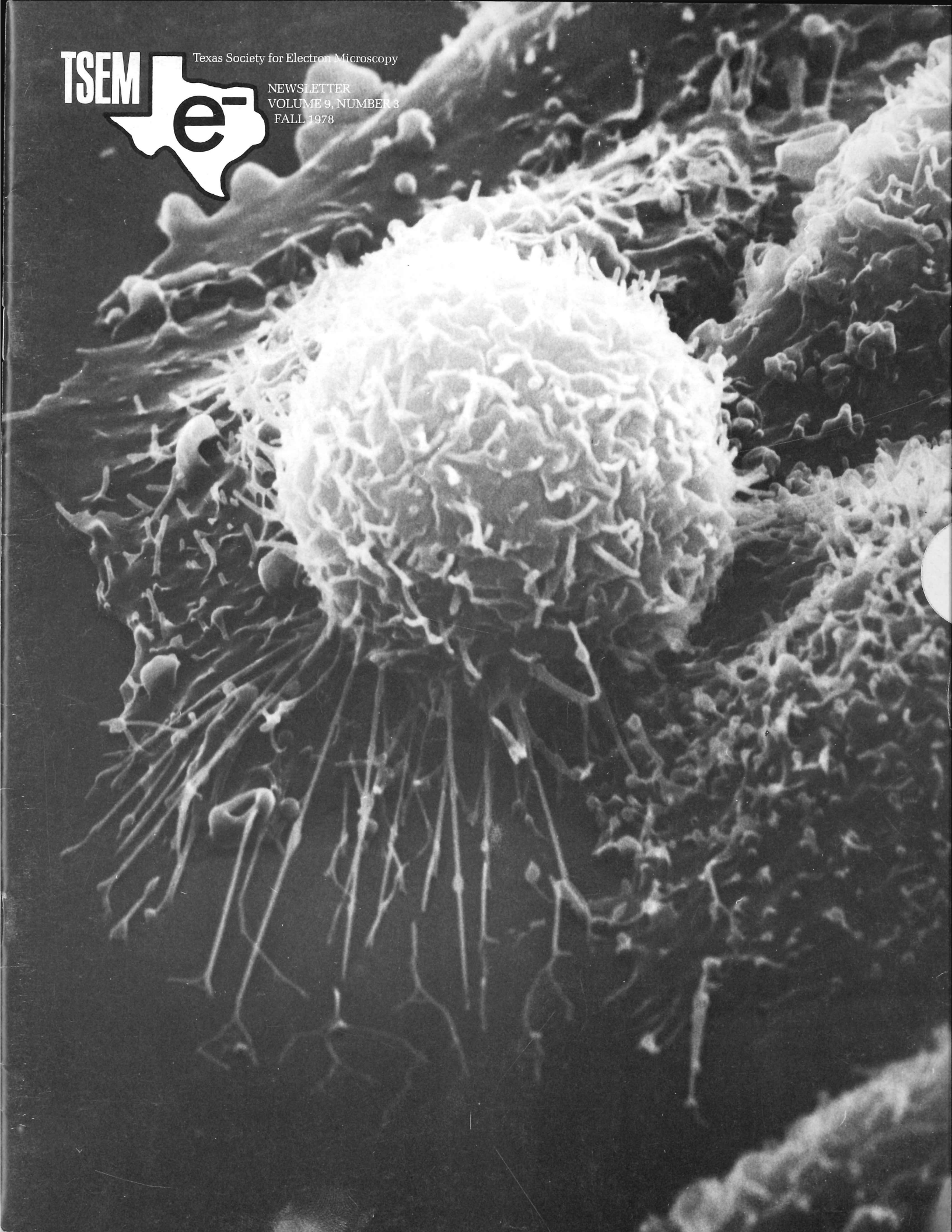
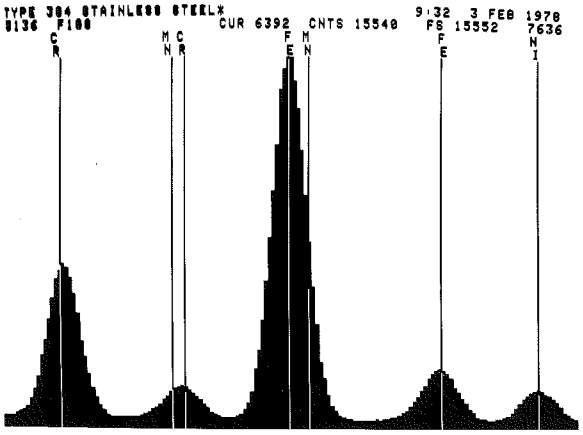
TSEM
Texas Society for Electron Microscopy
NEWSLETTER
VOLUME 9, NUMBER 3
FALL 1978



For electron microscopes

...the X-ray analyzer that eXCELs



The XCEL—PGT X-ray analyzer for SEMs, TEMs and microprobes—offers more analytical capability and more user convenience per equipment dollar than any competing microanalysis system.

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The new PGT-1000 XCEL continues these traditions and adds a new dimension of automation that reduces routine analytical processes to touch-of-the-key commands —all from an English language keyboard.

The XCEL's new color-coded, backlit keyboard also contains a full alphanumeric layout.

The XCEL can be upgraded—in a matter of hours—to mass data storage capability (XCEL-D) with the addition of dual floppy disks and to full quantitative capability (XCEL-DQ) by adding floppy disks, PGT software and an external data terminal.

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Contents

Volume 9, Number 3

Fall, 1978

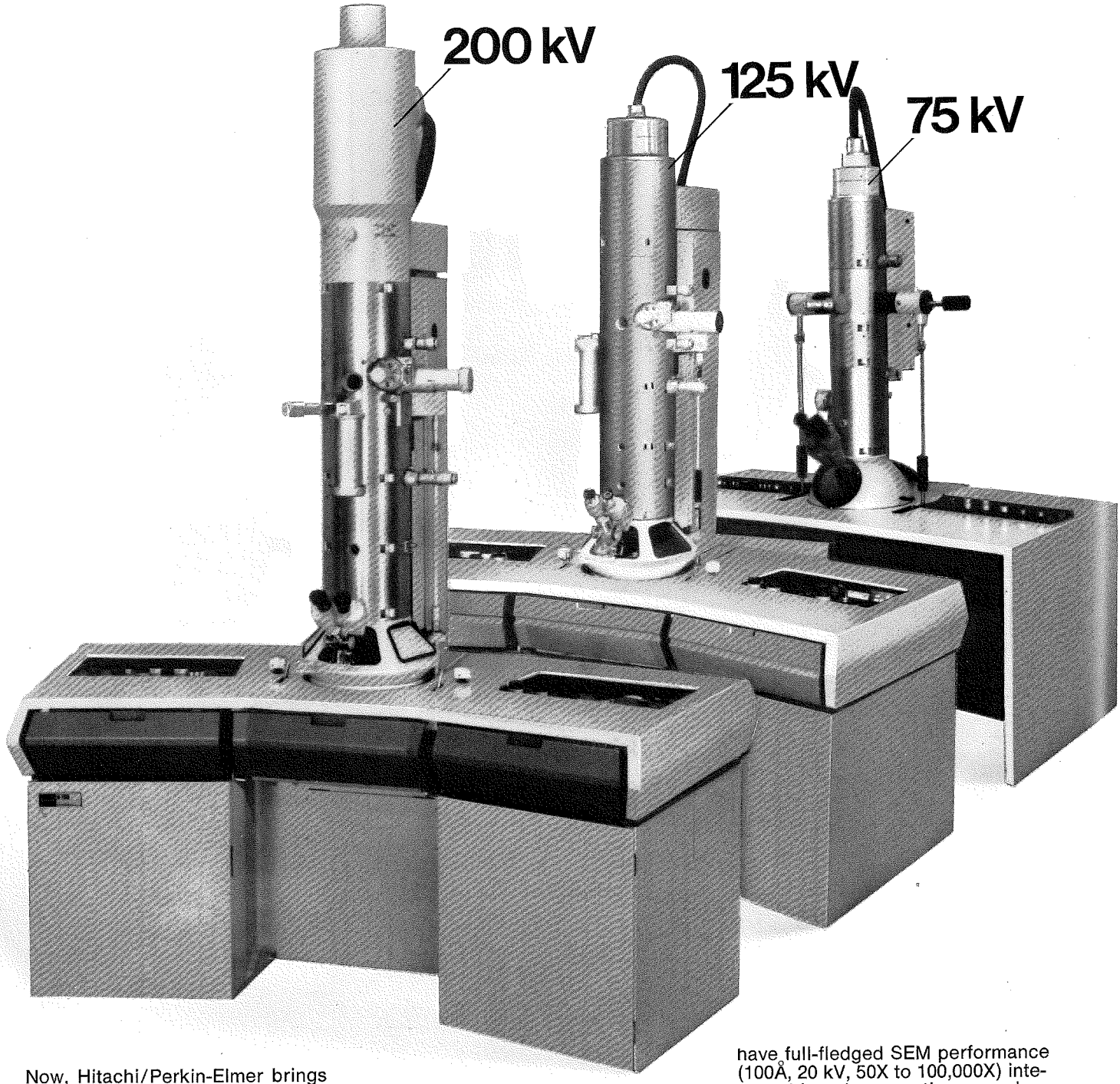
Texas Society for Electron Microscopy
"For the purpose of dissemination of research with the electron microscope"

