TSEM

Texas Society for Electron Microscopy

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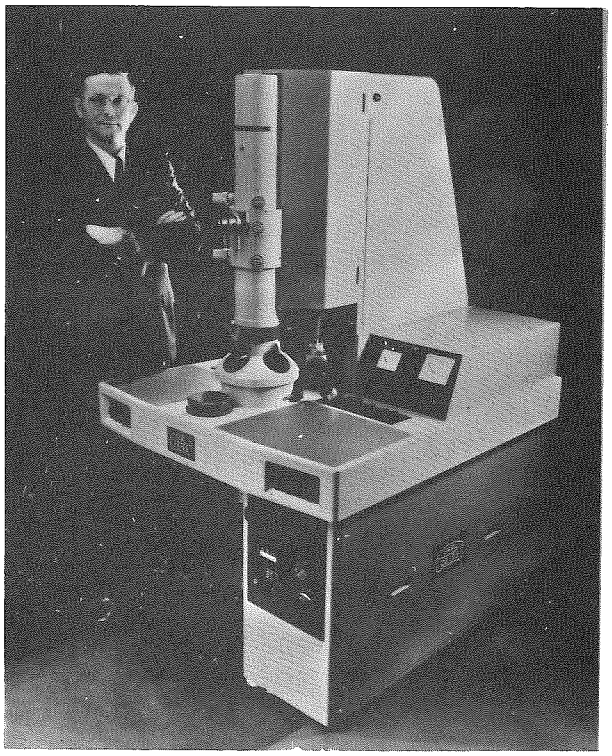

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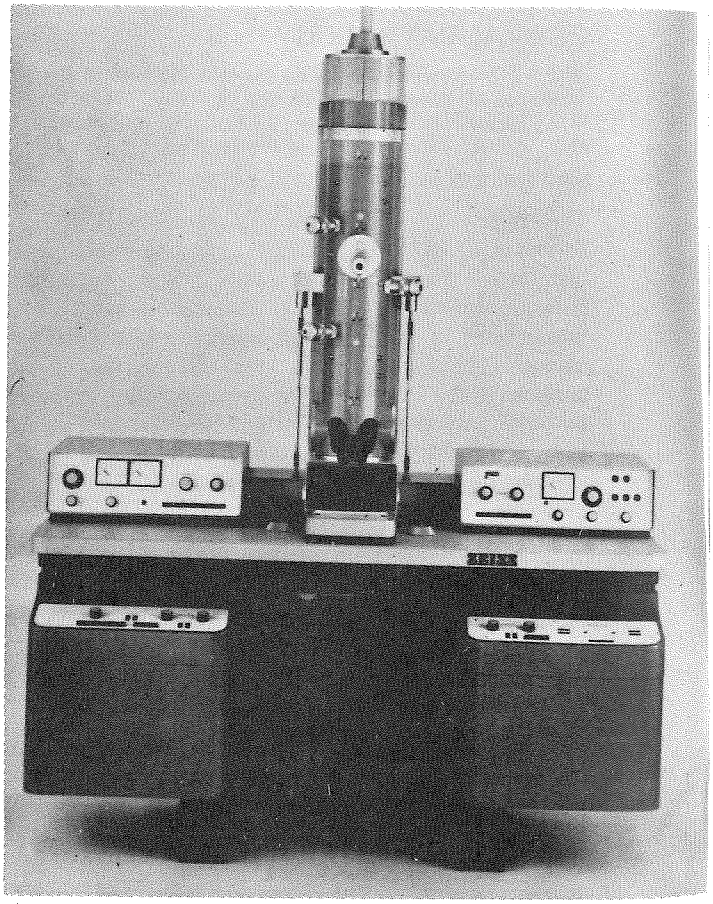

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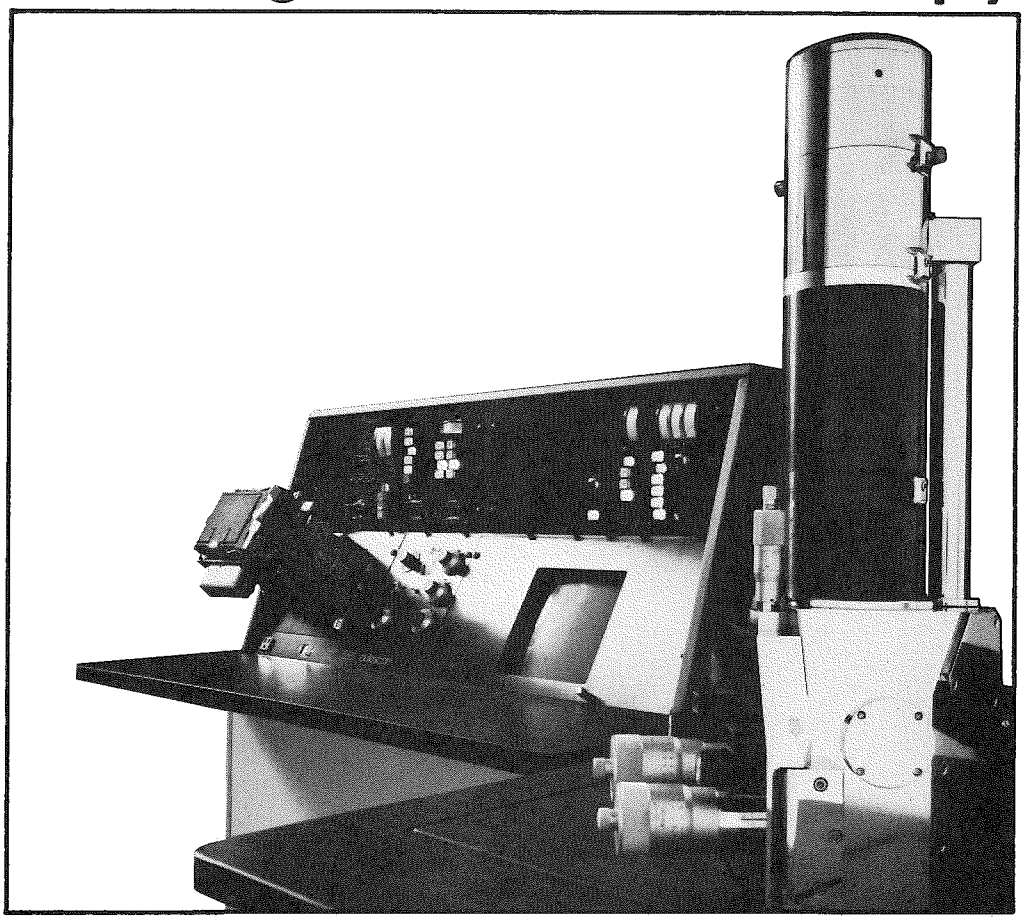
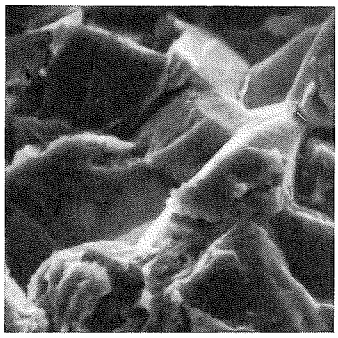
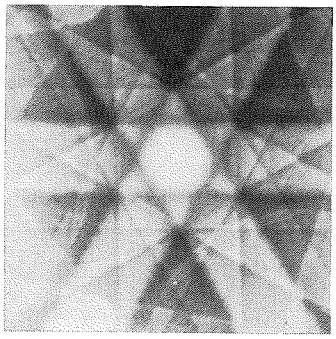
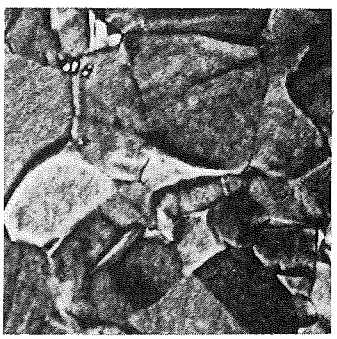




