

TEXAS SOCIETY FOR ELECTRON MICROSCOPY

TEXAS SOCIETY FOR ELECTRON MICROSCOPY

NEWSLETTER

Vol. 2

No. 1

SUMMER 1970

Officers 1970- 1971: Dr. Joe G. Wood, President
Dr. Robert D. Yates, Vice President
Robert A. Turner, Secretary
Joyce Kephart, Treasurer
Dr. William Winborn, Program Chairman

Letters and Inquiries to:

Dr. C. Ward Kischer
Editor, TSEM Newsletter
Department of Anatomy
UTMB
Galveston, Texas

HOW THE GOOD NEWS WAS BROUGHT FROM HOUSTON TO SAN ANTONIO

"Sometime in the course of human history, man began to ask the questions: What is the world outside? What is man himself? These questions eventually led to the development of the sciences of physics and chemistry on the one hand, and the science of biology on the other.scientists in general have not been certain that the universality of physical principles does extend into the realm of biologyaccording to (the concept of "Vitalism"), living systems operate on a set of principles quite different from those governing the inanimate world. Vitalism, however, did not long survive its first proponents.....simplification and analysis are not sufficient to complete the biologists task, for the ultimate simplification leads to physics."

Gilbert N. Ling, Ph.D.
from the Foreward,
A Physical Theory of the Living State

Approximately six years ago the Texas Society of Electron Microscopy was born, in Houston, of Biologists and Engineers as parents and the electron microscope as mid-wife. The parents were often doting, full of hope and promise, but sometimes neglectful of each other. Who could say, at that time, whether the offspring would resemble one or the other parent, or even survive.

When Michale Faraday was asked of what use there was for one of his inventions, he countered, "Of what use is a baby?". So, just as Faraday watched the development of his "baby", so we watched that of ours.

One day this spring in San Antonio we observed a coming of age of our offspring. Lea Rudee, gaining an idea from listening to a presentation from Howard Arnott, and in cooperation with Bill Philpott, presented us with a highly stimulating report of electron diffraction analysis of crystallites from Amphioxus. It was a typical example of how an engineer and a biologist look at the same piece of material. Dr. Rudee deduced helical symmetry of the crystallites from his analysis. The contribution which this analysis will make towards an explanation of function will have to await further efforts, combined at that, between two separate disciplines.

As Ling points out, the eventual goal of biology must be the understanding of intact living matter, per se. Thus, at some point in biological studies an approach must be used involving a conceptual synthesis of principles derived from simple inanimate systems and from specific properties of isolated components of living matter.

Dr. Rudee received no questions from the audience. This was not due to lack of interest. Rather, it seems to imply that the biologists present simply had not been thinking in these terms of analysis. Perhaps, for some of us, it is high time we did. We are using an instrument which has far greater use, and potential, than most of us employ.

Lea Rudee and Bill Philpott are to be commended for their loyalty to one of the purposes of our Society. They have "brought the good news from Ghent to Aix". And we vote them (by common consent) a good measure of our appreciation.

Editor

PRESIDENT'S MESSAGE

TO THE MEMBERS:

This coming year promises to be an exciting one for TSEM. As most of you know, EMSA will be meeting in Houston in October, and the local arrangements group has been hard at work to make this national meeting both successful and pleasing. Members involved in this endeavor from TSEM are numerous, and we should all plan to attend but to offer and lend our support whenever and wherever possible. Please check the information in this Newsletter from Past President (Emeritus?) Brinkley and make every effort to attend the meeting. Remember that this EMSA meeting will replace the Fall TSEM meeting; however, there will be a room available at the Shamrock Hilton for the regular TSEM Business Meeting. Details will be available later.

Program Chairman Bill Winborn as well as the executive committee are hard at work to make the other TSEM meetings unique, attractive and informative. Newsletter Editor Ward Kischer has been laboring to produce a Newsletter of increasing quality, and we can support Ward in many ways. His task is not at all easy, and many times just a kind word will go a long way toward brightening his day.

