliensis</i> Using Regular And Overplus Cells: An Energy Dispersive X-Ray Spectroscopy Study—J. J. Goldberg, T. Jensen .....	586
Do Ultra-Thin Polymer X-Ray Windows Leak Water Vapor?—A. J. Nielson, J. Thorne .....	588
Observing The Chemical State Of Elements With $Z=21$ To $Z=27$ From $L\alpha_1$ To $L\beta_1$ Ratios With Energy Dispersive Spectroscopy (EDS)—A. O. Sandborg, R. Anderhalt .....	590
Expert System For EPMA—C. Fournier, C. Merlet, P. Staub, O. Dugne .....	592
Analysis Of Metallic Pigments Used In The 19th Century Japanese Prints—R. Y. Hashimoto, S. Menon, J. Fiorillo .....	594
SEM And EDS Characterization Of Palladium Cathodes After Electrolysis In Light And Heavy Water—D. Silver, J. Dash .....	596
SEM And EDS Characterization Of Titanium Cathodes Before And After Electrolysis In Heavy Water— J. Warner, J. Dash .....	598
Characterization Of Aluminum Floccs In Distribution Drinking Water Using Differential Interference Contrast (DIC), Transmission And Scanning Electron Microscopy (TEM & SEM) And Energy Dispersive X-Ray Analysis (EDXA)—Y.-K. Song, A. Stark .....	600
Microstructural Evaluation And Quantitative Analysis In The Unleaded Solder Joint—J.-G. Duh, Y. G. Lee, F. B. Wu .....	602
Cryogenic Microcalorimeters For High Resolution Energy Dispersive X-Ray Spectrometry—J. Hoehne, M. Altmann, G. Angloher, M. Buehler, F. V. Feilitsch, P. Hettl, T. Hertrich, J. Jochum, S. Pfnuer, J. Schnagl, S. Waenninger .....	604
Simulation Of Energy Deposition In E-Beam Irradiated Polymers—P. Horny, R. Gauvin, P. Hovington, S. Besner .....	606

Monte Carlo Simulation Of Electron Scattering For Arbitrary 3D Structures Using A Multi-Quadtree Geometry Representation—C. O. Schiebl, V. Ambrose	608
--	-----

### COMPOSITIONAL IMAGING AND SPECTROSCOPY

Incoherent STEM Imaging At 1.5Å Resolution With A 200kV FEGTEM—E. M. James, N. Browning	610
Misfit Dislocation Core Structures At Ba <sub>0.5</sub> Sr <sub>0.5</sub> TiO <sub>3</sub> /LaAlO <sub>3</sub> Interfaces—H. Gao, B. Rafferty, C. Chen, R. Singh, S. Pennycook	612
Antimony Delta Doping By Scanning Transmission Electron Microscopy And Electron Energy Loss Spectroscopy—R. R. Vanfleet, D. Muller, H.-J. Gossmann, J. Silcox	614
Comparison Of STEM EELS Spectrum Imaging vs EFTEM Specturm Imaging—J. A. Hunt, G. Kothleitner, R. Harmon	616
Image Spectroscopy: New Developments And Applications—P. J. Thomas, P. A. Midgley	618
Analysis Of Diffraction Contrast As A Function Of Energy Loss In Energy Filtering Transmission Electron Microscope (EFTEM) Imaging And Possible Implications On High-Resolution Compositional Mapping—K. T. Moore, J. M. Howe	620
X-Ray Mapping Of Bimetallic Catalysts In Mesoporous Silicon—V. J. Keast, P. A. Midgley, B. F. G. Johnson, J. M. Thomas	622
Segregation Of Silicon In Metal-Ceramic Composites—R. Y. Hashimoto, S. Menon, A. Fox	624
Compositional Phase Mapping Using True Colour X-Ray Imaging—P. Statham	626
Energy Filtering TEM Of Polymers And Hybrid Materials—A. A. Du Chesne	628
Trace Element Mapping Of Minerals And Materials By Electron Microprobe—J. H. Fournelle, C. Davidson, F. F. Spear, M. Kohn, H. Guo	630
Electron Energy Loss Spectroscopy Characterisation Of The SP <sup>2</sup> Bonding Fraction Within Carbon Thin Films—A. J. Papworth, C. J. Kiely, S. R. P. Silva, G. A. J. Amaratunga	632
Quantitative Composition Maps Of Magnetic Recording Media By EFTEM—J. Bentley, J. Wittig, T. Nolan	634
An EELS-Study Of The Chemical Homogeneity In Cu-In-S Films—D. S. Su, P. Schattschneider, E. Zeitler	636
Characterization Of SiO <sub>x</sub> Smoke Particles By Electron Energy Loss Spectroscopy And Energy-Filtering Imaging—D. C. Dufner, S. Danczyk, M. Wooldridge	638
EELS Characterization Of Silicon Oxycarbide Glasses—S. C. Cheng, P. Colombo, C. Pantano	640
Electron Beam Induced Damage Of GaN And Changes In EELS—T. J. Eustis, J. Silcox	642
Jump Ratio Elemental Mapping In Amorphous Ice Cryo-EFTEM Opens The Window To Solution Chemistry—J.-O. B. Bovin, T. Huber, O. Balmes, J. Malm, G. Karlsson	644
Energy Filtering Of Schottky Field Emission Gun Using Fringe Field Monochromator—H. W. Mook, A. van Veen, P. Kruit	646
Integration Of A Monochromator In The Field Emission STEM—H. W. Mook, P. E. Batson	648
Z-Contrast Imaging And Electron Energy Loss Spectroscopy Analysis Of Chromium Doped Diamond-Like Carbon Film—X. Fan, E. Dickey, S. Pennycook	650
The Electronic Band-Gap Of Polycrystalline Diamond And Tetrahedral Amorphous Carbon By EELS In A STEM—A. J. Papworth, C. J. Kiely, G. A. J. Amaratung	652
Measurement Of Effective Extinction Distances In Zone Axis Silicon—Z. Yu, R. Vanfleet, J. Silcox	654

A Method For Determining The Volume Fraction Of Sub-Micron Particulates In Aluminum Alloys Using Energy Filtered Transmission Electron Microscopy (EFTEM)—D. Steele, M. Ball, D. Lloyd . . . . .	656
--	-----

**A. HOWIE SYMPOSIUM: CELEBRATION OF PIONEERING ELECTRON MICROSCOPY**

Archie Howie Symposium: Celebrations Of Pioneering Electron Microscopy—P. L. Gai, E. D. Boyes, C. B. Carter, L. D. Marks, S. J. Pennycook . . . . .	658
Extended And Point Defects In Diamond Studied With The Aid Of Various Forms Of Microscopy—J. W. Steeds . . . . .	660
Threshold Energy Effects In Secondary Electron Emission—A. Howie . . . . .	662
The Use Of ELNES For Microanalysis—A. J. Craven, M. MacKenzie . . . . .	664
Insights Into The Electronic Structure Of Ceramics Through Quantitative Analysis Of Valence Electron Energy-Loss Spectroscopy (VEELS)—H. Muellejans, R. H. French . . . . .	666
Valence Electron EELS Spectroscopy On Nanoparticle Surfaces—C. Colliex, M. Kociak, O. Stephan, K. Suenaga . . . . .	668
Stem Without Spherical Aberration—O. L. Krivanek, N. Dellby, A. Lupini . . . . .	670
Scattering Cross Sections In Electron Microscopy And MicroAnalysis—P. Rez . . . . .	672
Low Voltage Scanning Electron Microscopy (LVSEM) In Perspective—E. D. Boyes . . . . .	674
“Y Contrast” Of Single Shell Carbon Nanotubes: Determination Of Young’s Modulus By Observing Thermal Vibrations—M. M. J. Treacy, A. Krishnan, E. Dujardin, P. Yianilos, T. Ebbesen . . . . .	676
A Big Tripod Polisher; 16 Years Of Imaging Surfaces—L. D. Marks . . . . .	678
Microscopy Of Metal Oxide Surfaces—M. R. Castell, S. L. Dudarev, C. Muggelberg, G. A. D. Briggs, A. P. Sutton, D. T. Goddard . . . . .	680
Some Things Never Change—The Microcrystallite Story After 25 Years—J. M. Gibson . . . . .	682
Characterisation Of Amorphous Materials By Electron Diffraction And Atomistic Modelling—D. Cockayne, D. R. McKenzie, W. McBride, C. Goringe, D. McCulloch . . . . .	684
Designer Nanostructures Of Catalysts In The Environmental-HREM—P. L. Gai . . . . .	686
Diffraction Channeling And The Production Of Secondary Excitations—S. J. Pennycook . . . . .	688
Quantitative Valence-Loss Spectroscopy Of Carbon Nanostructures—T. Stoeckli, Z. L. Wang, J. M. Bonard, P. Stadelmann, A. Chatelain . . . . .	690
EELS Characterization Of Electronic Structure In Group III—Nitrides Compared With Synchrotron Ellipsometry Results—H. Lakner, G. Brockt . . . . .	692
Stacking-Fault Fringes—C. B. Carter, D. Medlin, D. Cohen, G. Campbell . . . . .	694
An Automated And Rapid Process For Determining The Number Of Atoms In Supported Ultra-Small Metal Clusters—J. C. Yang, S. Bradley, J. M. Gibson . . . . .	696
In-Situ HREM Of A Surface Reconstruction Of Si Surface With Molten Al At High Temperature—S. Tsukimoto, S. Arai, H. Miyai, H. Saka . . . . .	698
Direct Observation Of Growth Behaviour Of Athermal Omega-Phase Crystals In Beta-Titanium Alloy Due To Cooling To 77K Using In-Situ Dark Field Imaging Technique—H. Matsumoto, E. Sakedai, H. Hashimoto . . . . .	700

