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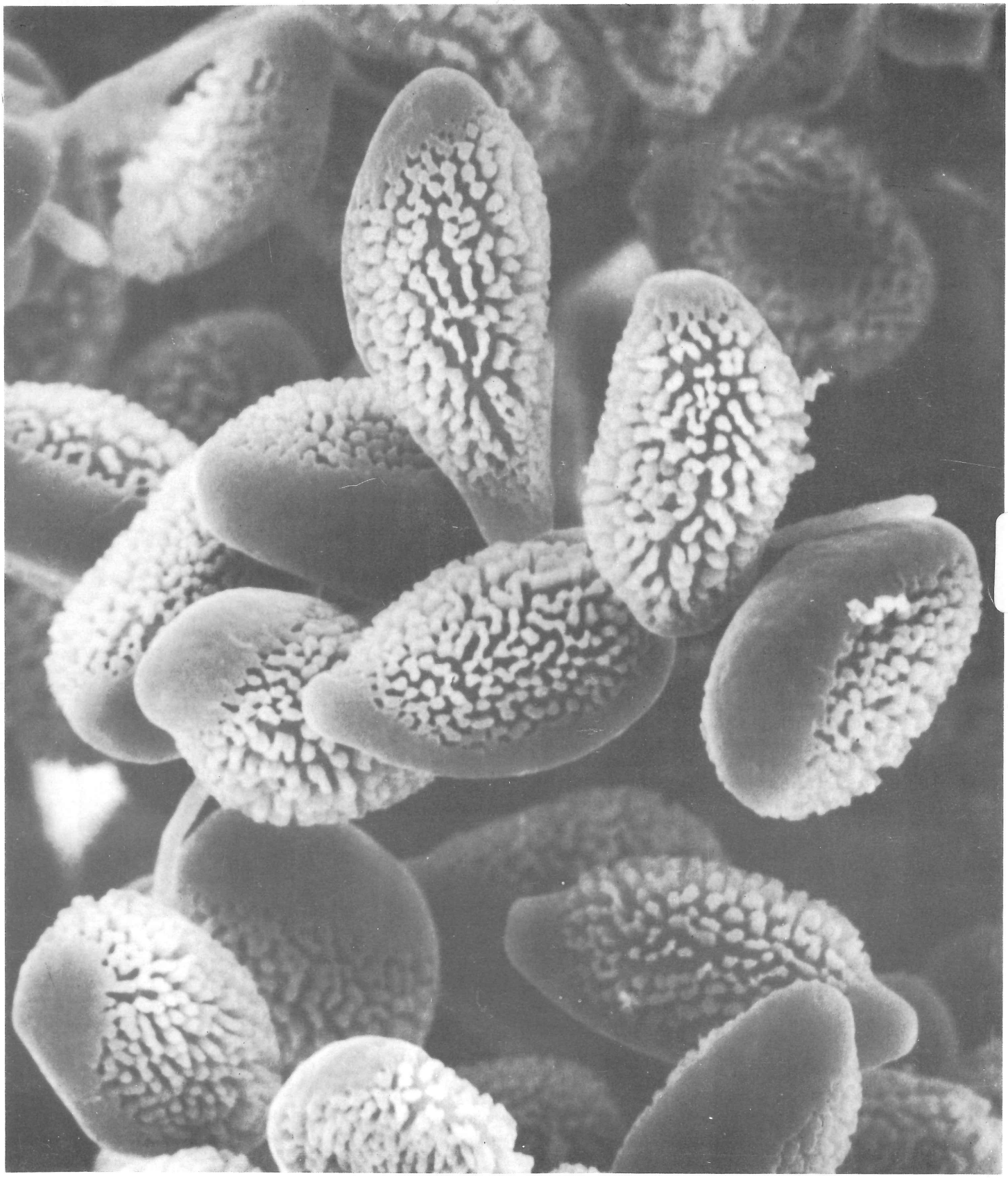

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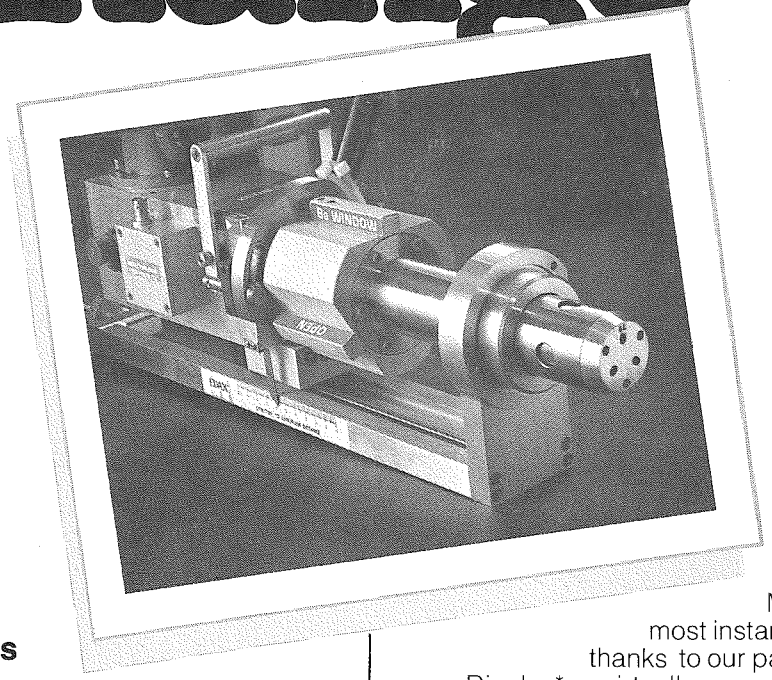

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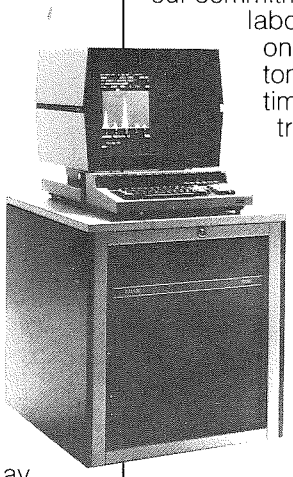

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Contents

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Texas Society for Electron Microscopy
"For the purpose of dissemination of research with the electron microscope"

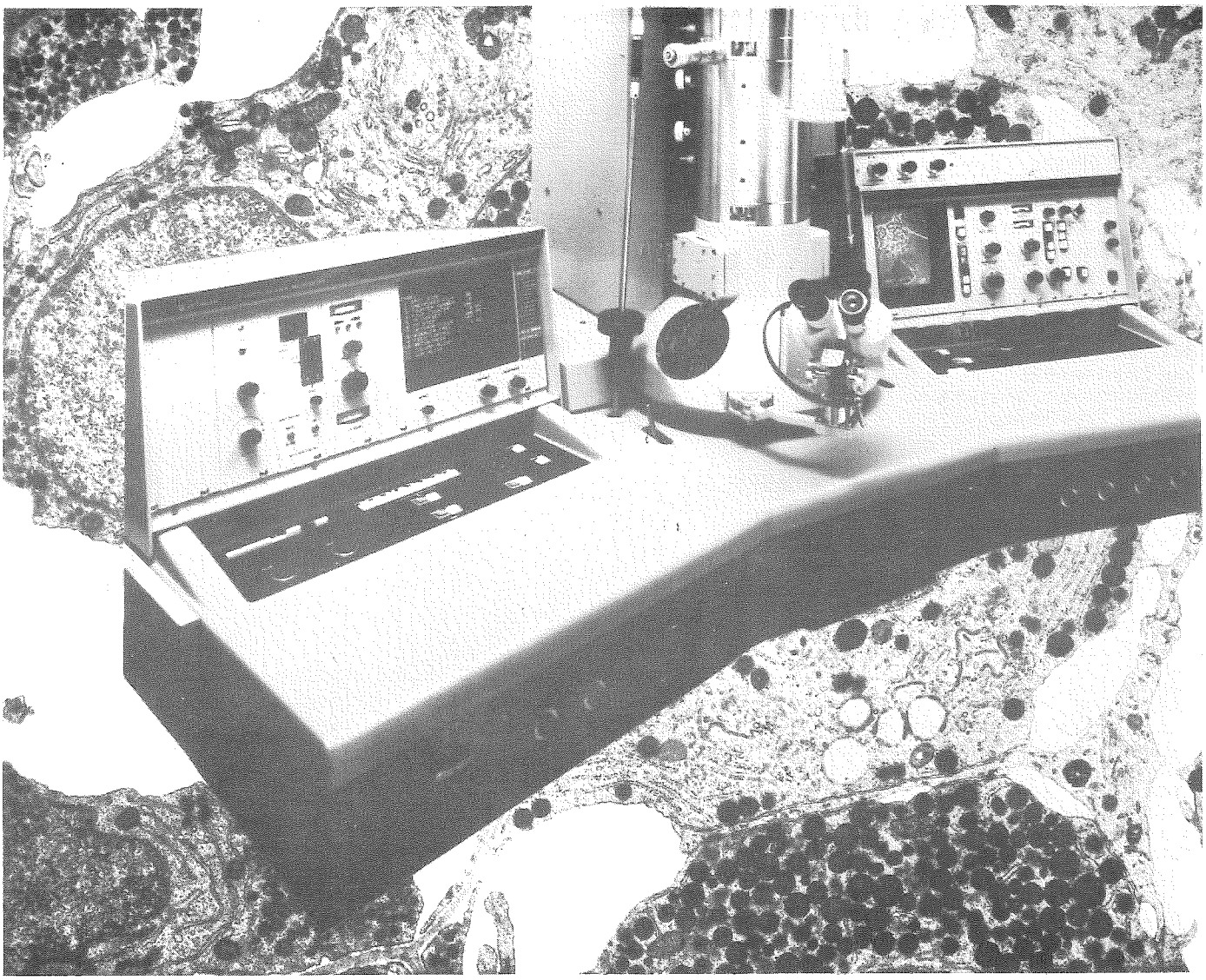
EDITORIAL POLICY

Feature articles, news, letters to the editor, and micrographs may be submitted. Feature articles should be 3-10 typewritten pages, double spaced, with figures, tables and electron micrographs mounted for an 8-1/2x11 inch format. Three types of articles are solicited: 1) reviews 2) research reports 3) techniques papers. Reviews provide background material on a given research problem and often are condensed versions of review sections from current grant proposals. Research reports are short summaries of work published in part or in full in other journals but presented for a diverse audience with an interest in electron microscopy and allied technical approaches. Techniques papers describe new or rediscovered methods for improving or adding to existing techniques and give examples of the results obtained with these methods.

News items should be submitted through the regional editor in your area and conform to the standard format used by the regional editors. Letters to the editor are printed as they are received in the order of their arrival. These letters reflect the opinion of the individual members and do not necessarily reflect the opinions of the editor or the society. Electron micrographs to be used for cover photos are welcome and should be selected with some attention to aesthetic appeal as well as excellence both in technique and in scientific information content.

ON THE COVER

SEM of a mass of aeciospores of **Cronartium fusiforme** the fusiform gall rust fungus of pine. X3800. Submitted by Charles W. Mims Department of Biology, Stephen F. Austin State University, Nacogdoches, Texas.



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President's Message

Dear TSEM Members:

Several good suggestions have come to me recently from our TSEM members who have moved from Texas and who still continue to take an interest in our society. The Texas connection remains strong and I am glad. I would like to hear from more of you. Our journal makes it possible for us to keep in touch between meetings and our editor deserves a word of praise. I encourage you to submit material for the journal.

I attended the annual EMSA meeting in Atlanta in August. I extended to the Executive Council on behalf of TSEM an invitation to San Antonio, Texas for the annual meeting in 1986. The San Antonio Convention Bureau hosted a very nice party and presented convincingly all the great features of this lovely city.

The sessions I attended at EMSA on superconducting EM and on computers in electron microscopy were very interesting. A number of the sessions were quite good, so it was of concern to some of us that attendance at this meeting was so low. Last year attendance was low, but of course, the last minute move to Las Vegas due to the hotel strike in San Francisco was a major factor. This year the air controllers strike did not help matters. The overall reduction in travel money in many labs is also an important factor. Yet, the feeling is that people would overcome these obstacles if the meetings were improved. A number of suggestions for improving attendance were discussed such as 1) a three day meeting instead of five for EMSA in the meeting years without MAS, 2) a meeting back to back with another society whose interests complement those of EMSA, and 3) more emphasis on biological programs presented in the framework of shared technology. What do you think?

I attended the Presidents' breakfast with Bob Turner, retiring Local Society Director, the candidates for the new Director and the other affiliate presidents. Twenty of the twenty-five affiliates were represented. Bob was given a special thank you from the group for his service to the EMSA council. He will be succeeded by Ben Spurlock, who was elected by those present at the breakfast. Several issues of importance to the society were also discussed. These included more participation by the technicians and technologists who are members of EMSA, the certification process of EM technicians, the qualifications of EMSA officers and their level of past participation in EMSA, ways to get more members of EMSA affiliates like TSEM to join the parent organization EMSA, ways to get better programs at EMSA meetings and the membership and work of the program committee.

TSEM continues to be one of the strong and successful affiliates, therefore, TSEM Executive Council will be discussing some of these issues. We would like to hear your ideas and will pass them on to EMSA council. If you are a member of EMSA, you can contact the Local Society Director or the Secretary directly or write a letter to the Editor of the EMSA bulletin.

I look forward to seeing you in Corpus Christi for the fall meeting.

Ann Goldstein
TSEM President

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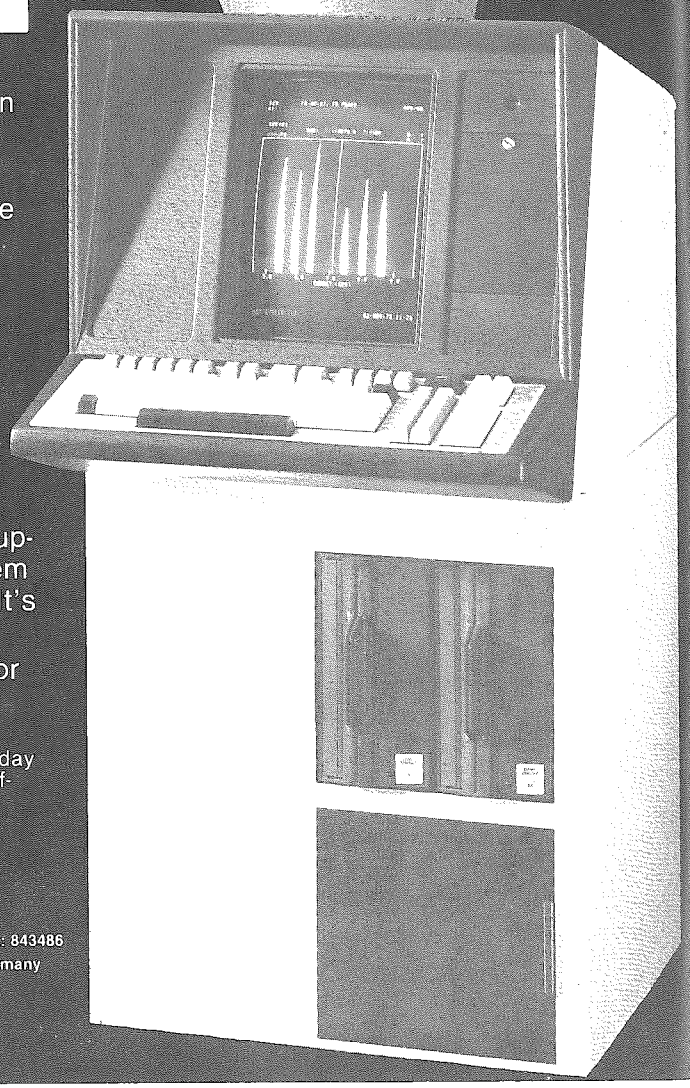

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TEM AND SEM OF TELIOSPORE GERMINATION AND BASIDIOSPORE FORMATION IN TWO SPECIES OF THE RUST FUNGUS GYMNOSPORANGIUM: AN OVERVIEW

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The fungi commonly referred to as "rusts" are an interesting and important group of organisms. Technically these fungi belong to the order Uredinales of the class Basidiomycetes. All of the 4000 or so known species are plant pathogens with many attacking economically important plants often causing a considerable reduction in both the yield and the quality of the plant product. Examples of economically important hosts include coffee, asparagus, wheat, oats, apple and pine to name a few.

In addition to their importance as pathogens, the rusts have attracted the attention of biologists because of their complex life cycles. Most rusts require two different species of host plants in order to complete their life cycle. The typical life cycle may consist of as many as five distinct stages. These are as follows:

Stage O - Spermogonial stage consisting of a structure termed a spermogonium bearing spermatia (male reproductive structures) and receptive hyphae (female reproductive structures).

Stage I - Aecial stage consisting of a structure termed an aecium bearing aeciospores.

Stage II - Uredinial stage consisting of a structure termed a uredinium bearing urediniospores.

Stage III - Telial stage consisting of a structure termed a telium bearing teliospores.

Stage IV - Basidial stage consisting of a structure termed a basidium bearing basidiospores.

Normally stages O and I are produced on one host termed the alternate host while stages II and III are produced on a different species termed the primary host. Stage IV arises from the teliospore and is not correlated directly with a host.

Of the stages noted above perhaps the most interesting are the telial and basidial stages. The teliospore is the site of nuclear fusion in the rust fungi and gives rise to the basidium in which meiosis occurs. Basidiospores then develop on the surface of the basidium and initiate the life cycle in the spring by infecting the alternate host. In this paper both TEM and SEM are used to examine the structure of the teliospores of two species of the cedar rust *Gymnosporangium* and to highlight the sequence of events leading to the production of mature basidiospores. The life cycle of *Gymnosporangium* is more or less typical for rusts in general although it should be emphasized that there are exceptions to the pattern of events described here.

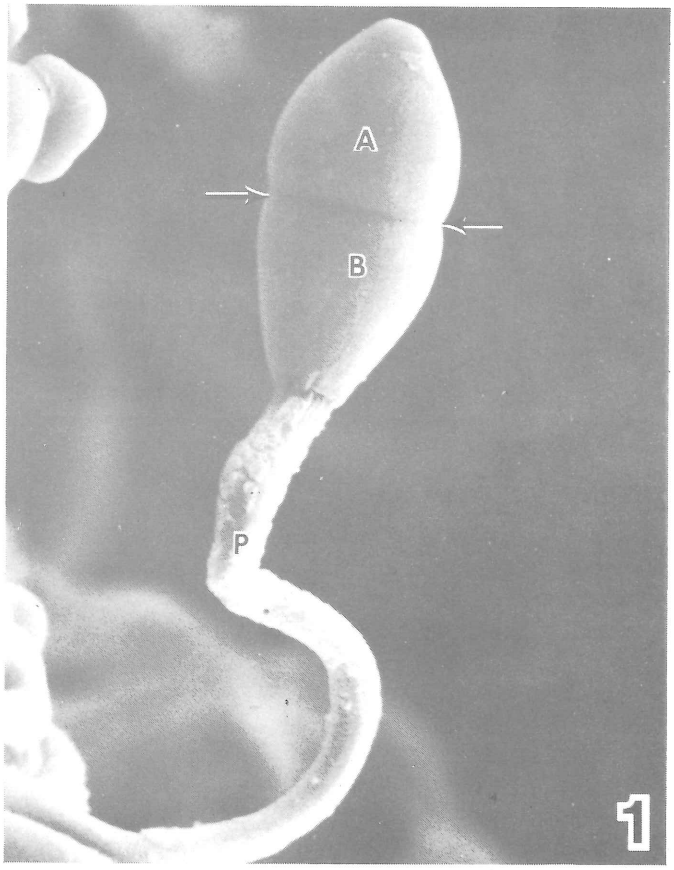

Figure 1. SEM of a mature teliospore of *G. clavipes*. Note the central septal region (arrows) dividing the spore into an apical cell (A) and a basal cell (B) to which the pedicel (P) attaches. X 1200.

The fungi examined in this study are the cedar-apple gall rust *G. juniperi-virginianae* and the quince rust *G. clavipes*. The primary host of both species is eastern red cedar. The alternate host of *G. juniperi-virginianae* is either apple or crabapple while in East Texas *G. clavipes* normally completes its life cycle on hawthorn. Various stages in the life cycles of both these rusts have been previously studied in some detail with a combination of TEM and SEM and the procedures for obtaining and preparing the material for study are described elsewhere[2-4]. A detailed discussion of the ultrastructural aspects of the overall rust life cycle is also provided by Littlefield and Health[1].

Teliospores of both *G. juniperi-virginianae* and *G. clavipes* are produced in the early spring on eastern red cedar. The spores of the former species are produced on large galls often exceeding two inches in diameter while those of the latter are produced on smaller, fusiform swellings on infected branches of the host. Teliospores of both species (Figures 1 and 2) are basically similar in appearance although those of *G. clavipes* are slightly smaller (35-50 μm) than those of *G. juniperi-virginianae* (50-75 μm). Teliospores of both species are ellipsoid with slightly tapered ends. A long tail-like structure termed the pedicel is attached to the base of each spore. Each spore consists of an upper apical cell separated from a basal cell by a near median, transverse septum. When viewed by SEM this septal region is more pronounced in *G. juniperi-virginianae* (Figure 2) than in *G. clavipes* (Figure 1).

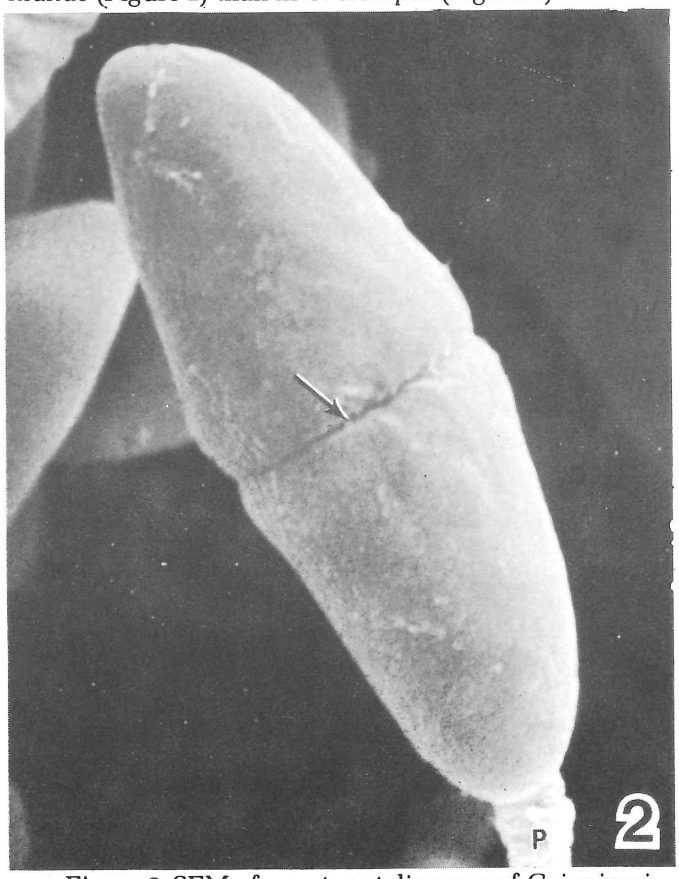

Figure 2. SEM of a mature teliospore of *G. juniperi-virginianae*. Note that the septal region (arrow) is more pronounced than in *G. clavipes*. A portion of the pedicel (P) is visible at the base of the spore. X 3000.