The past meeting in San Antonio was most successful thanks to the participation of the membership, to the quality of the presenters and above all to Mr. Local Arrangements (Winborn). The new officers are all eager to serve the Membership and the Society. We are pleased that you have selected us, and most of all we appreciate the confidence you have shown by your selection of an executive committee. Probably one of the most significant events at the San Antonio meeting was the occurrence of a DISCUSSION at the Business Meeting. Thoughts and ideas were exchanged and spontaneous motions were made from the floor, seconded and approved. Such discussion and participation is indicative of a healthy organization. The officers of TSEM attempt to keep the members informed of progress and events, and these same officers would appreciate knowing more of the feelings, thoughts and ideas of the members. There are a number of ways this can be done, and one is attendance at business meetings and participation in discussions. Such a procedure can turn former moments of torture into profitable and pleasant happenings.

The subject discussed at the Spring meeting concerned a future joint meeting with the Louisiana Society for Electron Microscopy (LSEM). For several years we have been discussing such a joint venture with these two active groups. This year seemed like the year, and the

Louisiana group invited us to join them at their January 1971 meeting in New Orleans, French Quarter and all. Initially many of us were in favor of this project, but this is an atypical year since our Fall meeting is substituted for by parent EMSA. Thus, if we were to have another joint meeting (LSEM), it would mean that some of our programs might not occur; i. e., the productive graduate student session, or an invited paper session, or our own symposium. In other words, to be familial about it we would have only one meeting to ourselves; and as brought out in San Antonio our strength lies in our membership, its action and participation. The feeling was apparent at San Antonio that there is a genuine desire to meet with LSEM and to witness the advantages of exchanging ideas, making new friends, visiting New Orleans and then subsequently having the LSEM group in Texas. This cross fertilization would indeed be very profitable. The discussion as indicated earlier was healthy, well thought and productive. It was decided that the membership should be polled regarding joint meetings in general and this year in particular. Therefore, please bear with us and indicate on the enclosed card your wishes and comments. If you care to write a letter to the Editor, he should be happy to receive it or if you care to write to the President, any message will be gratefully received. Whatever your desire please fill in the enclosed card as soon as possible and return it so that we can make the plans accordingly. Remember that results of the poll will be made public and the decision of the membership will be final.

Once again, we look forward to a great year although last year will be hard to top. Let us make this a year of communication and growth, so best wishes to all of you and -- keep those cards and letters coming in folks.

Warm regards,

Joe G. Wood
President

CHANGE IS IN

With this issue the TSEM Newsletter is instituting a new feature: The Plate Page. The first one is morphological variability of mitochondria, Dr. Donald Duncan, Ashbel Smith Professor of Anatomy, at the Medical Branch in Galveston has written a brief resume as an introduction to the plate. Dr. Duncan is a real pioneer in electron microscopy in the state of Texas and, lately, has developed a special interest in mitochondria.

The next issue will be a display of contribution representative of the areas of interest from our engineer members. The editor is now soliciting from each of you engineers, chemists, all of the physical scientists your micrograph for the next plate. The dimensions should be 3-1/2" by 2-1/2" of medium contrast. Please include a credit(s) and brief description. You can save the Society the expense of phone calls by doing it now!

Note, also, that we have gone to stiff covers. The design on the cover has been tentatively accepted as the symbol of the Society.

Technique Hint

Dr. Ann Goldstine reports the use of a multicolored stain for epon sections introduced by Dr. J. Gbidoni at the 26th annual EMSA meeting. It is quite suitable for LM autoradiography. Sections stained before dipping with Ilford L4 emulsion shows low background count and little movement of label.

Lost and Found Department

If there is anyone who has issues No. 1 and No. 7 of the Newsletter, please, either send them or send Xerox copies to the Editor, Anon.

Madison Ave. Revisited

Dear TSEM:

As a major supplier of a wide variety of embedding media, supplies and chemicals for electron microscopic research, we are interested in activities of your group.

We are always interested in seminars, programs and meetings sponsored by your group wherever new advances in electron microscopy

may be presented. We shall appreciate having our name added to the list of interested individuals for such news releases.

We would welcome individual inquiries for any unique chemicals or materials which your membership may find it hard to obtain.

Very truly yours,

POLYSCIENCES, INC.

B. David Halpern
President

Paul Valley Industrial Park
Warrington, Penna. 18976

Annual EMSA Meeting October 5th - 9th, 1970
Houston, Texas

Dr. Lea Rudee reports that this year's meeting of the EMSA in Houston promises to be the biggest ever. To date, 277 papers have been accepted for presentation. The commercial exhibits have already been oversubscribed. There will be equivalent emphasis this year on scanning electron microscopy.