Structure And Composition Of Supported Pt-Sn Electrocatalysts—V. Radmilovic, T. Richardson, S. Chen, P. N. Ross .....	702
Novel Xerogel Catalyst Materials For Hydrogenation Reactions And The Role Of Atomic Scale Interfaces— P. L. Gai, K. Kourtakis, H. Dindi, S. Ziemecki .....	704
Electron Microscopy Of Solid-Liquid Interfaces: HREM Observation And EELS Analysis—H. Saka, S. Arai, S. Tsukimoto, H. Miyai, K. Sasaki, M. Konno, T. Kamino .....	706
Analysis Of Extended Energy-Loss Fine Structure Of Nanometer-Scale Clusters—Y. Ito, H. Jain, D. B. Williams .....	708
Theoretical Investigations Of RHEED Oscillations—Z. Mitura, S. Dudarev, M. Whelan .....	710
High Angular Resolution Measurements Of K Shell X-Ray Emission Created By Electron Channeling In The Analytical Electron Microscope—N. J. Zaluzec .....	712
Field Emission Characteristics Of Single Nano-Tips Of Amorphous Carbon Grown On Tungsten Mini- Spheres—C. J. Edgcombe, U. Valdrè .....	714
Inner-Shell Damage Thresholds Below 1kv In Cu-Phthalocyanine—Q. Chen, J. Spence, M. Stevens, U. Weierstall .....	716
Structural Fluctuations In Metal Nanoparticles—M. Tanaka, M. Takeguchi, K. Furuya .....	718
Visibility Of Small Metallic Catalyst Particles In High-Resolution Secondary And Backscattered Electron Images—J. Liu .....	720

#### DEFECTS IN SEMICONDUCTORS

High Resolution Measurements Of Two Dimensional Dopant Diffusion In Silicon—C. Spinella .....	722
Investigating The Effect Of As And Te Passivation On The MBE Growth Of CdTe (111) On Si (111) Substrates—Y. Xin, S. Rujirawat, G. Brill, N. D. Browning, S. J. Pennycook, S. Sivananthan, R. Sporcken ...	724
Defect Structure In Semiconducting Rhenium Disilicide Epitaxial Thin Films—A. Misra, T. E. Mitchell, J. E. Mahan .....	726
In-Situ TEM Studies Of The interaction Of Dislocations In SiGe Heterostructures—E. A. Stach, R. Hull, R. Tromp, F. Ross, M. Reuter, J. Bean .....	728
Lighting With GaN: How Can HREM Help To Understand The III-Nitride System?—C. F. Kisielowski, E. Nelson, C. Song .....	730
Detection Of Interstitial Molecules In Wide Band Gap Materials Using Cathodoluminescence Microanalysis— M. A. Stevens Kalceff .....	732
Horizontal Defects Parallel To The Interface In GaN Pyramids—Z. Mao, S. McKernan, C. B. Carter, W. Yang, S. McPherson .....	734
Weak-Beam Thickness Contrast Analysis Of Defects In GaN Pyramids—Z. Mao, S. McKernan, C. B. Carter, W. Yang, S. McPherson .....	736
Analysis Of Degraded Gold-Plated Surfaces In Contact With Lead-Tin Solder During Elevated Temperature Testing Of 208-Pin Microelectronic Packages—J. A. Schaper, R. Weberg .....	738
Characterization Of FIB Damage In Silicon—C. Urbanik, B. I. Prenitzer, L. A. Giannuzzi, S. R. Brown, T. L. Shofner, B. Rossie, R. B. Irwin, F. A. Stevie .....	740

Chemical Characterization Of Semiconductor Defects And Particles On The Wafer Surface By Multiple Microanalysis Techniques—Y. S. Utirsky, G. Conti, C. R. Brundle, R. Savoy, P. D. Kinney . . . . .	742
Effects Of Protective Capping On Ultra-Thin Simox Structures—T. E. Wilson, J. Jiao, S. Seraphin, B. Johnson, M. Anc, B. Cordts . . . . .	744
Control Of Si-Island Free Ultra-Thin SIMOX Structures By Implant Energy And Oxygen Dose—B. Johnson, J. J. Jiao, S. Seraphin, T. Yan, T. Wilson, M. Anc, B. Cordts . . . . .	746
Interface Voids And Precipitates In GaAs Wafer Bonding—R. R. Vanfleet, M. Shverdin, Z. Zhu, Y. Lo, J. Silcox . . . . .	748
Microanalytical Characterization Of Structure And Defects for The Development Of Low Temperature Silicon Epitaxial Growth—K. M. Jones, J. Thiesen . . . . .	750
Transmission Electron Microscope Characterization Of Size Selection Deposition Of Si Nanoparticles—H.-P. Wu, K. Nishimura, N. Kebaili, N. Fujinuma, K. Takayanagi . . . . .	752
Tem Study Of Amorphous Silicon Recrystallization—L. K. Lam, N. Jiang, D. Ast, J. Silcox . . . . .	754

### IRRADIATION AND IMPLANTATION EFFECTS IN MATERIALS

TEM Study Of Short-Range-Order In Zirconolite Induced By High Temperature Ion Irradiation—S. Wang, L. M Wang, R. C. Ewing . . . . .	756
Transmission Electron Microscopy Observation Of 11 MeV B <sup>5+</sup> Ion Irradiation In Bi <sub>2</sub> Sr <sub>2</sub> CaCu <sub>2</sub> O <sub>7-x</sub> Single Crystal—W. L. Zhou, Y. Sasaki, Y. Ikuhara, C. J. O'Connor . . . . .	758
Grain Boundary Segregation And Irradiation-Assisted Stress Corrosion Cracking Of Stainless Steels— E. A. Kenik, J. Busby, M. Miller, A. Thuvander, G. Was . . . . .	760
Nanoscale Lead Inclusions In Silicon—E. Johnson, A. Johansen, V. S. Touboltsev, L. SL Sarholt, U. Dahmen . .	762
Observation Of An Elementary Cuboctahedron Of Xe Nanocrystal In An Al Mtrix—C. W. Allen, R. Birtcher, K. Furuïya, M. Song, S. Donnelly, E. Ryan . . . . .	764
AES And SEM/EDS Analysis Of Silvered Teflon Laminates Of Optical Solar Reflector—L. Wang, R. Kiwak, G. Greer . . . . .	766

### FUTURE OF MICROSCOPY: CERAMICS, COMPOSITES, AND CEMENT

EELS And XANES Analysis Of Plutonium And Cerium Edges From Titanate Ceramics For Fissile Materials Disposal—J. A. Fortner, E. Buck, A. Kropf, A. Bakel, M. Hash, S. Aase, D. Chamberlain . . . . .	768
Microstructural And Compositional Characterization Of SiC-On-Insulator Structures—M. Ishimaru, R. Dickerson, K. E. Sickafus . . . . .	770
Relationship Between High-Strain-Rate Superplasticity And Interface Microstructure In Aluminum Alloy Composites—J. Koike, K. E. Sickafus, T. E. Mitchell . . . . .	772
Nanoscale Structural Characterization At The Titanium/Sol-Gel/Primer/PETI-5 Interface—J. D. Holbery, R. Fisher . . . . .	774