Titanium fracture



Selected area electron channeling pattern



Channeling contrast

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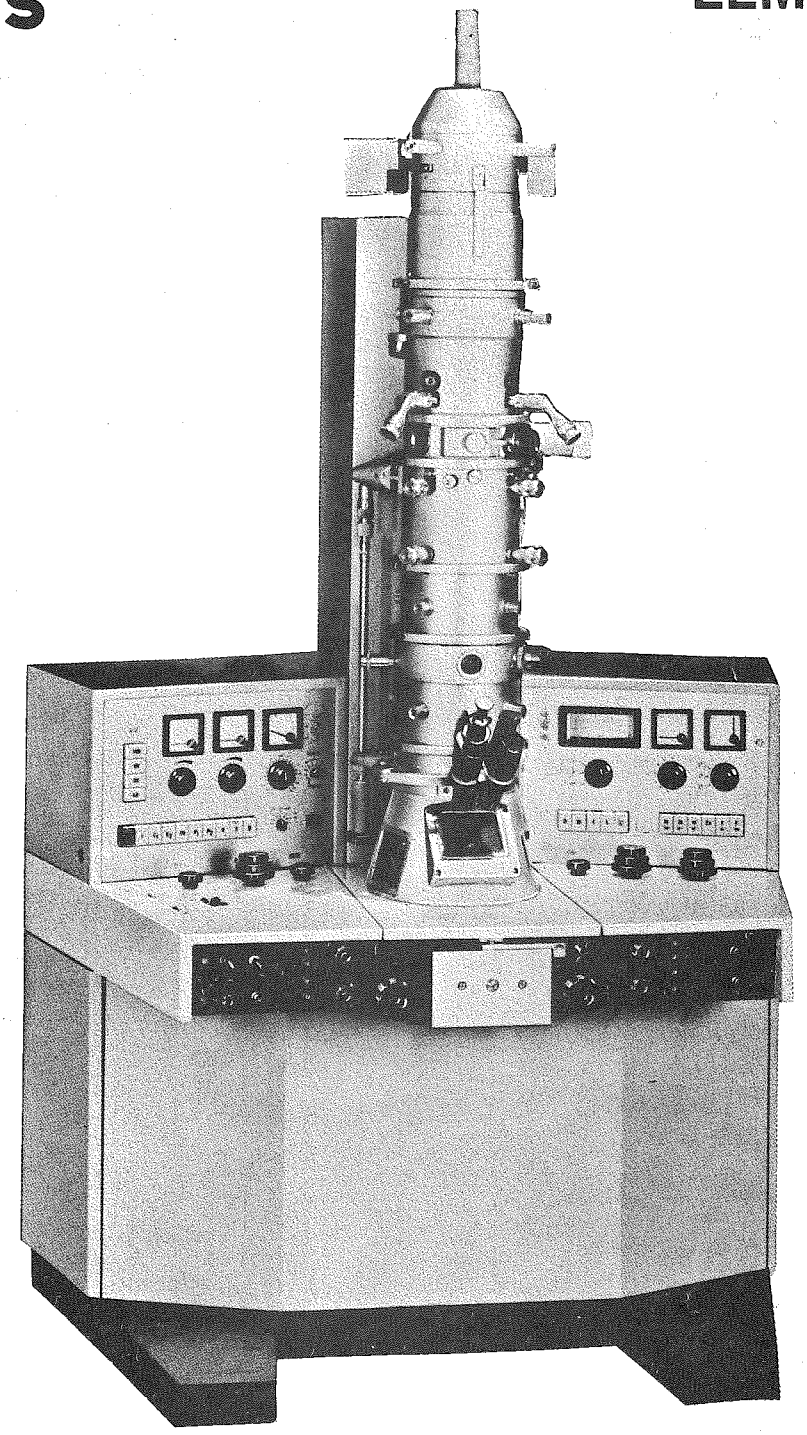

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TEXAS SOCIETY FOR ELECTRON MICROSCOPY –

" FOR THE PURPOSE OF DISSEMINATION OF RESEARCH WITH THE ELECTRON MICROSCOPE "

FOUNDED IN 1965

VOLUME 4 NUMBER 3

FALL 1973

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Editorial

An Analysis of the National Institutes of Health Research and Training Budgets, Past, Present and Future

Three months ago I wrote a letter to President Nixon explaining my thanks to my government for the important part it has played in my own training and in the support of my research activities.

I also expressed my concern over a possible decrease in funding of basic research (not including contract grants) and decreased funding for research training grants and training fellowships.

My letter to The President was referred to a Mr. Storm Whaley, Associate Director for Communications at the National Institutes of Health. Mr. Whaley's response explained that "The Administration's understanding of and appreciation for the importance of biomedical research and its fruits is reflected in the continued, indeed the increased, support of such activity in the new budget. The President has asked for support at a time when every effort is being made to limit Federal expenditures and to eliminate nonproductive programs". Mr. Whaley also informed me of a new research and training program.

Well, this all sounds fine and I began to wonder if I were misinformed, so I asked him to send me specific budgetory information on the grant situation and on the new training program. After several more letters back and forth, I was able to get the budget information I needed to assess the situation myself. The budget is reproduced here for your information.

	Millions of Dollars (Rounded Off to Nearest Million)		
Type of Grant	1972	1973	1974 President's Budget
I. Regular Research Programs			
Noncompeting Projects (Continuation Grants)	357	428	461
Competing Projects (New or Renewal Grants, Peer Review)	208	159	120
Subtotal	565	587	581
II. Fellowships and Training Grants	46	37	32
	140	113	97
Subtotal	186	150	129
III. Research and Development Contracts (No Peer Review)	230	246	290
Total of Three Categories	981	983	1000

The funds for regular research grants in The President's 1974 budget is decreased 6 million dollars over 1973. While the funds for research and fellowships have decreased 21 million dollars from 1973 to 1974, at the same time the amount of money for contract grants is increased by 44 million.

More specific information on the regular extramural research program budgets of the various research institutes shows that all institutes are taking cuts except for the Cancer Institute and the Heart and Lung Institute.

The most appalling aspect of the budget is the realization that competing research grant funds are on a straight line decrease which, if extrapolated, will reach zero by mid-1976! Many more things can be said at this point but I will let the reader say them.

Regarding the Administration's new fellowship announcement, I have specifically asked Mr. Whaley three times for further information on the new fellowship program but no further information has been forthcoming.

At this point, each of us must consider what the future holds for biomedical research and training opportunities. Certain trends seem apparent. Training funds are decreasing as are regular research grants (competing grants are decreasing at an alarming rate). On the other hand, contract grants are up. Some alternatives can be listed:

1. Fight back, change the trend.
2. Start thinking in terms of contract grants. By the way, who decides on these contract grants anyway?
3. Drop out of research.