For the social minded there will be a Bar-B-Que and reception with cash bar on Tuesday night, October 6th, around the pool at the Shamrock Hilton Hotel. The ladies program includes an all day excursion organized by the Heritage Home Society and a wine tasting and luncheon at the Criterion Club.

Registration is \$21.00 for non-members, and this includes copies of the Proceedings. Cost is \$11.00 for EMSA members, and \$5.00 for students. Membership to EMSA is \$5.00 per year.

Those who wish additional information may contact Drs. Brinkley, Rudee, or Roberts. All TSEM members are urged to attend and support this meeting.

A Little Bit About Mitochondria

Although not the first to see them, Richard Altmann is generally regarded as the "father" of mitochondria. Between 1880-90 using acid fuchsin as a more or less specific stain he was fascinated by the little red bodies he saw in all cells. He called them bioblasts and believed they were living organisms. By and large his papers attracted little favorable attention. A superserious young man to begin with, Altman became increasingly tense and withdrawn. His associates referred to him as "der Geist". Near madness and death came early.

Not too long afterwards, ca. 1900, Michaelis discovered the peculiar affinity of mitochondria for Janus green B and with this came the first speculations on the oxidative functions of these organelles. However, definite statements on the respiratory properties of mitochondria are attributed to Kingsbury (1912) of Cornell. But in 1924 E. V. Cowdry said the notion that mitochondria are the seat of protoplasmic respiration was only a theory and one that should be regarded with caution. By this time more than 500 articles had been written about mitochondria. From 1912 and through the 30's Cowdry and his associates devoted much of their energies to the study of mitochondria. They firmly established their presence in all cells, their great diversity in size and shape and their pronounced sensitivity to environmental changes.

By 1916 Warren and Margaret Lewis had good movie films of living mitochondria. Among other things they learned that mitochondria are not sessile creatures but objects that twist and turn and move about in the cytoplasm. In 1934 Benseley and Hoerr succeeded in fractionating living cells and by centrifugation they obtained a moiety that could be identified as mitochondrial. However, it was not until 1940 that Hogeboom, Hotchkins and Porter isolated completely intact and apparently undamaged mitochondria. Isolation and fractionation of mitochondria still goes on and still brings forth additional information of great value.

Starting with Altmann there have been those who insisted that mitochondria are symbiotic organisms derived from a once independent and free living ancestor. In this country this idea was championed and cherished by Ivan Wallin, Professor of Anatomy at the University of Colorado. Throughout the 20's, 30's and into the 40's he stood virtually alone and undaunted on this issue. Curiously enough, the symbiont theory has gained considerable respect in recent years, see Lehninger, 1965.

The initial EM pictures added nothing new to the mitochondria story since they were taken by directing the beam through flattened fibroblasts in tissue culture. The mitochondria looked like solid rods and spherules, but the same pictures did reveal endoplasmic reticulum for the first time. Information on the internal architecture awaited the arrival of buffered osmium fixation and adequate thin sectioning techniques. Then the cristae were seen independently and almost simultaneously by F. Sjöstrand and George Palade (1952, 1953).

The accompanying plate is a flie's eye view of both the common structural features and the diverse internal artchitecture of mitochondria. Missing is a picture of a mitochondrion fixed in the energized state. This configuration first seen and illustrated by Hackenbrock (1966) has not yet come to Texas. So far all of ours are "conventional" or non-energized. Nevertheless, the discovery of the energized configuration must be regarded as one of the great steps forward of the 1960's. As a result everyone can be sure now that the mitochondrion is the power plant of the cell, a real machine for "nitrating" the "glycerine". Furthermore, it again exemplifies the fact that as things are constructed so they will function.