Nanoindentation In TiN/NbN Multilayers And Thin Films Examined Using Transmission Electron Microscopy—S. J. Lloyd, J. Pitchford, J. Molina-Aldareguia, Z. Barber, M. Blamire, W. Clegg . . . . .	776
Heterogeneous Formation Of Oriented Silicon Oxynitride On Alpha-Silicon Nitride Seed Crystals: Habits And Radiation Stability—R. Carpenter, W. Braue, M. J. Kim . . . . .	778
In Situ Observation Of Ferroelectric Domain Motion In BaTiO <sub>3</sub> —A. Krishnan, M. Bisher, M. Treacy . . . . .	780
Combined HRTEM And High Spatial Resolution Analysis Of Homologous Compounds In Mo <sub>3</sub> (ZnO) <sub>m</sub> By A 300kv FE-TEM—Y. Bando, C. Li, M. Nakamura, N. Kimizuka . . . . .	782
Analytical Electron Microscopy Of Composite Interfaces—V. P. Dravid, S. Kim . . . . .	784
ALCHEMI Analysis Of Cation Distributions In Spinel-Structured Compounds Using Oxygen As A Marker Element—I. M. Anderson . . . . .	786
Electron Spectroscopic Imaging And Diffraction: Ideal Tools For The Characterisation Of Ceramic Materials— J. Mayer, J. Plitzko, J. Marien, S. Kraemer, T. Gemming . . . . .	788
Local Density Information From Low Energy-Loss PEELS Measurements—D. C. Bell, C. Allred, L. Hobbs . . . .	790
Cation Coordination At Sigma-5 Grain Boundaries In TiO <sub>2</sub> And SrTiO <sub>3</sub> And Its Effect On The Local Electronic Properties—J. A. Zaborac, J. P. Buban, H. O. Moltaji, S. Stemmer, N. D. Browning . . . . .	792
Characterization Of Ceramics Using Electron Backscatter Diffraction In The SEM—J. R. R. Michael . . . . .	794
The Study Of Grain Boundaries In Ag-sheathed BSCCO Tapes By Scanning Transmission Electron Microscopy—K. Kishida, Y. Pan, N. Browning . . . . .	796
Growth And Texture Of Polycrystalline SiC. On Graphite During Forced-Flow Thermal Gradient Chemical Vapor Infiltration (FCVI)—K. Appiah, Z. L. Wang, W. Lackey . . . . .	798
Migration Of Silicate Liquid Out Of Grain Boundaries In Ceramics—N. Ravishankar, C. B. Barry Carter . . . .	800
Segregation Of Ba To Cr Thin Film And Glass Interfaces—N Jiang, J. Silcox . . . . .	802
Characterization Of Nanoporous TiO <sub>2</sub> Membranes Used As Electrodes For Injection Solar Cells—D. S. Su, U. Bloeck, B. Meißner, F. Willig, M. Giersig . . . . .	804
Statistical Analysis Of SEM-EDX Spectrum Images Of A Metal Ceramic Braze—P. G. Kotula, I. Anderson, J. Stephens . . . . .	806
Second Difference Electron Energy-Loss Spectroscopy With The Gatan Imaging Filter—E. C. Buck . . . . .	808
Characterization And Production Of Structural Ceramics In The Systems Fe <sub>(1-x)</sub> O-Fe <sub>3</sub> O <sub>4</sub> And MgO- MgFe <sub>2</sub> O <sub>4</sub> —H. A. Calderon, A. Huerta, R. Ordoñez, M. Umemoto, K. Tsuchiya, H. Balmori, E. Reguero, H. Yee-Madeira . . . . .	810
Wetting Of Anorthite Liquid On m-Sapphire Substrates—N. Ravishankar, S. Ramamurthy, H. Schmalzried, C. B. Barry Carter . . . . .	812
Preparation Of Silicon Oxide Nanostructures Using Anodic Alumina As Templates—M. Zhang, Y. Bando, K. Wada, K. Kurashima . . . . .	814
The Apex Structure Of Co-Produced Helical Boron Nitride And Carbon Cones—L. Bourgeois, Y. Bando, K. Kurashima, T. Sato . . . . .	816
Double Length-Scale Ordered Nanoporous Silica—J. Yin, Z. L. Wang . . . . .	818
Electron Microscopy Of Hierarchical Materials—C. F. Blanford, A. Stein, C. B. Carter . . . . .	820
Effect Of Correction Of The 3-Fold Astigmatism On HREM Lattice Imaging With Information Below 100pm— Y. C. Wang, A. Fitzgerald, E. C. Nelson, C. Song, M. A. O'Keefe, C. F. Kisielowski . . . . .	822
Analytical Electron Microscopy Investigation Of Coated 3M Nextel 720 Fibers—R. Nagarajan, A. G. Fox, E. Boakye, R. S. Hay . . . . .	824

Microanalysis In The Development Of Thermal Sprayed Anodes For The Cathodic Protection Of Reinforced Concrete Bridges—W. K. Collins .....	826
---	-----

### THIN FILMS/COATINGS

Use Of Electron Diffraction For Determining The Orientation Of Rapid Thermally Annealed Lead Zirconate Titanate Thin Film On (111) Pt Coated Si Substrate—S. C. Cheng, T. Su, S. Trolier-McKinstry .....	828
High Resolution TEM Of Post-Deposition Ion Implanted c-BN Films—T. Dolukhanyan, S. Gunasekara, E. Byon, S. Lee, S. Lee, C. Sung .....	830
Microstructure Of $YBa_2Cu_3O_7$ Thick Films By Post Annealing Of The Precursor By High Rate E-Beam Deposition On $SrTiO_3$ Substrates—L. Wu, Y. Zhu, M. Suenaga, R. Sabatili .....	832
TEM Study Of Nanocrystalline Ni Films Grown By DC Magnetron Sputtering—R. Mitra, W. A. Chiou, J. R. Weertman, R. Hoffman .....	834
Microstructural Evolution In Al-Ti Multilayered Film With Annealing—R. Mitra, W. A. Chiou, A. Madan, R. Hoffman, J. R. Weertman .....	836
Interfacial Elemental Distribution In Tungsten Carbide Coated Steel—S. V. Naidu, C. Green, C. Maxie, J. Garber, G. Glass .....	838
Effect Of Pre- And Post-Deposition Heat Treatment On Microstructure And Electrical Properties Of ITO Films Deposited On PET And Glass Substrates—T. Dolukhanyan, J. Kwon, S. Moon, M. Kang, C. Sung .....	840
TEM And IR Reflectance Studies On Phase Transitions In Thin $VO_x$ Films—M. A. Verheijen, E. Boonekamp .....	842
TEM Examination On The Microstructure Rearrangement Of ECR-PECVD nc-Si Thin Films Caused By Low Temperature Annealing—S. C. Cheng, A. Kalkan, S. Bae, S. Fonash .....	844
Influence Of Triple Junction Structure On Cu Segregation In Al Thin Films—C. J. Wauchope, R. R. Keller, J. E. Sanchez, Jr. ....	846

### OXIDATION/CORROSION

Transmission Electron Microscopy Of Corrosion Of Stainless Steel-Zirconium Metal Waste Forms—J. S. Luo, D. P. Abraham .....	848
The Characterization And Phase Transformation In Iron Oxides—K. C. Liao .....	850
Electron Probe Microanalysis (EPMA) Characterization Of Scales Formed On Laves Phase Reinforced Cr Alloys at 1100C—L. R. Walker, M. Brady .....	852
Determination Of The Structure And Chemistry Of Thermally Grown Oxides In Thermal Barrier Coatings—M. R. Brickey, J. Lee .....	854

### METALS AND ALLOYS

Dislocation Substructure Contributions To The Tonal Qualities Of The Caribbean Steel Drum—A TEM Study—E. Ferreyra, L. E. Murr .....	856
---	-----



Identification Of Alpha Prime In An Aged Fe-12Cr Steel Using Extraction Replicas And Energy Filtered TEM— M. Larsen, T. Angeliu, C. Mukira .....	858
Microstructure Of Off-Eutectic Nanoscale Pb-Cd Inclusions In Al—D. Peters, E. Johnson, V. S. Touboltsev, A. Johansen, L. Sarholt .....	860
SIMS/AEM Characterization Of Banded Microstructures In An Ni-Cr-Fe Alloy—M. G. Burke, B. Z. Hyatt, G. McMahon .....	862
Estimation Of Interfacial Energies Based On The Shapes Of Coherent Intragranular Precipitates—X. Chen, L. K. Rabenberg .....	864
Microstructures Of Chill-Cast And Directionally Solidified Ti-44Al-11Nb Alloys—S. K. Menon, T. Halladay, A. Fox, R. Mahapatra .....	866
Microstructure Of Laser Surface Melted Nickel Aluminum Bronze—C. Bennett, C. Hyatt .....	868
Characterization Of Interfacial Microstructure In Joints Between Pb-Sn Eutectic Solder And Pd/Ni/Pd-Ni/Ni/Cu Metallization—G. Ghosh .....	870
TEM Microstructural Characterization Of A 2091 (Al-Li-Mg-Zr) Alloy Subjected To Welding Operations— M. C. S. de Macedo, I. G. Solórzano .....	872
Pre-Martensitic State In A $Ti_{50}Ni_{48}Fe_2$ Alloy Studied By Electron Microscopy With Energy-Filtering— Y. Murakami, Y. Ikematsu, D. Shindo, T. Oikawa, M. Kersker .....	874
Observation Of Microstructural Evolution Of Aluminum Bonding Wires In Power Electronic Package— D. R. Liu, K. Chen, E. Jih .....	876
Formation Of Gamma Phase On Hot-Dip Galvanized Coating Steel Sheet After Various Heat Treatment— Y. Lin, H.-C. Lin .....	878
Characterization Of Cup Earing In Tim Mill Product By X-Ray Diffraction—K. C. Liao, W. C. Swartz .....	880
Imaging Dislocations In A Duplex TiAl Using Electron Channeling Contrast—B. C. Ng, T. R. Bieler, M. A. Crimp .....	882