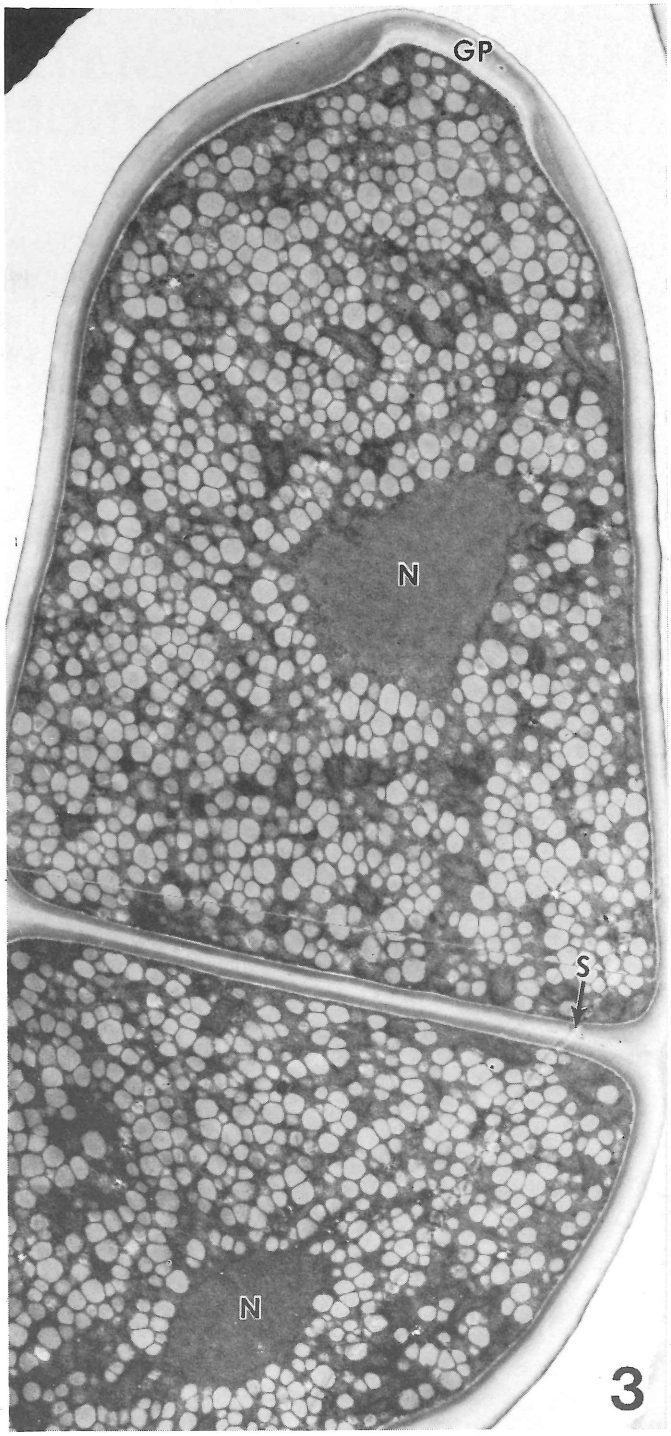

Figure 3. TEM of a mature teliospore of *G. clavipes*. Note the septum (S) separating the spore into two cells. The germ pore region (GP) is visible at the tip of the apical cell. Nuclei (N) are visible in the dense cytoplasm that is filled with many small, more or less spherical lipid droplets. X 6000.

Teliospores of both species lack surface ornamentations and appear more or less smooth when viewed with SEM.

When viewed with TEM (Figure 3) the two-celled nature of the teliospores of *Gymnosporangium* is clearly visible. Each cell of a mature teliospore contains a single diploid nucleus and possesses a dense cytoplasm packed with lipid droplets, mitochondria and ribosomes. The

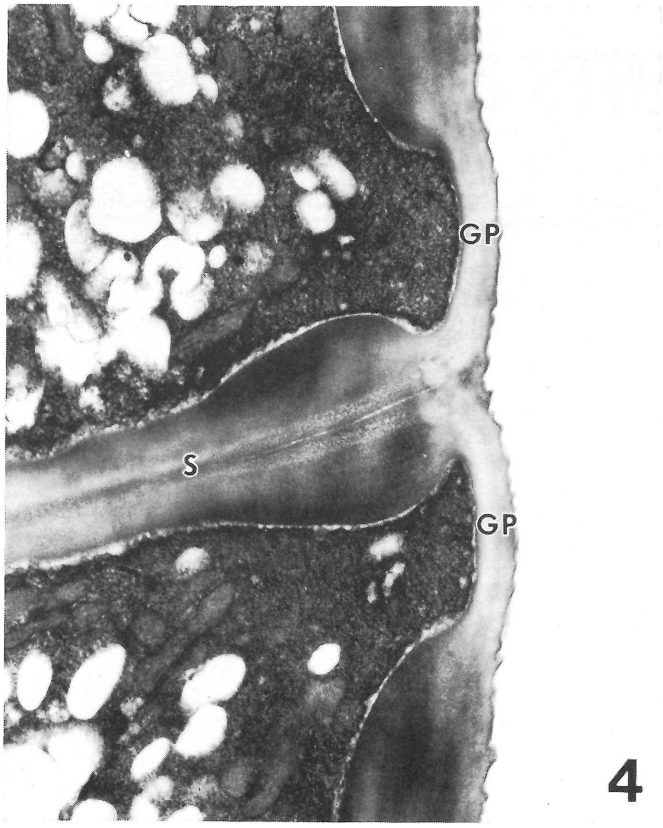

Figure 4. TEM showing two germ pore regions (GP) of *G. juniperi-virginianae* located on either side of the central septum (S). X 21,000.

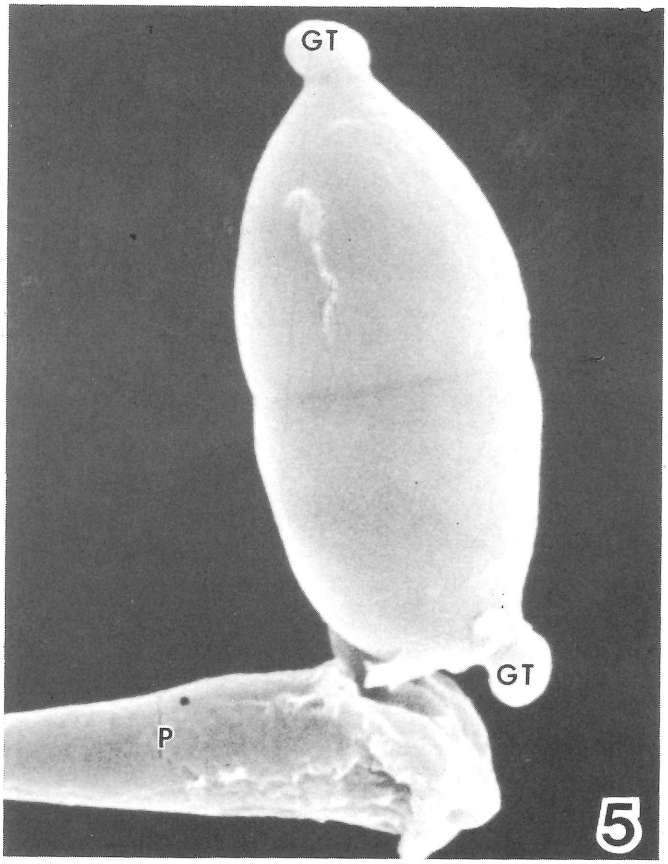

Figure 5. SEM of a germinating teliospore of *G. clavipes*. Small germ tubes (GT) are visible at each end of the spore. The partially detached pedicel is visible at P. X 2500.

teliospore wall in both species is of more of less uniform thickness over the entire surface of the spore except in special "germ pore regions" where it is thinner than elsewhere (Figures 3 and 4). A germ pore region is a site in the wall at which a germ tube may emerge during teliospore germination. In *G. clavipes* the teliospore possesses two germ pore regions. One is located at the apical end of the spore (Figure 3) while the other is located at the base of the spore and is covered by the pedicel. In *G. juniperi-virginianae* the situation is somewhat different since each cell of the spore possesses a number of germ pore regions. These are located near the septal region in the middle of the spore (Figure 4) so that germination occurs laterally rather than at the ends of the spore as in *G. clavipes*.

Unlike the teliospores of many rust fungi, those of *Gymnosporangium* do not require a dormancy period prior to germination. In nature the spores of *G. clavipes* and *G. juniperi-virginianae* germinate during rainy periods in the spring. In the laboratory germination can be initiated by simply placing masses of spores in a drop of water contained in a petri dish. Normally within 1-2 hours it is evident that germination is underway and within 3-4 hours mature basidiospores are present. When first placed in water the pedicel of the spore swells and either disintegrates or detaches from the spore (Figure 5). Small bulges representing developing germ tubes appear on the surface of the teliospore in the germ pore regions (Figures 5 and 6). A germ tube is capable of developing into a short hypha technically known as the promycelium. TEM examination of a developing germ tube reveals that it actually ruptures the outer layers of the teliospore wall (Figure 6). The germ tube contains a typical complement of cellular components including mitochondria, lipid droplets, ribosomes and small vesicles and possesses a thin wall that is continuous with an inner layer of the teliospore wall. As mentioned previously, germ tubes emerge from the opposite ends of the spore in *G. clavipes* (Figure 7) while in *G. juniperi-virginianae* they develop laterally (Figure 8). Actually a number of bulges may initially appear on the teliospore of *G. juniperi-virginianae* since each cell has multiple germ pore regions but eventually only a single germ tube per cell will develop into a promycelium.

The promycelium of a rust fungus is actually part of the basidium. Promycelia in both species examined in this study appear as slender, tubular outgrowths from the surface of the spore (Figures 7 and 8). Promycelia of *G.*

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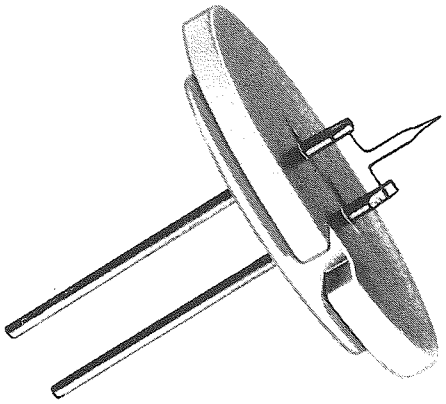

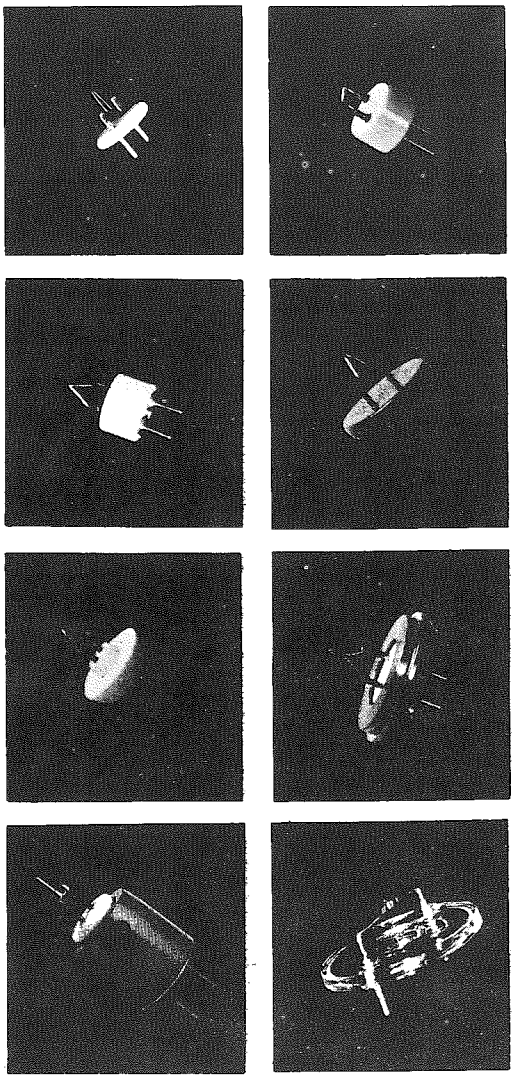

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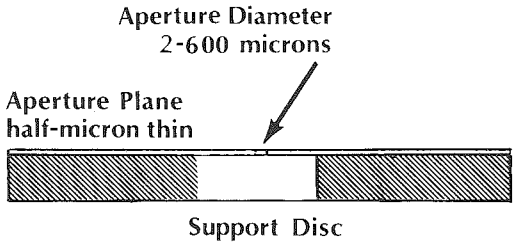

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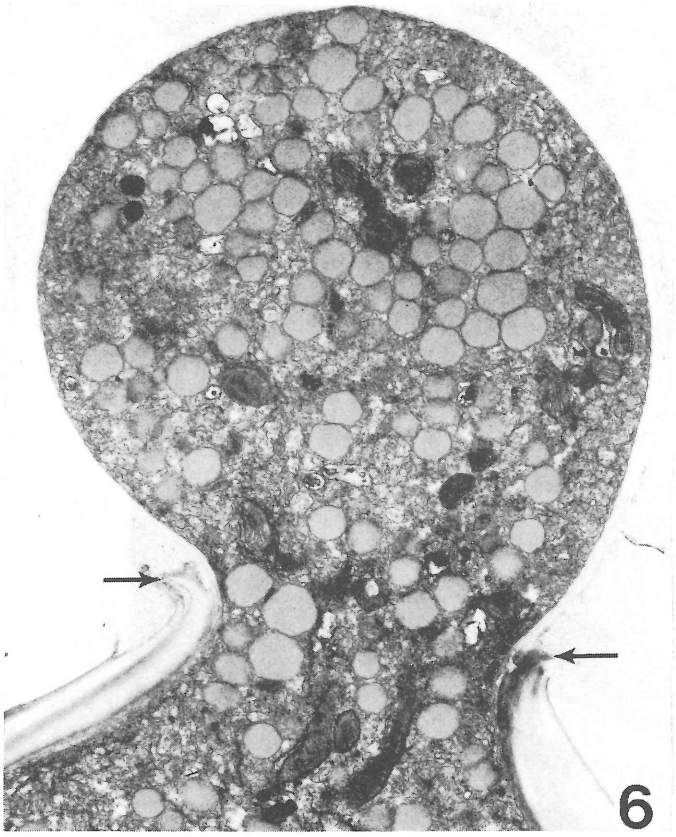


Figure 6. TEM of a developing germ tube of *G. clavipes* protruding through the ruptured teliospore wall (arrows). X 13,000.

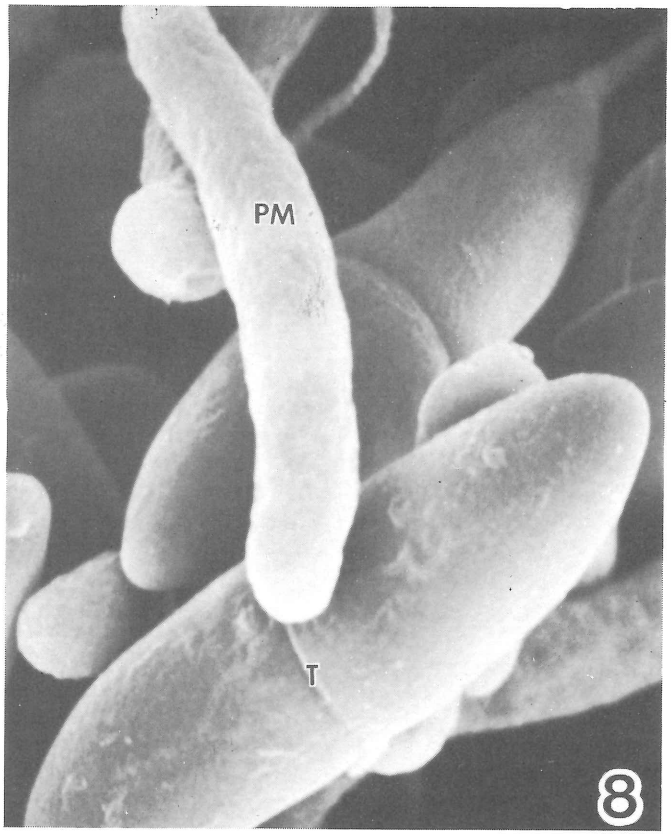


Figure 8. SEM of a promycelium (PM) of *G. clavipes*. The more or less intact nuclear envelope is visible at the arrows. X 21,000.

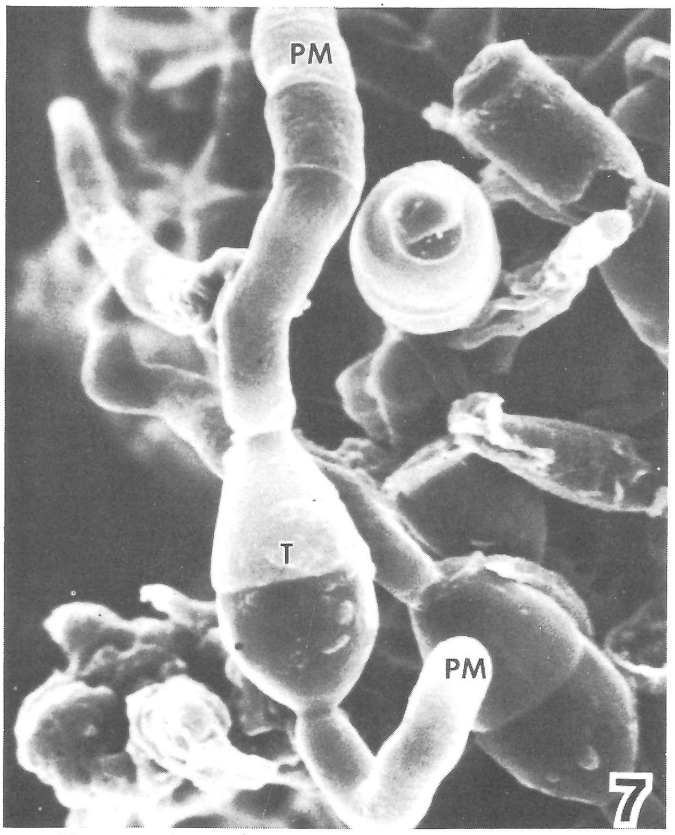


Figure 7. SEM showing promycelia (PM) of *G. clavipes* developing from opposite ends of the teliospore (T). X 1300.

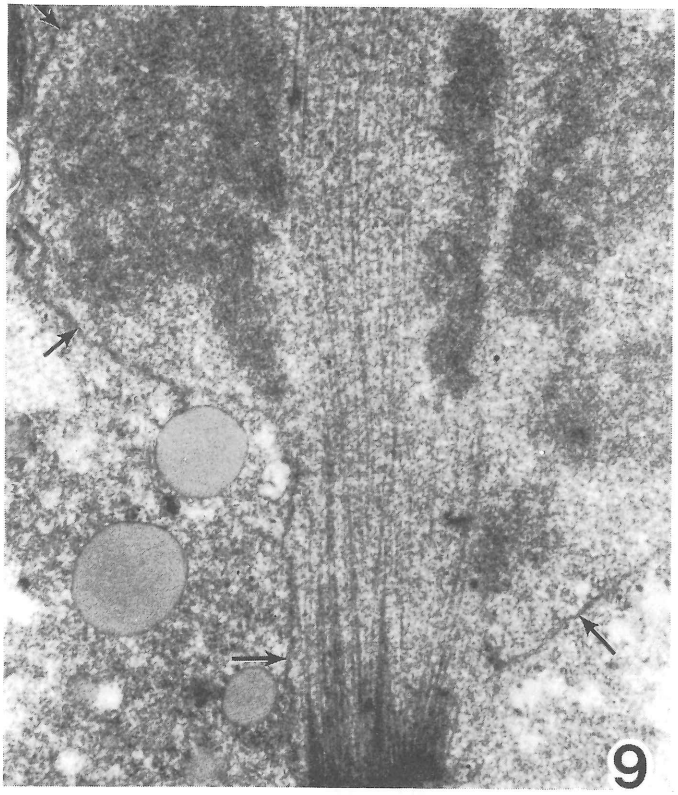
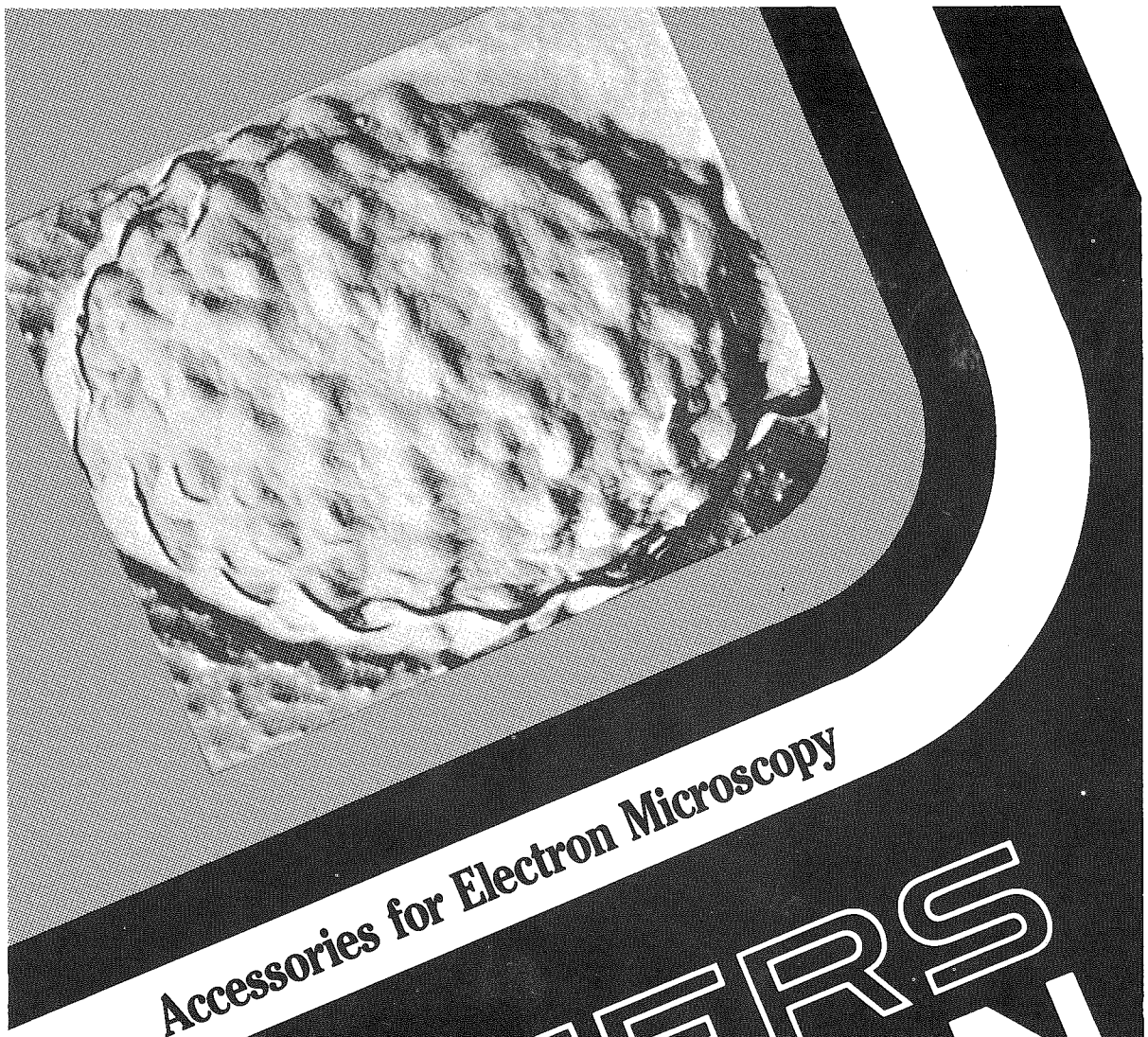


Figure 9. TEM of a portion of a meiotic nucleus of *G. clavipes*. The more or less intact nuclear envelope is visible at the arrows. X 21,000.