Donald Duncan

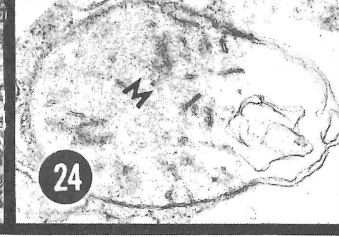
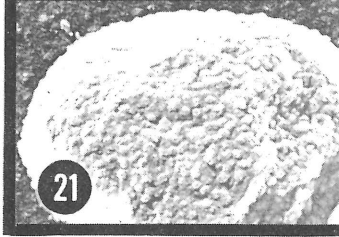
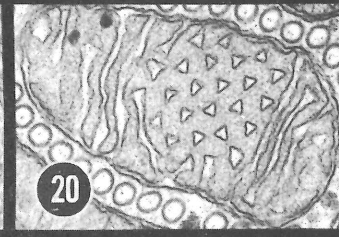
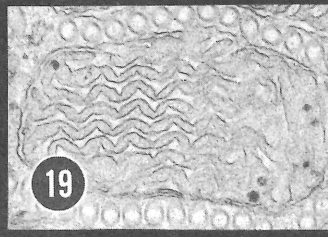
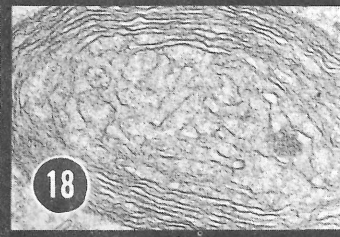
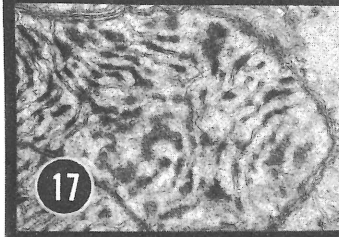
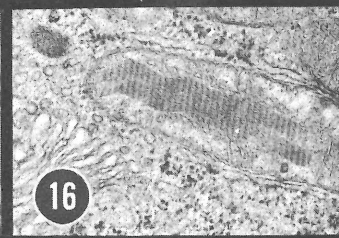
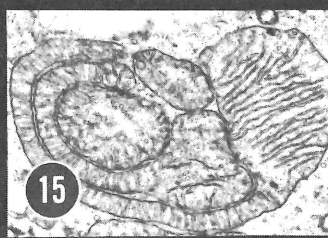
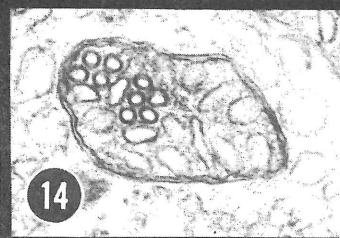
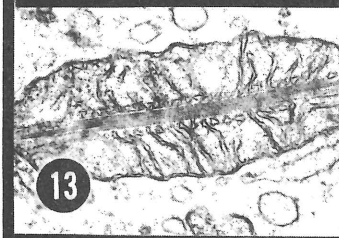
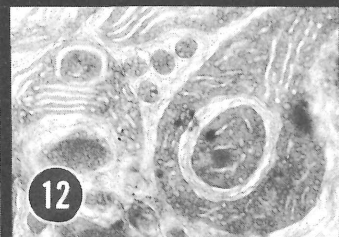
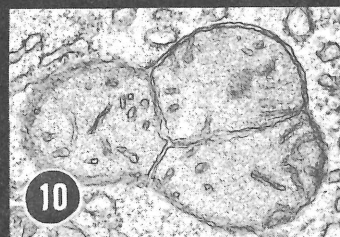
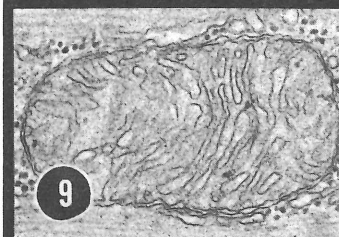
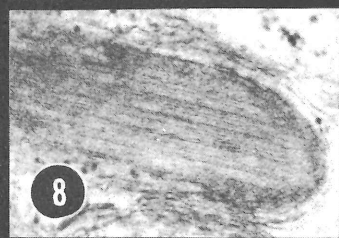
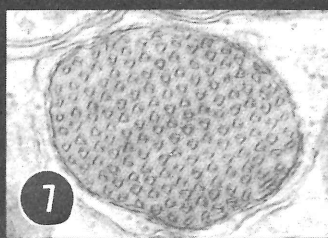
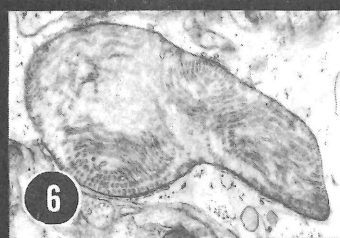
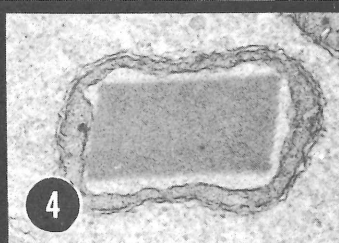
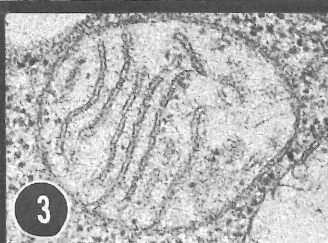
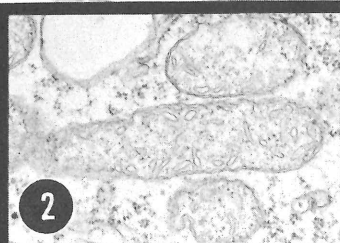
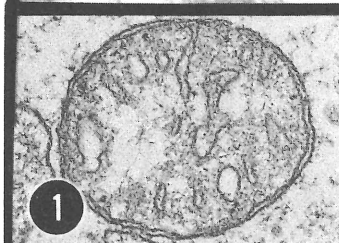
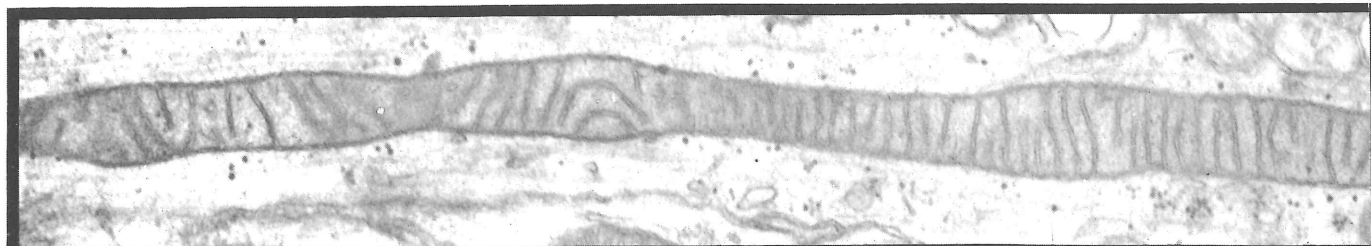
MORPHOLOGICAL VARIABILITY OF
MITOCHONDRIA