Perhaps it is time for TSEM as an organization to consider the situation. As for me, I opt for fighting back because I consider contract grants much less productive. Although the peer review is subject to criticism, I think it is the best system we now have for judging grant applications. One can always drop out but if one is really interested in doing research he can find a way.*

IVAN L. CAMERON

Newsletter Editor

* The Editor is on his way to Canada for six months.

PRESIDENT'S MESSAGE

The original concept of the formation of an EM society in the State of Texas was started by two prominent electron microscopists in Texas. I am speaking of Drs. Bill Philpot and Lea Rudea of Rice University.

Questionnaires were originally sent out to many people and EM labs in the spring of 1965 to have an organizational meeting. As a result, 38 interested people arrived one night in May of 1965 at Rice University and the T.S.E.M. society's first slate of officers consisted of:

President - Dr. Bill Philpot, Rice
Vice President - Dr. Lea Rudea, Rice
Secretary - Mr. Don Benifiel, Dow Chemical
Treasurer - Mr. Glenn Williams, Southwestern Medical School
Program Chairman - Mr. Harwood Johnson, Ivan Sorvall

Since the original 38 members, the T.S.E.M. has grown to over 300 individual members and 22 corporate members. The society has truly lived up to its original purpose and intent, i.e., to increase and diffuse the knowledge of electron microscopes and related instruments and results obtained through their use in whatever fields they may be found to be applicable.

The society, in eight years of existence, has not only lived up to its purpose but everyone has benefited in innumerable ways from its tri-annual meetings. The T.S.E.M. has had many outstanding and famous men in the field of electron microscopy as their guest keynote speakers. Just to name a few: Drs. Cecil Hall, Russell Barrnett, John Luft, George Palade, Keith Porter, Al Crewe, Dan Pease, John Watson, Fernandez-Moran and many others.

Believe me, the T.S.E.M. has genuinely established itself as one of the nation's leading local E.M. societies.

Other achievements of the T.S.E.M. have been the joint symposium with the L.S.E.M. We have jointly met with the L.S.E.M. for the past two years; once in Fort Worth and most recently in New Orleans. They were both very successful meetings, even though Bourbon Street was covered with snow.

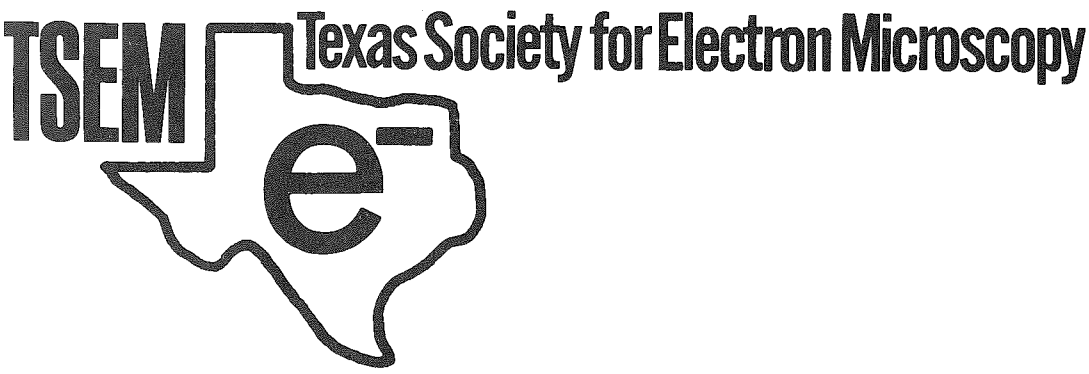
As the 9th President of T.S.E.M., I feel quite humble in being elected to head such a prestigious society. I pledge to you as members and to the T.S.E.M. society as an organization that we will continue to have one of the country's most outstanding societies of electron microscopy.

Our tremendous growth has been largely due to the great works and efforts of many officers and members during the past eight years and I would like to personally thank all of them for their many contributions. They have made the

T.S.E.M. the high caliber of EM society that we have today. We can all be very proud to be a member of the Texas Society for Electron Microscopy.

ROBERT A. TURNER

President



T.S.E.M. MINUTES

The T.S.E.M. business meeting was held Friday, May 25, 1973, at 8:15 P.M., at the Jack Tar Hotel, Galveston, Texas. President Dimitrij Lang presided. The minutes of the last meeting were read and approved. The treasurer's report was read and approved.

D. Lang announced the below items:

1. The ballot to amend the term of Treasurer and Secretary to two years was approved.
2. The new officers for next year.
3. W. Kischer had resigned as Newsletter Editor and has been replaced by Ivan Cameron.
4. The New Orleans abstracts will be published in the Texas Reports on Biology and Medicine.
5. The next joint LSEM-TSEM meeting would be held in February, 1974, in San Antonio.

Randy Scott suggested two individuals be nominated to each T.S.E.M. office in the future. No action was taken.

Bob Turner suggested that a committee might be needed to rewrite the constitution in the future. No action was taken.

Ward Kischer noted that Siemens was the sponsor for the evening social and other contributions to the meeting were made by Brinkman, Curtin-Matheson, Kent-Cambridge and Reichert.

Ward Kischer moved that the current diamond knife committee be abolished and that the Newsletter Editor be appointed to chair a new committee. The motion passed.

Ward Kischer spoke to the point of having previous T.S.E.M. officer's expertise and support used more. After discussion Kischer moved to have the new excecutive committee consider a letter to the entire membership, with emphasis on old officers, soliciting support. The motion passed 12 for, 3 against. Subsequently, the Newsletter Editor was appointed to write the letter.

Ward Kischer suggested that the new Executive Committee consider travel grants to, in order of priority, 1) senior graduate students, 2) junior faculty, 3) technicians, and 4) senior faculty. No action was taken.

Bob Turner commended the local arrangements committee for the meeting, especially the low rates for the rooms and luncheon, and expressed hope that low rates could be obtained at future meetings.

The meeting adjourned at 9:20 P.M.

JERRY BERLIN

Secretary

ANNOUNCEMENTS

The joint TSEM-LSEM symposium will be held at the Menger Hotel, San Antonio, Texas on February 8th and 9th, 1974. This meeting will solicit presentations from all TSEM-LSEM members and the abstracts of the meeting will be published in the Texas Reports on Biology and Medicine.

The spring meeting is intended to be a workshop-graduate student meeting to be held at Texas A & M University, May 17th and 18th, 1974. Papers will be presented by graduate students only and they will also chair each session. This meeting is intended to appeal to the graduate community by providing inexpensive housing and meals. In addition, TSEM is currently working on an award program to be given to outstanding student presentations. Details will follow in subsequent announcements.