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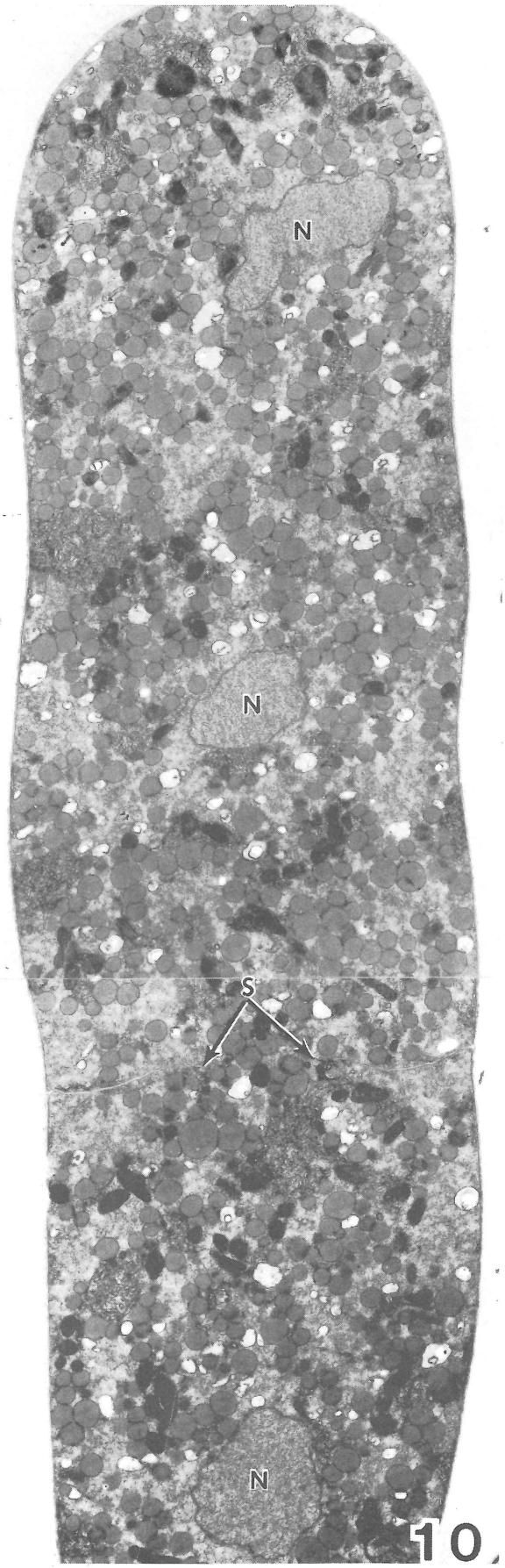

Figure 10. TEM of a near median longitudinal section of the promycelium of *G. clavipes*. Three of the four daughter nuclei (N) resulting from the meiotic division are visible along with a developing septum (S). X 6900.

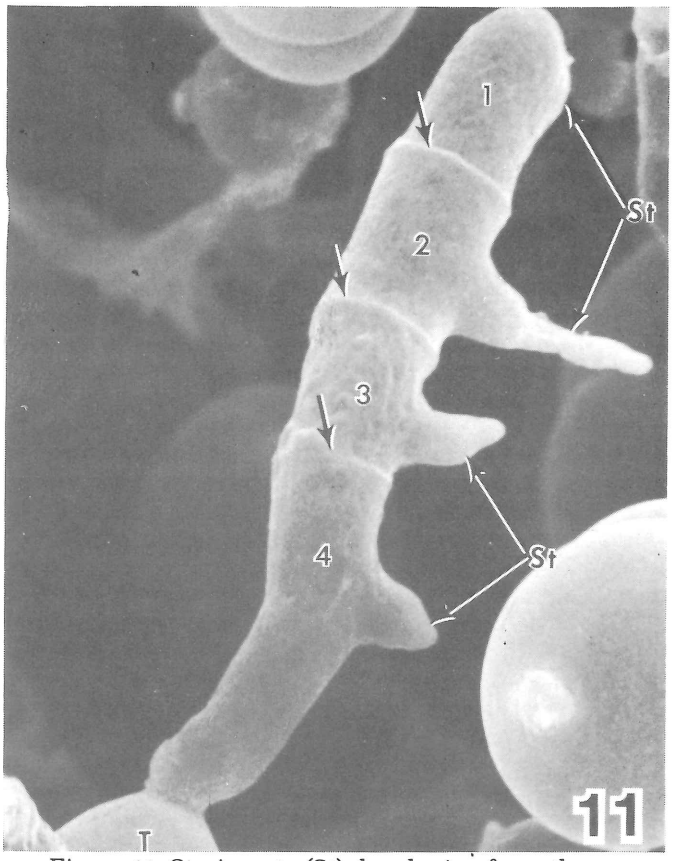

Figure 11. Sterigmata (St) developing from the promycelium of *G. clavipes*. The locations of the septa dividing the promycelium into four compartments (1-4) are shown at the arrows. The tip of the teliospore (T) is barely visible. X 2500.

juniperi-virginianae tend to be longer and more contorted than those of *G. clavipes*. The promycelium elongates as the cellular components of the teliospore cell move into it. Eventually the nucleus enters the promycelium and divides meiotically to form four daughter nuclei. As is evident in Figure 9 the meiotic divisions are intranuclear in nature. Centrioles are not present in rust fungi although structures known as spindle pole bodies are present and behave much like centrioles during meiosis. Following the completion of meiosis the daughter nuclei line up more or less equidistant along the length of the promycelium (Figure 10). Septa then develop in a centripetal fashion within the promycelium dividing it into four unincleate segments. Small outgrowths termed sterigmata then develop more or less synchronously from the surface of each of the four compartments of the promycelium (Figure 11). Sterigmata from the same promycelium all develop in the same plane. They initially appear as small bumps on the promycelial cells but, quickly enlarge and elongate becoming pointed (Figure 11). Eventually the tip of each sterigma enlarges to form a small basidiospore initial (Figure 12). This initial enlarges as materials, including the nucleus, move into it from the promycelial cell (Figure 13). Eventually the basidiospore is delimited from the sterigma by the formation of a septum near the base of the spore and the process of basidiospore formation is completed. The mature basidial apparatus in the rusts therefore consists of the old teliospore, the promycelia and the sterigmata bearing the basidiospores.

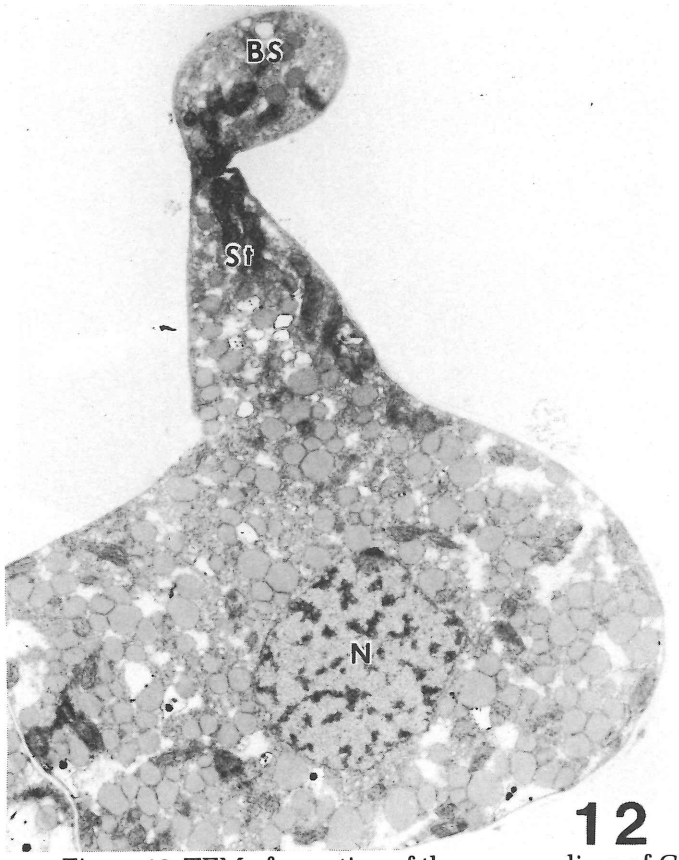

Figure 12. TEM of a portion of the promycelium of *G. juniperi-virginianae*. A young basidiospore initial (BS) is visible at the tip of the sterigma (St). The nucleus (N) is evident in the hyphal compartment. X 6300.

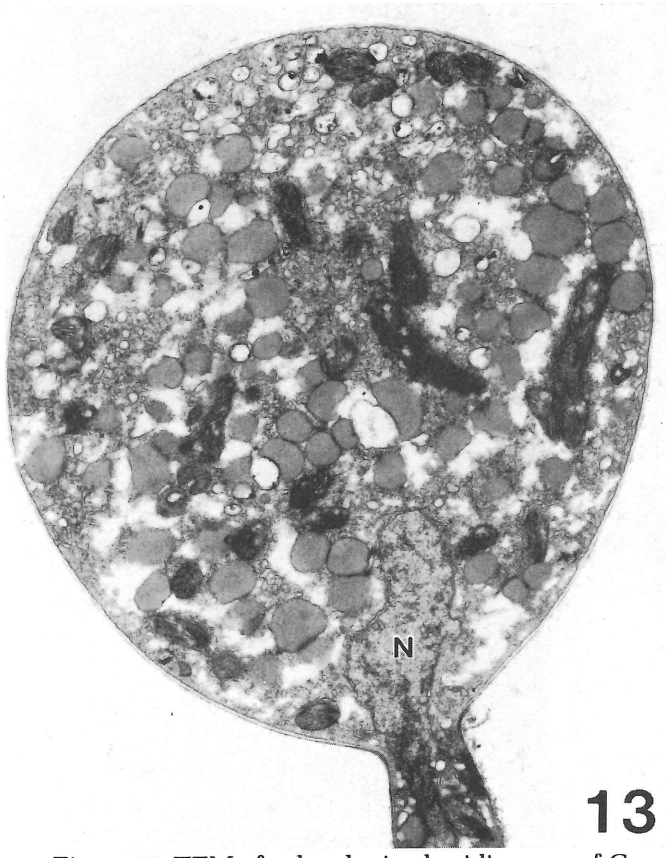

Figure 13. TEM of a developing basidiospore of *G. clavipes*. The nucleus (N) has nearly migrated through the sterigma from the promycelial cell and can be observed entering the basidiospore. X 10,000.

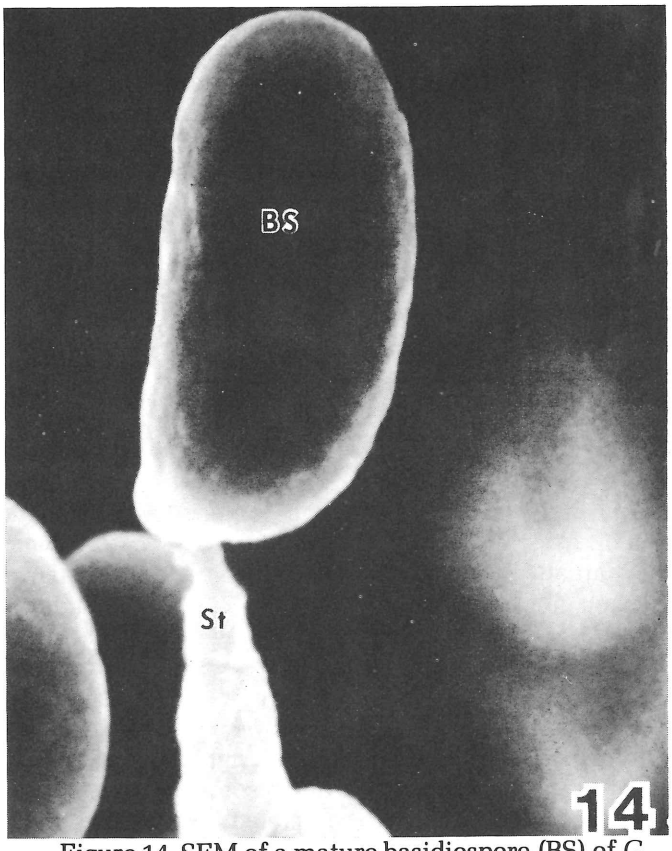

Figure 14. SEM of a mature basidiospore (BS) of *G. juniperi-virginianae* perched at the tip of its sterigma (St). X 5000.

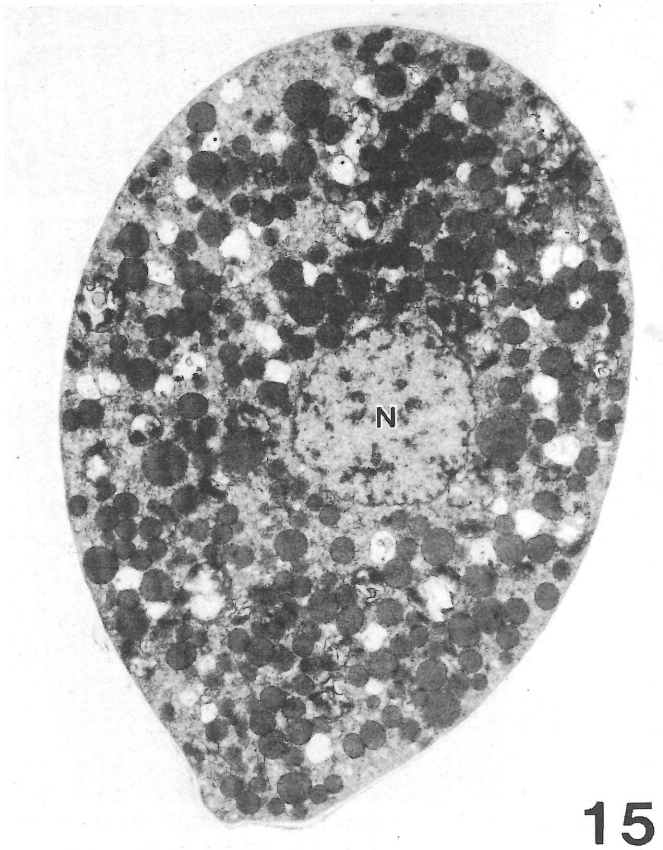

Figure 15. TEM of mature basidiospore of *G. clavipes*. The nucleus is visible at N. X 10,000.

Mature basidiospores of both *G. clavipes* and *G. juniperi-virginianae* are obliquely perched on their sterigmata (Figure 14) and, like those of other rust fungi, are eventually forcibly discharged from the sterigmata. Basidiospores of both species are either pear or kidney shaped and measure about 10x17 μm. Each is surrounded by a thin wall and contains a typical complement of cellular organelles (Figure 15). In both species the nucleus of the spore may divide mitotically so that the spore is eventually rendered binucleate. The mature basidiospore is capable of germinating immediately after it is formed and can infect either a leaf or a fruit of the appropriate host. Infection by basidiospores gives rise to the spermogonial stage thus initiating a new life cycle of the fungus.

ACKNOWLEDGEMENTS:

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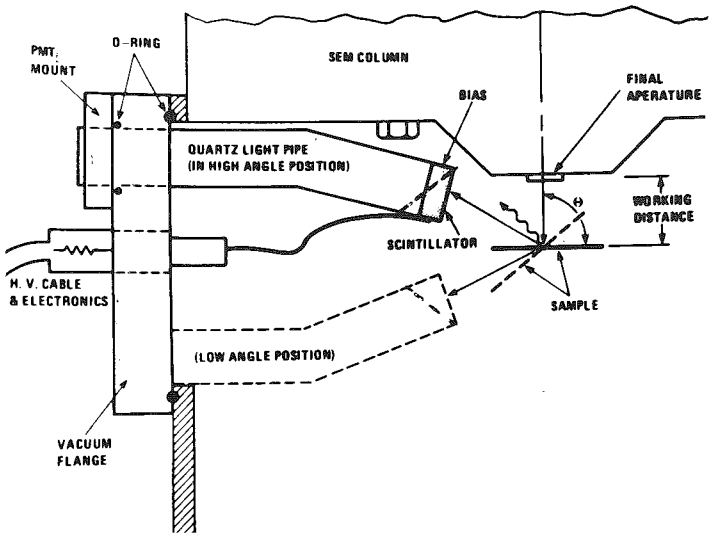

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Abstracts

ULTRASTRUCTURAL EXAMINATION OF A CHLAMYDIA INFECTION. Steven K. Koester, Electron Microscopy, and Thomas R. Perez, Paula Mosman and Maureen Neill, Virology, Department of Pathology and Area Laboratory Services, Brooke Army Medical Center, Fort Sam Houston, Texas 78234.

Study of the infection involved ultrastructural examination of cells obtained from an inguinal node aspirate and a liver biopsy, as well as, an isolate of the organism, from the inguinal node, propagated in McCoy cells. A typical Chlamydial inclusion was first noted upon electron microscopic examination of the inguinal node aspirate specimen, followed with a positive iodine stain on a 48 hour McCoy cell isolate arising from the same source. The McCoy cell isolate was confirmed with electron microscopy and was further propagated to observe the growth cycle of the Chlamydia. Examination of the liver biopsy specimen was non-conclusive.

IMPROVED FIXATION AND IMMUNOCYTOCHEMICAL DEMONSTRATION OF INSULIN — CONTAINING GRANULES IN PANCREATIC B-CELLS. Richard D. Dey and W. Allen Shannon, Jr., Department of Cell Biology, University of Texas Health Science Center at Dallas, Dallas, TX 75235 and VA Medical Center, Dallas, TX 75216.

Most immunocytochemical studies at the EM level have used either the PAP method or ferritin conjugated antisera as markers for tissue antigens. Recently, gold particles coupled to protein A have been used for ultrastructural immunocytochemical studies. The dense gold particles provide a discret and highly visible ultrastructural marker. A major weakness of ultrastructural immunocytochemistry, however, has been inferior morphologic preservation because of the necessity to omit osmium fixation in order to retain antigenic reactivity. This pitfall has been overcome by using a mixture of osmium and potassium-ferrocyanide. In the present study, we have combined the osmium-ferrocyanide fixation procedure and the protein A-gold immunocytochemical technique to demonstrate the occurrence of insulin-like immunoreactivity in B-cells of pancreatic islets. Pancreatic tissue from normal rats was fixed by perfusion in 3% glutaraldehyde and then postfixed in a solution of 1% osmium and 1% potassium ferrocyanide for 1 hr. A mixture of 2.5 mg of protein-A and 10 ml of colloidal gold was centrifuged at 100,000 x g for 1 hr. The supernatant was discarded and the pellet containing the protein A-gold complexes was resuspended in PBS. Thin sections of pancreatic islets were etched in 10% H2O2, incubated overnight in antiserum against insulin (diluted 1:200), and then incubated for 1 hr in the protein A-gold. Gold particles were located predominantly over the insulin-containing secretory granules inside B-cells. The number of gold particles in the background was very low in comparison to the B-cell granules. B-cell granules in sections treated with nonimmune rabbit serum did not bind the protein A-gold complexes. The various cell types and ultrastructural details were easily distinguished because of the excellent morphologic preservation. In conclusion, the protein A-gold immunocytochemical technique in combination with osmium-potassium ferrocyanide postfixation can be used to precisely visualize the ultrastructural locations of tissue antigens.

PMN CELL AND ORGANELLE MEMBRANE STRUCTURE WITH TANNIC ACID-GLUTARALDEHYDE (TAG) FIXATION: A FREEZE-FRACTURE STUDY. W. Allen Shannon, Jr., Daniel M. Zellmer, and James J. Yaquinto, VA Medical Center and Department of Cell Biology, The University of Texas Health Science Center at Dallas.

TEM of PMN membranes following TAG fixation has revealed membrane substructure, assumed to be of a proteinaceous nature, which is not apparent with glutaraldehyde and osmium fixation. This substructure, or "coating," becomes thicker in cells treated with the calcium ionophore A23187 along with a concomitant increase of iodinated proteins. In other to determine the extent and validity of this component, freeze-fracture of rabbit peritoneal exudate PMN was performed following TAG and glutaraldehyde fixation. Digitizer-computer particle counts/unit area were performed on the protoplasmic (PF) and exoplasmic (EF) faces of cell and organelle membranes. TAG vs glutaraldehyde fixation resulted in the following range of particles/$10^{-3}nm^2$ of cell membrane: PF-2.6 vs 2.1 and EF-1.3 vs 7.2. Both primary and secondary granules exhibited a wide range of particle density. There were also numerous small granules apparent.

The results indicated that the additional membrane substructure, or "coating," seen in TAG-fixed PMN is real and is not a product of the fixative but is merely enhanced by it. Secondly, it appears that a number of plasma membrane areas, possibly adjacent to cytoplasmic granules, undergo a loss of particles either actively or passively — possibly by distention of the membrane in that area in preparation for degranulation. Thirdly, it appears that there are several types of granules based on size and shape which may possibly be further characterized by membrane particle density. In addition, there appears to be a subpopulation of small granules possibly representing the "tertiary" granule reported by some investigators.

MORPHOLOGICAL STUDY OF HUMAN LARYNGEAL EPITHELIUM: NORMAL AND PATHOLOGICAL. James J. Yaquinto, Werner Schultz, Steven D. Schaefer, and W. Allen Shannon, Jr., VA Medical Center, and Department of Cell Biology, The University of Texas Health Science Center at Dallas.

Laryngeal epithelium can serve as a useful model for studying pathological changes in squamous cells because of the broad spectrum of pathological states encountered, the relative ease with which the biopsy can be taken, and the availability of a mirror image site for a control sample. Surgical biopsies from the area of the true vocal cords were taken at endoscopy and processed for routine SEM, TEM, and freeze-fracture TEM. Statistical analyses of freeze-fracture specimens were performed on a digitizer-tablet computer setup to give the number of particles/nm area.

SEM showed no apparent differences among normals, tumors, and papillomas. TEM showed, firstly, the presence of intercellular material in the tumors which was not found in the normals. Secondly, the tumor cells appeared to have fewer desmosomal attachments than the normal cells possibly due to the retraction of these structures by the tumor cells. Also, TEM showed an increase in coated pits and vesicles in the tumors and less so in the papillomas as compared to normal cells. Freeze-fracture TEM showed, first, that the number of gap junctions/nm^2 was increased in the papillomas at $15/4.0x10^6nm^2$ as compared to $<1/4.0x10^6nm^2$ for the tumors and $2/4.0x10^6nm^2$ for the normals. Moreover, the number of protein particles/gap junction was increased in the papillomas at a range of 114-731 particles/gap junction versus 36-550 particles/gap junction for the normals and 95-119 particles/gap junction for the tumors. However, the number of protein particles/nm^2 of gap junction was constant for normals, tumors, and papillomas at an average of $9.8x10^3$. Values for the numbers of exoplasmic face (EF) and protoplasmic face (PF) protein particles/nm correlate well for

the papilloma and the normal. However, values for EF and PF protein particles/nm for the tumor samples were not consistent.