Descriptions and Credits:

Top piece

Neuronal mitochondrion from molecular layer of hamster cerebellum.
Dr. Donald Duncan, Medical Branch, Galveston.

1. Human Testis - Dr. Jerry Berlin, Texas Tech University.
2. Cotton Plant - Dr. Jerry Berlin, Texas Tech University.
3. Fungus, Cunninghamella echinulata - Kenneth H. Burk, Texas Tech University.
4. Rana oocyte during yolk formation - Dr. Terry Hoage, Sam Houston State University.
5. Zona fasciculata of adrenal cortex of Syrian hamster - Dr. Robert Yates and Joe Mascorro, Medical Branch, Galveston.
6. Giant form, cerebellar astrocyte of Syrian hamster - Ricardo Morales, Medical Branch, Galveston.
7. Astrocyte in Syrian hamster; prismatic cristae and paracrystalline matrix - Ricardo Morales, Medical Branch, Galveston.
8. Long section from astrocyte of Syrian hamster - Ricardo Morales, Medical Branch, Galveston.
9. Extraocular muscle of fundulus grandis - Dr. Ann Goldstein, M. D. Anderson Hospital, Houston.
10. Hamster hepatocyte following treatment with reserpine - Leonard L. Seelig, Medical School, San Antonio.
11. Rat cerebellum from tissue culture for 1 month - Dr. Gerald Callas and Tony Moore, Medical Branch, Galveston.
12. Zona reticularis from rat adrenal - Dr. Gerald Callas and Tony Moore, Medical Branch, Galveston.
13. Parathyroid carcinoma in human - Dr. Richard Marshall, Medical Branch, Galveston.
14. Adrenal cortex of rat, normal - Dr. Richard Marshall, Medical Branch, Galveston.



AREA NEWS

DALLAS

Two new members to TSEM from our area:

Dr. R. S. Sohal Biology Dept. SMU

Lt. Col. J. R. Snoga, M.D. Anatomy UTSWMS

Instruments recently acquired in the area:

LKB Ultratome III Biology Dept. SMU

Olympus Photomicrography Equip. Biology Dept. SMU

LKB Ultratome I Anatomy Dept. UTSWMS (this will be an all-school instrument, purchased on a grant to Dr. Costas Kastritsis, Anatomy.