ON THE COVER

Photo courtesy of Dr. Miles L. Mace and Dr. B. R. Brinkley, Department of Cell Biology, Baylor College of Medicine.

This scanning electron micrograph illustrates the dramatic change in cell shape as cells progress from flattened anisotropic forms in interphase to rounded shapes in mitosis. Such alterations in cell form appear to be regulated by a system of microtubules and microfilaments comprising the cytoskeleton. X7,900.

From Hitachi/Perkin-Elmer... a powerful TEM lineup



Now, Hitachi/Perkin-Elmer brings you the most complete line of high performance TEMs in the industry, to meet your most demanding performance and budget requirements.

First there's the H-700: accelerating voltages from 75 to 200 kV, a resolution of 2.8Å and magnification from 200X to 300,000X. The H-700 fits most anywhere, stands only 106″ high.

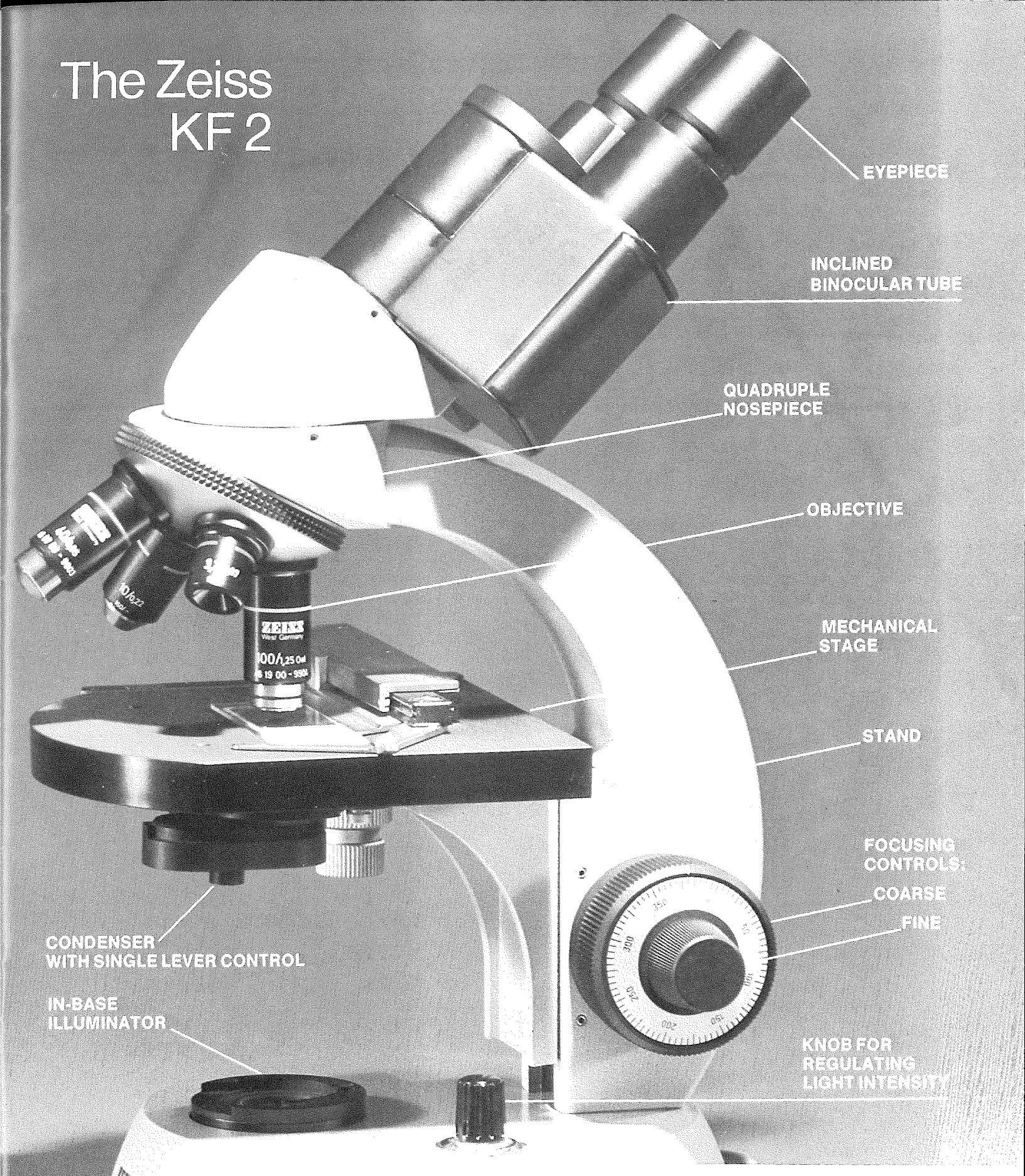
Or choose our H-500: 25 to 125 kV accelerating voltages, 100X to 800,000X magnification and a guaranteed resolution of 1.4Å. It's available in top or side entry versions. Additionally, both the H-700 and the H-500 can have SEM and STEM modes, plus most brands of x-ray analysis equipment, added at any time.

Finally, there's our H-300, the world's first UEM (Universal Electron Microscope). As a TEM, it gives you 4.5Å, 75 kV and 250X to 100,000X. But, unlike other TEMs, it can have full-fledged SEM performance (100Å, 20 kV, 50X to 100,000X) integrated into the operating console: without compromising either mode. That's why we call it a UEM. It's also modular.

So, for high performance in a TEM, choose from the Hitachi/Perkin-Elmer lineup. For details and/or a demo, call or write: Perkin-Elmer, Instrument Marketing Division, 411 Clyde Avenue, Mountain View, CA 94043. Phone: (415) 961-0461.