## PRECISION SPECIMEN PREPARATION

Cross-Sectional Sample Preparation And Analysis Of Intergranular Stress-Corrosion Cracks In Fe-Ni-Cr Alloys—L. E. Thomas, S. Bruemmer .....	884
New Transmission Electron Microscope Characterization Techniques From Precision Focused Ion Beam Membranes—R. Hull, D. Dunn, J. Demarest, D. Mathes .....	886
The FIB Lift-Out Specimen Preparation Technique For Tem Analyses And Beyond: Sem, Auger, Stem, And Sims Applications—F. A. Stevie, C. B. Vartuli, R. H. Mills, R. B. Irwin, T. L. Shofner, L. A. Giannuzzi .....	888
Precision TEM Specimen Preparation 'At A Distance'—T. Malis, P. Buseck, J. J. Bradley, J. J. Li, M. M. Phaneuf .....	890
Transmission Electron Microscope Specimen Preparation Of Metal Matrix Composites Using The Focused Ion Beam Miller—P. R. Munroe, J. Cairney, R. Smith .....	892
Cross-Sectional Transmission Electron Microscopy Sample Preparation Using Focus Ion Beam Machine And Wedge Technique—D. Li, R. Zhou, R. Zanoya .....	894
Enhancement Of SEM/EDS Analysis Using FIB Sample Preparation—C. B. Vartuli, F. A. Stevie, J. B. Bindell, T. L. Shofner, B. M. Purcell .....	896

Thickness Measurement Of Focused Ion Beam Thinned Silicon Crystals Using Convergent Beam Electron Diffraction And Electron Energy Loss Spectroscopy—D. C. Delille, R. Pantel, G. Auvert, E. Van Cappellen . . . . .	898
Defect Analysis And Process Development Of Microelectronics Devices Using Focused Ion Beam And Energy Filtering Transmission Electron Microscopy—R. A Pantel, G. Mascarin, G. Auvert . . . . .	900
Optimization Of FIB-Milling Technique For Preparation Of TEM Specimens From Copper/Low-k Materials—F. Shaapur, D. Brazeau, B. Foran . . . . .	902
Novel Preparation Of Precision Planar TEM Specimens For Integrated Circuits Using Dual-Beam Focused Ion Beam—Z. Ma, B. Davies, J. Brandt, B. Baker, K. Headley, B. Miner . . . . .	904
Effect Of Surface Roughness On STEM Samples Prepared By FIB—C. Vartuli, F. A. Stevie, T. Kamino . . . . .	906
TEM FIB Lift-Out Of Mount Saint Helens Ash—J. Drown-MacDonald, B. Prenitzer, T. Shofner, L. A. Giannuzzi . . . . .	908
SEM Specimen Preparation By Broad Ion Beam Etching For Enhanced Channeling And Orientation Imaging—R. Alani, D. P. Field, K. Ogura . . . . .	910
Reactive Ion Beam Etching (RIBE) Technique And Instrumentation For SEM Specimen Preparation Of Semiconductors—R. Alani . . . . .	912
A Method For Site Specific Characterization Using A Dedicated FIB System Combined With An Analytical TEM—T. Kamino, T. Yaguchi, H. Matsumoto, H. Kobayashi, H. Koike . . . . .	914

#### SPECIMEN PREPARATION POSTER SESSION

Novel Sample Preparation Methods For Transmission Electron Microscopy Observation Of Dopant Profiles In Silicon Devices—S. Pannitteri . . . . .	916
A New Specimen Preparation Technique For Metallographic Evaluation Of Lead Alloys—J. Vahaaho, P. A. Zielinski . . . . .	918
Boron Substrates For Particulate X-Ray Microanalysis—E. S. Windsor, D. E. Newbury, J. D. Kessler, P. H. Chi . . . . .	920
Microanalytical Techniques For The Determination Of Carbonaceous Aerosols In Remote Air And Snow Samples—J. D. Kessler, L. Currie, D. Newbury, E. Windsor . . . . .	922
Image Analysis And Fourier Transform Infrared Light Microscopy And Transmission Electron Microscopy Of Mercerized Cotton Yarns—E. K. Boylston . . . . .	924
A Reactor For “Ex-Situ” TEM Catalyst Characterization—C. E. Kliewer, M. Disko, S. Soled, G. DeMartin . . . . .	926
In-Situ Transformation Of A Zinc TEM Lift-Out Specimen—B. Prenitzer, S. Collins, L. A. Giannuzzi . . . . .	928
Effect Of Specimen Aspect Ratio On The Reconstruction Of Atom Probe Tomography Data—D. J. Larson, K. Russell, M. Miller . . . . .	930
Recent Developments In Mechanical Specimen Preparation For TEM And SEM Application—W. Li, S. Wang, R. Trussell, M. Xu, R. Venables, D. Venables, D. Maher, E. Hirsch . . . . .	932
Characterization Of Thin Films On Oxide Using A Unique TEM Specimen Preparation Process—L. K. Lam, D. Ast . . . . .	934

## COMPUTATIONAL METHODS FOR MICROSCOPY AND MICROANALYSIS

Synthesis Of Electron Energy Loss Spectra And Application To Quantifying Detection Limits In Materials Science—N. K. Menon, O. L. Krivanek, M. K. H. Natusch . . . . .	936
Optimum Window Size For Quantitating Trace Elements Using Linear Least Squares Fit With EELS—R. Ho, J. Feng, Z. Shao, A. Somlyo . . . . .	938
Near Real-Time X-Ray Cone-Beam Microtomography—A. Shih, G. Wang, P.-C. Cheng . . . . .	940
PC-Based Imaging System For Color Cell Identification And Scoring—J. S. Suri, S. Kumar . . . . .	942

## ELECTRON HOLOGRAPHY

Electron Holography Of Magnetic Memory Cells—B. G. Frost, E. Voelkl, M. Kowalewski . . . . .	944
Electron Holography Of Potential Barriers In ZnO Varistors—M. Elfving, M. Saunders, E. Olsson . . . . .	946
Development And Applications Of Highly Precise Phase Measurement Technique Using Phase-Shifting Electron Holography—K. Yamamoto, I. Kawajiri, T. Tanji, M. Hibino, T. Hirayama . . . . .	948
Live Electron Holography: A Window To The Phase World—E. Voelkl . . . . .	950
Visualization Of Pure Phase Objects By Amplitude-Division Three-Wave Interference—T. Hirayama, T. Saito . . . . .	952
Interpretation Of Holographic And Lorentz Images Of An Array Of Reverse Biased p-n Junctions In A Semi-Infinite Specimen—M. Beleggia, R. Capelli, G. Pozzi . . . . .	954

## SCANNED PROBE MICROSCOPY: MUCH MORE THAN JUST BEAUTIFUL IMAGES

Applications Of Scanned Probe Microscopy In The Integrated Circuit Fabrication Industry—J. F. Richards, R. J. Kline . . . . .	956
Nanometer-Scale Dimensional Metrology With The NIST Calibrated Atomic Force Microscope—R. G. Dixon, R. Koning, V. Tsai, J. Fu, T. Vorbürger . . . . .	958
Two-Dimensional Carrier Profiling Of Advanced Sub-Micron Silicon Devices Using Scanning Capacitance Microscopy—A. A. Konkar, W. Chen, K. Noehring . . . . .	960
Characterization Of Multi-Phase And Multi-Component Polymer Systems Using The Atomic Force Microscope—M. R. VanLandingham, X. Gu, D. Raghavan, T. Nguyen . . . . .	962
Self-Assembled Monolayers: Assembling, Disassembling And Reassembling Studies Using AFM—B. R. Neves, M. Salmon, D. Leonard, P. E. Russell, E. Troughton . . . . .	964
Identification Of Halogen Atoms In Scanning Tunneling Microscopy Images Of Substituted Phenyldecyl Ethers—I. H. Musselman, H. S. Lee, S. Iyengar . . . . .	966
Atomic Force Microscopy And Near-Field Scanning Optical Microscopy Study Of Quantum-Dot Assemblies And Fractal Films—J. G. Zhu . . . . .	968
Chemical Imaging With A Scanning Probe Microscope—D. A. Kossakovski, J. D. Baldeschwieler, J. L. Beauchamp . . . . .	970

The Effect Of Thin Water Films On Force Microscopy Measurements—D. L. Sedin, K. Rowlen . . . . .	972
Scanning Probe Microscope Studies Of Nanoscale Corrosive Wear Of Single Crystal Surfaces— J. T. Dickinson . . . . .	974
Development Of A Combined Scanning Ion-Conductance And Near-Field Optical Microscope To Image Live Cells—M. Raval, D. Klenerman, T. Rayment, Y. Korchev, M. Lab . . . . .	976
Effect Of Surface Oxide Characteristics On Scanning Capacitance Microscopy Imaging—A. A. Konkar, W. Chen, K. Noehring . . . . .	978
Novel Aspects Of Micro-Thermal Analysis Of Polymer Blends—M. Conroy, H. Pollock, A. Hammiche, G. Mills, J. Weaver, M. Reading, D. Price . . . . .	980

#### DEVELOPMENTS IN SCANNED PROBE MICROSCOPY OF POLYMERS

Atomic Force Microscopy Of Industrial Polymers—A. A. Galuska . . . . .	982
Nanomechanical Property Determination Of Organic Matrix In Mollusc Shell Nacre: A Biocomposite— J. Sopp, M. Sarikaya . . . . .	984
Morphology And Film Properties Of Composite Carboxylated Latexes—O. L. Shaffer, M. Sandor, M. El-Aasser . . . . .	986
Polymer Characterization Using Confocal Scanning Laser Microscopy: A Review—M. R. Atkinson . . . . .	988
Imaging Mechanisms In Dynamic Force Microscopy Of Polymers—G. D. Haugstad, J. A. Hammerschmidt, W. L. Gladfelter . . . . .	990
FTIR Imaging Of Multiphase Polymer Systems—B. G. Wall, J. Koenig, R. Bhargava, C. Snively . . . . .	992
Tapping Mode Near-Field Scanning Optical Microscopy Of Molecular Crystals And Thin Films—C. D. Frisbie, A. Koserin, H. Stadniychuk . . . . .	994