INTRACELLULAR CHANGES IN CULTURED BOVINE ADRENOCORTICAL CELLS DURING ACTH STIMULATION: A HIGH VOLTAGE ELECTRON MICROSCOPIC AND IMMUNOFLUORESCENCE STUDY. Bill Rainey, James Mrotex, Jerry W. Shay, Univ. of Texas Health Science Center, Dept. Cell Biology, 5323 Harry Hines Boulevard, Dallas, Texas 75235.

Morphological changes induced during adrenocorticotropin (ACTH) stimulation of steroidogenesis in primary cultures of bovine adrenocortial cells were examined. These cells, unlike cultured rat or Y-1 mouse adrenocortical cells, remain well attached to the growth substratum after ACTH stimulation allowing a high voltage electron microscopic examination of whole cell preparations. When bovine adrenocortical cells are incubated with ACTH (1 μm) for 24 hours a decrease of microfilament bundles is observed by both high voltage electron microscopy and techniques of indirect immunofluorescence using actin antibodies. A 10 to 20 fold increase in cortisol production is also observed in cells stimulated by ACTH for 24 hours. However, if cytochalasin D, a drug which disrupts microfilament organization, is added with ACTH, the normal production of cortisol is blocked. These findings suggest that functional actin-containing cytoskeletal elements may be necessary for normal ACTH-stimulated cortisol production in bovine adrenocortical cells.

ULTRASTRUCTURAL LOCALIZATION OF GROWTH FACTORS PRODUCED BY HUMAN CILIARY EPITHELIUM CELLS *IN VITRO.* Cameron E. McCoy, Thomas E. Runyon, O. Dile Holton and Marie P. Morgan. Department of Microbiology, Scott & White Clinic, Temple, Texas 76508.

Nerve growth factor (NGF) and epidermal growth factor (EGF) were shown to be produced *in vitro* by human ciliary epithelial cells using spent growth medium for stimulation and inhibition studies.

The double antibody technique was used to localize and semi-quantitate these growth factors. Monolayers of cells were grown on carbon coated Beem capsules and prefixed *in situ* with buffered 10% formalin. Commercially available rabbit antibody to NGF and EGF was allowed to react with the cells, and this was followed by either ferritin or peroxidase tagged goat anti-rabbit Ig. Fixation in glutaraldehyde and osmium followed, and the cells were embedded in Spurr's plastic.

Thin sections of the cell monolayers showed the NGF to be present in abundance and localized to the cell surface. The EGF tended to be found in patches on the cell surfaces and in abundance on material apparently shed from the cell surfaces.

ULTRASTRUCTURE AND CATECHOLAMINE CONTENT IN CAROTID BODIES FROM NORMOTENSIVE AND SPONTANEOUSLY HYPERTENSIVE RATS. James Brokaw and John Hansen, Department of Anatomy, The University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, San Antonio, Texas 78284.

Alterations in the function of the sympathetic nervous system have been implicated in the development and maintenance of hypertension. The carotid body, an arterial chemoreceptor, provides a catecholaminergic system in which to examine possible changes in the structure and catecholamine content related to elevated blood pressure in spontaneously hypertensive rats. Two groups of rats, normotensive Wistar-Kyoto rats (WKY) and spontaneously hypertensive rats (SHR), were perfusion fixed and the carotid bodies excised and processed for electron microscopy. In addition, carotid bodies from decapitated WKY and SHR rats were removed and the levels of norepinephrine and dopamine measured by high performance liquid chromatography with electrochemical detection (HPLC-EC). Ultrastructural examination of the WKY carotid bodies revealed three basic parenchymal cell types. Two varieties of glomus cells were found; they differed in cell size and shape and in the concentration of their dense-core vesicles. Afferent nerve endings were seen preferentially associated with only one glomus cell type. The third cell type was presumably sustentacular in nature. No appreciable differences were noted in the morphology of the SHR carotid bodies. The catecholamine determinations indicated a small alteration in the proportions of norepinephrine and dopamine relative to each other. Dopamine predominated in the WKY carotid bodies, whereas norepinephrine predominated in the SHR carotid bodies.

(Supported by USPHS Grant HL-25508 and NIH RCDA KO4 HL-00680 to John Hansen.)

STEREO ELECTRON MICROSCOPE STUDIES OF CHROMOSOME STRUCTURE THROUGH THE CELL CYCLE. Arthur Cole, Ruthann Langley and Margaret Hall; The University of Texas M.D. Anderson Hospital, Houston, TX. 77030.

CHO cells were synchronized by mitotic shake-off and allowed to progress through the cell growth cycle. Mitotic chromosomes and interphase nuclei isolated and sedimented through various treatment layers directly onto support membranes. No fixation or stain was utilized. The samples were dried by the Anderson critical point method and stereo electron micrographs were prepared. We have previously proposed that mammalian chromatids contain a lateral array of 8 stretched circular DNA molecules which are attached every 100 nm along a backbone ribbon. The 16 strands from the 8 circular DNA molecules loop outward between attachment regions to form condensed nucleohistone loops. In partially dehistonized metaphase chromosomes a massive protein aggregate (overlay) is found closely associated with the backbone ribbon. Backbone components associate during telophase (15 minutes post-metaphase) to form a distinct nuclear cage structure in the early G1 period (30 minutes post-metaphase). The association is first seen as a merging of the backbone protein overlays which, within 75 minutes post metaphase, develops into a mature nuclear cage structure containing a uniform distribution of backbone ribbons with the attached nucleohistone loops extending into the nuclear interior. In cell prophase the cage structure is dissassembled and the backbones separate to form individual chromosomes. Supported in part by DOE contract DE-AS05-79-EV-02832.

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SEM STUDIES OF EXPERIMENTAL SKIN WOUNDS IN THE HAIRLESS MOUSE. P.S. Baur[1,2] and J.D. Hudson[2], [1]Shriners Burns Institute, 610 Texas Avenue, Galveston, TX 77550. [2]Graduate School of Biomedical Sciences, University of Texas Medical Branch, Galveston, TX 77550.

Most wounds are healed by the multifunctional cell known as the fibroblast. In skin wounds the basal cells reestablish the epidermis by mitosis and migration while the fibroblasts repair the dermis by migration and concomitant protein synthesis. Spindle shaped fibroblasts, initially associated with fibrin strands in the wound bed, appear to produce collagen fibers in the papillary layer of the scar dermis. Flattened fibroblasts found in the deeper regions of the wound produce the collagen laminae which comprise the reticular layer of the scar dermis. The laminae are first formed in the subpannicular area several mm behind the wound margin. Ironically, the origin of these cells still remains speculative. The laminae grow centripetally and become thickened by subsequent depositions of collagen and/or mucopolysaccharide ground substances.

The configurations of the various collagenous structures comprising the soft connective tissues of a scar appear therefore to be determined by the shape of the cells involved in synthesis and/or assembly.

RECRUITMENT OF FIBROCLASTS IN HAIRLESS MOUSE WOUNDS. P.S. Baur[1,2] and R.A. Cox[2], [1]Shriners Burns Institute, 610 Texas Avenue, Galveston, TX 77550, [2]Graduate School of Medical Sciences, University of Texas Medical Branch, Galveston, TX 77550.

Fibroblasts synthesize collagen and assemble it into filament and/or fiber configurations. Fibroclasts (sic) on the other hand phagocytize collagen filaments, incorporate them into phagolysosomes, and digest the fragments enzymatically. Fibroclasts appear to mediate soft connective tissue degradation, especially scar maturation and/or remodeling. Evidence suggest that fibroblasts and fibroclasts are one in the same cell differing only in function. However, their origin(s) still remains speculative.

The ability to recruit fibroclasts from a fibroblast population could drastically alter the level or rate of wound healing and scar formation by favorably balancing synthetic activities within the tissues against cell mediated connective tissue degradation. Thus, the increased collagen production that occurs in hypertrophic scars could be effectively controlled or diminished by increasing the size of the fibroclast population in the tissue at the expense of the fibroblast population. Our studies indicate that fibroblasts can be induced to convert into fibroclasts by the use of a variety of stimuli. Collagen fragments, glutaraldehyde fixed collagen fragments, and latex particles all appear to be phagocytized by soft connective tissue fibroblasts *in vivo*. Furthermore, our data suggests that the degree of fibroplasia can be quantitatively reduced by the recruitment of fibroclasts.

CYTOPLASMIC FILAMENTS IN TUMOR CELLS. Bruce Mackay, Pathology, University of Texas M.D. Anderson Hospital and Tumor Institute, Houston, Texas 77030.

The presence of filaments within the cytoplasm of tumor cells is a relatively common finding, but their identification and appearance may be the means of classifying a tumor in cases where this is not possible by routine light microscopy. Specific types of cytoplasmic filaments include the tonofilaments that are plentiful in the better differentiated squamous carcinomas but become sparse with dedifferentiation. Similar filaments may be present in any tumor whose cells are united by desmosomes, but the density of the tonofilaments is not always proportional to the number and length of the desmosomes. Skeletal muscle myofilaments occur in the cells of many rhabdomyosarcomas, but they vary considerably in number and organisation. The presence of smooth muscle myofilaments can be helpful in identifying a sarcoma as a leiomyosarcoma, but myofibroblasts can be difficult to distinguish from poorly differentiated leiomyosarcoma cells. Non-specific filaments occur in a variety of human neoplasms, and when they are plentiful and aggregated, may confer a hyalinished appearance on the cytoplasm in light microscopic sections.

THE Z BAND LATTICE IN A SLOW SKELETAL MUSCLE. M.A. Goldstein, J.P. Schroeter, and R.L. Sass. Depts. of Medicine and Cell Biology, Baylor College of Medicine and Dept. of Biology, William Marsh Rice University, Houston, Texas 77030.

One of the important structural parameters in skeletal muscle is Z band width. Slow twitch skeletal muscle fibers such as those found predominately in rat soleus muscle typically have Z band widths of greater than 90 mm at rest length. We have previously shown in longitudinal sections in periodicity of 37.5 nm along the axial filaments, that is associated with an array of oblique connecting filaments, and in cross sections a 25 nm centered square lattice. We have proposed that the soleus Z band consists of at least 3 repeating units of 38x25x25 and is therefore similar to the cardiac Z band. In the present study we have examined cross sections of rat soleus muscle using optical diffraction and reconstruction techniques. EM's show both basket weave and small square lattice forms characteristic of Z band bross sections. Regions of the Z lattice having the same axial filament spacings showed both of the lattice forms. Patterns typical for transition regions located between the two lattice forms were seen. Modeling of the transition regions in three dimensions and in two-dimensional projections suggests that a change in filament diameter together with a change in curvature of the connecting filaments can explain the different appearances of the Z lattice at a given sarcomere length. Short range responses to tension or torque or both within a myofilament bundle without changes in axial interfilament distances are suggested by our data and incorporated into the 3-d model. Long range changes in axial interfilament distances over a whole Z band in response to shortening or stretching of adjacent sarcomeres or compressive forces perpendicular to the myofibril axis are accomodated also by this model. We conclude that the Z band is a dynamic structural lattice important for effective muscle contraction. (Supported in part by 1K04HL00321, HL 17376, HL 17269 and the Muscular Dystrophy Association).

THE EFFECT OF CYTOCHALASIN B ON GLYCERINATED ADULT SKELETAL MUSCLE. Danna B. Zimmer and Margaret A. Goldstein. Section Cardiovasc. Sci. Depts. Med. and Cell. Biology, Baylor College of Medicine, Houston, Texas 77030.

Cytochalasin B has been reported to interact with isolated globular and filamentous actin from various sources. It is also thought to disrupt Z-bands in cultured embryonic heart muscle. This study was undertaken to determine the effect of cytochalasin B on actin-containing filaments in adult fast and slow mammalian skeletal muscle. We used the chicken pectoralis major and rat soleus muscles as typical fast and slow muscles respectively. Incubation of these muscles with 40 μg/ml or less cytochalasin B for one hour or less had no effect on the muslce ultrastructure. Fast skeletal muscle treated with 40

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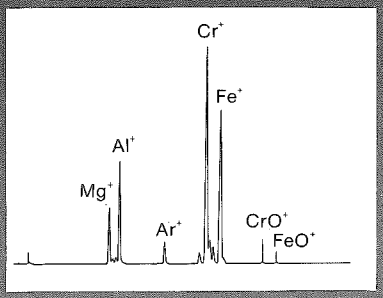

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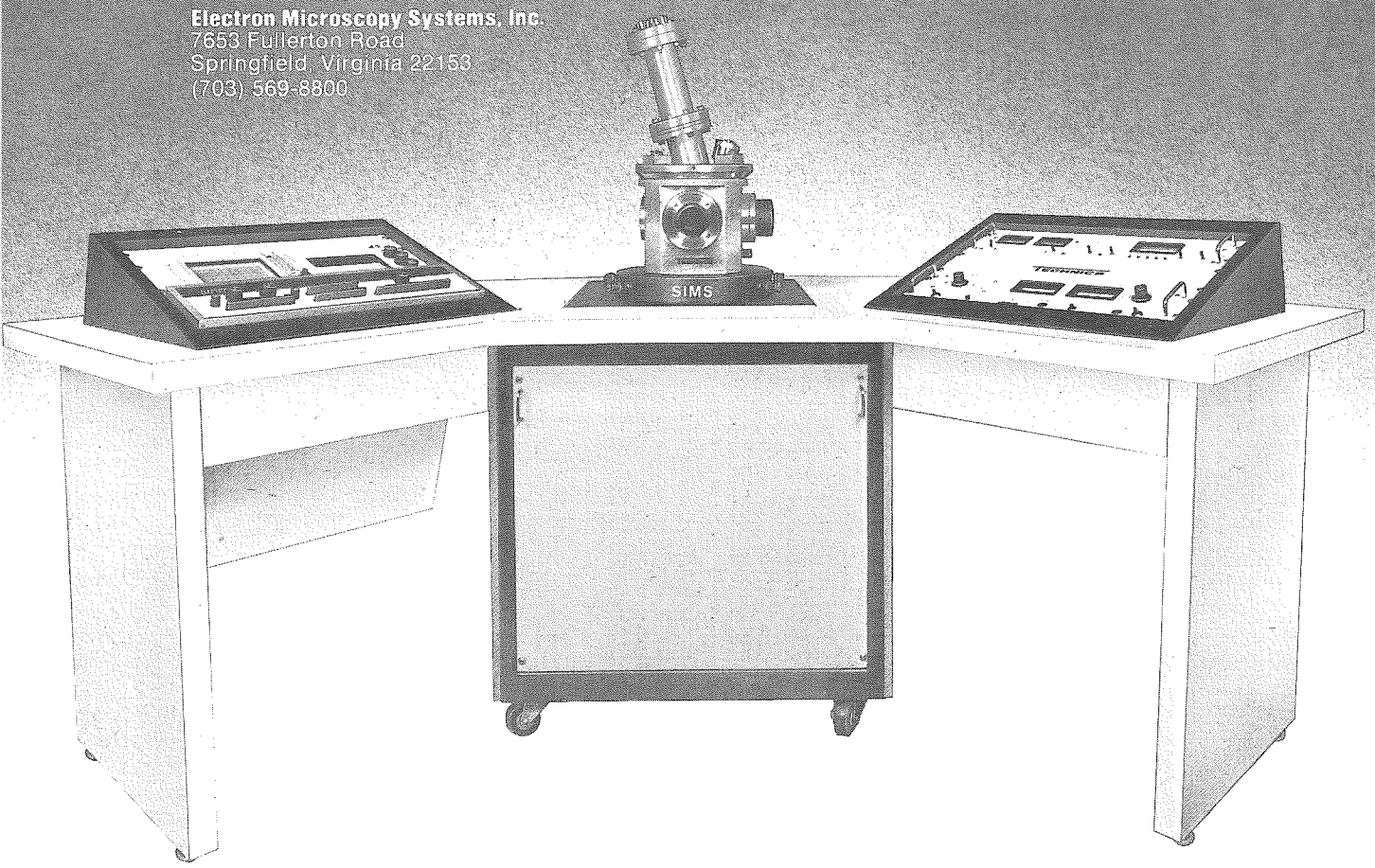

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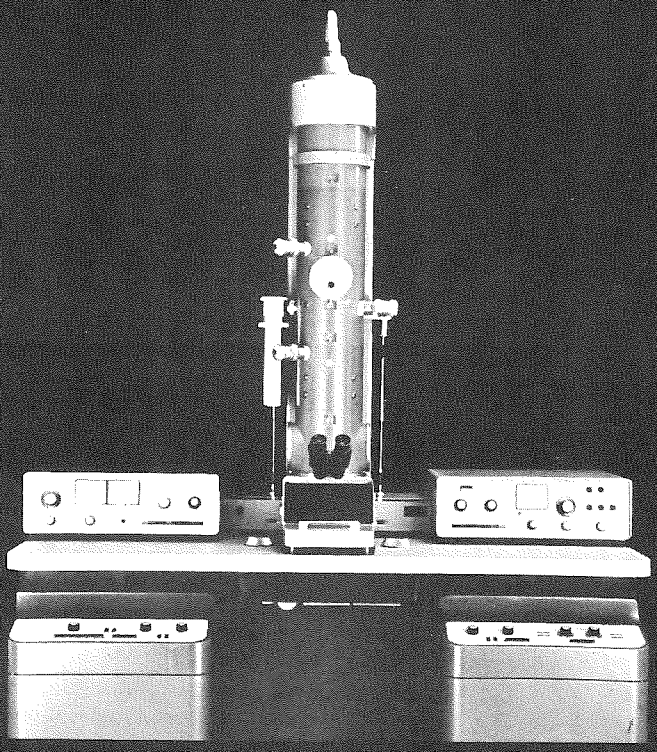

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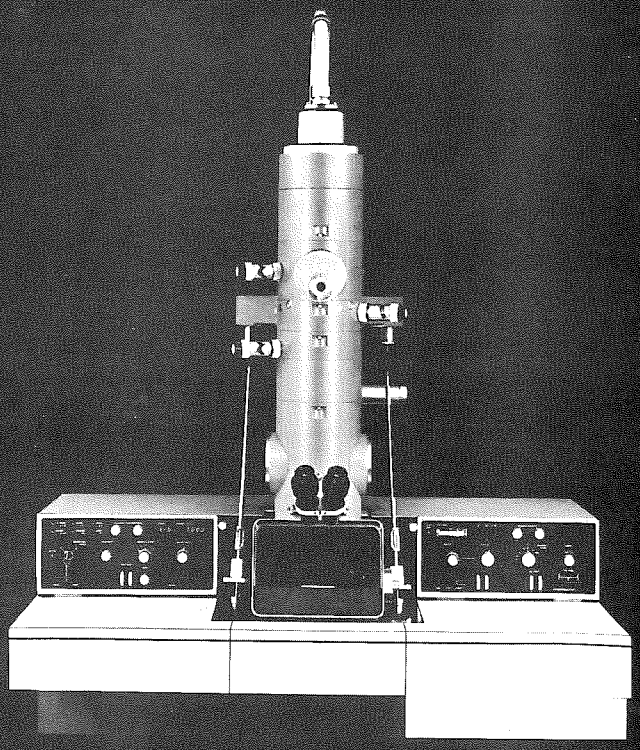

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μg/ml cytochalasin B for two and four hours exhibited loss of the typical subunit structure of the Z-band. On the other hand, slow skeletal muscle Z-bands were resistant to breakdown under the same conditions. The data suggest that the ends of the actin filaments in fast skeletal muscle are able to bind cytochalasin B which alters the binding of the other Z-band proteins causing disruption of the Z-lattice. It is also possible that Z-band proteins other than actin may be the binding site for cytochalasin B. (Supported by NIH grants HL 17376 and HL 17269).

THIN FILAMENT ARRANGEMENT IN SKELETAL MUSCLE. L. Traeger, J.M. Mackenzie, Jr., H.F. Epstein, M.A. Goldstein, Section of Cardiovascular Sciences, Dept. of Med., Cell Biology, and Neurology, Baylor College of Medicine, Houston, Texas 77030.

Understanding the arrangement of thin filaments in striated muscle is important to understanding thin-thick filament interactions during contraction. We are studying thin filament arrangement in growing rat skeletal muscle. Soleus (SOL) muscle from 3 and 9 day old and adult rats and adult extensor digitorium longus EDL) muscle were glutaraldehyde fixed at rest length (sarcomere length 2.4 μm) and serially cross sectioned 60 nm thick from the H zone of one sarcomere to the H zone of an adjacent sarcomere. Radial distribution functions for thin filament arrangement (TFA) were calculated by computer from cross sections taken at specified distances from the Z band or AI junction. The periphery of myofibrils were not included because TFA appears to be different between the central and outer regions of the myofibril. TFA was measured from micrographs enlarged to 285,000x. Between 200 and 300 thin filaments per myofibril were used to calculate a mean TFA per myofibril. Means of TFA per myofibril for three myofibrils were used to calculate a mean TFA per muscle, and mean TFA per muscle for three rats used to calculate a mean TFA per age group. TFA was expressed as number of thin filaments within a 27 nm radius of each thin filament in the lattice. In all muscles studied, TFA was best represented by a tetragonal array throughout the I band, becoming trigonal only in the A band. TFA became less ordered with increasing distance from the Z band. Adult I band TFA was closer to idealized tetragonal than neonatal I band TFA. These data suggest that (1) TFA is inherently tetragonal in the I band, making the transition to trigonal only upon interaction of thin and thick filaments in the A band, and (2) TFA order increases during muscle development. (Supported by Muscular Dystrophy Association, NIH HL 17376, HL 05920 and HD 12610).

APPLYING ZONE SYSTEM TECHNIQUES IN SETTING THE WAVEFORM MONITOR TO MAXIMIZE INFORMATION ON SEM MICROGRAPHS. Holm, J.M., Thurston, E.L., Electron Microscopy Center, Texas A&M University, College Station, Texas 77843.

The SEM waveform monitor is the ultimate in "light-metering" systems in that it displays the signal amplitude, and therefore the resulting photographic density, of every point on the displayed image. If the waveform monitor is precisely calibrated, zone system techniques can be easily applied to minimize photographic noise and maximize information for each sample. The term zone system refers to the idea of dividing the tonal range of the resulting print into an arbitrary number of equally wide zones. The signal amplitude is measured for as many points on the image as is necessary to allow a relationship to be established between the brightness of the various parts of the image. These points are then assigned to the previously determined zones, making a previsualization of the finished print possible before the negative has been exposed. The inability to determine precisely the brightness of a large number of points on the image, and the problems with contrast manipulation make use of the zone system difficult in TEM and light photography. However, in SEM photographs, the waveform monitor allows every point of the image to be easily placed in the desired zone. Experimentation with placing the different areas of the image in different zones should enable an operator to acquire a "feel" for the zone system. A JEOL SEM microscope, having six lines on the waveform monitor, was used in illustrating aspects of the zone system using seven zones.

MORPHOMETRIC ANALYSIS OF THE ULTRASTRUCTURE OF OVARIAN TISSUE OF *PASPALUM* GROWN *IN VIVO* AND *IN VITRO*. Denise Roper and Randy Moore, Biology Department, Baylor University, Waco, Texas 76798.