TREASURER'S REPORT

TEXAS SOCIETY FOR ELECTRON MICROSCOPY

Through September 11, 1973

Total Assets:	
Balance on hand	$3,231.85
Allocation of Funds:	
A. Bank Account:	
University Bank at Fort Worth	2,231.85
B. Certificate of Deposit:	
University Bank at Fort Worth	1,000.00
	$3,231.85

FINANCIAL REPORT

T. S. E. M. Spring Meeting

Galveston, Texas

May 25-26, 1973

Receipts:

A.	Registration fees and dues	$ 932.72
B.	Dues received during pre-registration	70.50
C.	Balance from Secretary's operating account	46.00

Disbursements:

A.	Plaque for Russel Barrnett, Guest Lecturer (Note: $14.54 had already been credited to our account because Emblem & Badge Co. mistakenly overcharged us for the Watson, Dempsey and Fernandez-Moran plaques. Thus, this check was in the amount of $2.40)	16.94
B.	Dr. Norman Granholm (Note: for newsletter typing)	26.25
C.	Dr. Russell Barrnett (Note: personal and travel expenses, $258.98; Honorarium, $50.00)	308.98
D.	U. T. M. B. Print Shop (Note: Printing T. S. E. M. Newsletter)	374.27
E.	Dr. Terry Hoage	17.40
F.	Jack Tar Hotel Note: $ 18.00 .....Coffee break 15.20 .....Barrnett's room 159.60 .....70 lunches at $1.90 each, plus tax and tip	192.80
G.	Dinner for Russell Barrnett and T. S. E. M. officers, Robert Turner and Joe A. Mascorro and member, Lonnie Shepherd	34.01

Donations and Support:

A. Ivan-Sorvall, Mr. Robert Bostick	$ 100.00
B. Siemens Corp., Mr. Dietrich Voss (Approximate cost for the Social Hour)	370.00
C. Kent-Cambridge Scientific, Mr. Carl Freeman (Reimbursement for entertainment during Social)	37.50
D. Reichert Division/American Optical Corp., Mr. Howard Hayden (Reimbursement for coffee break)	18.00
E. Brinkmann Instruments, Mr. Helmut Schares	50.00
F. Univ. of Texas Medical School at Houston, Dr. Joe G. Wood (Partial payment for Guest Lecturer's expenses)	100.00

Newsletter Advertisements:

A. Curtin/Matheson	50.00
B. Carl Zeiss, Inc.	50.00
C. Philips Electronics	50.00

Note: Under Disbursements:

E. Dr. Terry Hoage, $17.40 for cost of printing programs	
H. Entertainment (Mr. Andres Garza)	37.50

Summary:

Total Receipts (from fees and dues)	$1,049.22
Total Disbursements (Dr. Wood, Mr. Freeman and Mr. Hayden will reimburse the Society for $155.50 of this amount)	1,008.15
Total Donations & Support (Not including Social Hour contribution which is billed directly to Mr. Voss)	305.50
Total Newsletter Ads	150.00

Bank balance prior to meeting	823.74
Bank balance after meeting	$1,293.26

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DEMONSTRATION OF DNA OF BACTERIA AND PLASTIC BIOLOGICAL STRUCTURES BY MEANS OF FREEZE-ETCHING. P. Giestrecht. 1968 P. Zbl. Bakt (Orig.) 207: 198-221.

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SCANNING AN AMOEBA

Amoebae have many talents. They divide and multiply; they invest, ingest, digest, then replicate, fabricate, applicate, operate, ambulate, degenerate, and defecate. They have fission, fusion and in general create illusion, delusion, and confusion.

One aspect of amoeboid movement that is most confusing is the continual cellular shape deformation. An amoeba may be monopodial one minute and polypodial the next. It has numerous appendages which extend, retract, diverge, or disappear. As a cell migrates, pseudopodia may bifurcate repeatedly during extension producing a series of Y junctions. The surface outline may appear smooth or folded or ridged. The surface conformation is characterized by its variance of overall form, diversity of rugosity, and general transient behavior. What properties of the plasma membrane allow for such conduct? Is the membrane like a paper bag which must wrinkle and fold to accommodate shape changes? Does the membrane grow at expansion sites and degrow elsewhere? Can the membrane molecules slide past one another like a fluid and so by shear deformation conform to any shape? Does it stretch like a balloon? Scanning an amoeba can provide a few answers.

The micrographs show three characteristic forms displayed by Amoeba proteus. Each form is photographed from several angles. Single cells are often seen to assume each of the shapes within a few minutes time by sequential transformation from one form to another. The usual order of occurrence is monopodial to bipodial to polypodial. The amoebae were filmed during chemical fixation to record the direction of cytoplasmic movement within the pseudopodia. The cells were dried by lyophilization and the entire preparation was performed in situ.

The pseudopodia and uroid, the physiological posterior, are generally carried aloft although the advancing pseudopodial tip periodically contacts the substratum. Upon contact the tip apparently adheres, a new advancing front forms just above the adhesion site, and pseudopodial extension continues. Substratum contact is also often provided by a lateral extension resembling a flange. These appendages are functional feet; that is, they provide support for the cell body and a frictional resistance union with the surface, against which motile forces can push to propel the cell. These functional feet are soon lifted as the uroid passes over the attachment site. The remnants of the "feet" appear as small protuberances of smooth outline attached to the uroid. They are carried there for several minutes before being absorbed. The kinetics of the "feet" are analogous to those of walking. When the center of gravity is directed over the soles of a walker, the frictional resistance is great enough to allow forward motion without slippage, but when the gravity center is shifted ahead of the foot, as in a step, friction is greatly reduced and the foot may be slipped or lifted easily. Similarly, the amoeba places a foot on the substrate with its weight directly over it, streams forward by pushing tangentially against the sole, and finally lifts the foot when the cell bulk is displaced forward. So even

though amoebae may appear to be gliding smoothly over the substrate, they are actually engaging in an amoeboid version of walking.

The conformation of amoeba feet departs from the general character of the cell surface. The vertical walls of a foot are quite smooth in comparison to the rest of the cell exterior and form sharp surface angles with its sole. Most other surface contours are rounded rather than angular. Tensile stress within the membrane is suggested by the smooth surface with angulation as if the membrane were being stretched from above, even though the weight of the cell is being borne by the structure with accompanying compressive stress. Net membrane tension may not be unexpected however, because the membrane in contact with the substrate, being adherent, is compelled to remain stationary while adjoining membrane surface is being pulled forward by pseudopodial extension. Thus tension is exerted on the vertical sides of the foot by the moving surface of the pseudopodium immediately above, resulting in the observed angularity and smoothness.

Flange-like protrusions occur dorsally as well as laterally; they lend the ridged appearance to the cell as seen optically. Pseudopodia can extend in any direction from vertical to horizontal, but starved cells like those in these micrographs typically motivate as if to search the territory quickly in conquest of food. The most efficient direction of pseudopodial extension for amoebae in a hurry would be that displayed by these specimens - the horizontal projection. The cells frequently support these cantilevered pseudopodia to extensions of half the cell length or more. A certain rigidity of the plasma membrane and its underlying gelatinous cortex is implied.

The general appearance of the surface is slightly wrinkled (perhaps a preparation artifact, even though numerous smooth areas are visible), but lacks major surface folds and sites of extensive bunching. The appearance is inconsistent with the paper bag theory of membrane deformation. For if the membrane, like the bag, could neither quickly grow nor shear nor stretch, pseudopodial retraction would result in bunching and folding of membrane at the original base of the pseudopodium. Similar bunching would necessarily occur at the juncture of the adhering feet to the cell body, because the feet are first placed on the substrate from the anterior of the cell and remain adherent until picked up by the uroid. All forward moving membrane posterior to a foot would bunch up behind it, being incapable of moving forward past the foot without tearing. No such bunching is seen; in fact, in those instances where serial feet occur, the connecting surface is quite smooth.

The general appearance seems to belie the balloon model also. Stretched balloons are smooth and rounded, even when stretched over some internal structure. The most damaging evidence, though, is again the feet. Feet laid down anteriorly and picked up posteriorily imply membrane stretching though the entire cell length. What a recoil would result upon lifting of the feet!