#### BIOLOGICAL APPLICATIONS OF SCANNING PROBE MICROSCOPIES

Structure, Flexibility And Intramolecular Forces Observed On Individual Proteins Using AFM—D. J. Müller, A. Engel . . . . .	996
Multimodal Atomic Force Imaging Of Open Hemichannel-Induced Modulation Of Cell Volume And Viscoelastic Property—R. Lal, S. Rhee, A. Quist, H. Lin . . . . .	998
Atomic Force Microscopy (AFM) Of Chromatin Fibers: What Can We Learn?—S. H. Leuba, R. R. Bash, D. Lohr, S. Lindsay, J. Zlatanova . . . . .	1000
Direct Magnetic Excitation Of Cantilevers For Dynamic Force Microscopy In Liquids—S. Lindsay . . . . .	1002
Scanning Force Microscopy And Nanomanipulation: Studies Of DNA And Proteins Involved In DNA Repair— D. A. Erie, G. Ratcliff, M. Guthold, V. Bullock, M. Pliske, R. Superfine, R. Taylor . . . . .	1004
In Vitro Studies Of Microtubule Structures Using The MAC Mode™ AFM—J. Y. Zhu, J. Hartman, R. Case, S. Rice, R. Vale . . . . .	1006
Resolving Spatial Conformations Of Immuno-Proteins With Cryo-Atomic Force Microscopy (Cryo-AFM)— Z. Shao, S. Sheng . . . . .	1008

Micro & Nano-Scale Structure Of Enamel And Dentin-Enamel Junction Of Human Teeth—H. Fong, M. Sarikaya, S. White, M. Snead . . . . .	1010
Probing Biomaterials With The Atomic Force Microscope—H. G. Hansma . . . . .	1012
Single Protein Mechanics Studied With AFM Techniques—J. M. Fernandez, M. Carrion-Vazquez, A. Oberhauser, S. Fowler, P. Marszalek, J. Clarke . . . . .	1014
Structural Forces In Biomolecules—M. Rief, H. Gaub . . . . .	1016
Gel-Immobilized Microarrays For The Study Of Nucleic Acids And Proteins—J. S. Zlatanova, A. Mirzabekov . . . . .	1018

**STRUCTURAL APPROACHES TO THE STUDY OF CELL CELL INTERACTIONS  
IN THREE DIMENSIONS**

Vesicular Transport Of Connexins And Gap Junction Turnover In Living Cells Visualized Using Green Fluorescent Protein Tagged Connexins—D. W. Laird, K. Jordan, P. Fistouris, J. Solan, P. Lampe, C. Shao . . . . .	1020
3D Confocal Microscopy And Image Analysis For Measurement Of Genetic Instability—C. Ortiz de Solorzano, K. Chin, D. Knowles, A. Jones, E. Garcia, J. Gray, S. Lockett . . . . .	1022
Structural Studies Of Dynamin Provide Insights Into The Mechanism Of Membrane Recycling—J. E. Hinshaw, P. Zhang, S. Sweitzer . . . . .	1024
Clathrin-Mediated Endocytosis In The Giant Reticulospinal Synapse In Lamprey—O. Shupliakov . . . . .	1026
Localization Of Nicotinic Acetylcholine Receptors On Somatic Spines Of Chick Ciliary Ganglia Neurons— R. D. Shoop, M. M. Martone, N. Yamada, M. Ellisman, D. Berg . . . . .	1028
Localization Of CaMKII mRNAs To Dendritic Spines Visualized By High Resolution In Situ Hybridization— A.-L. Byrd, S. Shenoy, M. Martinez, M. Plociniak, H. Zhang, R. Singer, G. J. Bassell . . . . .	1030
Structural And Organizational Studies Of Soluble TAR-CHEW-CHEA Complexes By Electron Microscopy And Image Analysis—N E. Francis, T. Shaikh, M. Levit, L. Melanson, J. Stock, D. DeRosier . . . . .	1032
Molecular Mechanisms Of Self-Assembly And Polymorphic Switching Of The Bacterial Flagellum—K. Hasegawa, I. Yamashita, Y. Mimori-Kiyosue, F. Vonderviszt, K. Namba . . . . .	1034

**NOVEL APPROACHES TO MICROSCOPY OF LIVING CELLS**

Imaging Protein Interactions And Gene Expression In Individual Cells By Fluorescence Resonance Energy Transfer—R. Y. Tsien, A. Miyawaki, R. Kerr, G. Baird, B. Griffin, S. Adams, G. Zlokarnik, M. Whitney, P. Negulescu, W. Li . . . . .	1036
Requirement Of Prolonged Calcium Increases For The Induction Of Nuclear CaM <sub>Ca</sub> 4 Signals—T. Meyer, M. Teruel . . . . .	1038
Protein Dynamics During Apoptosis—B. Herman . . . . .	1040
Elastic Properties Of Erythrocyte's Membrane Measured By Atomic Force Stretching Method—R. Korenstein, A. Bitler, L. Scheffer, E. Ben-Jacob . . . . .	1042

Imaging The Lateral Distribution Of Fluorescently Labeled Membrane Components Of Human Erythrocytes Under Deformation—D. W. Knowles, N. Mohandas, C. Ortiz de Solorzano, S. Lockett . . . . .	1044
Increase In Intracellular Sodium Evoked By Glutamate Transporter Activation In Cortical Astrocytes: A Fluorescence Microscopy Analysis—J.-Y. Chatton, P. Marquet, P. J. Magistretti . . . . .	1046
Quantitative Imaging Of Metabolism During Glucose-Stimulated Insulin Secretion—D. W. Piston, S. Knobel, G. Patterson . . . . .	1048
Phytofluors: Phytochrome-Based Orange Fluorescent Protein Probes—J. C. Lagarias, B. Montgomery, J. Murphy, S. Wu . . . . .	1050
Submembrane Events In Triggerable Cells Studied By Total Internal Reflection Fluorescence Microscopy—D. Axelrod, L. Johns, E. Levitan, G. Omann, R. Holz . . . . .	1052
Quantitative Phase Contrast Microscopy Of Living Astrocytes By Numerical Reconstruction Of Digital Holograms—P. Marquet, E. Cuche, J. Y. Chatton, C. Depeursinge, P. J. Magistretti . . . . .	1054
Monitoring Of Cell Surface Movement At The Erythrocyte's Edge By Scanning Phase Contrast Microscopy—R. Korenstein, A. Bitler, A. Barbul . . . . .	1056

#### MULTI PHOTON EXCITATION MICROSCOPY: THE NEXT GENERATION

2-Photon Excitation Laser Scanning Microscopy For High Resolution Imaging In Scattering Biological Tissues: Applications to Neuroscience—K. Svoboda, B. Burbach, B. Lendvai, Z. Mainen, M. Maravall, E. Nimchinsky, P. O'Brien, B. Sabatini, E. Stern . . . . .	1058
Imaging Subcellular Changes In Living Mammalian Embryos Using 1047 nm Two Photon Excitation Fluorescence Microscopy—J. M. Squirrell, D. Wokosin, B. Bavister, J. White . . . . .	1060
Biological Applications Of Chromophores With Large Two-Photon Cross Sections—M. E. Dickinson, D. Mccord-Maughon, K. Staub, M. Levin, T. Parker, S. Fraser, S. Marder . . . . .	1062
Two-Photon Microscopy As A Useful Tool For Elucidating The Mode Of Action Of Novel Potential Cancer Therapeutics—C. S. Navara, F. Uckun . . . . .	1064
All-Solid-State Diode-Pumped Fluorescence Lifetime Imaging System For Biomedicine And Microscopy—M. J. Cole, K. Dowling, P. M. W. French, R. Jones, D. Parsons-Karavassilis, M. J. Lever, A. K. L. Dymoke-Bradshaw, J. D. Hares, M. A. A. Neil, R. Juskaitis, T. Wilson . . . . .	1066

#### APPLICATIONS OF IMAGING TECHNIQUES TO THE STUDY OF EMBRYOLOGICAL DEVELOPMENT

Multi-Dimensional Microscopic Analysis Of Sea Urchin Development—R. G. Summers, G. Martins, J. Morrill . . . . .	1068
The Effects Of Spaceflight On Calcium-Dependent Secretion And Cytoskeletal Organization During Fertilization And Cell Division In Sea Urchin Eggs And Embryos—H. Schatten, A. Chakrabarti, H. Levine, M. Runco, K. Anderson, M. Taylor . . . . .	1070
Soma/Germline Interactions In Caenorhabditis Elegans Gonad—D. H. Hall, V. Winfrey, G. Blauer, L. Hoffman, T. Furuta, K. Rose, O. Hobert, D. Greenstein . . . . .	1072