We have previously reported on the ultrastructural differences between the various cell types composing the ovary of *Paspalum dilatatum* (Dallis Grass). In order to quantify these differences in cellular ultrastructure, we have performed a morphometric analysis of cells composing the various regions of the ovary. Cells grown *in vivo* and *in vitro* exhibit no apparent ultrastructural differences at comparable stages of development. Various regions of the ovary (e.g., chalazal, micropylar, etc.) have their own distinct ultrastructure. Although the precise boundary between these zones is difficult to detect, the ultrastructural differences between the different zones are nevertheless significant when reported as fractional volumes, absolute volumes, and number of volume of individual organelles per cell. For example, the differential activity o the micropylar region of a mature ovary is distinguishable from the chalazal region by: 1) increased levels of cell division, 2) increased numbers of mitochondria and dictyosomes, 3) decreased vacuole to cytoplasm ratio, and 4) thinner cell walls. These results thus quantify the differences in cellular ultrastructure associated with the polarization of the ovule as it prepares for penetrance of the micropylar region by the pollen tube and subsequent fertilization.

ULTRASTRUCTURAL ASPECTS OF CHLOROPLAST DIMORPHISM IN *SORGHUM* LEAVES. Russell Wilson and Randy Moore, Biology Department, Baylor University, Waco, Texas 76798.

Ultrastructural changes that occur in plastids during greening were investigated in *Sorghum bicolor*, a C4 plant. Etioplasts in mesophyll cells are 1-2 um in diameter and possess rudimentary grana (composed of 3-4 lamellae per granum). Mesophyll etioplasts also possess prominent and highly ordered prolamellar bodies. Some thylakoids originate from these prolamellar bodies while others appear free in the densely ribosomal stroma. The most prominent changes in mesophyll etioplasts that occur during greening are (1) a pronounced increase in size, and (2) the organization of numerous well-defined grana, each consisting of up to 20 lamellae. Starch grains are conspicuously absent during all stages of chloroplast ontogeny in mesophyll cells. Etioplasts of bundle sheath cells are more elongate than those of mesophyll cells and possess an internal membrane system consisting of parallel but unappressed rows of stroma lamellae. These lamellae occasionally overlap, but there is no indication of grana. Bundle sheath etioplasts also possess prolamellar bodies similar to those found in mesophyll etioplasts. Following greening, bundle sheath etioplasts are characterized by: (1) a marked increase in size, (2) the disappearance of the prolamellar bodies, (3) an increase in the number of stroma lamellae, (4) the presence of rudimentary grana and starch grains. Thus, there is a pronounced dimorphism that distinguishes chloroplasts of mesophyll and bundle sheath cells in *Sorghum*. The ultrastructural features associated with chloroplast dimorphism will be discussed relative to their functional implications in C4 photosynthesis.

FINE STRUCTURE OF THE HAUSTORIAL APPARATUS OF THE PLANT PARASITIC FUNGUS *EXOBASIDIUM CAMELLIAE*. Charles W. Mims, Department of Biology, Stephen F. Austin State University, Nacogdoches, Texas 75962.

Members of the genus *Exobasidium* are all plant pathogenic fungi attacking not only wild plants but various ornamentals as well. Infected leaves and stems of the host enlarge to many times their normal size. Examination of infected tissue reveals that the fungus produces an extensive system of slender, branched, intercellular hyphae. Short, branched or lobed structures referred to as haustoria arise from the intercellular hyphae and penetrate the host cell wall coming in intimate contact with the host cell plasma membrane. Such structures are thought to absorb nutrients from the host. In this study TEM is used to examine the structure and development of the haustorial apparatus of *E. camelliae* produced on *Camellia sasanqua*.

The haustorial apparatus of *E. camelliae* arises from an intercellular hyphal compartment in close association with a host cell. Each haustorial lobe is initially ensheathed by host cell wall material but eventually the wall is penetrated by the lobe. Each lobe contains an extensive inclusion body consisting of many interconnected branches of electron dense material. The inclusion appears to lie between the haustorial wall and the infolded haustorial plasma membrane. At the tip of the lobe is an electron dense mass of material here termed the "haustorial cap". The results of this study suggest that the haustorial cap arises from the inclusion body and is involved in the breakdown of the host cell wall. The haustorial cap is intimately associated with the host cell plasma membrane. Whether or not it actually penetrates the host plasma membrane is not clear.

AN SEM STUDY OF CRYSTALS IN THE LEAVES OF *ROSA MULTIFLORA*. Mary Lou Kelly and Howard J. Arnott, Department of Biology, University of Texas at Arlington, Arlington, Texas 76019.

Crystals in the leaves of *Rosa multiflora* Thumb were studied by SEM and x-ray diffraction. The crystals were determined to be composed of calcium oxalate monohydrate (whewellite). *In situ* the crystals are located in the cells surrounding the veins in the leaves. When isolated, a variety of crystalline forms were seen, ranging in symmetry from an ahedral crystalline mass and prismatic aggregates to a spherical druse. Some of the crystals observed were single crystals and others multiple crystals including contact and interpenetrant twins and ordinary druses. The majority of the crystals were larger than 15 micrometers with a small percentage of single crystals and ordinary druses that were less than 15 micrometers in size.

CRYSTALS AND CRYSTAL CELLS IN THE COTYLEDONS OF *CERCIS CANADENSIS* L. Mary Alice Webb and Howard J. Arnott, Department of Biology, University of Texas at Arlington, Arlington, Texas 76019.

Light and electron microscopy have been used to study crystals in both mature and slightly immature embryos of *Cercis canadensis* L. In cleared botyledons and sections observed with light microscopy each epidermal cell of both abaxial and adaxial surfaces of the cotyledons contains a crystal aggregate, or druse. Marginal cells of the cotyledons do not have crystals. Druses are located within large spherical bodies, determined by histochemical staining to be protein bodies. In addition to the large druse-containing protein body, crystal cells also contain smaller protein bodies and lipids. Using scanning electron microscopy (SEM) crystals are observed *in situ* in fractured cotyledon segments. SEM is also used to observe isolated druses. Some of these crystal aggregates are ordinary "spherical" druses; others consist of a pair of interconnected contact twins arranged in a plane on the surface of which smaller crystals are observed. The latter type appears to be more frequent in immature cotyledons. Intermediate forms between the two types are also observed, suggesting that they may be developmental stages.

A SCANNING ELECTRON MICROSCOPE STUDY OF PROTEIN BODIES IN DORMANT AND GERMINATED SUNFLOWER SEEDS. R.D. Allen and H.J. Arnott, Department of Biology, University of Texas at Arlington, Arlington, Texas 76019.

Mature sunflower seeds contain storage proteins which are organized into distinct units called protein bodies. Scanning electron microscopy was used to observe the morphology and structure of protein bodies in dormant seeds and to document protein body decomposition during germination. Dormant seed tissue was prepared either anhydrously by OsO4 vapor fixation or aqueously by glutaraldehyde-osmium fixation. Comparisons of seed tissue prepared by these methods reveals marked structural differences which indicate that hydration of seed tissue occurs before fixation in aqueously prepared seeds. As germination proceeds protein bodies lose their smooth spherical shape and become indented and pitted. Loss of protein body integrity and fusion of the protein bodies within a cell precedes the formation of a central protein vacuole. The protein vacuole first becomes granular in appearance then fibrous as protein is removed and transported to the developing embryonic axis. Protein vacuole density decreases and eventually forms the main cell vacuole.

A MICROSCOPY SURVEY OF CUCURBITA POLLEN MORPHOLOGY. Thomas C. Andres. Texas A&M University.

Mature pollen exine morphologies of eighteen of the twenty-seven species of Cucurbita were examined and measured using light and scanning electron microscopy (SEM). Samples were procured form dry herbarium material and living plants. Representative species from eight of nine taxonomic groups in the genus were used including three of the five cultivated species. No definite systematic relationships can be drawn from the pollen morphologies. Every species examined is polymorphic with often parallel ranges in phenotypes. Despite the markedly eurypalynous nature of Cucurbitaceae the genus Cucurbita is surprisingly homogeneous in pollen structure. This supports the belief that the genus is of recent evolutionary origin. Cucurbita pollen is large (80-215μm), spheroidal, pantoporate, operculate, and spiny. The exine is intectate and profusely covered with surface sculpturing, ranging from scabrate and verrucate to baculate and clavate. These surface structures are clearly visible only after acetolysis. Most surface details are visible only using light microscopy, but are more easily measured using SEM. Despite the similarities a few species seem to possess some diagnostic characteristics in spine and surface sculpture morphology. Identification of the species from archeological collections, such as several reported finds in human coprolites, would help clarify the early agricultural history of the genus. No support was found for previous suggestions of coevolution between Cucurbita pollen morphology and pollen collecting devices of the squash bees. Infraspecific spine shape variations, found in nine varieties of Cucurbita pepo may have significance in applied plant breeding investigations.

MORPHOLOGICAL RESPONSE OF EMBRYONIC CHICK LUNG TO VARYING DOSES OF DEXAMETHASONE. Robert V. Blystone and Douglas W. Cromey, Dept. of Biology, Trinity University, San Antonio, Texas 78284.

The glucocorticoid dexamethasone has been shown to accelerate latter stages of lung maturation in mammalian fetuses by inducing alveolar type II cells to release surfactant. The

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parameters of lung response in relationship to dose size and time of injection of dexamethasone are ill-defined. This study reports on these parameters as investigated in chick.

Doses of dexamethasone phosphate ranging in concentration from 0.25 to 4 micrograms were injected into the chorioallantoic space of embryonic White Leghorn chicks. The varying concentration single dose was administered to embryos of one of five different incubation ages: 336 hrs. (14 days), 360 hrs. (15 days), 384 hrs. (16 days), 418 hrs. (17 days), or 442 hrs. (18 days). Lung tissue was removed from embryos after one of two intervals from time of injection: 24 hrs. from injection or 466 hrs. (19 days) into incubation. The tissue was prepared for light and electron microscopy.

The results of this study revealed that time of injection of dexamethasone as well as dose size affect the morphological course of lung development in chick. The transition from the canalicular stage to the air capillary stage was altered by the steroid. Vascular patterns, connective tissue density and air capillary development differed from control birds and varied in a gradient fashion within the range of the injection times. Effects of varying dose size were examined in an effort to compensate for the time of injection-morphological alteration relationship. This latter effort was only partially successful.

THE INVOLVEMENT OF ACID PHOSPHATASE IN LETHAL CELLULAR SENESCENCE IN AN INCOMPATIBLE PLANT GRAFT. Randy Moore, Biology Department, Baylor University, Waco, Texas 76798.

In order to elucidate the events that lead to cellular autolysis, and thus better understand the mechanism of cellular incompatibility between *Sedum telephoides* and *Solanum pennellii* stems, we have followed the appearance and fate of the hydrolytic enzyme acid phosphatase in both the compatible *Sedum* autograft and the incompatible *Sedum/Solanum* heterograft. Acid phosphatase was localized by a modified Gomori-type reaction. Following an initial association with the endoplasmic reticulum and dictyosomes by 6-10 hours after grafting, acid phosphatase activity in the compatible autograft was localized along the plasmalemma, tonoplast, and vacuole. This strict compartmentation in membranes or organelles and absence of enzyme from the cytosol was maintained throughout development of the compatible autograft in *Sedum*. Although enzyme activity in the incompatible *Sedum/Solanum* heterograft was initially similar to the compatible autograft, a marked difference in enzyme localization occurred in the two graft partners over time. *Solanum* cells accumulated increased amounts of enzyme activity, but the enzyme remained sequestered in the vacuole and other organelles. In comparable *Sedum* cells, however, there was a dramatic increase in acid phosphatase activity in the cytosol, often without any prior compartmentation within the vacuole. This high activity of enzyme activity in the *Sedum* cytosol was correlated with cellular autolysis. Thus, while acid phosphatase synthesis and/or activation is induced in both the compatible and incompatible grafts, incompatibility between *Sedum* and *Solanum* involves a failure of *Sedum* cells to isolate hydrolytic enzymes from the cytosol, which subsequently leads to cellular necrosis.

PATHOGENICITY OF *MYCOPLASMA PULMONIS* IN EPENDYMAL ORGAN CULTURE. N. Chinookoswong and D.F. Kohn, University of Texas Medical School at Houston.

Ependyma organ culture was used as a model to study the effect of *Mycoplasma pulmonis* on the ciliated ependyma of the rat. One mm^2 portions of cerebellum from newborn rats were harvested in roller tubes containing Ham's F-12 medium, calf serum, and glutamine. Ciliary activity was monitored by stereomicroscopy and, after vigorous ciliary motion was established, tubes were inoculated with 10^4 to 10^6 CFU of *M. pulmonis*. Explants were examined by SEM at 6,24,48 and 72 hours after inoculation. Reduced ciliary activity or ciliostasis occurred 48 to 72 hours after infection. Beginning at 24 hours, the organism was abundant in most explants at the cellular membrane of the host cells. In contrast to uninfected explants in which cilia were erect and singly oriented, cilia from infected explants were matted together, or lying upon the cytoplasmic membrane in a web-like orientation. Some explants displaying ciliostasis had lost their ciliated surfaces.

***IN VITRO* ADRENERGIC STIMULATION OF PINEAL MELATONIN PRODUCTION IN THE YOUNG AND OLD SYRIAN HAMSTER.** C.M. Craft and R.J. Reiter. Dept. of Anatomy, Univ. of Texas Health Sci. Ctr., San Antonio, TX 78284.

In vivo studies have suggested that the nocturnal peak in pineal melatonin content was depressed in old Syrian hamsters in comparison to that in young Syrian hamsters (Reiter *et. al., Peptides 1*, Suppl. 1:69, 1980). This study examined the responsiveness of the B-adrenergic receptors within cultured pineal glands after the addition of norepinephrine (NE) by measuring and comparing melatonin content in pineals from 3-month and 20-month-old hamsters. NE induced significantly elevated levels of melatonin content (840±112 pg/gland/hr) over control levels of melatonin content (250±70 pg/gland/hr) in cultured young hamster pineal glands. A similar increase in melatonin content was observed following NE addition to cultured old hamster pineal glands. With 3-month-old vs. 20-month-old hamster pineals, no statistically significant difference was found *between* these two groups. However, *within* each NE stimulated group, earlier incubations showed no significant differences in melatonin content until 0200 ($P<0.05$), 0400 ($p<0.01$), and 0800 ($p<0.001$). At 0400 and 0800, values were significantly different ($p<0.001$) between NE old and young unstimulated glands vs. NE old and young stimulated glands. This study indicates that β-adrenergic receptors do not show impared capacity to respond to NE stimulation in aged hamsters pineals in organ culture; therefore, the ability of the hamster pineal gland to respond to exogenous adrenergic stimulation was undiminished in culture whether young or old. (Supported by PCM 8003441.)

ABNORMAL SPERMATOZOA OF THE COMMON MARMOSET *CALLITHRIX JACCHUS*. M. Lynn Davis, Department of Veterinary Anatomy, Texas A&M University, College Station, TX 77843.

Semen samples collected from fertile marmosets by electroejaculation reveal a homogenous sperm population with few malformed individuals. Those cells which are defective take on a variety of forms including misshapen or abnormally sized heads, double tails or improperly arranged axonemes. These abnormalities surely result from accidents of formation or perhaps genetic causes. Other individuals may exhibit a wide range of anomalies including coiled or bent tails, broken tails, acrosome reactions and cytoplasmic droplet retention. Whether or not these defects result from improper formation, artifactual induction or other reasons is debatable. Abnormal cells of both varieties are presented by means of the scanning and transmission electron microscopes.

CHOOSING A FILM/DEVELOPMENT COMBINATION FOR SEM AND CALIBRATING THE PHOTOGRAPHIC CRT. Holm, J.M., Electron Microscopy Center, Texas A&M University, College Station, Texas 77843.

The photographic process accounts for a significant part of the noise observed in SEM micrographs. It is possible to greatly reduce photographic noise and make microscope-sample noise

less apparent by carefully selecting a film/development combination and precisely correlating the waveform monitor calibration. Factors to consider in choosing a film are speed, contrast and resolution. Kodak Tri-X Pan #4164 and Tri-X Ortho #4163 both have high film speeds, sufficient contrast and resolving capabilities greater than most high resolution CRT'S. The subsequent developer and development time should be selected to produce a negative which exhibits a full range of tones when printed on a #2 grade paper. It is necessary to precisely calibrate the photographic CRT to take full advantage of a specific film/development combination. If only one type of sample is routinely observed, it may be possible to adjust the photographic CRT so that when the signal amplitude is placed between the top and bottom lines of the waveform monitor, an acceptable negative will be consistently produced. To allow maximum flexibility, however, it is usually desirable to calibrate the photographic CRT so that the bottom line of the waveform monitor represents the lowest signal amplitude and the top line represents the highest signal amplitude which can be recorded on the film. This calibration is accomplished by moving the secondary electron detector brightness control to pre-determined settings while exposing the film to make density steps, and alternately adjusting the photographic CRT to align these density steps with the corresponding ranges or zones on the waveform monitor. The zone system can be consistently used to obtain excellent micrographs of a wide range of samples with minimal experimentation.

ULTRASTRUCTURE OF THE FOX PINEAL GLAND. Michael Karasek and John T. Hansen, Laboratory of Electron Microscopy, Medical Academy, Lodz, Poland and the Department of Anatomy, The University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, San Antonio, Texas 78284.

The ultrastructure of the fox pineal gland was examined and compared with that of other mammals. Two different populations of pinealocytes (I and II) were observed. A Golgi apparatus, granular endoplasmic reticulum, mitochondria, lysosomes, centrioles, and cilia were present in both cell populations. The presence of dense-core vesicles, presumably of Golgi origin, were a characteristic feature of pinealocytes I, whereas glycogen deposits and pigment granules were commong features of pinealocytes II. The pinealocytes I were distributed homogenously throughout the parenchyma, while pinealocytes II were located generally near blood vessels. Besides pinealocytes, the pineal parenchyma contained fibrous astrocytes. Capillaries of the fox pineal gland consisted of a nonfenestrated endothelium. Numerous adrenergic nerve fibers were situated in perivascular areas as well as the parenchyma.

ULTRASTRUCTURAL PATHOLOGY OF STRIATED MUSCLE. R. Thomas King, Robert A. Turner and James C. Stinson, Department of Pathology, Scott & White Clinic, Temple, TX 76508.

Diseased muscle at the ultrastructural level shows alterations which make it classifiable more readily than the pathology seen by light microscopy. Inflammatory processes, vascular abnormalities, changes secondary to nerve abnormality, changes secondary to metabolic abnormality and myopathies and dystrophies are shown.

ULTRASTRUCTURE OF THE SHELL OF THE FRESHWATER SHRIMP *MACROBRACHIUM ROSENBERGII.* B.J. Lee, M.L. Davis and P. Neill. Department of Veterinary Anatomy, Texas A&M University, College Station, TX 77843.

The shell of *Macrobrachium* is a layered, acellular structure. The epicuticle is the thin outer layer. It is eosinophilic, lacks lamella and invaginates around seta that penetrate all the exoskeletal layers. The exocuticle is the thick underlying layer. It is basophilic, has 7 ot 8 lamellae and is crossed by pore canals. The endocuticle is the thickest inner layer. It is eosinophilic has lamellae and is crossed by pore canals. The surface of the cleaned shell is very smooth, but is interrupted by a regular pattern of pits and setae. Shell disease, probably due to the action of chitinoclastic bacteria, manifests itself in the erosion of outer shell layers in various patterns.

HISTOLOGICAL AND ULTRASTRUCTURAL STUDY OF THE CORPUS CARDIACUM OF THE STABLE FLY, *STOMOXYS CALCITRANS.* Shirlee Meola and J. Mark Thompson. Veterinary Toxicology and Entomology Research Laboratory, ARS, U.S. Department of Agriculture, College Station, Texas. 77840.

Due to the important role of the corpus cardiacum of insects as a site of synthesis, storage, and release of neurohormones that regulate growth, moulting, differentiation, reproduction, as well as feeding and digestion, the morphology of this structure in thestable fly, a blood-feeding livestock pest, was studied as a basis for future physiological and toxicological investigations concerning the control of this insect.

The corpus cardiacum of *S. calcitrans* was found to contain large intrinsic neurosecretory cells as well as numerous axon terminals containing neurosecretory granules of diverse size and electron density. Release of these elementary neurosecretory granules was found to occur both into the aortal lumen and into the hemocoel surrounding the organ. Paraldehyde fuchsin stainable material was located in the neurosecretory axons transversing as well as those terminating in the corpus cardiacum.

MONENSIN TOXICITY AS OBSERVED IN ROOT TIP CELLS OF MAIZE. Hilton H. Mollenhauer and D. James Morre, USDA, ARS, VTERL, PO Drawer GE, College Station, TX 77841 and Department of Medicinal Chemistry and Pharmacognosy, Purdue University, West Lafayette, IN 47907.

Monensin is used as a feed additive to promote utilization of nutrients and weight gain in cattle but is highly toxic to the equine species. In equine species the toxic effects are manifested in diaphram and myocardial muscle as mitochondrial swelling. Recent studies indicate that monensin also tends to inhibit Golgi apparatus-mediated phenomena and causes swelling of intercalary Golgi apparatus cisternae; however, these phenomena were not observed in the equine studies. Therefore, to further illucidate these aspects of monensin toxicity, we exposed maize root tip cells to low concentrations of monensin. These cells are excellent models for ultrastructural studies because of their simplicity and because their growth patterns are so consistent. We found that concentrations of monensin as low as 10-5 M rapidly (less than 30 min) destroyed the Golgi apparatus without significantly altering the structural appearance of other cellular constituents. In the presence of monensin, the Golgi apparatus shed its secretory vesicles and the cisternae curled up and/or became disassociated from one another. The cisternal swelling reported by others appeared prominent only in tissues fixed in glutaraldehyde and osmium tetroxide but was absent in tissues fixed in potassium permanganate. Therefore, swelling of Golgi apparatus cisternae is probably not a primary effect of monensin poisoning.

PLATELET-ENDOTHELIUM INTERACTION IN ARTERIAL LESIONS PRODUCED BY ULTRASOUND. Harol Nunez-Duran and Ernestina Ubaldo, Electron Microscopy Laboratory, Instituto Nacional de Cardiologia Ignacio Chevez, Mexico 22 DF, Mexico.

Damage of the arterial endothelium causes the activation of platelets. This phenomenom plays a central role in the formation of thrombus and probably in the genesis of atherosclerotic lesions. To study the platelet-endothelium interaction in the rat, we damaged the femoral artery with ultrasound by applying the tip of the sonicator (20 KHz, 10 watts, 10 sec) to shaved limb skin. We fixed the tissues with high molecular weight tannic acid and processed them for electron microscopy. Small lesions in the plasma membrane of endothelial cells, only detectable by tannic acid, were enough to attract platelets. Nevertheless, portions of endothelial cells not normally exposed to platelets (e.g. intracellular membranes) did not activate them. Detachment of endothelial cells with exposure of subendothelial tissue activated the platelets and stimulated the adhesion. These platelets showed thick pseudopods, which displayed bundles of microfilaments. A layer of microfilaments was also found in the platelet cytoplasm adhering to the internal elastic lamina. The leading edge of the spreading platelets seems to detach damaged endothelial cells from the internal elastic lamina. Our findings suggest that platelets migrate with active movements toward the damaged zone, and that once there, they glide over the internal elastic lamina and under the remainders of epithelial cells.

BRAIN CELL ALTERATIONS IN VITAMIN B6 DEFICIENCY. Elizabeth Root, Graduate Nutrition Division, The University of Austin, Austin, Texas 78712.