PERKIN-ELMER

The Zeiss KF 2



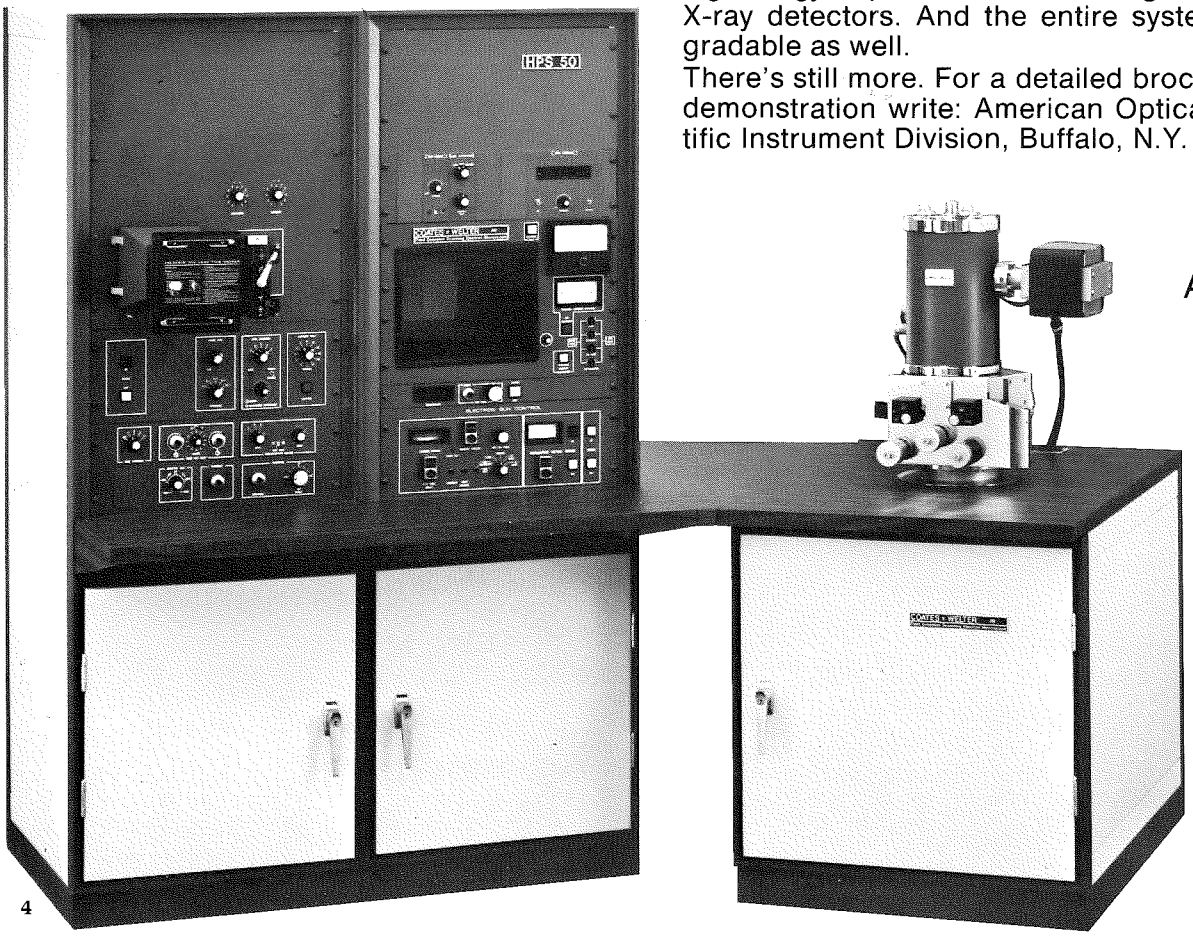
Why not buy the world's finest scanning electron microscope? It may not cost as much as you think.

The AO HPS Series field-emission scanning electron microscope may be setting the standards for performance in SEMs for years to come. AO and Coates & Welter pioneered the development of field-emission optics to its present state of precision and reliability.

Exclusive TV rate scanning and display of images at all magnifications up to 300,000 times facilitates surveying the sample and reduces typical exposures to 16 seconds or less for faster throughput and fatigue-free operation. Practical day-to-day resolution of 50Å or better and a 3000 line micrographic system guarantee the finest quality micrographs in the business—whether you're working at 50x or 50,000x. Versatile electron optical performance modes enable the operator to work at any accelerating voltage between 0.5KV and 30KV with highest signal and contrast. A unique high-resolution low-voltage mode permits the observation of many insulating materials, such as plastics, ceramics and semiconductors, in their natural state. Long-focal-length optics yield the highest depth-of-field of any SEM.

There's much more to the HPS Series. You'll like the electronic features. Gamma, derivative, contrast reversal and a digital magnification display are all standard. In the staging area, you'll delight in the precision X, Y and Z micrometer drives with full rotation and tilt. Nine extra ports on the clean ion-pumped sample chamber accommodate a wide array of accessories, including energy-dispersive and wavelength-dispersive X-ray detectors. And the entire system is upgradable as well.

There's still more. For a detailed brochure or a demonstration write: American Optical, Scientific Instrument Division, Buffalo, N.Y. 14215.



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President's Message

It was my pleasure to thank our immediate past president, Jerry D. Berlin, for the leadership he has given to the Society over the last few years. Thanks are also extended to Jerry Shay as last year's program chairman and to Randy Brackeen for serving as local chairman at Lubbock.

Jerry Berlin and Bill McCombs (last year's secretary) were instrumental in securing our postal permit to mail Society material on a non-profit organization basis. This act is now saving considerable money.

On behalf of the TSEM, I thank Robert A. Turner, our outgoing Newsletter Editor, for his outstanding contribution in producing the TSEM Newsletter. Bob served us well by producing a high quality product which paid for itself because of corporate advertisements. Our new editor, Ann Goldstein, is already getting ideas from our regional editors on how the Newsletter can best serve the membership. One of the ideas I favor is getting a Library of Congress number for the Newsletter. This would make the TSEM Newsletter or proceedings an official publication. I'm sure Ann Goldstein would welcome your opinions and your articles.

This year's program chairman, Bruce McKay, has both of our Texas-based meetings planned. The next meeting in Nacogdoches is being arranged by Charles Mims. The winter joint meeting with LSEM will be in New Orleans. Our spring meeting will be in Dallas with Leonard Seelig acting as local arrangements chairman.

I just returned from the joint Ninth International Congress on Electron Microscopy and EMSA meeting in Toronto, Canada. A number of TSEM members attended these meetings, and two of our student members won EMSA and TSEM scholarships for their work, namely Michael Taronto and Tom Dreier. Our congratulations and our support go to these two young scientists. My objective opinion is that TSEM is the most active local society affiliated with EMSA. The next EMSA meeting will be August 13-17, 1979 and will be in San Antonio with our president-elect, Bill McCombs, in charge of local arrangements. TSEM is planning to host an EMSA council meeting in concert with the regular EMSA meeting.

John Hansen has assumed the TSEM secretariat and has now computerized our membership list. Paul Baur continues to put in much of his valuable time as TSEM treasurer. He reports some concern that we have reduced our funds somewhat during the year but that we are still in reasonable financial shape. Some of this loss of funds was due to over commitments on meals at the last joint meeting in San Antonio. We will try not to do this again.

I pledge myself and the council of TSEM to faithfully serve the needs of its individual and corporate members. All members of the TSEM council should be receptive to input from any member about changes that will make more effective the promotion and uses of electron microscopy.

An exciting program for the Nacogdoches meeting on September 22-23, 1978 is now formalized. Come learn and exchange ideas at this and the other TSEM meetings. I'm sure you will profit in many ways by your attendance.

Ivan Cameron
President

TSEM FINANCIAL REPORT
Period Ending May 1, 1978

Total Assets (12/1/77)		$ 6,162.22
Certificate of Deposit (University Bank #4470)		1,271.14
Certificate of Deposit (Fannin Bank #17864)		1,000.00
Savings Account (University National Bank #01-7420-3)		3,500.00
Balance in Checking Account as of 12/1/77		$ 391.08
RECEIPTS:		
Dues	$ 970.00	
Corporate Donations (San Antonio)	1,175.00	
Interest on Cert of Dep #17864	38.69	
Transfer from Savings (Cert of Dep)	2,000.00	
Interest on Savings	105.57	
Transfer from Savings	1,800.00	
Income from Registration (San Antonio)	4,748.00	
Total Income		10,837.26
Subtotal		$11,228.34
DISBURSEMENTS:		
Purchase of Cert of Dep (U.N. Bank #1099)	$2,000.00	
Savings Account Deposit (12/9/77)	500.00	
Secretarial expenses (McCombs)	500.00	
Printing Expenses (Shay)	394.05	
Dues & Registration overpay returns	313.50	
San Antonio Expenses	6,194.03	
Postmaster, Temple, Texas	110.00	
Local Arrangements, Lubbock, Texas	150.00	
Internal Revenue Service Tax	4.20	
Treasurer Expenses (Baur)	61.62	
Photo Supplies (McGraw)	43.69	
Student Travel (San Antonio)	507.79	
Total Disbursements		10,778.88
Balance in Checking Account as of 5/1/78		$ 449.46
SAVINGS ACCOUNTS:		
Certificate of Deposit (University Nat'l Bank #1099)		$ 2,000.00
Certificate of Deposit (University Bank #4470)		1,309.83
Certificate of Deposit (Fannin Bank #17864)		1,000.00
Savings Account		305.57
Total Assets as of 5/1/78		**$ 5,064.86***

*An estimated $1,000 in extra revenue is still outstanding from San Antonio Meeting.