Papers recently published or accepted:

Ernest Couch, Ph.D. TCU in Endocrinology,

Dec. 1969, entitled "Electron Microscopy

Studies of Rat Pituitary After Injection

of Purified Growth Hormone Releasing Factor (GRF).

Vick Williams, MD, PhD and Robert G. Grossman, MD

"Ultrastructure of Cortical Synapses After Failure of Presynaptic Activity in Ischemia" to appear soon in Anatomical Record.

Eleanor Siperstein and Katy Miller "Further Cytophysiological Evidence for the Identity of the Cells in the Anterior Pituitary that Produce Adrenocorticotrophic Hormone" to appear in Endocrinology, March, 1970.

Other:

Dr. Snoga is working on a Masters degree in Electron Microscopy under Dr. Vick Williams, Anatomy UTSWMS
Baylor Univ. College of Dentistry was well represented at American Association of Anatomists meeting in Chicago in April with a total of 4 papers from their EM labs.

The new officers of the Metropolitan Microscopic Society for 1969-1970 are: Pres - Dr. Ernest Couch, TCU, Sec - Dr. Les Matthews, BUCD, and Program Chairman - Venita Allison, SMU.

The January meeting of MMS was held at SMU. Dr. R.S. Sohal, Biology Dept, SMU, presented a paper entitled "Fine Structural Changes in Cardiac Muscle Fibers with Age". A tour of the recently expanded and renovated Electron Microscopy Laboratories was also included in the evening activities.

Mrs. Nancy Cooper has completed her Master of Science at SMU. Her work concerned the Ultrastructural studies of cysticeroid of Hymenolepis diminuta. She was directed by Dr. John Ubelaker and Mrs. Venita Allison.

SAN ANTONIO

U. Texas Med. School: Department of Anatomy - Dr. Hou-chi Dung, Dept. of Anatomy, Univ. of Louisville Medical School, has accepted a position of Instructor in Anatomy at UTMSSA to begin on July 1st, 1970.

Dr. Gen Colburn received a grant from the American Heart Association and Texas Affiliate Inc. for a research study entitled: "Electron Microscopy of the Atrioventricular Conduction System of Primates".

On March 6, 1970, Dr. John W. Everett, Professor of Anatomy, Duke University Medical Center visited Anatomy Department of UTMSSA and presented a Seminar entitled, "Neural Regulation of Factors Controlling Ovulation in the Rat".

On May 1, 1970, Dr. C. H. Sawyer, Professor, Department of Anatomy, UCLA visited Anatomy Department of UTMSSA and presented a Seminar entitled, "Hypothalamic Unit Activity Related to Control of the Pituitary Gland".

On May 29 and 30, 1970, Dr. Folke Knutson, from the Department of Pathology, University of Gothenburg, Sweden, visited the Anatomy Department of UTMSSA and consulted with faculty and students.

Michael Rudick - working in a postdoctoral position with Dr. I. L. Cameron is looking at ultrastructural changes occurring during the cell cycle of Tetrahymena pyriformis HSM. Victoria Rudick, on a postdoctoral position with Dr. I. L. Cameron, is working on the ultrastructural changes accompanying aging in strains of Tetrahymena pyriformis, synngen 1.

Department of Pathology - Mr. Harvey Thomas recently joined our laboratory staff as Technical Director of Electron Microscopy. He was previously employed in the Laboratory of Experimental Pathology, Dept. of Pathology, Baylor College of Medicine in Houston

Department of Microbiology - Melvin D. Trousdale has just become a new member of TSEM. Welcome. Recent visitors to the department included: Dr. S. M. Klimenko, Head of Laboratory of Electron Microscopy, and Dr. I. Ivanovski, Institute of Virology, Academy of Medical Sciences, Moscow, USSR.

HOUSTON

M. D. Anderson Hospital - Department of Virology -

Papers recently published or accepted:

"Light and electron microscope studies of osteosarcomas induced in rats and hamsters by Harvey and Moloney sarcoma viruses". S. Fujinaga, W. E. Poel, and L. Dmochowski. Accepted for publication in Cancer Research.