Both in human infants and in experimental animals, dietary deficiency of vitamin B6 has induced convulsions which are considered to result from a biochemical lesion since cellular changes are not usually seen in paraffin-embedded tissue. But methods of tissue preparation which visualize neuropil, such as electron microscopy of Golgi impregnation show that tissue alterations also occur.

Weanling albino rats were fed purified diets with or without vitamin B6. After two to three months, brains were fixed by cardiac perfusion with 2 percent paraformaldehyde and 2 percent glutaraldehyde in 0.08 M sodium phosphate buffer at pH 7.4, and were either postfixed in osmium tetroxide, stained in the block with uranyl acetate and embedded in an Epon-Araldite mixture or impregnated using Golgi-Cox solution and embedded in celloidin.

Golgi impregnation showed that although most cells retained normal morphology, numerous pyramidal cells of the cerebral cortex showed loss of dendritic arborization or swelling of dendrites. Total loss of basal dendrites occurred in some cells.

Electron microscopy showed that ultrastructural changes resulting from vitamin B6 deficiency also affected primarily the neuropil. These changes included axonal swellings and either swollen mitochondria or vacuoles and alterations of microtubules in dendrites.

ELECTRON PROBE X-RAY MICROANALYSIS OF NORMAL, HYPERPLASTIC, AND NEOPLASTIC MOUSE MAMMARY TISSUE. Nancy K.R. Smith, Ivan L. Cameron, Sidra B. Stabler, and Daniel Medina. The University of Texas Health Science Center, San Antonio, Texas 78284, and Baylor College of Medicine, Houston, Texas 77030.

Electron probe X-ray microanalysis was employed to determine the intracellular Na, C1, and K concentrations (mmole/kg dry weight) of individual epithelial cells in freeze-dried 2μm sections of mouse mammary tissue which were cut at - 30°C. A model system was used in order to compare elemental content of cells from control tissue, preneoplastic tissue, and neoplastic tissue from female BALB/cCr1Med mice that were bred and maintained in a closed, conventional mouse colony. Normal mammary glands were obtained from primiparous mice at 16-17 days of gestation. Tissue from the hyperplastic alveolar nodule (HAN) line D1 was removed from donor mice 12-16 weeks after transplantation into cleared mammary fat pads of syngeneic mice. Nodule line D1, although originally characterized by low tumor-producing capabilities, has recently progressed to a high tumor-producing line. All mammary adenocarcinomas, D1T, were primary tumors which developed from D1 nodule transplants. It was found that the electrolyte content of cells of preneoplastic tissue was the same as that of control tissue but was significantly ($p<0.001$) elevated in neoplastic tissue but was significantly ($p<0.001$) elevated in neoplastic tissue (162% inplastic increase for Na; 130%, C1; 48%,K). The fact that electrolyte content of preneoplastic cells is the same as that of control cells is consistent with previous observations that preneoplastic cells have some characteristics which are typical of normal cells and some which are typical of transformed cells. An increase in electrolyte content seems to be associated with the transformation to a neoplastic state and not with the as-yet-unidentified, irreversible step associated with conversion to the preneoplastic state.

THE RETINA OF THE NINE-BANDED ARMADILLO (Dasypus novemcinctus): Some Unusual Features. Robert S. St. Jules and Newell H. McArthur. Department of Veterinary Anatomy, College of Veterinary Medicine, Texas A&M University, College Station, TX 77843.

It has been known for some time that the retina of *D. novemcinctus* does not contain cone cells, and is avascular. Yet the potential of this animal as a model in the study of the role of rod cells has not been explored. A study is currently being conducted to provide more information on the morphology of the retina of this species and has revealed several remarkable features. Densely staining cells among the photoreceptors have been observed with the light microscope. These cells most often occur among the photoreceptor outer segments near the retinal pigment epithelium. Portions of photoreceptor project from some of these cells and a few have been observed at the level of the outer limiting membrane, apparently emerging from the outer nuclear layer. With TEM all appear quite similar and resemble closely the cells of the outer nuclear layer. It is hypothesized that these cells represent ectopic rod cells. Preliminary investigation indicates that in the armadillo, photoperiod can influence the number of these seemingly ectopic cells. In animals exposed to constant light for five days, ectopic cell numbers were consistently very low. Only a few ectopic cells were present in one micron thick sections of the posterior portion of the globe, including the entire retinal circumference. In similar sections from eyes of armadillos maintained in a natural light-dark cycle, ectopic cell numbers were often much higher, with well over 50 ectopic cells per section in some animals.

Two other unusual features not apparent in thick sections are the presence of multiple synaptic ribbons in some rod spherules and a lattice-like structure in some retinal pigment epithelial cell nuclei which resembles annulate lamellae. The significance of these features is also currently under investigation.

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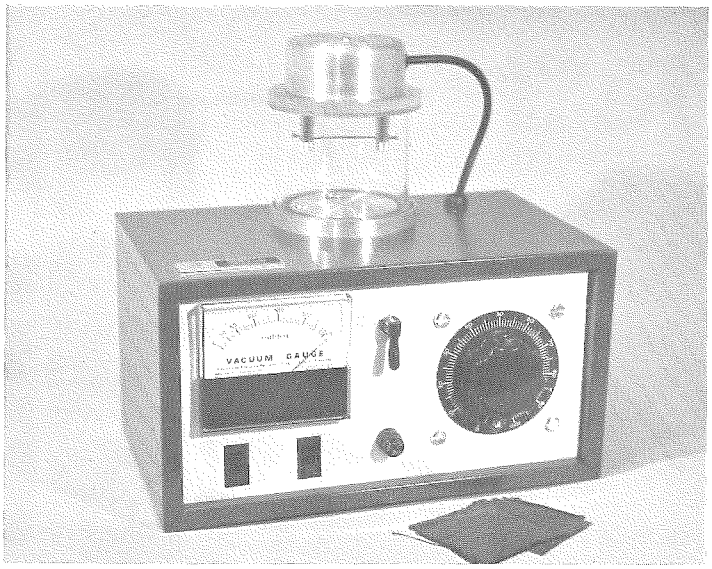

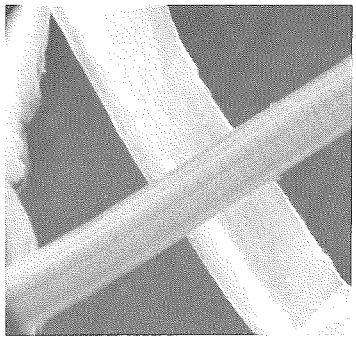

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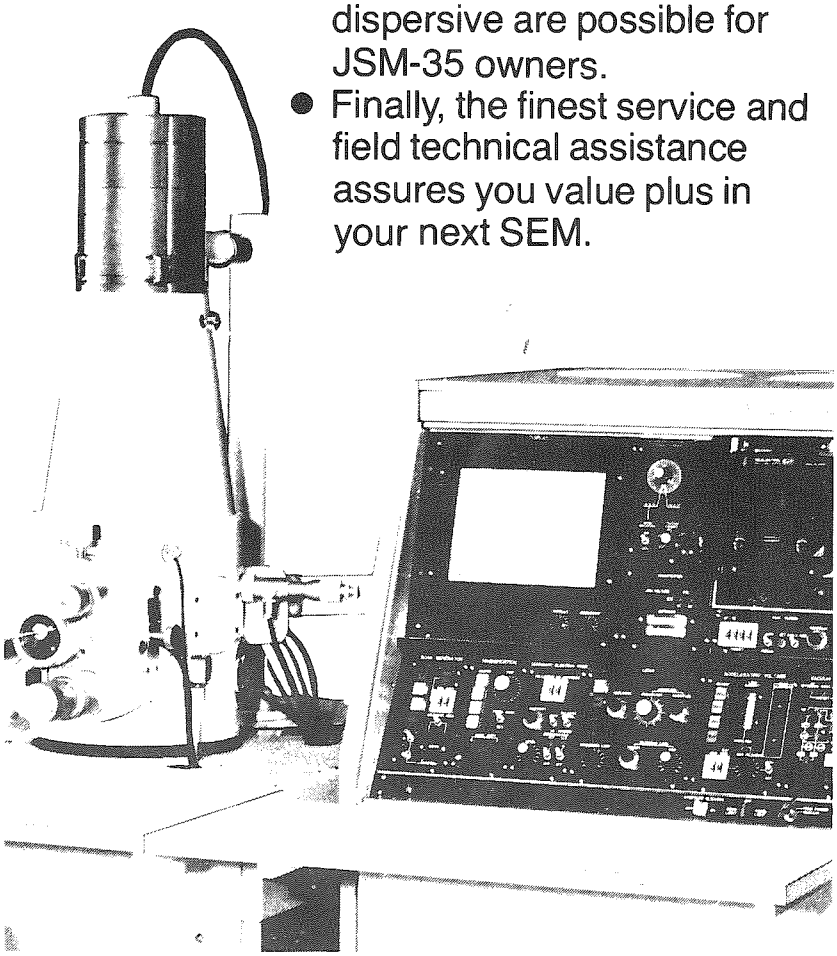

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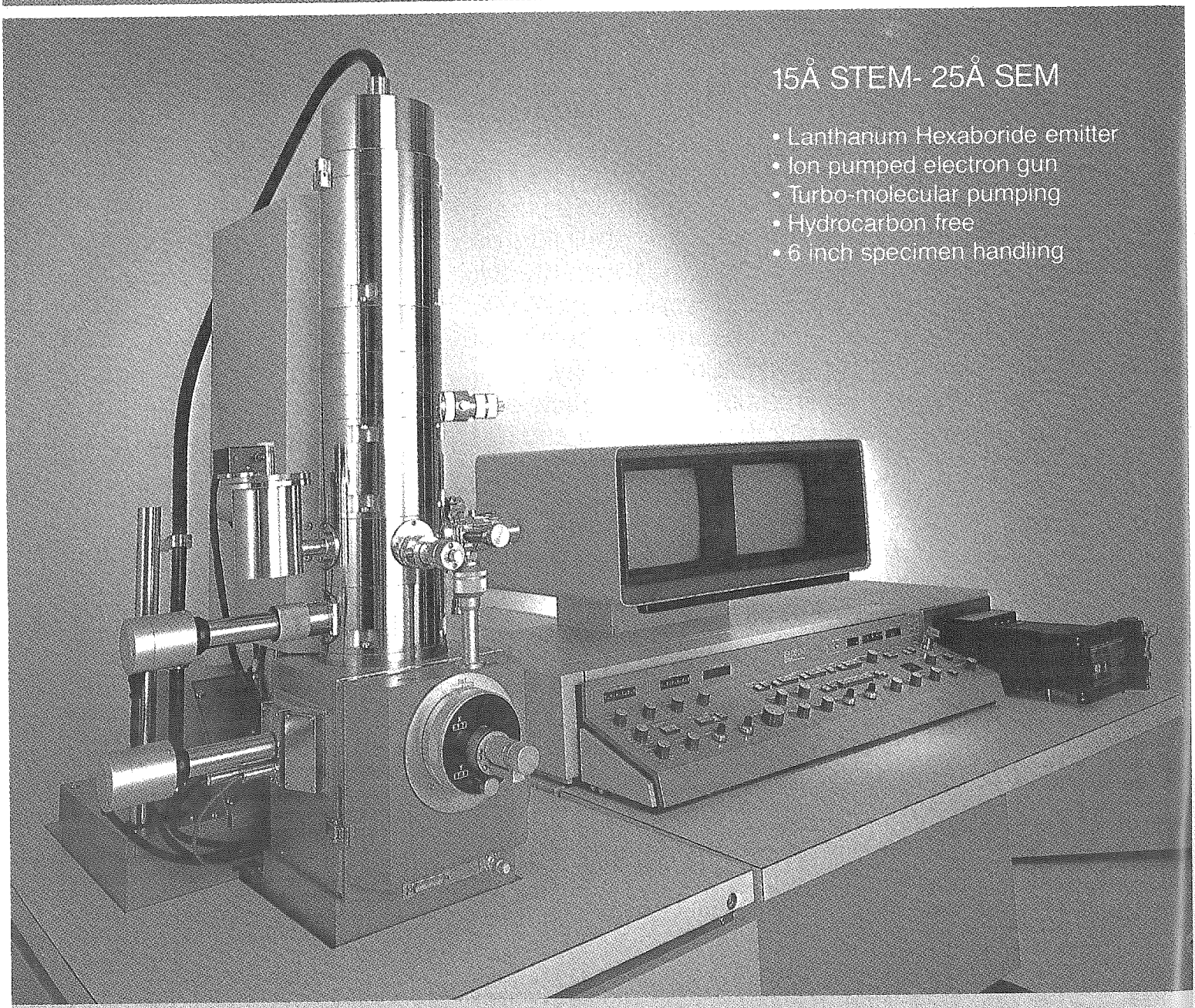

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CORPORATE MEMBERS

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Polyscience, B. David Halpern, Paul Valley Industrial Park, Warrington, PA 18976, (215) 343-6484.

Princeton Gamma Tech, Dick Stancher, 17756 Kings Park Lane, Houston, TX 77058, (713) 280-8766.

Rockwell International, R. W. Max, Mail Station 406-146, Richardson, TX 75081, (214) 996-6973.

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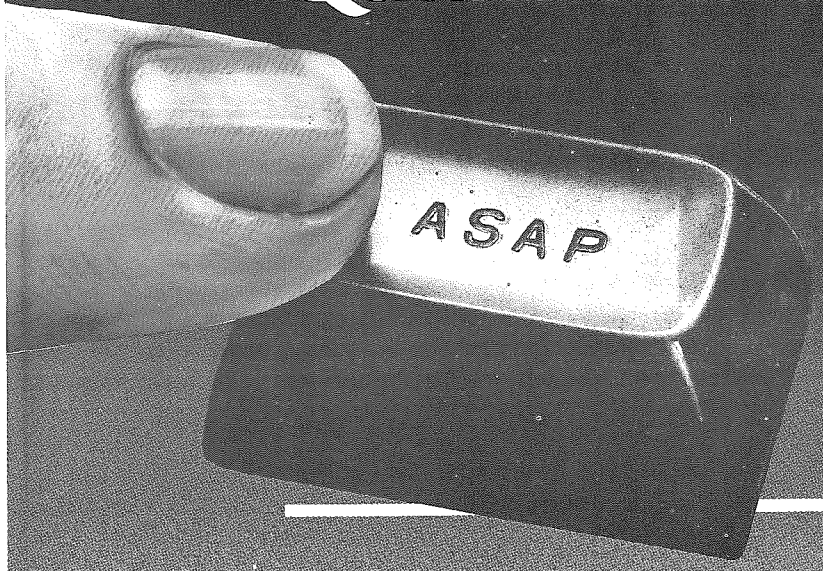

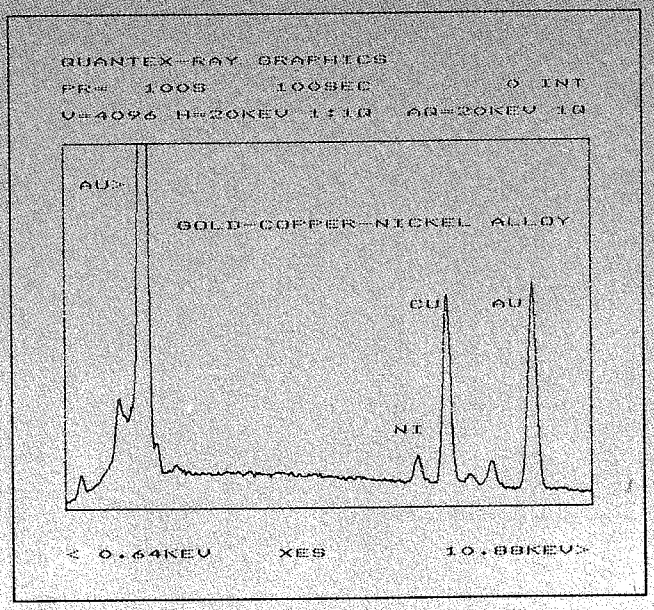

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CU KA	18.72	40.03	0.60	0.2266	A
AU MA	78.45	54.13	1.09	0.6932	
TOTAL	99.68				

Regional News

AUSTIN
THE UNIVERSITY OF TEXAS AT AUSTIN
DEPARTMENT OF BOTANY

GRANTS AWARDED

Dr. Garry T. Cole has a grant for two years from the National Institutes of Health for the study of gastrointestinal and systemic candidiasis and a National Science Foundation grant for 3 years entitled: "Experimental-Taxonomic Studies of Coelomycetous Fungi." Current research concerns location of wall antigens in cell types of the pathogenic fungus **Coccidioides immitis**, and is being earried out in collaboration with Dr. M. Huppert of the V.A. Hospital in San Antonio.

LECTURES, AND MEETINGS ATTENDED

Dr. Garry Cole presented a lecture on "Developmental and Ultrastructural Studies of Microfungi" at the XIII International Botanical Congress in Sydney, Australia, 1981.

At the SEM, Inc. Symposia/1981 in Dallas, Texas, Dr. Cole spoke on "Applications of SEM to Studies of Conidiomatal Development in the Fungi Imperfeci. Dr. Cole spent January through March at the University of Heidelberg, Germany, in the Lehrstuhl fur Zellenlehre.

PUBLICATIONS

M. Dauwalder, W.G. Whaley and R.C. Starr: Differentiation and secretion in **Volvox.** J. Ultrastruct. Res. 70: 318-335, 1980.

G.T. Cole and Kendrick (eds.): Biology of Conidial Fungi, Vols. 1 and 2. Academic Press, New York (1981).

G.T. Cole: Architecture and chemistry of the cell walls of higher fungi. IN D. Schlessinger (ed.): Microbiology - 1981. Am. Soc. Microbiol. Publ., Washington, D.C.

G.T. Cole and R. Samson: Conidium and sporangiospore formation in pathogenic microfungi. IN D.H. Howard (ed.): Fungi Pathogenic for Humans and Animals, Vol. 1. Marcel Dekker, New York (1981).

L.H. Field, L.M. Pope, G.T. Cole, M.N. Guentzel and L.J. Berry: Persistence and spread of *Candida albicans* after intragastric innoculation of infant mice. Infection and Immunity 31: 783-791, 1981.

J.W. LaClaire II: Occurrence of plasmodesmata during infurrowing in a brown alga. Biol. Cell 40: 139-142, 1981.

New Faculty and/or Staff Members.

Joe Dominguez, B.S. (microbiology, 1981) has recently joined the staff as a Research Scientist Assistant II.

E.M. EDUCATION POSSIBILITIES

On July 10, 1981 the first of a series of symposia on medical mycology was held at UT Austin. This symposium was entitled "Applications of Animal Models to Studies of Mycoses.". For the proceedings, or for information concerning forthcoming meetings, contact Dr. G.T. Cole, Dept. of Botany, The University of Texas at Austin, Austin, Texas 78712.

A fungal discussion group is being organized for anyone interested in research on fungi. Interested persons should contact: Dr. Milton Huppert, Mycology Research Lab. Director, V.A. Hospital, San Antonio, Texas 78284.

An introductory course in electron microscopy is being taught this fall under the direction of Dr. Dennis Brown, using facilities of the Cell Research Institute.

JOB OPPORTUNITIES

Research assistantships are available for students working toward an M.A. or Ph.D. in mycology. Contact Dr. G.T. Cole, Dept of Botany, The University of Texas at Austin, Tx. 78712.

THE CELL RESEARCH INSTITUTE

PUBLICATIONS

K. Coombs, E. Mann, J. Edwards and D.T. Brown: Effects of chloroquine and cytochalasin B on the infection of cells by Sindbis virus and vesicular stomatitis virus. J. Virology 37: 1060-1065, 1981.

C. Erwin and D.T. Brown: Intracellular distribution of Sindbis virus membrane proteins in 3HK-21 cells infected with wild-type virus and maturation-defective mutants. J. Virology 36: 775-786, 1980.

U. Scheefers-Borchel, H. Scheefers, J. Edwards and D.T. Brown: Sindbis virus maturation in cultured mosquito cells is sensitive to actinomycin D. Virology 110: 292-301, 1981.

H. Scheefers, U. Scheefers-Borchel, J. Edwards and D.T. Brown: Distribution of virus structural proteins and protein-protein interactions in plasma membrane of baby hamster kidney cells infected with Sindbis or vesicular stomatitis virus. Proc. Nat'l. Acad. Sci. USA 77: 7277-7281, 1980.

K. Wang and R. Ramirez-Mitchell: Myofibrillar connections. The role of titin, N2 line protein and intermediate filaments. Biophysical J. 33: 21A, 1981.

E.M. Sorensen, R. Ramirez-Mitchell, C. Harlan and J. Bell: Cytological changes in the fish liver following chronic, environmental arsenic exposure. Bull. Environmental Contamination Toxicology 25: 93-99, 1980.

E.M. Sorensen, R. Ramirez-Mitchell and L. Graham: Stereological analysis of hepatocyte ultrastructure as a monitor of arsenic liver burdens. Proc. 38th Annual Meeting of the Electron Microscopy Society of America (G.W. Bailey, ed.) Claitor's Publ. Div. Baton Rouge Louisiana (1980). pp. 442-443.

PAPERS PRESENTED AT MEETINGS

E.M. Sorensen and R. Ramirez-Mitchell: The three dimensional organization of the arsenic inclusion using HVEM. Presented at the 39th Annual Meeting of the Electron Microscopy Society of America, Atlanta, Georgia, 1981.

R. Ramirez-Mitchell and K. Wang: A three dimensional network of intermediate filaments connecting inter and intrafibrillar M and Z lines of vertebrate striated muscle. Presented at the VII International Biophysics Congress and III Pan-American Biochemistry Congress, Mexico City, Mexico, 1981.

NEW EQUIPMENT AND/OR FACILITIES

The EM lab of the Cell Research Institute has recently acquired a new Balzers freeze-etching system, BAF 400 D, equipped with a quartz crystal thin - film monitor and electron beam gun, and also a Sorvall cryomicrotome attachment for an MT-2 ultramicrotome. These were added to equipment installed during the previous year: an Edwards 306 vacuum coater with film thickness monitor and electron beam gun, and a JEOL-100 CX electron microscope with SEG and ASID scanning attachment.

DEPARTMENT OF ZOOLOGY

GRANTS AWARDED

Dr. John R. Ellison and Nan Hampton have a one-year cooperative agreement with the U.S. Dept. of Agriculture entitled: Sterility and Age Determinations Using Insect Apodeme Structure.

An additional cooperative agreement of Dr. Ellisons with R.H. Richardson and W.W. Averhoff is entitled: Autocidal Control of Screwworms in North America. These agreements both involve use of SEM for obtaining information important for control of these insects as agricultural pests.

Dr. Stephen Neier has a three-year grant from the Dental Institute of the National Institutes of Health entitled: Matrix-Cell Interaction in Craniofacial Development, and a two-year grant from the National Science Foundation entitled: Mechanisms of Pattern Formation in Embryonic Mesoderm. SEM is an important tool for this work.

LECTURES AND MEETINGS ATTENDED

Dr. Stephen Meier attended the second meeting of the International Society for Cell Biology in West Berlin in August, 1980.

PUBLICATIONS

J.S. Johnston and J.R. Ellison: The basis of daily growth layers in apodemal structures of *Drosophila*. J. Insect Physiol. 1981 (to appear).

J.R. Ellison and G. Howard: Nuclear orientation during the early stages of embryogenesis in *D. virilis*. Chromosoma, 1981 (to appear).