1979
SAN ANTONIO
EMSA - MAS

Combined 37th. Annual Meeting of the Electron Microscopy Society of America
and 13th. Annual Meeting of the Microbeam Analysis Society

TENTATIVE PROGRAM AUGUST 13-17, 1979

WORKSHOPS
Analytical Electron Microscopy
Electron Microscope Immunocytochemistry and the Intracellular Localization of Macromolecules

SYMPOSIA
Electron Microscopy in the Plant Sciences
Unconventional Imaging
The Cytoskeleton
Very High Resolution Imaging
Molecular Cytogenetics
Hot Topic in Physics to be Selected from Contributed Papers
Biomembranes
SIMS: Secondary Ion Mass Spectroscopy
Quantitative Techniques and Monte Carlo Methods
Backscattered Electron Imaging

EDUCATIONAL
Tutorials on Advanced Methods in Microprobe Analysis
Electron Microscopy in Medical Diagnosis
Tutorials on Advanced Techniques in Biological Sciences
Tutorials on Advanced Techniques in Physical Sciences

SOCIAL
Mexican Fiesta Reception
Giant BBQ and Western Dance
EMSA/MAS Awards Luncheon
Visitor's Program
Post-Conference Tours to Mexico (Acapulco, Mexico City)

SESSIONS OF CONTRIBUTED PAPERS: EMSA, MAS, JOINT MAS/EMSA

SCIENTIFIC DEMONSTRATIONS

COMMERCIAL EXHIBITS

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Abstract forms and cards for advance registration will be available around January 1, 1979. All EMSA and MAS members automatically will receive these. The abstracts for contributed papers will be due by Monday, April 2, 1979.

For business information about commercial arrangements, please write to:

Dr. William McCombs
Chairman, EMSA Local Arrangements
Scott and White Clinic
Department of Microbiology
Temple, Texas 76501
(phone 817-778-4451 ext. 2714)

OR

Dr. Robert Dobrott
Chairman, MAS Local Arrangements
Texas Instruments
P. O. Box 225936
Dallas, Texas 75265
(phone 214-238-3981)

NON-MEMBERS: For meeting information and abstract forms, please write to:

Dr. William H. Massover
Chairman, EMSA Program Committee
Division of Biology & Medicine
Brown University
Providence, Rhode Island 02912
(phone 401-863-2810)

OR

Dr. Dale Newbury
Chairman, MAS Program Committee
National Bureau of Standards
Building 222, Room A121
Washington, D. C. 20234
(phone 301-921-2875)

Editor's Comments

My thanks to all the regional editors, the corporate members and to Bob Turner and Paul Baur for their help with this first issue.

The growth and development of our newsletter has paralelled that of our society. We have a reputation to maintain. If the newsletter is to continue to be first rate it must reflect and answer the communication needs of our society.

I urge all members to submit feature articles, news, letters to the editor and micrographs. These items together with the abstracts for the meetings form the typed copy of the newsletter. Every effort is made to proof these carefully so that the text will correspond exactly to that sent by the contributor. 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 opinions of the newsletter's editor or the society.

I hope you will take a few minutes to fill out the questionnaire in this issue of the newsletter and express your opinions on the format and content of the newsletter. Both positive and negative feedback are welcomed. My aim is to help make the newsletter even more responsive to the readership.

Our society is still growing, and I hope the newsletter will continue to reflect this growth. I believe that good editors, like good scientists, are made, not born. I invite you to sharpen your writing skills along with me in the coming year.

Sincerely,

Ann Goldstein
TSEM Newsletter Editor

Editorial

Reply to an Editorial

Commilitones:

(For those of you who are younger and also those of you who did not have the alleged benefits attributed to the mental acrobatics of the *Lingua Latina* of the European educational background: Under a "Commilito" (-tonis, etc.) at the academic level one understands a buddy-in-spirit who is involved in the same truth-finding task of the philosophy of cognition as oneself is supposed to be, a com-miles, a soldier among soldiers at a level without ranks.)

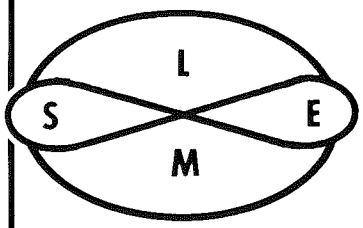
The reason for this form of address and for this introduction is the editorial by Ward Kischer of Tucson, Arizona, in the spring issue of the Newsletter of the Texas Society of Electron Microscopy. The editorial deals with such moving events as admission requirements, student laziness, and similar as observed in our colleges and universities. It is well written.

But why do we, members of the Texas Society of Electron Microscopy, bother? Our Society is an association of people who are interested in and apply the electron microscope as a tool for all kinds of investigations. Among us, there are biologists, physicians, physicists, metallurgists, engineers working in fundamental and applied research, in routine quality control and diagnostics. Our membership shows a similar diversity in education: Scientists (PhD's or similar), professionals (MD's or similar) as well as technical personnel of all levels of education. There are those of us who are working in the government or in the industry or at universities.

For our Society the individual conditions outside of the field of electron microscopy are really not of that much interest. The question of student laziness would be only of interest as it may pertain to electron microscopy. And certainly, it does not. Questions concerned with the actions and interactions of any one of the three science moving forces, the educational facilities, the facilities where the obtained skills are applied, and the regulatory role of government, become only of interest for us if they interfere with what we are doing as scientists. Here, as commilitones, should we worry: It would become highly alarming to us if the color of one's skin or if one's "roots" would become the determining factor whether an author's publication is accepted or not.

From a similar perspective one should take a closer look at the membership roster. There are, indicated behind certain names, the designations of academic accomplishments. But there are also quite a number of names with the same accredited (and not only in Texas or in the U.S.) accomplishments, where such an indication has been left out. And then, there may be people who have done more for electron microscopy and our Society than others, and who do not have any academic title. I would suggest that in the Commilito spirit in our field of science we should let the individual accomplishment speak and drop the titles altogether.

Bernard E.F. Reimann



LOUISIANA SOCIETY
FOR
ELECTRON MICROSCOPY, INC.

Greetings from LSEM! The officers and members of the Louisiana Society for Electron Microscopy take pleasure in announcing the 8th Annual Joint Symposium of the Louisiana and Texas Societies for Electron Microscopy. The meeting will be held during the dates of February 8-10, 1979 at the beautiful and historic Monteleone Hotel located in the heart of the fabulous French Quarter. In addition to the many attractions of New Orleans, a Wine & Cheese Party and a Social Hour will be held the first and second nights of the Symposium. Please mark your calendars and plan to be with us for this important meeting.