"Studies on the relationship of viruses to the origin of human breast cancer. II Viruslike particles in human breast tumors". G. Seman, B. Myers, W. Clydell Williams, H. S. Gallager and L. Dmochowski. Texas Reports on Biology and Medicine 27: #3, 839-866, Fall, 1969.

Other Items:

Dr. L. Dmochowski presented a lecture entitled "Tumor Viruses" to Dr. Brinkley's class on February 11, 1970.

Dr. L. Dmochowski presented a talk entitled "Classification of Tumor Viruses" at the Pathology Conference held on February 25, 1970.

Department of Pathology - Welcome to a new member of TSEM,

Dr. Masao Yokoyama.

Dr. K. Ogawa, Visiting Professor of Yale University, spoke on "Ultracytochemistry of Mitochondria" at M. D. Anderson on April 20th.

Dr. Jeffrey Chang gave a seminar on April 13th at the Medical College of Virginia. His title was, "Fate of Golgi Apparatus in Dividing Cells: Ultrastructural and Ultracytochemical Studies".

Department of Biology - Dr. Bill Brinkley has recently been appointed to the NIH Molecular Biology Study Section.

Drs. Brinkley and Margery Shaw presented a joint seminar at the University of Texas at Austin, Department of Genetics, entitled, "Chromosome Structure".

Recently accepted for publication:

Rattner, J. B. and B. R. Brinkley. Ultrastructure of Mammalian Spermiogenesis. I. A tubular complex in developing sperm of the cottontop marmoset Sequinus oedipus. J. Ultrastructure Research.

Department of Oncology - New equipment acquisitions include a 26" Pakasol Dryer and a 4x5 Zeiss camera for the Zeiss Photoscope.

Rice University: Department of Biology -

Dr. C. W. Philpotts Laboratory:

B. J. Martin earned a Ph.D. degree this May. Thesis title: Avian salt gland: A morphological and cytochemical study of a tissue specialized for electrolyte transport.

Dr. Martin will be moving to Charleston to do a postdoctoral with Dr. Samuel S. Spicer of the Department of Pathology, South Carolina Medical College.

Karl J. Karnaky, Jr. earned a Master of Arts degree this May. Thesis title: The chloride cell of Cyprinodon variegatus: Cytochemical studies on a cell specialized for electrolyte transport.

Mr. Karnaky will continue his graduate studies toward the Ph.D. degree.

GALVESTON

University of Texas Medical Branch: Department of Pathology -

Randy Scott has received the Master of Arts degree in Pathology at the June Commencement.

Douglas Horbelt, freshman medical student, who has been working in the EM lab under Dr. Roberts for the past three years, has won a Texas Medical Association Award for his article entitled, "Ultrastructural Changes in Fallopian Tube Epithelium at Term Gestation and During the Post-Partum Period". It will be published in Texas Medicine. The award includes \$300.00.

Four papers have been accepted for presentation at the upcoming EMSA meeting at Houston: 1) "Preliminary Studies on Heterotopic Calcification" by R. Scott, D. K. Roberts, and R. B. Marshall, 2) "Nuclear Inclusions Found in Endometrium During Medroxyprogesterone Acetate Therapy" by D. K. Roberts, L. C. Powell, and Nola Busby, 3) "Fine Structural Alteration in Fallopian Tube Epithelium", by D. Horbelt and D. K. Roberts, and 4) "Diagnostic Use of Electron Microscopy in Female Disease", by D. K. Roberts and J. T. Wharton.

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Paper published: "Ultrastructure of ovarian Tumors", in Cancer, 25: 947-958 (1970), authored by D. K. Roberts, R. B. Marshall, and J. T. Wharton.

Department of Anatomy - Dr. Don W. Fawcett, Chairman of the Department of Anatomy at Harvard Univ. Med. School, recently presented a seminar on the ultrastructure of sperm.

Dr. Ward Kischer recently presented an invited paper at the third International Symposium on Inflammation at Brook Lodge, Augusta, Michigan, sponsored by the Upjohn Co. Title of the presentation was "Epithelization".