S. Meier: The role of neural crest cells in the morphogenesis of the eye. IN D.L. Daentl (ed.): Clinical Structural and Biochemical Advances in Hereditary Eye Disorders, Birth Defects Original Article Series. Alan R. Liss (in press).

S. Meier: Development of the chick embryo mesoblast: pronephros, lateral plate and early vasculature. J. Embryol. exp. Morph. 55: 291-306, 1980.

S. Meier: Development of the chick embryo mesoblast: morphogenesis of the prechordal plate and cranial segments. Develop. Biol. 83: 49-61, 1981.

C.B. Anderson and S. Meier: The influence of the metameric pattern in the mesoderm on migration of cranial neural crest cells in the chick embryo. Develop. Biol. 85, 1981 (to appear).

E.M. EDUCATION POSSIBILITIES

If his work load permits, Dr. John R. Ellison will teach in introductory course acquainting students with many areas of light microscopy and electron microscopy in the spring semester, 1982.

Dr. Stephen Meier will teach a course in electron microscopy (TEM and SEM) in the fall of 1982.

COLLEGE STATION
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Grants Awarded:

H. Wayne Sampson (Medical Anatomy): "Intracellular Calcium and exocrine Gland Secretion" (N.I.H.)

E.L. Thurston (E.M. Center) and C.R. Benedict (Plant Sciences): "Metabolic Action of Cis-Polyisoprenes (Rubber) in Guayule Plants" (N.S.F.) $237,500.

PUBLICATIONS

Barlin, M.R. and F.B. Vinson. 1981. Multiporous plate sensilla in antennae of the Chalcidoidea. Int. J. Insect Morph. and Embryol. 10:29-42.

Barlin, M.R., F.B. Vinson and G.L. Piper. 1981. Ultrastructure of the antennal sensilla of the cockroach-egg parasitoid *Tetrastichus hagenowii*. J. Morph. 168:97-108.

Barlin, M.R. and F.B. Vinson. 1981. Character of potential use in elucidating the systematics of Braconidae. Can. Entomologist (in press).

Mayeux, H.S., Jr., W.R. Jordan, R.E. Mayer, S.M. Meola. 1981. Epicuticular wax on golden weed (Isocoma spp.) leaves: variation with species and season. Weed Sci. 29:389-393.

Meola, S.M. and R.W. Meola. 1981. Cephalic neurohemal organs of Lepidoptera. in: Neurohemal Organs of Arthropods. A.P. Gupta, ed., Charles Thomas Press, Springfield, Ill., Chap. 12 (in press).

Meola, S.M. and I.I. Tavares. 1981. Ultrastructure of the haustorium of *Terenomyces histophtorus* and adjacent host cells. J. Invert. Pathol. (in press).

Mollenhauer, H.H. and D. James Morre. 1981. Selective staining of dictyosome-like structures (DLS) from spermatocytes of the guinea pig using phosphotungstic acid at low pH. Eur. J. Cell Biol. (in press).

NEW EQUIPMENT

The Electron Microscopy Center has purchased a complete Tracor-Northern EDS system including digital beam control and two crystal spectrometers. The system will upgrade the center's JEOL JSM-35 SEM to microprobe capabilities. A full time technician will be hired to operate the $200,000 system.

PRESENTATIONS

Busch, L.J., Jr., M.L. Davis, F.J. Stein and J.E. Martin, (all Veterinary Anatomy). 1981. Semen collection and evaluation in the fertile adult marmoset *Callithrix jacchus*. American Society of Primatologists, San Antonio.

Penn, P.E. (Medical Anatomy). 1981. Regeneration of the optic cushion in the inner tidal asteroid *Nepanthia belcheri* (Perrier). International Echinoderm Conference, Tampa, Fla.

POSITIONS AVAILABLE

Technician I or II (commensurate with experience) Qualifications: Background in TEM or SEM (preferably both with TEM experience most important), familiarity with insects desired but not essential. Contact: Dr. Brad Vinson, Dept. Entomology, Texas A&M University, College Station, TX 77843, Phone: (713) 845-2516.

DALLAS
VA MEDICAL CENTER

GRANTS AWARDED

Dr. Allen Shannon has received grants from the American Heart Assn. for the study of "Mitochondrial localization of Krebs cycle enzymes," the American Diabetes Assn. for "Morphometric analysis of pancreatic alterations following hypothalamic manipulation" and the Texas Affiliate of the American Diabetes Assn. for "Gastric and insular F and D-cells in diabetes." Dr. Richard Dey has been awarded a N.I.H. New Investigator award for "Localization of bioactive peptides in lung". Dr. Shannon is a co-investigator.

LECTURES:

Dr. Allen Shannon was an invited speaker for the University of Tulsa Natural Sciences Colloquium where he presented

"Cytochemistry and Fine Structure Analysis."

Dr. John LaBanc from Dr. Allen Shannon's lab presented "Correlative radiographic, histologic and scanning electron microscope study of temporomandibular joint primary osteoarthrosis in humans" at the SEM, Inc. meeting in Dallas.

Dr. Richard Dey presented "Localization of substance P-like immunofluorenscence in nerves within dog airways and pulmonary vessels" at the FASEB meeting in Atlanta and "Ultrastructural localization of serotonin in endocrine cells of the rabbit trachea" at the American Society of Anatomists meeting in New Orleans.

Pam Witte presented "C-type particles in thymic development: a correlation with thymic function," a collaborative study with Drs. Wayne Streilein and Allen Shannon at the FASEB meeting.

Dr. Bill Snell presented "Transfer of lysosomal membrane particles into phagosome membranes," results of an ongoing collaborative study with Drs. Bill Brown and Allen Shannon at the ICN-UCLA Symposium in Molecular Cellular Biology: Cellular Recognition, held at Keystone.

NEW STAFF MEMBERS:

Dr. Charles Shing Chang from Taiwan has joined Dr. Shannon's group to investigate hypothalamic-lesioned rats in collaboration with Dr. Richard Dobbs, Department of Physiology, UTHSCD. Dennis Bellotto, Kendra McIntyre from Canada and Barbara Shaw from Australia have recently joined the technical staff. Jay Yaquinto, a 2nd year medical student at UTHSCD is working on 2 summer projects in the lab - one on laryngeal pathology and the other on neutrophil structure and function.

NEW STAFF MEMBERS:

Linda McClellan has joined Dr. L.M. Buja's staff along with Jesse Flores from the University of Cincinnati. Glad to have you all with us!

NEW EQUIPMENT:

A Sorvall MT-5000 with the Hagler-Dupont Cryosystem Attachment has been added to the Pathology inventory of EM equipment. This coupled with our new computer stage drive and digital beam control on our JSM-35 will expand and enhance our ultrathin and scanning x-ray analytical capabilities.

PUBLICATIONS:

R.D., W.A. Shannon, Jr., and S.I. Said. 1981. Localization of VIP-immunoreactive nerves in airways and pulmonary vessels of dogs, cats, and human subjects. Cell Tissue Res. In Press.

Witte, P.L., J.W. Streilein, and W.A. Shannon, Jr. 1981. C-type particles in thymic development: a correlation with thymic function, pp. 455-462. In J.W. Streilein, D.A. Hart, J.S. Streilein, W.R. Duncan, and R.E. Billingham (eds.) Advances in Experimental Medicine and Biology: Hamster Immune Responses in Infectious and Oncologic Diseases, Vol. 134. Plenum Pub. Corp., N.Y.

Shannon, W.A., Jr., and S.I. Roth. 1980. The ultracytochemical localization of cytidine-5'-monophosphatase in normal thyroid follicle cells. J. Histochem. Cytochem. 28:413-418.

Reeder, R.L., S.H. Rogers, and W.A. Shannon, Jr. 1980. Histochemical and ultrastructural studies of the digestive epithelium in a gastropod gameolytic organ. Proceedings, 38th Meeting Electron Microscopy of America. G.W. Bailey, ed. Claitor's Publishing Division. pp. 568-569.

Rogers, S.H., R.L. Reeder, and W.A. Shannon, Jr. 1980. Ultrastructural analysis of the morphology and function of the spermatheca of the pulmonate snail, *Sonorella santaritana*. J. Morphol. 163:319-329.

Smith, R.G., V.G. Dev., and W.A. Shannon, Jr. 1981. Characterization of a novel human pre-B leukemia cell line. J. Immunol. 126:596-602.

Shannon, W.A., Jr., R.D. Dey, S.B. Bates, P. Raskin, and A. Pietri. 1981. Changes in basement membrane thickening. Diabetes Care 4:445.

LaBanc, J.P., W.A. Shannon, Jr., B.K. Taylor, B.N. Epker, and R.V. Walker. 1981. Correlative radiographic, histologic and scanning electron microscope study of temporomandibular joint primary osteoarthrosis in humans. Scanning Electron Micros. In Press.

Shannon, W.A., Jr., and D.M. Zellmer. 1981. A new species of lysosome in rabbit PMN leukocytes. J. Histochem. Cytochem. 29:1099-1101.

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Shannon, W.A., Jr., D.M. Zellmer, J.W. Brown, and W.J. Snell. 1982. Tannic acid-glutaraldehyde fixation reveals calcium ionophoreinduced changes in rabbit polymorphonuclear leukocyte membranes. Proceedings, ICN-UCLA Symposium on Cellular Recognition. In Press.

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HOUSTON

BAYLOR COLLEGE OF MEDICINE, DEPARTMENT OF MEDICINE, SECTION OF CARDIOVASCULAR SCIENCES

NEW FACULTY AND/OR STAFF MEMBERS

Miss Robin Hawley and Mr. Douglas Grue have joined Dr. Ann Goldstein's technical staff.

Dr. W. Barry Van Winkle has been promoted to Associate Professor.

JOB OPPORTUNITIES

cf1 EM Technician or Research Assistant. Experience in routine transmission procedures (fixation, sectioning, photography). Send resume and 5 representative micrographs.

Dr. W.B. Van Winkle
Section of Cardiovascular Science
Department of Medicine
Baylor College of Medicine
Houston, TX 77030
713/790-3146

BAYLOR COLLEGE OF MEDICINE, DEPARTMENT OF MICROBIOLOGY

LECTURES

"Interactions Between Herpes Viruses and AHV" — Dr. H.D. Mayor, Graduate Program in Cellular and Molecular Biology, University of Michigan, Ann Harbor - March 13, 1981.

"Interactions Between AHV and the Herpes Virus Genome" - H.D. Mayor and Roger Tilley, presented at the 5th International Congress of Virology Strasboorg, France, August

1981 and the International Workshop on Herpes Viruses Bocogna, Italy, July 1981.

"Dr. John Chalmers (Pathology)" will present a paper on computer graphics and virus architecture coauthored by Dr. Mayor. Philip H. Mayor and Philip Hendren (Univ. of Texas, Austin) at the 7th International Biophysics Congress in Mexico City in August 1981.

SAN ANTONIO

The University of Texas
Health Science Center at San Antonio

Grants Awarded:

NSF Grant on analysis and control of rapidly dividing cell populations from the Cell Biology program for doing electron-microprobe work on normal and tumor cells for 2 years. Ivan L. Cameron and Nancy K.R. Smith, $223,478.

Elements in Cardiac Muscle of Dystrophic Hamsters, American Heart Association, Texas Affiliate, 1 year, Dr. Nancy K.R. Smith, 1 year, $20,000.

National Science Foundation, for "Production of Nuclear Polyhedrosis Virus in Large Scale Cell Culture System", G. Con Smith and Stefan Weiss.

LECTURES:

Dr. Ivan Cameron was a feature speaker at the Western Regional EM meetings in Tucson, Arizona in May. He spoke on electronmicroprobe of thin-sectioned materials.

G. Con Smith attended EMSA meeting in Atlanta and gave a paper entitled: Quantitative analysis of nuclear polyhedrosis virus in cell culture."

PUBLICATIONS:

Hansen, J.T. 1981. Morphological aspects of secretion in the glomus cell paraneurons of the carotid body: Evidence for calcium-dependent exocytosis. Cytobios (in press).

Hansen, J.T. 1981. Innervation of the rat aortic (subclavian) body: An ultrastructural study following axonal degeneration. J. Ultrast. Res. 74: 83-94.

Hansen, J.T. 1981. Chemoreceptor nerve and type A glomus cell activity following hypoxia, hypercapnia or anoxia: A morphological study in the rat carotid body. J. Ultrast. Res. (in press).

NEW FACULTY AND/OR STAFF MEMBERS

Dr. Michael Karasek from the Medical Academy in Lodz, Poland, is a visiting fellow in Dr. J.T. Hansen's laboratory. Dr. Karasek will be here for one year and in Poland is in charge of his Medical Academy's electron microscopy laboratory, as well as being a practicing endocrinologist.

WACO

BAYLOR UNIVERSITY — MAIN CAMPUS

GRANTS AWARDED:

$2,000 research grant awarded to Randy Moore from the American Philosophical Society. Title of proposed study: "An *In Vitro* System For Studying Plant Grafting."

$250 research grant awarded to Charlotte Ransom for Sigma Xi. Title of proposed study: "Examination of Polyphosphate Bodies in Chrysophyta and Chlorophyta."

LECTURES:

Invited seminar presentations by Randy Moore at: University of New Mexico, Washington State University, Louisiana State University, Texas A&M University, and the University of Texas at Austin. Title of talks: "Graft Compatibility-Incompatibility in Higher Plants."

PUBLICATIONS:

Moore, Randy and Dan B. Walker, 1081. Studies of vegetative plant tissue compatibility-incompatibility. I.A. structural study of a compatible autograft in *Sedum telephoides* (Crassulaceae). Amer. J. Bot. *68* (5): 820-8e0.

Moore, R., Walker, D.B. II. A structural study of an incompatible heterograft between *Sedum telephoides* (Crassulaceae) and *Solanum pennellii* (Solanaceae). Amer. J. Bot. *68* (5): 831-842.

Moore, Randy, 1981. Graft compatibility-incompatibility in plants. BioScience *31* (5): 389-391.

NEW EQUIPMENT AND/OR FACILITIES

Nikon Optiphot Light Microscope.
Nikon SMZ-10 Dissecting Microscope.
Nikon UFX Camera System for microscopes.

NEW FACULTY AND/OR STAFF MEMBERS:

Dr. Darrell S. Vodopich, Aquatic Insects, Univ. of South Florida.

Dr. Bonnie Amos, Pollination Biology, Univ. of Oklahoma.

MEETINGS:

Dr. O.T. Lind, D.S. Vodopich, and Charlotte Ransom attended the annual meeting of the American Association of Limnology and Oceanography in Milwaukee in June.

Denise Roper, Steve and Charlotte Ransom, and Randy Moore attended the annual meeting of the American Institute of Biological Sciences (AIBS) in Indiana in August.

Randy Moore attended the XIII International Botanical Congress in Sydney, Australia in August.

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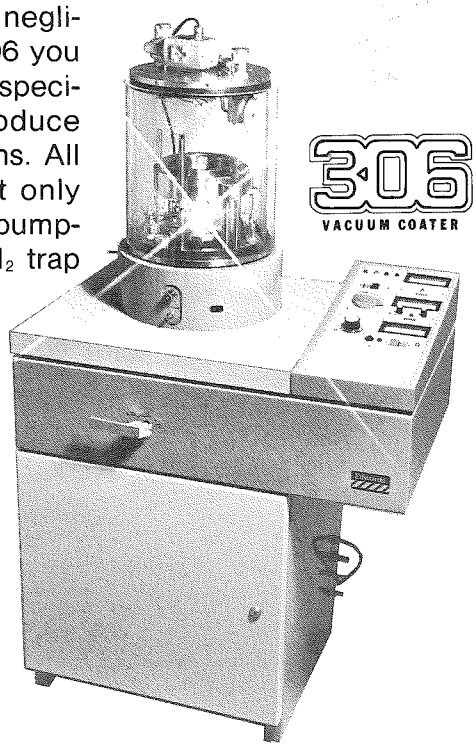

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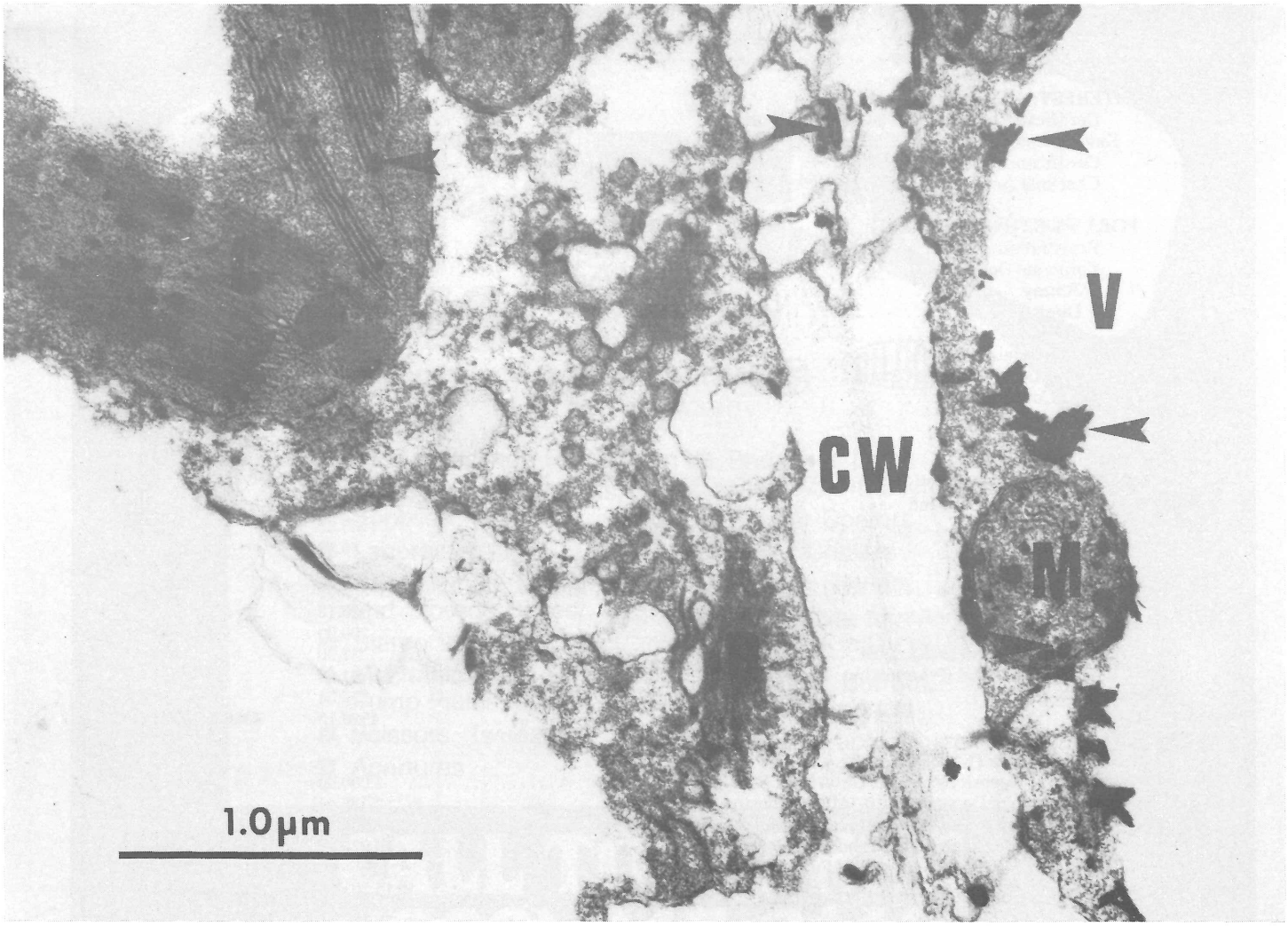
Financial Report

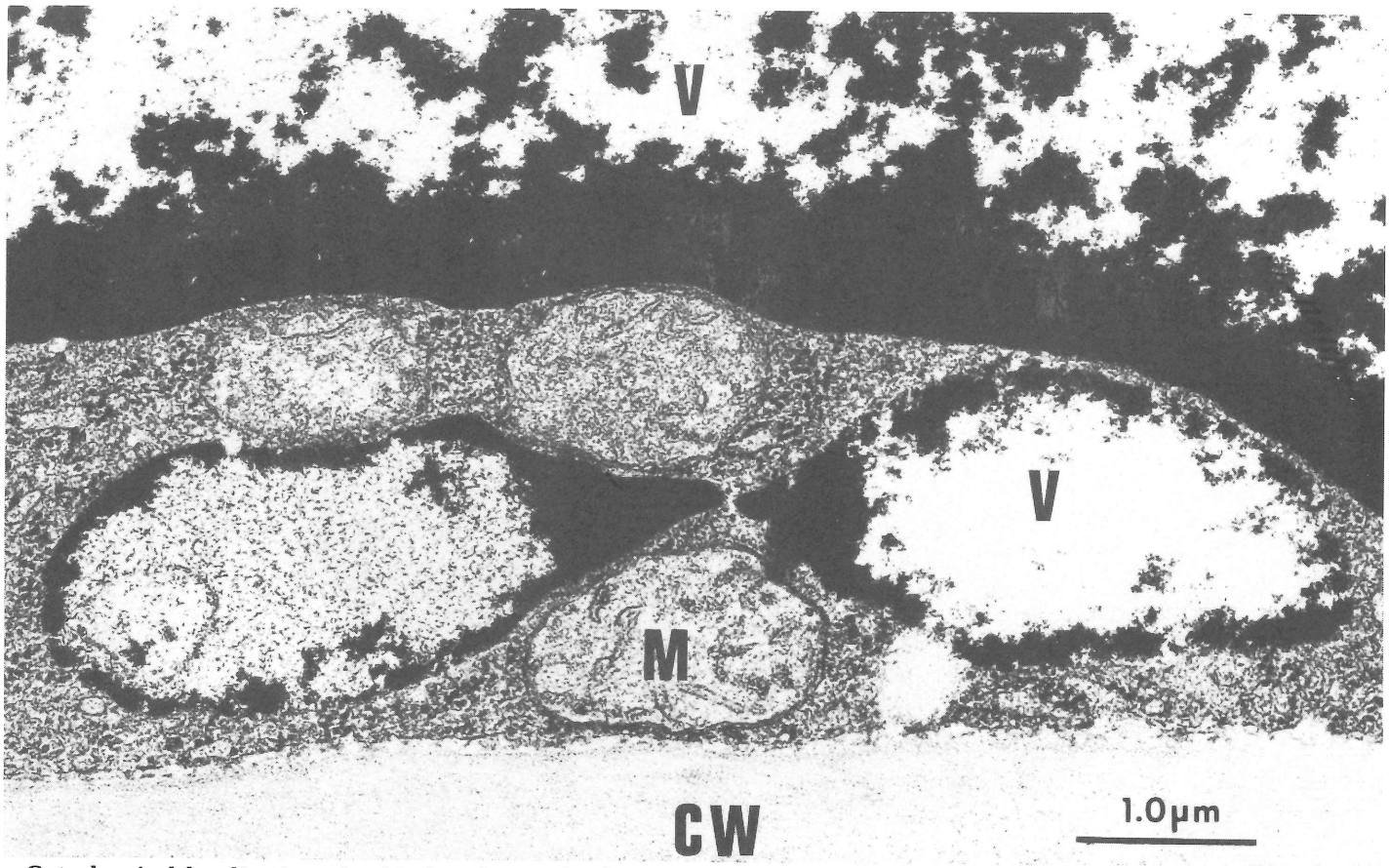
ASSETS ON APRIL 22, 1981		
Certificate of Deposit No. 91099, Univ. Natl. Bank, Galveston	2,000.00	
Certificate of Deposit No. 10-141345, Houston 1st Savings	2,278.01	
Certificate of Deposit No. 10-502435, Fannin Bank, Houston	1,317.94	
Checking Account, Fannin Bank, Houston	4,571.38	
	10,167.33	10,167.33
RECEIPTS		
Dues:		
Regular Membership	620.00	
Student Membership	70.00	
Corporate Membership	150.00	
INTEREST:		
Certificate Deposit of No. 10-141345, Houston		
Kavpcu ate of Deposit No. 91099, Univ. Natl. Bank, Galveston	50.00	
Certificate of Deposit No. 10-141345, Houston 1st Savings	57.43	
Checking Account, Forestwood Natl. Bank, Dallas	70.57	
FORT WORTH MEETING:		
Registration	2129.00	
Corporate Donations:		
Amray	100.00	
Dupont	75.00	
Zeiss	150.00	
Commercial Exhibitors	300.00	
EMSA Local Societies Grant	350.00	
TCU Contribution	500.00	
	4622.00	4622.00 (+)
DISBURSEMENTS		
FORT WORTH MEETING:		
Kahler Green Oaks Inn	2120.71	
Speakers	1185.23	
President	79.18	
Student Travel	284.95	
Commercial Booths	337.50	
Other	86.12	
Secretarial Expenses	200.00	
Treasurer's Expenses	32.90	
Presidential Travel (Pre-meeting - Corpus Christi)	91.00	
Other Expenses	110.54	
	4528.13	4528.13 (-)
ASSETS ON SEPTEMBER 7, 1981		
Certificate of Deposit No. 91099, Univ. Natl. Bank, Galveston	2,000.00	
Certificate of Deposit No. 10-141345, Houston 1st Savings	2,335.44	
Merrell Lynch Money Market, Dallas	2,000.00	
Checking Account, Forestwood Natl. Bank, Dallas	3,925.76	
Includes Paul Enos Memorial Fund-$50.00		
	10,261.20	$10,261.20

Respectfully submitted: W. Allen Shannon, Jr. - Treasurer.