The Symposium Committe is as follows:

Dr. Fred Hossler, Chairman
Dept. of Anatomy
LSU Medical Center
1900 Florida Ave.
New Orleans, La., 70119
(504) 947-0601

Dr. Randy Moses, Registration
Dept. of Anatomy
L.S.U. Medical Center
1900 Florida Ave.
New Orleans, La., 70119
(504) 947-9961, x-247

Dr. John Ruby, Advisor
Dept. of Anatomy
L.S.U. Medical Center
1900 Florida Ave.
New Orleans, La., 70119
(504) 947-9961, x-247

Dr. Diane Smith, Program
Dept. of Anatomy
L.S.U. Medical Center
1542 Tulane Ave.
New Orleans, La., 70112
(504) 568-4011

Dr. James Jeter, Guest Speakers
Dept. of Anatomy
Tulane Medical School
1530 Tulane Ave.
New Orleans, La., 70112
(504) 588-5255

Mr. Joe A. Mascorro , Advisor
Dept. of Anatomy
Tulane Medical School
1530 Tulane Ave.
New Orleans, La., 70112
(504) 588-5255

Job Opportunities

Position Available — Postdoctoral Position: Participate in ongoing research projects on ultrastructure and biochemistry of mammalian heart. Specific projects include: 1) optical diffraction studies of the Z band in intact and isolated myofibril preparations before and after selective extraction, 2) structural analysis of microtubules in intact heart cells and parallel studies on isolated fragments and repolymerized microtubules.

Prefer someone with strong background in biochemistry of muscle or microtubule proteins who wants to learn ultrastructural analysis but will consider someone with good background in EM techniques who wishes to learn biochemistry. Salary range, $10,000 minimum. Contact Dr. Margaret Ann Goldstein, Department of Medicine, Baylor College of Medicine, Houston, Texas 77030; phone (713) 790-3146.

Position Available — Technician: Department of Ophthalmology, Baylor College of Medicine, Houston, Texas 77030. Experience in electron microscopy, light microscopy, autoradiography and immunohistochemistry. Contact Dr. Dominic M-K Lam, (713) 790-5958.

Comparative Pathologist, M.D. or D.V.M. with Ph.D. Pathology Board or ACVP eligibility or certification desirable. Experience in rodent pathology, carcinogenesis, clinic pathology, immunology, histochemistry, autoradiography, or electron microscopy helpful. Duties include (1) involvement in multidisciplinary projects with some individual research time available, (2) participation in histopathologic examination of tissues from rodents involved in carcinogenic, mutagenic and teratogenic studies, (3) teaching, (4) involvement in graduate and undergraduate education, (5) involvement in interdisciplinary graduate toxicology program. Excellent clinical pathology and electron microscopy support. Salary commensurate with qualification/experience. Send resume to: Project Director, RSP, National Center for Toxicological Research, Jefferson, AR 72079. Equal Opportunity Employer.

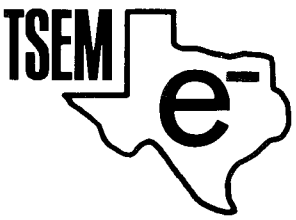
Position Available — Postdoctoral Fellow, Research Associate, or possibly senior technician. To work on etiology of keloids and hypertrophic scars. Position is funded from recently awarded NIH Research Grant to Dr. Ward Kischer. Applicant must be competent in transmission electron microscopy and have at least an academic background in biochemistry and immunology.

$10,000.00 minimum, renewable annually for maximum of three years. Contact: Dr. C. Ward Kischer, Department of Anatomy, University of Arizona. College of Medicine, Tucson, Arizona 85724, (602) 882-6090.

Situation Wanted — Raul Joseph Alvarado, 5300 Tropicana, El Paso, TX 79924. (915) 751-0691. Single, 5-10, 180 lbs. born July 24, 1951. Wants career in medical field as a Laboratory Technician. Majored in Microbiology at El Paso Community College, GPA 3.6 on a 4.0 scale. Presently employed as Bio-Lab aide, electron microscopy, Dept. of Pathology, William Beaumont Army Medical Center, El Paso, Texas. Has been recommended by Bernhard E.F. Reimann, Dr., rer. nat., Chief, at William Beaumont Army Medical Center. Dr. Reimann is in the process of training Mr. Alvarado and will be available for full-time job on Jan. 21, 1977. Other references and a complete resume are available.

Position Available — Ladd Research Industries, Inc. is in need of a highly knowledgeable electron microscopist to represent them and their line of products throughout the State of Texas. Has compulsory retirement deprived you of the challenges you enjoy? If so, you may be the person we need. We offer a modest monthly salary which can be negotiated and we provide transportation costs. You will be free to plan your own timetable and at the same time keep your self-starter in good condition. If interested please write to: M.W. Ladd, c/o Ladd Research Industries, Inc., P.O. Box 901, Burlington, Vt. 05401, or telephone (802) 658-4961 and reverse the charges.

Position Available — EM Technician II: Available immediately — salary $9,972 per annum. Bachelor's degree and 2 years experience or equivalent required. Contact Dr. Edward G. Rennels or Dr. D.C. Herbert, Department of Anatomy, University of Texas Health Science Center, San Antonio, Texas 78284; phone (512) 691-6533.



REGIONAL EDITORS

David L. Murphy, Department of Medicine, Baylor College of Medicine, Texas Medical Center, Houston, Texas 77030. (713) 790-3146.

Joanne T. Ellzey, Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968. (915) 749-5609.

John T. Hansen, Department of Anatomy, The University of Texas Health Science Center at San Antonio, San Antonio, Texas 78284. (512) 696-6537.

James K. Butler, Department of Biology, The University of Texas at Arlington, Arlington, Texas 76010. (817) 273-2871.

Donna Kerbow, Department of Neurobiology & Anatomy, University of Texas Medical School at Houston, 7.046 Medical School Main Building. Houston, Texas 77030. (713) 792-4885

Bernell Dalley, Department of Anatomy, Texas Tech University School of Medicine, Lubbock, Texas 79409. (806) 742-5277.

Peter Moller, Department of Human Biology, Chemistry and Genetics, University of Texas Medical Branch, Division of Cell Biology, Galveston, Texas 77550.

Marilyn Smith, Department of Biology, Texas Women's University, Denton, Texas 76204.

Joe A. Mascorro, Department of Anatomy, Tulane School of Medicine, New Orleans, Louisiana 70112. (504) 588-5255.

Ruben Ramirez-Mitchell, Cell Research Institute, Biology Lab 311, The University of Texas, Austin, Texas 78709. (512) 471-3965.

Donna Rainey, Department of Pathology, The University of Texas Southwestern Medical School, Dallas, Texas 75235. (214) 631-3220.

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The Micro-X-7000 subsystem is the forerunner of a powerful new generation of *multi-task,* microcomputer-based spectrometers. It offers unprecedented flexibility in internal data reduction capabilities as well as the most varied and unique color video displays ever provided. The superior capability inherent in the Micro-X subsystem makes it possible to structure an entire laboratory based on its extraordinary versatility and outstanding performance.

Here are some of the capabilities provided by the Micro-X subsystem: data acquisition modes provided are XES (x-ray energy spectrometry), PHA (general-purpose pulse height analysis), and SEQ (sequential pulse counting, sampling of continuous analog waveforms, or averaging or repetitive transients). A simultaneous XES/SEQ mode allows an x-ray energy spectrum to be acquired in one memory group simultaneously with the acquisition of a seqential wavelength dispersive x-ray, Auger, electron energy loss, or other spectrum in a second memory group.

Color-coded video display, 2,048- or 4,096-word memory, printer output, and a full ASCII keyboard are included as standard features.

μX 7000: a system for quantitative analysis

Biomedical Research Priorities in the 1970's

Antonio M. Gotto, Jr., M.D.