Growth and degrowth? Perhaps, but it would imply a virtually complete membrane turnover each time the cell moves through its own length. This has been shown to be highly improbable.

Membrane fluidity or plasticity is left as the probable primary property for accommodation of cell deformation. A membrane is required which can yield to tangential forces, as at the feet, and flow with tangential slippage or shear but at the same time withstand the internal pressure and other stresses without radial rupture. Thus the membrane would possess greater transverse than tangential yield strength. The principal aspect of such a membrane is tangential viscosity. The viscous membrane model does not encounter the conceptual and physical difficulties of the other models in commensurating with observed behavior. The model seems entirely consistent with the surface morphology. Although folding, growing, and stretching probably play a minor role in membrane deformation, membrane viscosity may be the major property of accommodation. If a soap bubble can have a viscous membrane, why not the talented amoeba?

Gerald Kirby
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Department of Mechanical Engineering
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Figure 1. Arrows in the schematic outlines indicate the direction of cytoplasmic streaming as recorded on film at time of fixation. All scales represent 25μm. (a) Top view of a monopodial cell. The uroid was moving forward with the same speed as the extending pseudopodium. (b) and (c) are side views of the monopodial cell. (d) Top view of a bipodial cell. The rectangular outline on the extending pseudopodium is interpreted as debris. The protoplasmic contents of the uroid were stationary with respect to the substrate so that material supplied to the advancing tip was primarily efflux from the retracting pseudopodium. Both lateral and dorsal flange like appendages are seen on this specimen. (e) and (f) are side views of the same bipodial cell. All side views are inclined 23° above horizontal.