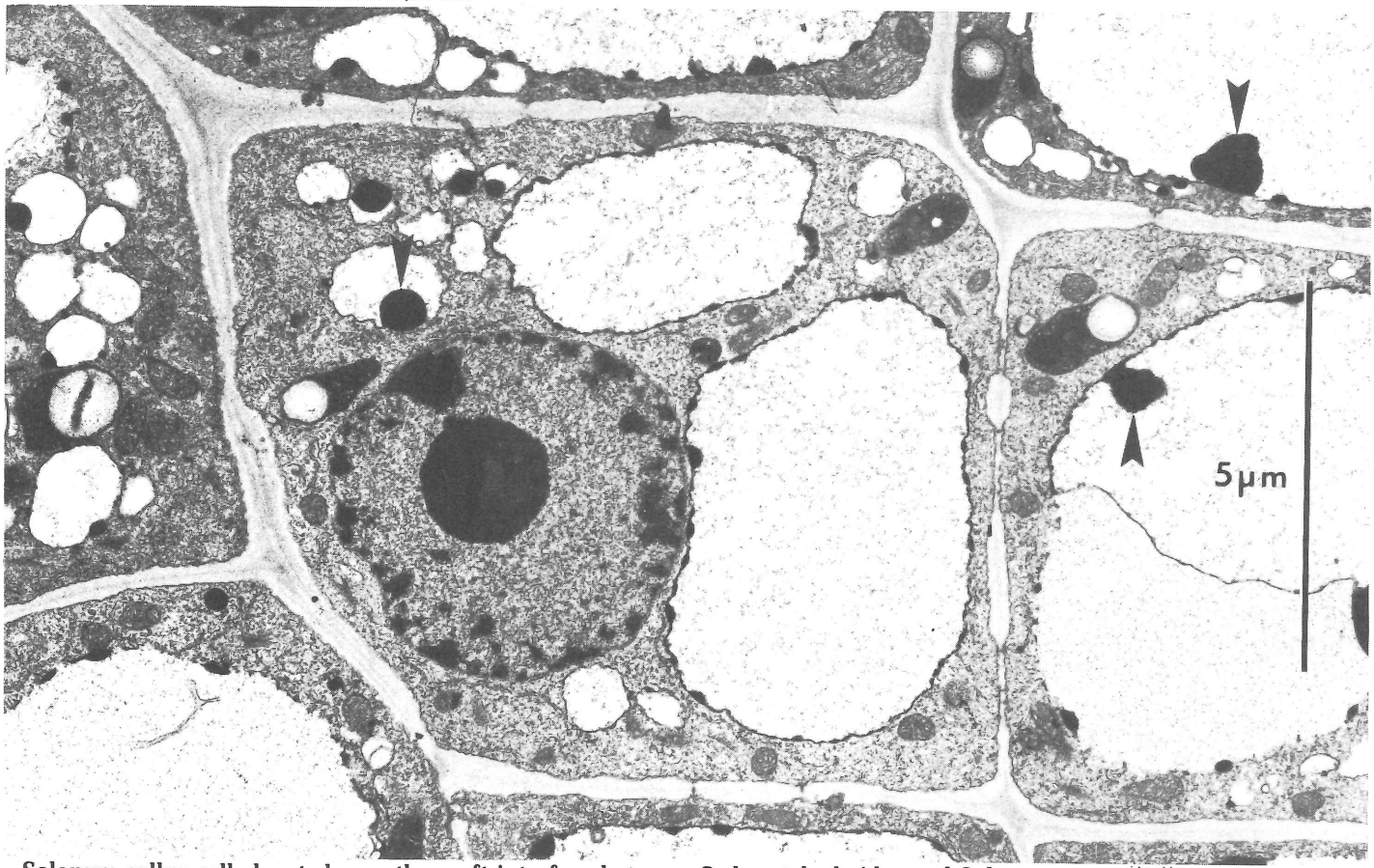
Photographic Contributions



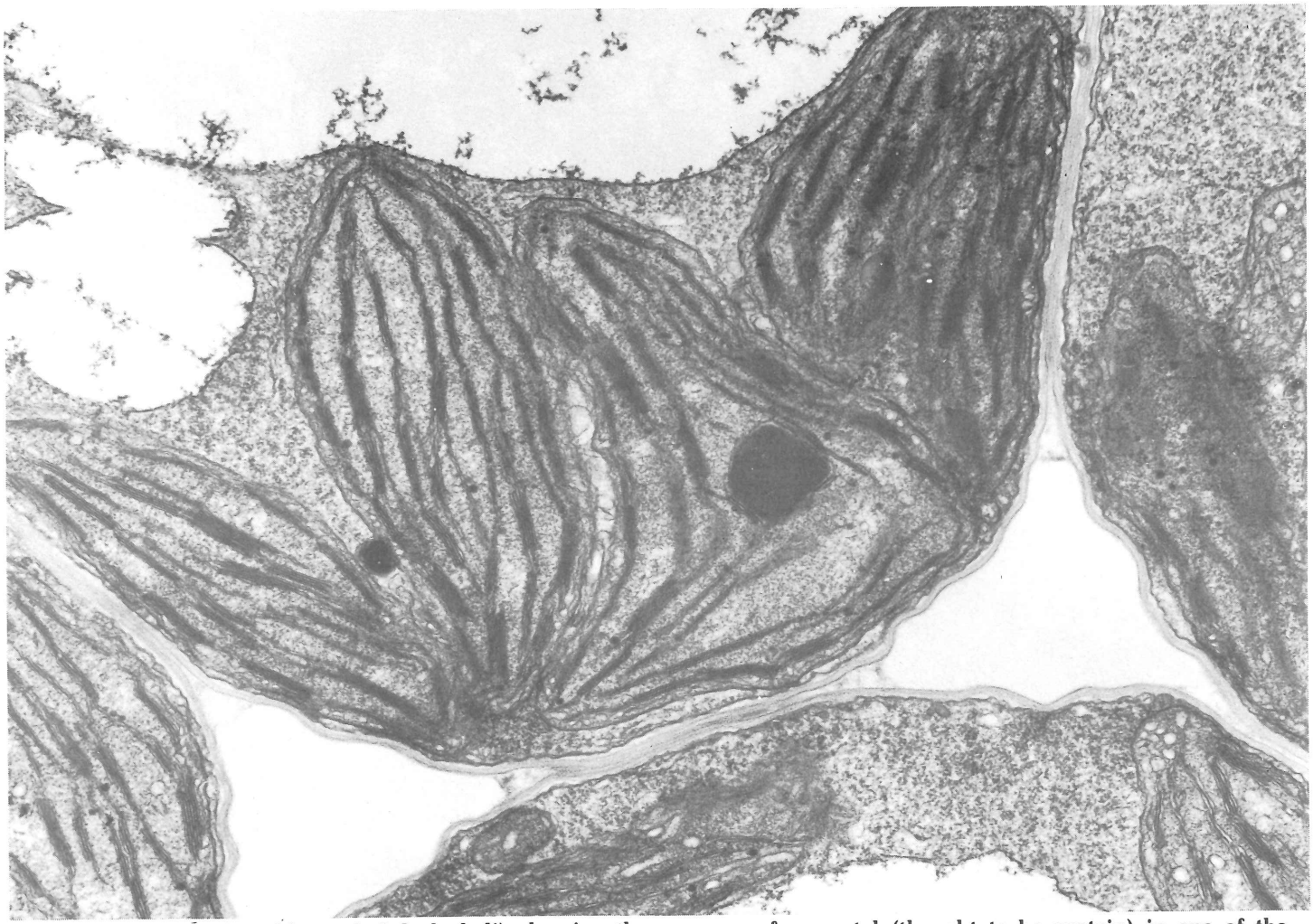
The distribution of acid phosphatase in a typical (i.e., unwounded) internodal cell of Solanum pennellii. Arrows indicate reaction product. C=chloroplast; CW=cell wall; D=dictyosome; M=mitochondrion; V=vacuole. 34,000X.



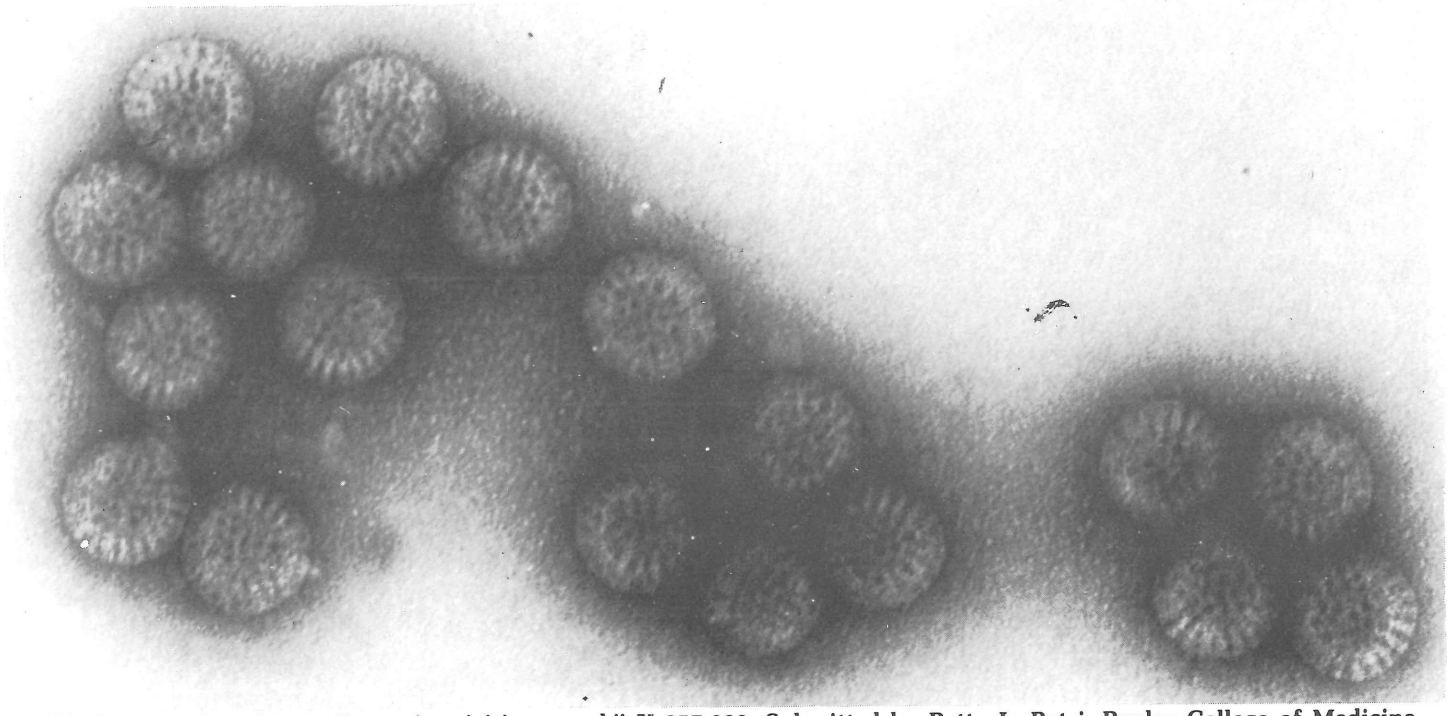
Cytochemical localization of acid phosphatase in the vacuoles of Solanum callus cells after wounding. CW=cell wall; V=vacuole; M=mitochondrion. 27,500X.



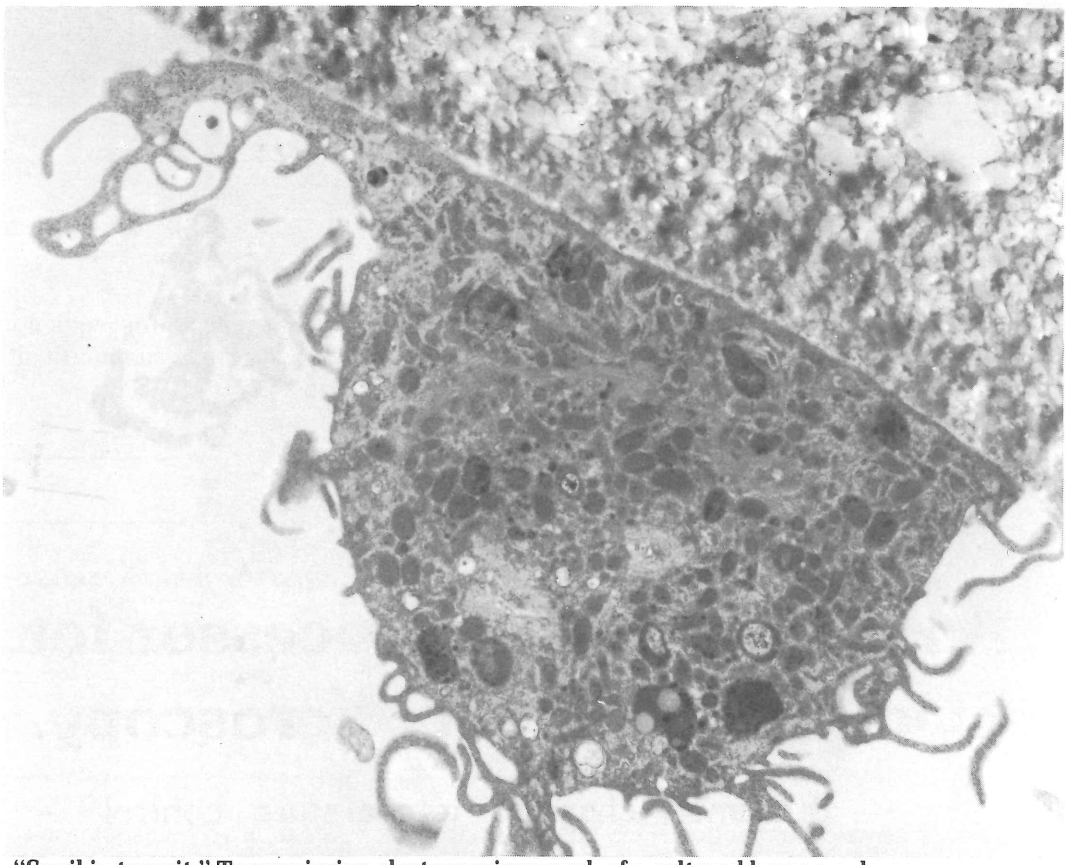
Solanum callus cells located near the graft interface between Sedum telephoides and Solanum pennellii. Arrows indicate tannin-like substances associated with the tonoplast. 6,000X.



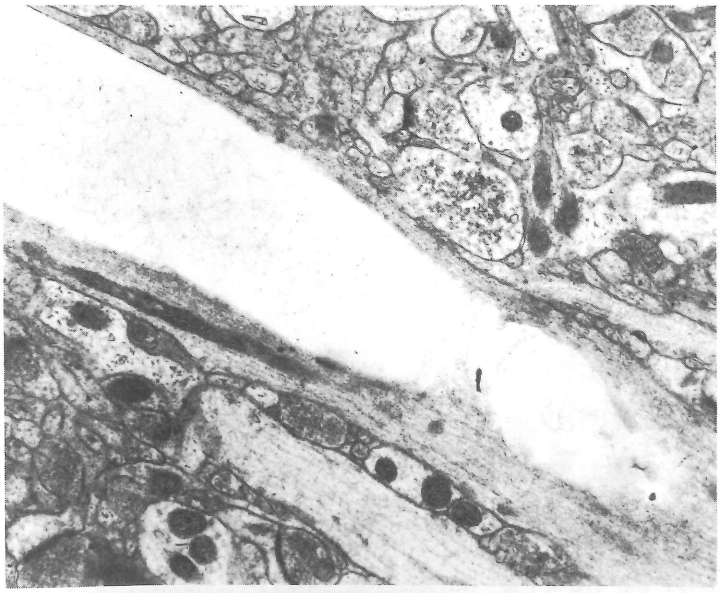
Russian Thistle (Tumbleweed, Salsola kali) showing the presence of a crystal (thought to be protein) in one of the chloroplasts. X8,000. Submitted by Patrick H. Ashbaugh, Dept. of Pathology, William Beaumont Army Medical Center, El Paso, TX.



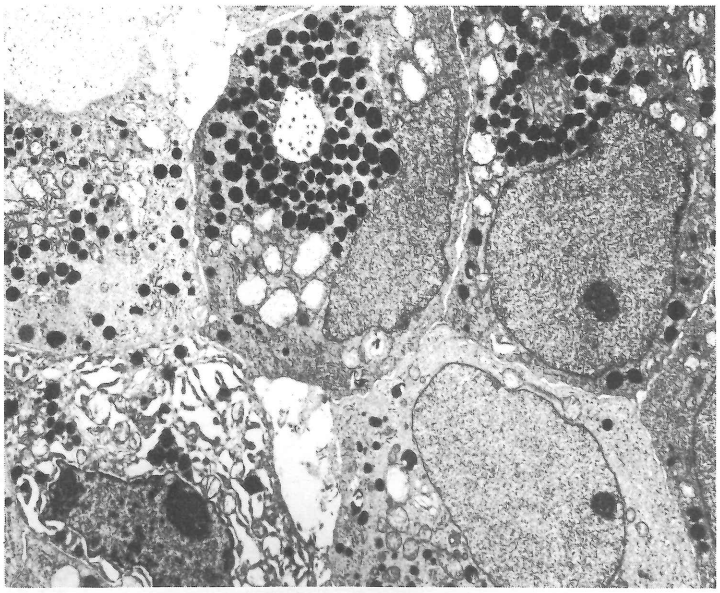
Simian rotavirus SA11, "in an inquisitive mood." X 357,000. Submitted by Betty L. Petri, Baylor College of Medicine, Department of Virology and Epidemiology.



"Snail in transit." Transmission electron micrograph of a cultured human pulmonary macrophage. Photo courtesy of: Michael F. O'Sullivan and Carolyn J. Corn, Department of Cell Biology and Environmental Sciences, University of Texas Health Center at Tyler and Dr. Russell Martin, Department of Medicine, Baylor College of Medicine. Magnification X15,000.



Longitudinally sectioned apical dendrite of a pyramidal cell from the cerebral cortex of a rat deficient in vitamin B^6 showing a large vacuole. Submitted by Dr. Elizabeth Root, The University of Texas at Austin, Austin, TX.



Apocrine gland carcinoma of breast. X15,000. Submitted by James C. Stinson, R. Thomas King and Robert A. Turner, Scott & White Clinic, Department of Pathology, Temple, TX.

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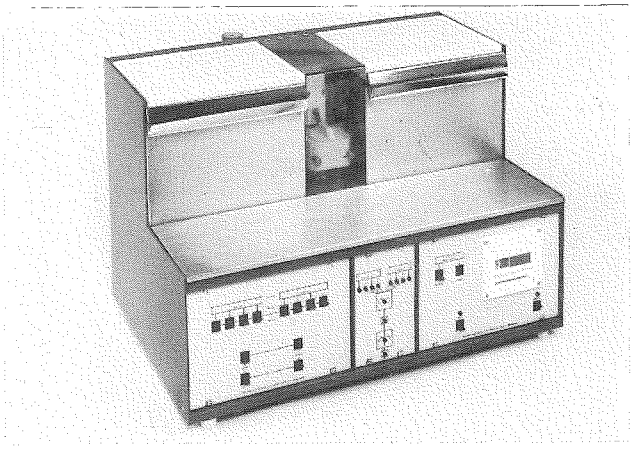

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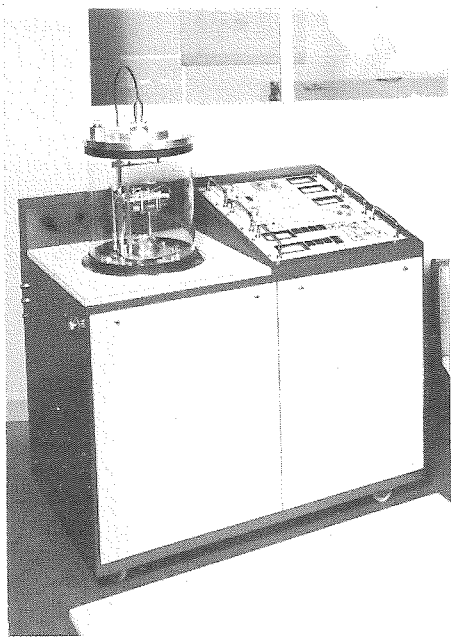

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I hereby apply/nominate for Regular ☐ Student ☐ Corporate ☐ membership in the Texas Society for Electron Microscopy.

Name of institution applicant or corporation nominee person _____

P. O. Address _____

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Information as to position, degrees, and qualifications for Membership: _____

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This nomination is accompanied by a statement of interest in and contributions to Electron Microscopy and associated fields of science.

One year's dues in the form of a check or money order should be sent with the application for Membership form. (Regular $10.00, Student $2.00, Corporate $75.00)

Signature of one Member making the nomination:

_____

Dated _____ 19 _____

This application to Membership in the Society, or this application for transfer from the grade of Student to Regular Member, signed by one Member should be sent to the Secretary to be presented at the next meeting of the Council or approval by a majority vote of the Council. Notice of approval will be mailed by the Executive Secretary.

_____

Presented to the Council at _____ meeting. Date _____

Action _____

Remarks _____

Send Application to: Marilyn Smith
Texas Woman's University
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Denton, TX 76204

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