The Bob and Vivian Smith Professor and Chairman of the Department of Medicine, The J. S. Abercrombie Professor, Baylor College of Medicine, and Scientific Director of the National Heart and Blood Vessel Research and Demonstration Center, Baylor College of Medicine, The Methodist Hospital, Houston, Texas 77030

Prior to 1900, the major developments in biomedical science, such as the development of the x-ray, came from Western Europe. That situation has been substantially reversed in the 20th century. Until the end of World War II, the most important support for biomedical research in the United States was the Rockefeller Foundation. A few other foundations also contributed, as did hospitals, universities, and pharmaceutical firms. The U. S. Government supported a very small, limited, single, National Institute of Health, as well as research carried on in the military branches. When the Office of Scientific Research and Development was closed at the end of the war, responsibility for the management of university contracts was transferred to the National Institute of Health. This transfer was to prove to be a highly significant development in establishing the pattern of biomedical research support in this country for the next 30 years. In 1948, the National Institute of Health became the National Institutes of Health with expanded and defined categorical roles. Two years later, the National Science Foundation was created.

Biomedical research, which had been developing appreciably in the United States in the 20th century has flourished at an accelerated rate since 1950. I will not herein detail the basic laboratory research that has led directly to clinical breakthroughs such as the development of the poliomyelitis vaccine. The scientific developments leading to the most significant advances in the following areas have been closely analyzed: open-heart surgery, blood vessel surgery, treatment of hypertension, management of coronary artery disease, prevention of poliomyelitis, chemotherapy for tuberculosis and acute rheumatic fever, cardiac resuscitation and pacemakers, oral diuretics in treatment for hypertension and heart failure, intensive care units and new procedures of diagnosis (Comroe and Drivesdale, *Science*, April 9, Vol. 92, p. 105, 1976). The conclusion of the study was that 41 percent of the work responsible for these medical advances was not goal oriented toward a disease at the time it was done. Approximately 62 percent of the total research was defined as being basic research. Clinically oriented studies comprised 21 percent of the total; development and engineering, 15 percent. Such findings support the concept that a substantial proportion of the funds available for biomedical research should be allocated to the creative sciences whose function it is to study the basic properties of living organisms. Basic research is the lifeline of medicine.

At a recent biomedical research hearing, Senator Edward Kennedy is quoted as saying that "at root, medical research is dedicated to uncovering new knowledge and relating it to the body of existing knowledge for sci-

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entists' sake, not for the conquest of specific diseases or development of specific new technologies." This statement is subject to various interpretations. The reporter for *Science* covering the hearing, Ms. Barbara Culliton concluded that "Kennedy either believes, or at least sounded as if he believed, that the biomedical research community is interested in little else than its own intellectual indulgence." (*Science*, July 2, 1976.) I doubt that this interpretation is valid since the Senator has also recently said that "basic and clinical research is at the heart of medical education." (Address delivered at Tufts Medical Center, April 23, 1976.) Regardless of the interpretation of Senator Kennedy's remarks, the biomedical research community is apprehensive that Congress, the White House, and the public are becoming impatient with basic research and may be losing sight of the fact that the medical advances of today and tomorrow eventually derive from fundamental laboratory discoveries. The discovery may or may not in the first instance be disease oriented. This is the fundamental premise which underlies the individual investigator initiated research grant, which has been the traditional mechanism for the support of most research activities under the auspices of the National Institutes of Health and National Science Foundation.

As science rapidly expanded in the United States in the first half of the century, the concept arose that major disease areas might be best attacked by a multidisciplinary effort. The concept was translated into reality with the establishment initially of the Program Project Grants and subsequently with categorical Center grants. In either case, a group of investigators representing several disciplines interact and collaborate under the premise that their collective activities will be greater than the sum of their individual efforts if each were working independently. A Center represents a unit of organization and brings together scientists representing various disciplines such as genetics, engineering, social sciences, physical sciences and the clinical sciences. Ideally, a Center should be located in one geographical unit to permit maximal interaction. The Center has proven to be one of the most effective means of bringing together the basic sciences for the purpose of applying knowledge gained from laboratory work to the treatment of patients. Most Centers are oriented very heavily toward a single human disease. The aim of a Center is to develop more effective procedures for the diagnosis, treatment and prevention of a specific disease. Centers provide excellent environments for the training of new scientists. Centers are subject to peer review, both as a whole as well as based on its individual components. In summary, the Program Project and Center Grants have led to the development of larger units of research through aggregation, to multidisciplinary attacks and to a targeting or focusing on a single disease entity. The most recent innovation has been the establishment of Education and Control and Demonstration Centers, the purpose of which is to develop improved methods for translating the findings of basic and clinical research into community health practices.

Undoubtedly, the question of the continued support of basic biomedical research as well as categorical or goal-oriented research is one that will receive much attention and debate in coming years. In my opinion, both types of activities should be supported.

THE COSTS

During the period between 1950 and 1975, the approximate total amount of expenditures for research and development in health in the United States increased from $160 million to more than $4.6 billion. The government provided about two thirds of this total. From 1965 to 1975, the total health costs in the United States increased from $37 billion to $120 billion per year. The costs continue to grow about 10 percent annually. Since 1960, the amount spent for health and medical care has increased four times and since 1950 by eight times. In a National Institutes of Health report on the 1975/1976 program areas of special concern, it was estimated that the loss to our economy through chronic diseases is about $100 billion per year and the loss in federal tax return about $3.5 billion. The aggregate loss to the gross national product, the loss of uncollected federal taxes and the cost of health care, exceeds $200 billion annually, a staggering figure.

Of the $120 billion of total health cost per year, between 1965 to 1975, the proportion of dollars devoted to research decreased from 4.8 percent to 3.9 percent. In order to maintain the stability of the biomedical research apparatus, I would recommend that a minimum of 4 to 5 percent per year of the total health expenditures be designated for this purpose. This is a relatively small fraction in comparison to the cost to the country of its health expenditures, the loss in revenue, and the fact that these problems are limited to specific diseases affecting approximately 150 million Americans.

An increase in the level of the competition for federal resources in health and in other areas as congressional limits are applied to appropriations could result in a destabilization of the biomedical research apparatus. Even if the level of funding for biomedical research remains constant, inflation would take its toll in reducing the availability of dollars actually available for research.

With the introduction of National Health Insurance, the increase in health costs in our country can be expected to rise even more sharply in the coming years. Such an increase will probably also result in further competition for the funds used to support biomedical research.

FUNDING

The highest priority for biomedical research in the coming years is to assure that the capacity and effectiveness of the apparatus now developed in the United States for scientific enquiry are fully maintained. The current apparatus now being supported includes the laboratories and clinics of the National Institutes of

Health at Bethesda (representing the largest single medical research facility in the world), the network of medical schools, and the other academic science and research institutions engaged in biomedical research. Unless all of these components are properly supported, the pace of biomedical research will slow and the apparatus itself will begin to disappear. Once it is lost, the apparatus may prove extremely difficult to replace. The rate of growth and expansion of the 50's and 60's is not obtainable and is not necessary in 1976. However, the apparatus cannot survive if it is repeatedly turned on and off through a series of continuing resolutions and by adversarial actions by Congress and the White House. Nor can it survive if the growth rate is brought to a complete halt. How to create short-term and long-term stability is a very difficult problem.

The current annual procedures for allocation of funds are well established. Each year, various self-interest health groups present their programs and pleas for funds to Congress. Public relations campaigns are mounted and often are an important determinant in the success or lack of success for research funds by a given group. A major trend since the early 1970's has been the tremendous increase in support for cancer research. The Nixon Administration identified cancer and heart research as being the two primary health areas on which it wished to focus. In five years, the total NIH expenditure for cancer research increased from approximately 17 percent to 33 percent. The annual expense for cancer research may soon reach as high as one billion dollars. Undoubtedly, there has been an upgrading of the quality of research in the cancer field as a consequence of this inpouring of funds. However, the state of the art in this field with respect to achieving a cure is not comparable to that of developing the Polaris submarine or placing a man on the moon. There is the danger that Congress and the public may become disillusioned if their expectations for major advances and even "cures" are not met. Heart research has benefited to a much lesser extent from additional funding than has cancer research. The funds available to support heart or cardiovascular research per se have been diminished by the fact that the National Heart, Blood Vessel, Lung and Blood Act of 1972 established mandatory percentages for the support of lung and blood disease. Thus, the NHLBI was required by law to put additional funding into these areas at the expense of supporting cardiovascular research. I would think that there is general agreement that adequate support for biomedical research should continue. The question becomes how to define adequate support and how to allocate the funds between the various competing health groups.