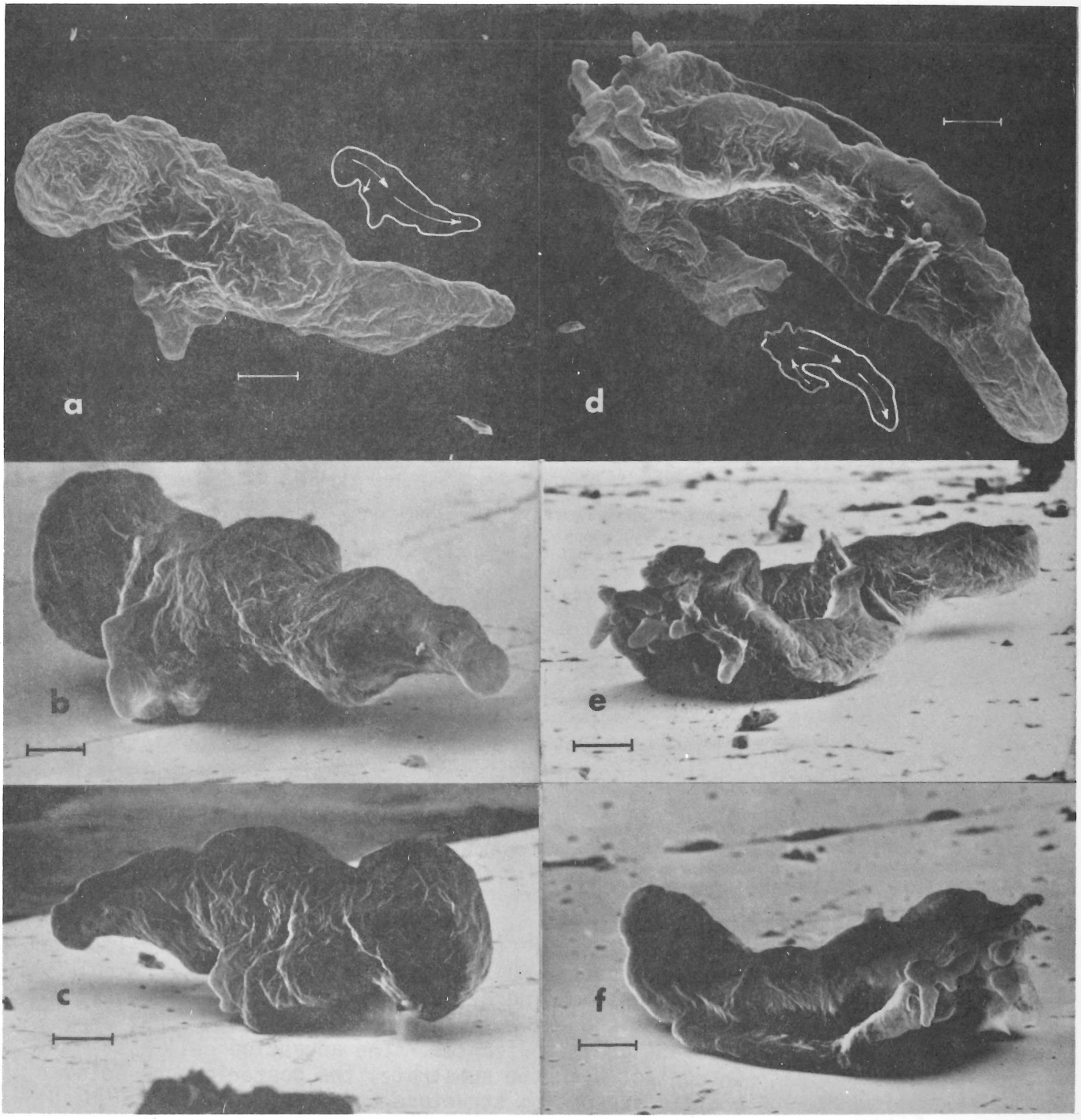

Figure 1

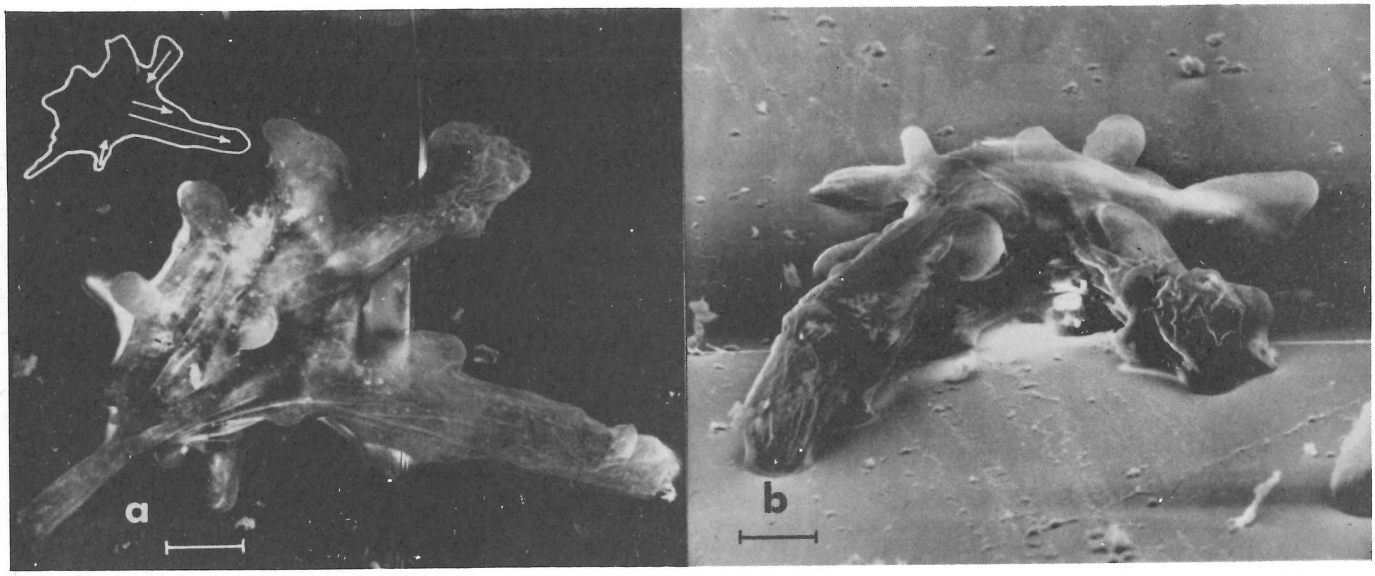

Figure 2

Figure 2. Scale represents 25μm. (a) Top view of polypodial cell. Posterior and anterior ends were moving with the same speed. The bulk of the uroid contained no streaming cytoplasm; it moved forward as if pulled by the membrane of the extending pseudopodium. (b) Front view of specimen inclined 35° above horizontal. The advancing cell has placed 3 "feet" in contact with the substrate, the posterior one being continuous with a broad supporting structure under the cell body.

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AREA NEWS

College Station

TEXAS A & M UNIVERSITY:

Dr. E. L. Thurston presented an invited lecture at Argonne National Laboratory entitled "X-Ray Analysis of Heavy Metals in Biological Thin Sections".

New Equipment:

12K Nova 1210 Mini Computer + Dual Drive Cassette Mag Tape to be connected to the EDAX X-Ray Spectrometer.

Recent Publications:

Gustafson, R. A., and E. L. Thurston. 1973. Calcium Deposition in the Myxomycete Didymium Squamulosum Mycologia (in press).

Thurston, E. L., J. R. Scott, and T. R. McKee. 1973. A Practical Device for Processing Polaroid SS P/N Film Used With Scanning Electron Microscopes. J. Microscopy (in press).

Scott, J. R., E. L. Thurston, and T. R. McKee. 1973. A Fine-Sieve Processing Container for Use in Critical Point Drying. J. Microscopy (in press).

Fort Sam Houston

U. S. A. INSTITUTE OF SURGICAL RESEARCH:

Recent Publications:

Nash, G., F. D. Foley, and P. C. Langlinais. Pulmonary Interstitial Edema and Hyaline Membranes in Adult Burn Patients: Electron Microscopical Observations. Human Pathology (in press).

Houston

M. D. ANDERSON HOSPITAL:

A grant has been received to initiate a research project on human prostatic cancer.

Recent Publications:

Seman, G., and L. Dmochowski. June, 1973. Viropexis of Type B Particles in Reticulum Cell Sarcoma of Rlll/Dm Strain Mice. Cancer Research, 33 (6): 1238-1246.

Visitors Giving Seminars:

Kalmon Perk, M.D., D.V.M., Professor and Head, Department of Animal Histology and Physiology, Hebrew University, Jerusalem, Israel, visited the Department of Virology, August 13, 1973, and presented a seminar entitled "Structure and Ultrastructure in Ovine Pulmonary Carcinoma".

Maurice Panigel, M.D., D.Sc., Professor of Reproductive Biology, University of Paris VI, Paris, France, visited the Department on August 30-31, 1973. Professor Panigel presented a seminar entitled "Physiopathology of Placental Exchange of Viruses in Primates and Humans" on August 30.

Dr. E. S. Priori presented a paper, "Studies on Oncornoviruses by Immunoferritin and Immunoperoxidase Electron Microscopy", by L. Dmochowski, M. Hoshino, T. Shigematsu, S. Hiraki, and E. S. Priori at the Second International Conference on Comparative Virology, Mont Gabriel, Quebec, Canada, August 22-25, 1973.

Other:

Dr. Dmochowski has been appointed to serve on the Ad Hoc Committee on Varicella-Zoster Infection.

JOHNSON SPACE CENTER:

The Cellular Analytical Laboratory, National Aeronautics and Space Administration, Johnson Space Center is supported by Northrop Services, Inc., as prime contractor.

Three papers from the Cellular Analytical Laboratory, Johnson Space Center, were presented at the Joint Meeting of the Electron Microscopy Society of America and Electron Probe Analysis Society of America, New Orleans, August 13-17, 1973:

"Electron Probe Microanalysis of Age Differences in Human Red Blood Cells", L. C. Burns, Northrop Services, Inc., Houston, Texas, and S. L. Kimzey, Johnson Space Center, Houston, Texas.

"Immature Muscle Sodium and Potassium Electron Microprobe Investigation", B. L. Nichols, D. J. Sachen, and C. F. Haylewood, Baylor College of Medicine, Houston, Texas, and L. C. Burns and S. L. Kimzey, Johnson Space Center, Houston, Texas.

"Utilization of Ion Beam Etching in Conjunction with Scanning Electron Microscopy to Study Red Blood Cell Structure", M. Spector, L. C. Burns, and S. L. Kimzey, Clemson University, Clemson, S. C., and Cellular Analytical Laboratory, Johnson Space Center, Houston, Texas.

Lackland Air Force Base

WILFORD HALL USAF MEDICAL CENTER:

Equipment Acquired by Department of Pathology includes a Fullum Vacuum Evaporator.

The Electron Microscopy Branch operates primarily for clinical diagnostic work and secondarily for research support in the Wilford Hall Medical Center.

Lubbock

TEXAS TECH UNIVERSITY:

Continuation of Grants:

J. Berlin, The Initiation and Development of the Cotton Fiber, sponsored by Cotton, Incorporated.

New Member:

Dr. Necip Güvan, Department of Geosciences.

New Faces:

Dr. Patrick Sterrette, Department of Anatomy, Texas Tech University School of Medicine, formerly of Chapman's Lab at the Kansas University Medical School.

Fannie Smith, Department of Biology, working on Ph. D., formerly of Hoage's Lab at Sam Houston State.

Visitors:

Department of Biology, Seminars last spring given by: Lynn Margulis, Boston, "Origin of Eukaryotic Cells" and Robert Briggs, Indiana, "Nuclear Transplants, etc.".

New Orleans

TULANE MEDICAL SCHOOL:

New Faces:

Dr. I-li Chen joined the Anatomy staff as a Visiting Research Professor. He came from Taiwan Medical School. Dr. Chen trained in UTMB, Galveston, under Dr. Robert Yates.

Robert Yates, Professor and Chairman, presented a paper and also chaired a session at the Third European Anatomical Congress in Manchester, England. Co-author was Jane Yates. The paper was entitled "An Electron Microscopic Study of Motoneurons of the Spinal Cord of the Rat Following Injections of Various Drugs".

Joe Mascorro recently was appointed by the LSEM Executive Council to serve as Acting Secretary of LSEM after that office was vacated as a result of the Secretary moving out of Louisiana. Joe is also to serve as liaison between TSEM and LSEM.

Recent Publications:

Mascorro, J. A., and R. D. Yates. Fine Structural Comparisons Between Paraganglion and Adrenal Medullary Cells. Tex. Rep. Biol. Med. (in press).

Mascorro, J. A., and R. D. Yates. Innervation of Hamster Paraganglia: An Ultrastructural Study. J. Morph. (in press).