Imaging Techniques Combined With Enzyme-Based Procedures That Facilitate The Simultaneous Imaging Of Nerves, Neurons, Cartilage And Bones During Development In <i>Gambusia</i> —E. Rosa-Molinar . . . . .	1074
Applications Of Confocal Microscopy To Study The Roles Of The Cytoskeleton During Early Embryogenesis In Amphibians—M. V. Danilchik, E. Brown, K. Larkin, K. Ray . . . . .	1076
Approaches For Understanding Dynamic Cell Movements, Cell-Cell Interactions And Tissue Shaping During Embryogenesis Of The Vertebrate Body Plan.—G. C. Schoenwolf . . . . .	1078
Microscopic Characterization Of Ocular Development And Disease—J. D. Potts, P. Conley, R. Champion . . . .	1080
Microscopy As A Tool In Understanding The Role Of Growth Factors In Cardiac Development—R. L. Price, T. Thielen, T. K. Borg, L. Terracio . . . . .	1082
Confocal Laser Scanning Microscopy Of Mouse And Human Embryos: Apoptosis And Morphology Studies—R. M. Zucker, K. Sulik, O. Price . . . . .	1084

### PATHOLOGY OF AIDS AND RELATED CONDITIONS

Ultrastructural Pathology Of AIDS: An Overview—J. M. Orenstein . . . . .	1086
Early “Events” In HIV Infection And HIV-Associated Neoplasia—B. G. Herndier . . . . .	1088
AIDS Dementia Complex—S. J. DeArmond . . . . .	1090
AIDS: Tubuloreticular Structures (TRS), Cylindrical Confronting Cisternae (CCC), And Related Alterations—G. S. Sidhu, N. D. Cassai . . . . .	1092
Contributions Of Microscopy To The Diagnosis And Investigation Of AIDS-Associated Renal Disease—D. N. Howell, L. Szczech . . . . .	1094
Aids/Opportunistic Infections—J. G. Guccion . . . . .	1096
AIDS-Associated Viral Infections—S. E. Miller . . . . .	1098
EARL Apoptotic Changes In The Leukocytes Of Rhesus Macaques Challenged With Chimeric Simian/Human Immunodeficiency Virus (SHIV)—N. J. Bryant, L. Asher, M. Lewis, J. Mascola, C. Carpenter, C. Hanson . . . . .	1100
Microsporidia Infection Results In Redistribution Of Host Cell Mitochondria—A. P. Shaw . . . . .	1102
Ultrastructural Examination Of An Opportunistic Organism In Acquired Immunodeficiency Syndrome—K. S. Snell, C. W. Boudreaux, J. A. C. King . . . . .	1104

### BIOMEDICAL APPLICATIONS

Permeability Oxygen Through Endothelium By Time-Resolved Fluorescence Microscopy: Influence Of Plasma Viscosity On Tissue Hypoxia—D. Dumas, V. Latger, M. M.-L. Viriot, J. F. Stoltz . . . . .	1106
Ultrastructural Morphology Of Cationic Liposome/DNA Complexes For Gene Therapy: Correlation To Transfection Activity—B. Sternberg, K. Hong, W. Zheng, D. Papahadjopoulos . . . . .	1108
Androgen-Responsive LNCaP And Androgen-Independent DU145 Cells Display Different Taxol Sensitivities—M. Ripple, M. Taylor, C. Hueser, H. Schatten . . . . .	1110

Enhancement Of Differential Interference Contrast Images Of Live Cells Obtained With Digital Cameras— M. V. Parthasarathy	1112
In Vivo Characterization Of Cardiac Tissue Defects Associated With PDGFR-Alpha Gene Deletion In The Patch Mouse—T. E. Thielen, L. Terracio, T. Borg, R. Price	1114

### BLOOD/IMMUNOLOGY

Application Of Cryo-High Resolution (HR) SEM Technique For Imaging Platelet Morphology—M. Wendt, K. A. Robinson, N. A. F. Chronos, K. L. Caran, R. P. Apkarian	1116
The Effects Of Spaceflight On Mitochondria In Human Lymphocytes (Jurkat)—H. Schatten, M. Lewis	1118
Fibrinogen Marburg Fibrin Network Structure—J. P. DiOrio, M. Mosesson, I. Hernandez, T. Sugo, M. Matsuda	1120
Biological Relevancy Of Quantitative Analysis Of Adherence Receptors On Polymorphonuclear Neutrophil By Flow Cytometry And Optical Scanning Microscopy—D. Dumas, V. Latger, J. F. Stoltz	1122
Localization Of Tissue Factor Pathway Inhibitor In Endothelial Cells: Pitfalls And Challenges—R. Olsen, J. B. Hansen, P. Webster	1124
N-Formyl Peptide Receptors Display An Asymmetric Distribution In Migrating Human Neutrophils— V. M. Loitto, B. Rasmusson, K. Magnusson	1126

### MICROBIOLOGY

Microscopic Studies Of Endospore And Parasporal Crystal In Bacillus Thuringiensis Kurstaki A3-4 From Fermentor—K. C. Feng-Chen, X. S. Jan, B. L. Liu, Y. M. Tzeng	1128
Low Voltage Field Emission Scanning Electron Microscopy Provides Structural Evidence For Actin-Sized Filaments In Toxoplasma Gondii—H. Schatten, D. Sibley, H. Ris	1130
The Structure Of Maize Streak Virus: Are Two Heads Better Than One?—W. Zhang, N. Olson, P. Chipman, R. McKenna, T. Baker	1132
CIV, An Iridovirus With A Pseudo T=147 Capsid Structure—X. Yan, N. Olson, M. Bergoin, M. Rossmann, T. Baker	1134
The Lyme Disease Spirochete, Borrelia Burgdorferi, Forms Spheroplasts In The Presence Of Spingolipid Analogue PPMP—C. F. Garon, L. Lubke	1136
Clofoctol-Induced Ultrastructural Changes In Staphylococcus Aureus—B. E. Maleeff, S. Pearson, D. Payne, T. Hart	1138
Infection Of Tick Cells By Two Nonpathogenic Strains Of Rickettsia—A. T. Palmer, U. Munderloh, T. Kurtti	1140
First Report Of A Putative Cyanophage, MC-1, Of Microcoleus Sp.—J. R. Rosowski, J. Shaffer, E. Martin, T. Kokjohn, K. Lee	1142



## PATHOLOGY

Ultrastructural Diagnosis Of Whipple's Disease At Autopsy—S. Siew, B. Newton .....	1144
Fatal Encephalitis In Young Children, Taiwan, 1998—C. S. Goldsmith, W.-J. Shieh, M. Pallansch, T. Ksiazek, C. Hsueh, S.-M. Jung, T.-T Kuo, Y.-P. Chen, S. Zaki .....	1146
Infrared Spectroscopic Micro-Imaging Of Macromolecular Leakage In Acute Lung Injury Tissue—J. Wang, P. Fata, B. Yip, L. Oppenheimer, R. O'Connor, R. Stimpson, H. H. Mantsch .....	1148
Light And Electron Microscopic Examination Of The Vascular Changes After Long Term-Low Dose Treatment—R. G. Aktas, K. Kutlu .....	1150
Centrosome And Centriole Abnormalities During Cancer In The Transgenic Adenocarcinoma Mouse Prostate (TRAMP) Model—H. Schatten, A. Wiedemeier, M. Taylor, D. Lubahn, M. N. Greenberg, C. Besch-Williford, C. Rosenfeld, K. Day, M. Ripple .....	1152
Comparison Of The Effect Of The Carbamate Herbicides, Barban And Chlorpropham, On mrc-5 And HeLa Cells—J. E. Tate, J. R. Palisono .....	1154
A Morphologic Study Of Canine Hepatozoonosis: An Emerging Tick-Transmitted Disease—C. A. Cummings, R. Panciera, S. S. Ewing, K. Kocan .....	1156
Comparison Of Ultrastructural Morphology Of Tissue Fixed In Formalin And Prefer (TM)—S. D. Billings, M. Goheen .....	1158
Cardiac Rhabdomyoma: Ultrastructural Features And Review Of Literature—S.-H. Zhu, J. Barrish, J. Hicks ...	1160
Skeletal Muscle Ultrastructural Alterations In Alcoholism—B. Müller, H. J. Finol, I. montes de Oca, A. Mayorca .....	1162
Skeletal Muscle Ultrastructural Pathology In Multihormonal Disorder—A Márquez, H. J. Finol, M. Pulido-Méndez, M. Campos de Veitia .....	1164
Diagnosis Of Polyoma Virus Infection In Renal Transplant Recipients—J. A. King, D. D. Howell, A. Tucker, R. Lowry .....	1166
Kidney Ultrastructural Pathology In Plasmodium Berghei Murine Malaria: Tubular Cell And Peritubular Capillary Alterations—M. Pulido-Méndez, H. J. Finol, A. Rodríguez-Acosta, A. Márquez, N. González .....	1168
Microcysts In The Dorsal Cochlear Nucleus Of The Acoustically-Deprived Gerbil—S.-M. Yu, Y. J. Yang .....	1170
Ultrastructural Characterization Of Hearts From Transgenic Mice Expressing The Epstein-Barr Virus Nuclear Antigen-Leader Protein—J. R. Megill .....	1172
Localization Of Inducible Nitric Oxide Synthase In A Rat Model Of Silicosis—L. E. Millecchia, P. Willard, A. Hubbs, D. Porter, V. Castranova .....	1174
SEM And TEM Observations Of Rat Trachea And Lung After Inhalation Injury And Cutaneous Burn In A Rat Model—P. C. Langlinais, D. W. Mazingo, M. A. Dubick, S. C. Carden, C. W. Goodwin .....	1176
Morphological Correlates Of The Protection Afforded By Varma Mixture* In Rat Cornea Exposed To Half Mustard (cees)—J. P. Petrali, M. Henein, A. H. ALi, P. S. Devamanoharan, T. A. Hamilton, S. D. Varma .....	1178
In Vitro Investigation Of The Synthetic Sebum Adsorbing Efficacy Of Acrylate Copolymer As An Excipient And In Clinac™ OC—R. W. Taylor, C. Smith, M. White .....	1180
Apoptosis In Experimental Unilateral Abdominal Cryptorchid Testis In Rat—F. K. Al-Bagdadi, R. Stout, S. Farouqi, S. Crawford, M. Kearny, S. Husein, J. O'Donnell .....	1182