It would be desirable to develop some objective criteria to be considered in determining the allocation of funds. A few examples of such criteria are the following: 1. What is the current state of the art of knowledge concerning this disease? 2. How many people are affected by the disease? 3. What is the annual loss to the economy from the disease in terms of gross national product, federal tax returns, and demands for government services? 4. What is the cost of the disease in human suffering? 5. What is the likelihood of reducing or conquering the disease? 6. What significant changes in knowledge would be likely to lead to a breakthrough in medical application?

I suggest the following approaches, which might be considered in arriving at an answer of what constitutes adequate funding to maintain the effective use of research capabilities. 1. One method would be to fix the level of support for biomedical research as a percentage of the total health expenditures. As noted above, the percent of total health costs for research decreased from 4.8 percent to 3.9 percent between 1965 and 1975. A fixed rate of 4 to 5 percent would represent a figure that would be conservative as compared to the amount invested in research and development by industry, A study of the feasibility of such an approach might be undertaken. 2. A second method would be to determine the level of funding necessary to maintain the present level of activity in the highly important areas of investigator-initiated grants (for basic and clinic research and of training programs). There would have to be additional funds available for growth and to take advantage of unusual opportunities which arise. Also, the level of funding to maintain current activities would have to take into account the factor of inflation. New programs would have to bring with them additional resources in order to implement them. For example, additional funds would be required for such special purposes as clinical trials.

If it were possible to obtain stable funding for a two- to three-year period, taking into account rising costs and making available supplemental funding for special needs, the cyclical swings in research support could be avoided and a greater degree of stability could be achieved. Regular, periodic review of funding should be carried out in order to maintain public accountability for the expenditure of funds. Congress has not been able to meet its schedules in the past and hence funding by the method of continuing resolution has been the rule rather than the exception. It is extremely difficult to plan and maintain long-term, middle-term, or short-term research programs on such a basis.

ACCOUNTABILITY AND THE REVIEW MACHINE

At least ten federal and nonfederal commissions have scrutinized the National Institutes of Health since the 1950's. One of the most significant of these was the Woolridge Committee which reported its finding in 1965. Most recently, the President's Biomedical Research Panel submitted its report for the President and Congress on April 30, 1976. This latter group enthusiastically supported the method of peer review which has been fundamental in the decision-making process concerning each individual grant application. It recommended a "need for a more effective advisory mechanism for both the NIH and the ADAMHA in order to provide policy advice for those responsible for directing the research programs of these institutions, and also when informing

or advising the President concerning the progress of these programs. This group has also recommended that a formula for biomedical research support be adopted. It recommended a separation of research from health care delivery. It strongly endorsed a continuation of research training programs. The report observed that "human beings are within reach of the capacity to control or prevent human disease . . . there do not appear to be any impenetrable, incomprehensible diseases. This in itself represents the major advance for biomedical science and it is a change which has occurred only within the last 25 years."

The peer review system has been the tried and proven mechanism for assessing and assigning a priority for the funding of each research grant. The integrity of the research programs is absolutely dependent upon this review mechanism. There is concern that certain of the new "sunshine laws" may damage the peer review system. For example, double-blind clinical trials to test the efficacy of new drugs would be impossible if information as to who was randomized in the control and treatment groups was made public. Also, it is difficult for a group of peers to review the grant application of an individual if the applicant is present during the entire deliberative procedure. Other aspects of the "sunshine laws," however, are quite exemplary and desirable. The Nixon Administration and the Office of Management and Budget undertook a concerted effort to destroy the peer review system. However, this attempt failed and the system is still alive and well in 1976.

TRAINING

With regard to training, the NIH supported the training of approximately 94,000 scientists between 1938 and 1972. This support formed the basis for the establishment of the biomedical research apparatus in our country. By 1969, support for training had reached 168 million dollars under the Nixon Administration. This declined by 1975 to approximately 155 million dollars. In 1973, there was a concerted attempt on the part of President Nixon and of the Office of Management and Budget to eliminate all federal support of biomedical training. On January 29, 1973, President Nixon submitted a budget that proposed the termination of all new NIH training grants and fellowships. Spokesmen for the White House and OMB stated that there was an oversupply of scientific personnel which should be reduced. A complete stoppage of training programs was avoided by a strong counterreaction from the scientific community. The National Academy of Sciences has now been assigned the task of identifying the areas where further government support for training is desirable. An assessment of health and research manpower needs for the upcoming years is badly needed and would be a worthy objective of a new administration.

WHAT THE PUBLIC EXPECTS FROM BIOMEDICAL RESEARCH

I would now like to turn to some major public concerns toward biomedical research which in my opinion must be addressed. The first is that the public has an exaggerated expectation of the ability of science to solve the major disease problems facing society. Too much has been promised in some instances and when the public is disappointed over practical results derived from basic and clinical research, then this disillusionment may be translated into a reduction of dollars for biomedical research support. Second, the public is demanding that science and technology today be scrutinized for its ethical, legal, economic, environmental, and social implications. Such demands must be met but they lead to additional problems of management and cost which must be assumed in implementing a given program. Perhaps the greatest source of public dissatisfaction with the biomedical research community has resulted from the health care system itself and the perceived relationship of this system to the biomedical research apparatus. Indeed, there are major problems within the health care system today which the system itself is incapable of correcting. The most significant of these problems are the escalating costs of health care and the variability in the quality and availability of care. In addition to its traditional role as described above, I would like to suggest that the biomedical research community might assume a new one which would be advisory assistance to the health care community. What I am suggesting then is that the biomedical research apparatus assume an advisory capacity for the problems of health care. How could such a relationship improve the quality and availability of health care? One is by providing guidance concerning the establishment of standards for the quality of health care. A second is in providing a continuing central and authoritative source of advice concerning the establishment of future standards. A third way, which is relevant to the subject of technology transfer, is in identifying clinically relevant and adequately validated new knowledge obtained from the research laboratories which is suitable for application in community and other clinical settings. The essence of what I am describing is a validating or rejecting of current health practices and an evaluation of new information that might be translated into new and innovative health practices, This would seem a logical extension of the research role. The role would be purely an advisory one and not a regulatory one. That is, such an advisory group would neither establish nor police the standards but would merely advise concerning acceptable standards. It is obvious that added resources would be required if the biomedical research apparatus were to carry out these additional missions. In summary, I suggest as a second major priority that the biomedical research community assume over a period of the next few years a much greater degree of responsibility for the quality of care available within our health delivery system.

TECHNOLOGY TRANSFER AND CLINICAL APPLICATIONS

The central problem in the application of clinical knowledge to community practice is that no formal processes are now available for identifying clinically relevant new research knowledge that has been adequately

validated and is ready for application. The problem is how to achieve a consensus concerning the optimal procedures to be followed for disease detection, diagnosis, prevention, treatment, and rehabilitation. Such functions are crucial in order to be able to transfer at the proper time new research knowledge into the health care practices. As discussed above, there is substantial pressure on the NIH to justify before Congress and the public the current biomedical research budget.

The key to regain public support may lie in the area of technology assessment and transfer. The President's Biomedical Research Panel has recommended that research programs be kept free of activities of health care delivery. I disagree with this conclusion. The NIH has in the past supported mission-oriented research through program project grants and Specialized Centers of Research. However, the National Heart, Blood Vessel, Lung and Blood Act of 1972 has established Education, Control and Demonstration Centers under the aegis of the National Heart, Lung and Blood Institute. Three such centers have been funded, one each in heart and blood vessel disease, pulmonary disease, and blood disease. The aim of these new centers is to improve translation of the findings of clinical and basic research and to improve the quality of practice.