A Review of Abdominal Paraganglia. In: EMSA Endocrinology Symposium. Wiley & Son Publishers. (in press).

Mascorro, J. A., and R. D. Yates. Ultrastructure of Mitotic Cells in Paraganglia of the Syrian Hamster. EMSA Proceedings, pp. 686-687, 1973.

Mascorro, J. A., and R. D. Yates. Summer, 1973. Occurrence of "Light" and "Dark" Chromaffin Cells in Newborn Hamster Paraganglia. Tex. Rep. Biol. Med.

Higgins, J. A., R. J. Barrnett, and R. D. Yates. The Localization of Acetyl CoA Carboxylase at the Fine Structural Level. In: Methods in Enzymology, M. A. Hayat, Editor. Van Nostrand Reinhold Company, New York. 1973.

Yates, R. D., R. H. Rigdon, and J. A. Mascorro. Amyloid in the Gastrointestinal Tract of Mice - An Electron Microscopic Study. 1973. Tex. Rep. Biol. Med., 31: 89-97.

San Antonio

SOUTHWEST RESEARCH INSTITUTE:

New Equipment:

ETEC SEM with wavelength dispersive spectrometer + vacuum evaporator and critical point dryer.

A Seminar was given at Naval Air Rework Facility, Alameda, California, on electron channeling by Dr. D. Davidson.

TRINITY UNIVERSITY:

Instruments in Operation:

Hitachi HS-8, HU11E. (These are not new, however, in an earlier TSEM survey, they were not recorded.) Trinity has recently acquired a Hitachi HS-4 vacuum evaporator and a LKB knife breaker.

Two Master's Candidates Have Completed Their Work:

George Conwell Smith, topic: Ultrastructure of the Daphnia Compound Eye Subjected to Different Wavelengths of Light.

Sally Blanchard, topic: Light and Electron Microscopic Investigation of a Timed Sequence of Iso and Allograted Mouse Heart.

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER:

New Equipment:

Denton freeze etch device, a Denton vacuum, and a Denton critical point dryer.

Continuation of Grants:

E. K. Adrian, Cell Proliferation in Injured Nervous Tissue, U. S. P. H. S.

V. Williams, Ultrastructural Aspects of Injured Cerebral Cortex, N. I. H.

W. Winborn, Electron Microscopic Studies of Parietal Cells, N. I. H.

Recent Publications:

Adrian, E. K., and M. G. Williams. Cell Proliferation in Injured Spinal Cord. An Electron Microscopic Study. J. Comp. Neurol. (in press).

Tingle, L. E., W. A. Pavlat, and I. L. Cameron. 1973. Sublethal Cytotoxic Effects of Mercuric Chloride on the Ciliate Tetrahymena pyriformis. J. Protozool., 20 (2): 301-304.

Shiino, M., G. Williams, and E. G. Rennels. 1973. Thyroidectomy Cells and Their Response to Thyrotrophin Releasing Hormone (TRH) in the Rat. Z. Zellforsch. Micros. Anat., 138: 327.

Shiino, M., and E. G. Rennels. 1973. Ultrastructural Observations of Gonadotrophin Release in Rats Treated Neonatally with Testosterone. Tex. Rep. Biol. Med., 31: 215.

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Abstracts of Papers Presented

at the

Fall, 1973, Meeting of the

TEXAS SOCIETY FOR ELECTRON MICROSCOPY

Mayan Dude Ranch

Bandera, Texas

September 28-30, 1973

Contributions of ultrastructural studies to the systematics of fungi imperfecti. Garry T. Cole, Department of Botany, University of Texas at Austin.

The taxonomy of imperfect fungi has been particularly difficult because it has been primarily based on plastic and ambiguous morphological characters like spore shape, septation and pigmentation and sporogenous cell arrangement. For many years systematists have been attempting in vain to formulate a working classification of this group of microfungi. Recently, experimental systematic investigations have indicated that developmental characters, such as the mechanisms of spore formation, are more biologically significant and, therefore, more taxonomically important than many previously used morphological features. Ultrastructural studies have been pivotal in our understanding the details of spore ontogeny and have contributed very useful criteria to the experimental classification. In this paper, the kind of information yielded by thin-sectioning and scanning electron-microscopic and freeze-etch analyses of imperfect fungi is demonstrated and its taxonomic significance is outlined.

A FILM PROJECTION SYSTEM FOR USE IN QUANTITATIVE MORPHOLOGICAL STUDIES

Russell L. Deter, Department of Cell Biology, Baylor College of Medicine, Houston, Texas

Quantitative electron microscopic investigations are frequently hampered by the need for a large number of micrographs to assure adequate sampling. The use of a 70mm roll film camera greatly facilitates negative collection, but the printing of many negatives is a significant problem. To obviate the need for printing, a film projection system, composed of a Leitz Prado projector, a combined film carrier and horizontal positioner, a Zeiss TGZ 3 particle size analyzer and an electro-mechanical counting system, has been developed. In this system, negatives are projected directly onto the measurement surface of the particle size analyzer (projector magnification can be varied between 2.7x and 6.7x). Particle identification, which is as easily done in negatives as in positives, can be aided by the use of a viewer usually employed in enlarger focusing. Profile enumeration (distributional studies) and axial ratio measurements (shape determinations) are carried out directly on the projected image. Superimposition of a point or line lattice makes possible relative volume and surface area measurements. Profile size distributions, from which particle size distributions can be calculated, are obtained by first centering individual profiles over a circle of light projected by the analyzer onto the measurement surface. Centering is accomplished by means of the motor driven horizontal positioner which moves the entire film carrier. The area of light is adjusted until it is equal to that of the profile and its size is then recorded. Measurements made on a series of negatives utilize the motor-driven film carrier to position negative in the focal plane of the 150 mm projector lens. Although designed primarily for use with 70 mm film, this system can accomodate smaller sized film if the appropriate adapter is used.

Fine structures of the substantia gelatinosa of the spinal cord after various deprivations of nerve fiber input.

Donald Duncan and Ricardo Morales
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The University of Texas
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In the electron microscope the substantia gelatinosa appears as a vast array of small neural profiles, dendritic, axonal and of synaptic sacs. This mosaic is punctuated with occasional nerve and glia cell bodies, capillaries and small myelinated fibers. Small profiles containing glial filaments are present but inconspicuous. The neural profiles are progressively diminished in numbers by dorsal root transection, dorsal root transection combined with double hemisection and by adding separation of the dorsal from the ventral horn to the combined lesion. The loss of neural profiles is compensated for by fibril laden glial profiles that dominate the picture 40-60 days after the most extensive destruction of incoming nerve fibers. However, even when the substantia gelatinosa is completely isolated from the rest of the gray matter and deprived of contributions from the ascending and descending fibers of the white matter, normal appearing neuron cell bodies, dendrites, axons and synaptic sacs are present in abundance. Most of the large synaptic vesicles containing dark cores that are characteristic of normal substantia gelatinosa are still present after the most extensive lesions. The implications of these pictures will be presented.

Microfilament Organization in Amoeba proteus

G. Kirby, Dept. of Mech. Engr., Texas Tech University

Both thick (140-160 Å) and thin (40-60 Å) microfilaments are found in Amoeba proteus. With most preparation procedures the filaments appear to be randomly oriented and distributed. Cells fixed simultaneously in glutaraldehyde, osmium tetroxide, and dimethyl sulfoxide have highly organized filament arrays if care is taken to minimize osmotic gradients during dehydration and embedment.