Papers recently accepted: "Ultrastructural Studies of Vagal Paraganglia in Syrian Hamsters", by I-li Chen and R. D. Yates, to appear in Zeitschrift f. Zellf. "Effects of Sinus nerve stimulation on carotid body glomus cells", by R. D. Yates, I-li Chen, and D. Duncan, to appear in J. Cell Biology. "Prostaglandin B₁, Embryonic Skin, and the Dermo-epidermal Junction", by C. W. Kischer and J. S. Keeter, to appear in J. Cell Biology.

TECHNICAL NEWS

Thin sectioning of either fresh or fixed biological tissues that have been frozen can be accomplished routinely with the new SORVALL FTS Frozen Thin Sectioner. Developed in conjunction with Dr. A. Kent Christensen, Department of Anatomy, Stanford University - School of Medicine, Palo Alto, California, the FTS utilizes cold nitrogen gas to maintain the cutting temperature as low as - 150°C. During prototype development, sections thinner than 1000A were easily obtained at - 75°C. from fresh frozen biological samples. The ability to work with unfixed tissue that is, thus, unaltered by fixation, dehydrating agents or embedding media will be of marked benefit to many investigators. The FTS will also prove invaluable for sectioning non-biological materials such as polymers, elastomers, rubber and rubber-like specimens. The FTS is quickly and easily attached to the SORVALL "Porter-Blum" MT2-B or the earlier MT-2 without any modification of the instrument.

Prices are f.o.b. Newtown, Connecticut and terms of payment are net 30 days. Shipment on the FTS can be made within 45-60 days.

Should you require further details on the above or any of our other SORVALL Laboratory Instruments, please write us.

IVAN SORVALL, INC.

Martin Wannberg
Sales Manager

PLACEMENT SERVICE

Positions Wanted

Electron microscope technician: M.S., experienced, female, US citizen. Available immediately. Reference #1.

Electron microscope technician: B.S., experienced, female, US citizen. Desires position in Houston area. Available immediately. Reference #3.

Electron microscopist: B.S., M.S., Ph.D. (August, 1969, Tulane University) male. Training in physics. Desires position in pure or applied physics.

Electron microscope technician: B.A., experienced, female, US citizen. Available immediately. Reference #5.

Electron microscopist: Ph.D., experienced, male, US citizen. Present position research associate. Available immediately. Reference #6.

Electron microscope technician: M.S., experienced, female, US citizen. Available July 1, 1970. Reference #7.

Electron microscope technician: B.S., experienced, female, US citizen. Available immediately. Reference #8.

Electron microscope trainee: B.A., female. Wants to learn EM techniques in Houston area. Available immediately. Reference #9.

Electron microscope technician: M.S. Biology, four years experience, female. Desires position in Houston. Available immediately. Reference #10.

Positions available.

Electron microscopist: Ph.D. to supervise nice EM facility and teach course in electron microscopy. Rank Assistant Professor. Salary approximately \$13,000/year. Contact Dr. Tom Sergeant, Chairman, Biology Department, Trinity University, 715 Stadium Drive, San Antonio, Texas.

Experienced EM technician: B.S. degree, skilled in microtomy and general EM techniques. Contact Dr. Jim Martin, Pathology Department, Baylor University, Medical Center, Dallas, Texas.

Experienced EM technician: B.S. degree or equivalent experience. Contact Dr. C. W. Goff, College of Arts and Sciences, Indiana State University, Terre Haute, Indiana.

Experienced EM technician: B.S. degree or equivalent experience in ultramicrotomy and EM technology. Contact Dr. Don Singer, Department of Pathology, Texas Children's Hospital, Houston, Texas, 77025.

Post-Doctoral Fellowship: US Citizen, background in Biochemistry preferred.....Electron microscopy of DNA. Contact Dr. Dimitrij Lang, Division of Biology, The University of Texas at Dallas, Box 30365, Dallas, Texas, 75230. (214) 231-1471.

EM Technician I: Full time position. Contact Dr. Vick Williams, Anatomy Department, The University of Texas Southwest Medical School, Dallas, Texas.

Research Associate: Ph.D. or M.D. required. Training in EM desirable. Histochemistry and knowledge in male reproductive system, spermatogenesis, meiosis preferred. Salary open available July 1st. Contact Dr. B. R. Brinkley, Section of Cytology, Department of Biology, or Dr. Jeffrey P. Chang, Section of Experimental Pathology, Department of Pathology, M. D. Anderson Hospital, Houston, Texas 77025.