## SAFE MANAGEMENT OF INFECTIOUS AND BIOHAZARDOUS AGENTS

Successful Management Of Infectious Pathogens From Microbial Outbreak Specimens: Safety And Identification—C. D. Humphrey . . . . .	1184
Laboratory Safety For The Electron And Correlative Microscopist—S. E. Miller, D. N. Howell . . . . .	1186

## APPLICATIONS AND ADVANCES IN VASCULAR CORROSION CASTING IN MICROVASCULAR RESEARCH

Vascular Regression In Gill Filters Of Tadpoles Of <i>Xenopus Laevis</i> Daudin: A Qualitative And Quantitative Sem Study On Vascular Corrosion Casts—H. Bartel, B. Minnich, I. Margreiter, A. Lametschwandtner . . . . .	1188
Physiological Aspects Of Vascular Corrosion Casting—K. R. Olson . . . . .	1190
The Vascular Structure Of The Kidney Of Mallards And Doves—H. Ditrich . . . . .	1192
Blood Supply And Function Of The Tegmentum Vasculosum (Stria Vascularis) Of The Duckling Cochlea—F. E. Hossler . . . . .	1194
Demonstrating Angiogenesis In A Human Testicular Malignant Tumor Using The Scid-Maus Model. Intravital Video Microscopy And Scanning Electron Microscopy Of Vascular Corrosion Casts—S. Aharinejad, M. Schlag, H. Abri, M. Fink, F. Nourani, S. Nedwed, P. Schlatter . . . . .	1196
Comparative 3D-Morphometry Of The Microvascular Unit In Tumors And Normal Tissues: Quantitative Studies On Corrosion Casts—M. A. Konerding, W. Malkusch, M. Presta, A. Gaumann . . . . .	1198
Microstructural Changes Of The Compact Bone In The Mandible Of Aging Rats Using Plastic Cast Method—S. Okada, F. Iwaku, S. Yoshida, Y. Ohta . . . . .	1200
Angiogenic Remodeling Of The Pulmonary Microcirculation—D. E. Schraufnagel, S. Kathula, F. Hu, R. P. R. Michel . . . . .	1202
Exact Detection Of Arterial And Portal Branches Of The Terminal Afferent Vessels In The Rat Liver By Means Of Corrosion Casts And EDX—U. M. Spornitz, I. Bartuskova, G. Morson . . . . .	1204
Angioarchitecture Of Palatine Mucosa Of Young Rabbits: A SEM Study Of Vascular Corrosion Casts—M. C. Kronka, I.-S. Watanabe . . . . .	1206
Microvascularization Of The Cerebral Cortex In Frontal And Parietal Lobes Of The Rabbit ( <i>Oryctolagus Cuniculus</i> )—R. P. Chopard, C. I. Conejero, I. Watanabe, R. Ocaña . . . . .	1208

## BIOPOLYMERS AND BIOMEMETICS

Examination Features Of Large Unilamellar Vesicles (LUVs) Using Cryo-HRSEM And Cryo-STEM—K. Caran, R. P. Apkarian, F. F. Menger . . . . .	1210
Self-Limiting Aggregation By Controlled Ligand-Receptor Stoichiometry And Its Use For A Novel Drug Delivery System—E. Kisak, M. M. M. Kennedy, J. Zasadzinski . . . . .	1212

Triggered Morphology Generation in A Biosynthetic Model Spider Dragline Silk Protein—R. Valluzzi, S. Szela, D. Kirschner, D. L. Kaplan .....	1214
Solid State Conformational Transitions In Peptides Modeling B. Mori Fibroin—D. Wilson, R. Valluzzi, T. Vuong, S. Chien .....	1216

### HIGHLIGHTS OF BIOLOGICAL MICROSCOPY IN THE PACIFIC NORTHWEST USA

1,2-Diacetylbenzene Neurotoxicity: A Model To Study The Role Of Schwann Cells In Maintenance Of Axonal Integrity In Toxic States—M. S. Kim, R. Kayton, J. Muñiz, D. R. Austin, P. S. Spencer, M. I. Sabri .....	1218
Transmission Of <i>Borrelia Hermsii</i> , The Agent Of Relapsing Fever, By The Tick Vector <i>Ornithodoros Hermsii</i> — E. R. Fischer, T. Schwan .....	1220
Strategies For Immunodissection Of The Connective Tissue Matrix And Basement Membranes—D. R. Keene, S. Tufa .....	1222
Quantitating Pressure-Induced Optic Nerve Injury In A Rat Model Of Glaucoma—E. C. Johnson, W. O. Cepurna, J. C. Morrison .....	1224
Recent Advances In Microscopy Of The Ear—D. R. Trune .....	1226
Imaging Molecular Targeting In Living Neural Cultures—C. S. Wallace, M. A. Silverman, M. A. Burack, J. E. Lochner, R. G. Allen, G. Banker .....	1228
Ultrastructural Immunocytochemical Synapse Changes In A Rat Model Of Parkinson's Disease—C. K. Meshul, C. Allen, T. Kay .....	1230
Alterations In Glutamate Synapses In The Nucleus Accumbens Following Sensitization To Cocaine— L. B. Kozell, C. Meshul .....	1232
Live-Tissue Videomicroscopy Of Different Vascular Beds In The Eye: A Microcosm Of Untouched Microcirculation—M. D. Becker, T. Martin, S. Planck, J. Rosenbaum .....	1234
Pericyte Ultrastructural Alterations In The Gastrointestinal Adenocarcinomas Microvasculature—P. Tonino, H. Finol, L. Sosa, C. Hidalgo .....	1236
Scripted Image Enhancement/Analysis Using Adobe Photoshop With IP Tools Plug-Ins—R. A. Underwood, L. Muffley, H. Predd, M. Piepkorn, J. Olerud .....	1238
Astrosclereids In Needles Of Old-Growth Douglas-Fir Trees—M. E. Apple, A. Soeldner, R. Hamill, K. Tiekotter .....	1240
Interactions Between Mouse Lymphocytes And <i>Borrelia Burgdorferi</i> , The Infectious Agent Of Lyme Disease— D. W. Dorward .....	1242
Aquatic Surface Film Organisms Collected On Glass Substrates For Evaluation By Scanning Electron Microscopy—R. W. Smith .....	1244

### APPLICATION OF CORRELATIVE MICROSCOPY TO STUDIES OF PLANT CELL FUNCTION

Visualization Of The Transcription Factor AGL15 In Plant Embryos: A Case Of Regulation Via Cellular Localization—D. E. Fernandez, S. Perry, M. Lehti .....	1246
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Cytosolic And Membrane Proteins In Plant Cytokinesis—S. Y. Bednarek, C. Dickey . . . . .	1248
Histological And Ultrastructural Changes In Leaves Of Resistant And Susceptible Chickpea Cultivars To Ascochyta Rabiei (Pass.) Labr—H. Ilarslan, B. F. S. Dolar . . . . .	1250
Transfer Cell Development And Immunolocalization Of A Senescence-Associated Gene (SAG14) In Senescing Arabidopsis Thaliana Leaves—W. A. Russin, L. M. Weaver, R. M. Amasino . . . . .	1252

### ULTRASTRUCTURAL ANALYSIS OF PLANT CELLS

Morphological And Immunocytochemical Analysis Of Polyhydroxybuterate Distribution In Transgenic Plants—S. M. Colburn, N. Biest, M. Hao, K. Houmiel, T. Mitsky, S. Padgett, S. Reiser, S. Slater, M. Tran, H. Valentine, K. Gruys . . . . .	1254
Effects Of Varying Salinity On Leaf Ultrastructure Of Potamogeton Pectinatus L.—A. D. Barnabas, P. Bunsu, Y. Naidoo, W. Przybylowicz, J. Mesjasz-Przybylowicz . . . . .	1256
Chloroplast Ultrastructure And Absorption Properties Of The Alga Phaeocystis Antarctica Karsten: A Qualitative Study Using Electron Tomography—T. A. Moisan, M. Ellisman, G. Sosinsky . . . . .	1258
Correlative SEM And TEM Of Plant Spermatozoids: Equisetum Arvense L.—S. J. Schmitt, K. S. Renzaglia . . . . .	1260
Three-Dimensional Visualization Of Meiotic Chromosomes In Maize Trisomy 6—W. Y. Cheng, D. B. Walden, P.-C. Cheng . . . . .	1262
Confocal Microscopy And Digital Deconvolution Study Of Meiosis-I In Maize—T. C. Lee, D. B. Walden, P.-C. Cheng . . . . .	1264