By examination of serial sections, fibrils composed of numerous parallel thin filaments surrounding central thick filaments are found to be continuous and to terminate on the plasma membrane. The fibrils form an anastomosing network which extends across the peripheral regions of some pseudopodia and numerous surface folds, particularly within the posterior portion of the cell. The location and organization of the microfilament fibrils is such that cytoplasmic streaming could be a result of fibrillar contraction by sliding filament mechanism. (Supported by Grant GK 27857 from NSF)

Extra- and Intracellular Collagen After Peroxidation and Digestion Through Epon

C. Ward Kischer, Department of Anatomy, University of Texas Medical Branch, Galveston, Texas 77550 and Marvin R. Shetlar, Department of Biochemistry, Texas Technological School of Medicine, Lubbock, Texas 79400

Using a procedure described by Monneron (6th Intn'l. Cong. Elect. Micro., Kyoto, Japan, Vol. II, 27), attempts were made to localize sites of chondroitin sulfates and collagen in the dermis of human skin.

Section-filled grids were immersed in 15% H_2O_2 for ten to twenty minutes, washed and placed in a 0.5% solution of chondroitinase A-B-C (Miles) for 1 hour, or in a 0.1% solution of collagenase (Worthington) for 1 to 3 hours, at 37° C. After washing with distilled water, the sections were doubly stained with lead citrate and uranyl acetate.

Appropriate controls were matched with the results. Additionally, whole pieces of tissue were placed in solutions of H_2O_2 up to 30% concentration for 30 minutes and the solution assayed for changes in soluble and insoluble collagen. Quantitation was performed by the determination of hydroxyproline content. No essential changes were found.

Digested areas were observed extra- and intracellularly. In sections from each enzyme test periodic holes appeared on the rough endoplasmic reticulum of fibroblasts. In the case of chondroitinase A-B-C some digestion appeared to have taken place in the granules of mast cells.

Cross-sectioned collagen treated with collagenase demonstrated a partially digested center of the filament; whereas, the action of the chondroitinase A-B-C seemed a bit stronger. In each test collagen in long section demonstrated digestion in similar areas.

The Theory of an Electron Optical System Which Assures Constant Magnification Independent of Object Position Along the Optical Axis

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The short focal length of electron microscopic objective lenses requires precise mechanical positioning of specimen grids along the optical axis in order to minimize variations in magnification from grid to grid. Differences between grids also contribute to these variations which may amount to several percent.

The theory of a simple optical system will be discussed which would permit the following procedure. First, a magnification standard (e.g., a cross-lined grating replica) is inserted and focused by the objective lens. Leaving the objective lens current unchanged, subsequent specimen grids (at varying positions) are focused on the fluorescent screen by a compensation lens which is located at a specified position. The magnification is then independent of specimen position along the optical axis.

ULTRASTRUCTURAL LOCALIZATION OF PROTEINS IN MYELIN USING MOLECULAR DISSECTION

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It is technically difficult to demonstrate the exact position of proteins in biological tissue at the ultrastructural level, especially when the proteins cannot be specifically demonstrated by histochemical or enzymological techniques. The proteins of myelin fall into this category. The exact location of these proteins is important in gaining better understanding of the molecular mechanisms of myelin formation, the maintenance of myelin integrity and demyelinating diseases. Biochemists have made use of the unique characteristics of individual proteins in separating and purifying them. The individual proteins in myelin also have unique biochemical properties. If these characteristics are utilized to dissect out groups of proteins and individual proteins without seriously disturbing the general remaining structure, the position of the removed proteins should be demonstrable by either a change of intensity or of configuration in the area of the removed proteins. The results of several experiments indicate that this generalized technique is applicable to myelin. The procedures used to evaluate these studies are electron microscopy to demonstrate changes in myelin structure, and gel electrophoresis to demonstrate the amount and type of protein which has been lost. Micrographs which demonstrate structural changes will be compared with gels which were prepared from tissue which was treated identically. These results will illustrate types of data which can be obtained by this method.

A MODIFIED GRID HOLDER FOR HIGH RESOLUTION TRANSMISSION SCANNING ELECTRON MICROSCOPY ON A JSMU-2 OR U3

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The transmission mode of the SEM when used in conjunction with a transmitted electron detector produces an image for general observation or for use with an x-ray microanalyzer. One of the major problems of this viewing mode is the relatively poor resolution obtainable at the standard working distance of 13 mm and the sharp decrease in resolution experiences when viewing specimens at the 32 mm working distance. A specimen holder was modified to be adjustable to any working distance from 1 mm to 32 mm with a minimum of inconvience. The construction of this device requires a specimen holder that can accept a 3/8" diameter stub and a 3/8" to 1/8" copper reducer.

ULTRASTRUCTURAL CELLULAR CHANGES OF ANTERIOR PITUITARY GLAND DURING HIBERNATION IN THE GROUND SQUIRREL*

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The ground squirrel (citellus tridecemlineatus) is known to be a hibernator. During their hibernatory period, the animals were deprived of photo-periodic information. It is believed that the pineal gland is functionally active during hibernation.

In the normal anterior pituitary gland of the ground squirrel, we could distinguish six cell types designated as types Ia, Ib, II, III, IV, V, and VI. Type Ia is the cell containing the largest secretory granules, and it may correspond to the prolactin cell. Type Ib is another acidophil which may be a growth hormone cell. Type II is a special cell type which contains two kinds of secretory granules. Some of these granules were small dark staining granules and other larger light staining granules. Type III is a cell type which contains intermediate sized dark staining secretory granules. Type IV cells contain the smallest secretory granules. This type of cell often appeared enlarged with well developed organelles. Type V is a special cell type that contains poorly developed organelles and very few secretory granules. Type VI is an ordinary follicular cell.

During hibernation, type Ia cells seemed to be slightly activated whereas all other cell types appeared to be rather inactive. The most remarkable change was observed in type II cells. These cells were mostly atrophic and contained poorly developed organelles and many lysosomes in the cytoplasm. The above observations may support the concept that during hibernation the pituitary gland may be modulated indirectly by the pineal gland.

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THE EFFECTS OF NIAMID AND RESERPINE ON THE NERVE ENDINGS OF THE PINEAL GLAND

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Kitten pineal glands were studied cytochemically under normal conditions, after reserpine injection, and after niamid administration. Adrenergic nerve elements were in perivascular spaces while cholinergic terminals were adjacent to pinealocytes, often times in synaptic contact. BA reactions are primarily in dotted vesicles of adrenergic terminals with some reaction in granular vesicles. Positive reaction occurs along neurotubules and membranous structures of adrenergic nerve fibers and terminals indicating membrane-bound BA's. Niamid increased the number and density of dotted vesicles, and some granular vesicles are increased in density and size. Reserpine produced a loss of reaction in dotted vesicles and a loss of vesicle matrix, producing elipitcal vesicles. There is loss of reaction of the dotted vesicles, but occasionally, the positive granular reaction remains. Cholinergic terminals demonstrate no changes with either niamid or reserpine. These findings indicate BAs are stored in reserpine sensitive dotted vesicles and membranous structures. The findings also show that the dotted vesicle matrix is reserpine sensitive and is necessary for storage of the BA's. Possibly biogenic amines cannot be stored or synthesized in terminals unless the matrix of the dotted vesicle is intact.