### BIOLOGICAL ULTRASTRUCTURE (CELLS, TISSUES, ORGAN SYSTEMS)

Morphometric Analysis Of Polychlorinated Biphenyl 118-Induced Ultrastructural Alterations In The Rat Liver—T. L. Gallant, A. Singh . . . . .	1266
Colocalization Of Markers Of The Endocytic And Biosynthetic Pathways In Multivesicular Bodies Of Murine Alveolar Type II Epithelial Cells—C.-L. Na, T. E. Weaver . . . . .	1268
Surface Morphological Changes Of Hela Cells Exposed To Tamoxifen And Taxol—S. K. Majumdar, J. Valdellon . . . . .	1270
Dynamics Of Mitochondria In P0 Human Cells Repopulated With Exogenous mtDNA Observed By Transmission Electron Microscopy—Y. Lu, M. King . . . . .	1272
Ultrastructural Analysis Of The Aseptate Gregarine Pterospira, A Parasite Of The Bamboo Worm Axiothella Mucosa—S. C. Landers . . . . .	1274
Ultrastructure Of Candida Albicans And Saccharomyces Cerevisiae After Treatment With SCH 56301 (An Aureobasidin)—B. D. Hartman, C. Cramer, J. Greene, K. Shaw, R. Hare, B. DiDomenico . . . . .	1276
Ultrastructure Of Conidium And Disjuncter Development In The Plant Pathogenic Fungus Monilinia Vaccinii- Corymbosi—C. Mims, E. A. Richardson . . . . .	1278
Primitive Patterns Of Reproduction In The Foraminifera (Protists)—S. T. Goldstein . . . . .	1280

Investigation Of DNA Organization In Spermatozoa Using High Resolution Scanning Electron Microscopy— A. V. Klaus, W. W. Ward .....	1282
Microscopic Examination Of Vascular Differentiation And Pattern Formation In The Inflorescence Stems Of Arabidopsis—G. D. Freshour, M. Hahn, Z.-H. Ye .....	1284
Centrosome Structure And Function Is Altered By Experimental Manipulations With Formamide: Implications For Abnormal Mitosis During Cancer—H. Schatten, C. Heuser, A. Chakrabarti .....	1286

### BIOLOGICAL MICROANALYSIS

Electron Probe Microanalysis Of Spirolactone Bodies—J. P. McNeil, J. E. Carter, C. W. Boudreaux, F. McDonald, J. A. Tucker, J. A. C. King .....	1288
Left-Handed z-rna In Lens Epithelium: Preequatorial Zone—C. E. Gagna, H. R. Kuo, W. C. Lambert .....	1290
Tissue Response To Three Mixtures Of A Bone Substitute Material In Tooth Extraction Sites—K. E. Krizan, D. Lew, R. Burton, J. Laffoon, J. C. Keller .....	1292
Localization Of Glutamyl/Prolyl-Trna Synthetase Within The Eukaryotic Multienzyme Complex By Immunoelectron Microscopy—M. T. Trempe Norcum, J. David Dignam .....	1294
Mapping Phosphorus In Macromolecular Assemblies At Near Single Atom Sensitivity By STEM-EELS— R. D. Leapman, N. Rizzo .....	1296

### NEUROBIOLOGY

Huntingtin Localization In Rat Cortex And Striatum—W. J. L'Amoreaux, S. Nevins .....	1298
High Pressure Freezing And Freeze-Substitution As A Tool For Post-Embedding Immunocytochemistry In Monkey Brain Sections—J. F. Pare, A. Charara, Y. Smith .....	1300
Light Microscopy, Confocal Laser Scanning Microscopy And Scanning And Transmission Electron Microscopy Of Cerebellar Golgi Cells—O. J. Castejón, P. Sims .....	1302
A Microscopic Investigation Of The Interaction Between <i>Borrelia burgdorferi</i> And Human Astrocytes— V. Karpiak, C. F. Garon .....	1304
Apoptosis Signalling In Retinas Of Mice With Inherited Photoreceptor Degeneration.—K. A. Rich .....	1306
Speedy Plankton: Myelinated Axons In Calanoid Copepods (Crustacea)—A. Davis, T. M. Weatherby, P. Lenz .....	1308

### BIOLOGICAL SPECIMEN PREPARATION

Rapid Procedure For Detecting Scrapie-Associated Fibrils In Chronic Wasting Disease Of Elk And Mule Deer— C. E. Hearne, J. Clapper, K. DeVries, E. Williams .....	1310
Specimens For Observing Single Events Of DNA Metabolism By Fluorescence Microscopy—M. Sun, P. Serwer .....	1312

Incorporation Of Membrane Proteins Into Lipid Bilayers For Scanning Transmission Electron Microscopy And 3D Reconstruction—D. E. McAlduff, Y. M. Heng, F. P. Ottensmeyer .....	1314
Glucose -6-Sulfate Is A Negative Stain/Sustain—W. H. Massover .....	1316
Potassium Permanganate Staining Allows For The Visualization Of An Outer Surface Component Of Selected Ehrlichiae—S. F. Hayes, U. G. Munderloh, J. L. Goodman, K. M. Kocan .....	1318

## CYTOCHEMISTRY

Quantitative 3D Analysis Of Intra_Nuclear Organization In The Tissue Context—S. J. Lockett, D. Knowles, D. Pinkel, C. Ortiz de Solorzano .....	1320
Visualization Of Uptake Of High Density Lipoprotein By Rat Aortic Endothelial Cells In Vitro—W. T. Chao, V. C. Yang .....	1322
A Covalently Linked 10 nm Gold Immunoprobe—E. Gutierrez, R. D. Powell, J. Hainfeld, P. Takvorian .....	1324
The Role Of p115 RhoGEF In The Rho Mediated Effects Of LPA And Thrombin On The Actin Cytoskeleton— C. L. Schwartz, C. Wells, X. Jiang, H. Arnott, P. Sternweis, M. Wilk-Blaszczak .....	1326
Cellular Redistribution Of Taurine In Osmotically Swollen Rat Hippocampus—C. A. Taylor, J. E. Olson, N. R. Kreisman, J. Leasure .....	1328
Microscopic Evidence Of Biofilm Formation In The Gut Of Two Pest Tephritidae—S. E. Potter, C. Lauzon, N. Smith .....	1330
Subcellular Distribution Of Basic Fibroblast Growth Factor-Like Molecules In Fibroblasts And Extracellular Matrix—R. G. Aktas, R. Kayton .....	1332
Age-Related Changes In Acetylcholinesterase Activity In The Efferent System Of The Cochlea Of C57BL/6 Mice—G. M. Cohen, B. Shah .....	1334
A Post-Embedding Colloidal Gold Immunocytochemical Approach To The Study Of Matrix Accumulation In Glomerular Basement Membrane—C. A. Miller, D. Cosgrove .....	1336
Identification Of Scavenger Receptor SR-BI In The Endothelial Cells And The Smooth Muscle Cells Of Rat Aorta In Vitro—Y. C. Yeh, G. Hwang, V. C. Yang .....	1338
Effectiveness Of Immunolabeling GFAP For Estimating Astrocytic Shape And Volume—E. A. Bushong, M. E. Martone, C. Foster, M. H. Ellisman .....	1340
Wax Particle Morphology And Ultrastructure Of Two Species Of Adult Insects: Prey And Predator.— T. P. Freeman, D. Nelson, J. Buckner, G. G. Jackson .....	1342

## MSA TECHNOLOGISTS' FORUM SYMPOSIUM: TECHNOLOGY FROM THE PACIFIC NORTHWEST

Utility Of Secondary Guard Hairs In Animal Hair Identification—B. C. Yates .....	1344
Typical Application In Metallurgical Failure Analysis Laboratory—B. L. Wong .....	1346
Insights Into The Past: The Use Of Microscopy In The Conservation Of Cultural Materials—J. C. Dean .....	1348
Uses Of Microscopy In The Crime Lab—T. McAdam .....	1350
Detecting And Optimizing Fluorescence Signals—W. K. Metcalfe .....	1352

MSA TECHNOLOGISTS' FORUM SPECIAL TOPIC PRESENTATION

25 Years In A Stereology Laboratory: A point By Point History—J. M. Basgen ..... 1354  
Factors Which Influence The Development And Success Of An Academic Electron Microscope Facility:  
A Case Study—J. C. Wheatley ..... 1356

**On the cover:** SEM of free-swimming sperm cell of the fern ally *Equisetum arvense*. The cell forms a helix of about 3.5 coils, with a locomotory apparatus consisting of approximately 55 flagella and associated structures occupying the anterior end of the cell. From S.J. Schmitt and K.S. Renzaglia, *Correlative SEM And TEM Of Plant Spermatozoids: Equisetum Arvense L.*, page 1261.