As an example of such a program, one might consider the case of cardiovascular disease which now costs the country more than 40 billion dollars a year and accounts for one half of the deaths each year in our society. It has become obvious that a serious investment in preventive medicine will be required in order to alleviate much of the suffering and economic loss from cardiovascular disease. A number of authoritative groups including the Council on Food and Nutrition Board of the American Medical Association, the Food and Nutrition Board of the National Academy of Sciences, the Inter-Society Commission on Heart Disease, the British Cardiac Society and Royal College of Physicians of London have recommended changes in diet and other practices, including smoking, exercise, and control of blood pressure which they believed would substantially reduce the risk of premature death and disability from cardiovascular disease. This knowledge is available, but effective programs for implementing the knowledge to produce the desired changes in behavior of large segments of the population are lacking. Federal support for education programs and for preventive medicine is miniscule. The establishment of national centers for developing education and control and demonstration programs directed at specific target populations seems a laudible objective. In addition to such centers, the NHLBI has initiated clinical trials to determine if high-risk individuals for heart attacks can, through treatment, have their risk reduced. The Lipid Research Clinic trial is testing whether cholesterol lowering with a drug will reduce heart attacks and death. In the Multirisk Factor Intervention Trial, cigarette smoking, blood cholesterol, and high blood pressure are all treated. These two trials will cost the institute at least 200 million dollars and represent a significant drain on its resources. At the same time, the budget for the institute was decreased so that in 1975 it was 325 million dollars instead of 520 million dollars. It is clear that there is no inexpensive way to gather this kind of information derived from clinical trials. It would not seem unreasonable that a national health insurance plan might be asked to sustain the cost of clinical trials which are carried out to determine what optimal care the plan should support. Also, it may be desirable to have within the NIH an identifiable body that is charged with administering education and demonstration projects oriented toward the community. By establishing budgetary independence for this activity, one could insure that it would not become a drain on the funding for basic and clinical research. One of the advantages of the Education and Control and Demonstration Centers is that they attract competent researchers from the fields of sociology, operation research, biostatistics, epidemiology, and the social sciences and to the study of the nature, cause, prevention, and treatment of specific diseases.

There are many important questions about technology transfer which remain to be answered. This in itself is a potentially fruitful area for research. We must determine how to achieve a consensus of what knowledge is ready for clinical application. We must develop ways of transferring this information and we must stimulate clinical and basic research developments to the point that they are suitable for such application. It seems desirable to allocate a certain portion of available funds to research on technology transfer per se.

CONCLUSION

To sum up, the biomedical research apparatus established through Federal support in our country has made the United States the world leader in medical discovery and development. The overall aim of this system is to gain new knowledge which will decrease premature death and will improve the quality of life for the widest number of people. There is dissatisfaction from the public and Congress in some areas over a lack of apparent results that can be practically applied, over inequitable distribution of medical care and over-rising costs in the health care delivery system. I make the plea that a *continued support of biomedical research be a sine qua non of public policy.* The biomedical research apparatus must not be allowed to disappear and must receive continued support that allows growth and seizure of new opportunities. Support should not fall below the current ratio of research expenditures to the national health expenditures, namely 1 to 25. Second, *I recommend that the biomedical research community assume a new responsibility concerning the quality of health care in our country.* The role would be an *advisory* one and would be concerned with the establishment of standards and with making decisions as to when knowledge is ripe for transfer into health practices. Finally, I recommend the support of programs of *education,* and *control* and *demonstration,* of *preventive medicine* and of *research* into the most effective modalities of promoting *technology transfer.*

Abstracts

DIAGNOSTIC ELECTRON MICROSCOPY IN A CANCER CENTER. Joyce E. Cox and Bruce Mackay. M.D., M. D. Anderson Hospital and Tumor Institute, Houston, Texas.

There are certain basic requirements for the successful application of electron microscopy in a clinical setting. Foremost, is the need to provide a report of the diagnostic study rapidly in order that the information can be used in planning therapy. A close liaison with the clinical services is necessary to allow discussion of clinical problems between pathologist and clinician, ensure accession of representative suitably preserved material, and facilitate interpretation of the findings from the ultrastructural study in the context of the clinical situation. The electron microscopy technician should be aware of the nature of each specimen and be prepared to modify the routine tissue processing schedule where necessary. Thus, specimens containing foci of calcific material may require preliminary decalcification. If contaminating cells are present in large numbers in effusions, steps must be taken to eliminate as many as possible. Aspiration specimens containing small numbers of tumor cells require particular care in handling and processing if sufficient cells are to be harvested. Examination of one micron sections is an essential preliminary to the cutting of thin-sections and their study. In a cancer hospital, most of the tissues received for diagnostic evaluation are tumors, but examples of non-neoplastic specimens from cancer patients will also be shown and discussed.

BLAST CRISIS OF CHRONIC MYELOID LEUKEMIA: ULTRASTRUCTURAL ANALYSIS OF LYMPHOBLASTIC AND MYELOBLASTIC MORPHOLOGY. Ahearn, M.J., Trujillo, J.M., and Hannah, K.E., Department of Laboratory Medicine, The University of Texas System Cancer Center M.D. Anderson Hospital and Tumor Institute, Houston, Texas.

The terminal phase of Chronic Myeloid Leukemia (CML), characterized by an increasing number of blast cells in both the bone marrow and peripheral blood, results in a hematopoietic state resembling that of acute leukemia. Recent studies have disclosed that the hematological features of these blast crisis cells may be myeloblastic or lymphoblastic (Blood, 49:705, 1977). Clinically the two groups have been found to differ both in therapeutic drug response and subsequent prognosis. In those cases where light microscopic morphology is indistinct, cell surface markers are routinely utilized as a diagnostic adjuvant. However, the undifferentiated characteristics of some lymphoblastic cases results in false negative reactions at presentation (British Journal of Hematology, 34:179, 1976). Our electron microscopic studies of these cases of undifferentiated blast crisis reveal that sufficient morphological and histochemical markers are present ultrastructurally to permit an accurate diagnosis and an effective choice of treatment regimen.

SEQUENTIAL ELECTRON MICROSCOPY AND IMMUNO-HISTOPATHOLOGIC STUDIES OF THE BURSA OF FABRICIUS OF CHICKENS INFECTED WITH INFECTIOUS BURSAL DISEASE VIRUS. Danny Millar, S. A. Naqi, B. Panigrahy, Texas A&M University, Department of Veterinary Microbiology & Parasitology.

Infectious bursal disease (IBD) is a unique virus-induced immunodeficiency of chickens without an analogue in the mammalian species. The infectious bursal disease virus (IBDV) causes destruction of lymphoid elements of the bursa of Fabricus (BF) without regeneration. Sequential pathogenesis in the BF was studied in chickens infected shortly after hatch with IBDV by TEM, SEM, and fluorescent antibody techniques (FA). Forty-eight hours following oral inoculation with IBDV mature virions were demonstrated by TEM and FA. SEM studies showed damage to the mucosal surface in the area of the lymphoid follicles culminating in a crypt instead of a button follicle. Progressive degenerative changes leading to complete destruction of the BF will be presented.

COMPARATIVE ULTRASTRUCTURE STUDY OF THE CELL WALL OF IRON AND SULFUR OXIDIZING MICROORGANISMS. V. K. Berry, Department of Anatomy, The University of Texas Health Science Center, San Antonio, Texas 78284.

Iron and sulfur oxidizing bacteria catalyze the oxidation of sulfides to water soluble sulfate and ferrous iron to ferric iron. These are gram-negative chemosynthetic autotrophic microorganisms and grow at very low pH values. The mesophilic microorganism **Thiobacillus ferrooxidans** is naturally found in leach dumps. The general structure of the cell wall of **T. ferrooxidans** is similar to most of the gram-negative bacteria. It has a well defined peptidoglycan layer next to the cytoplasmic membrane which stains well. This dense peptidoglycan layer is found to be absent in the cell wall of **Sulfolobus**-like thermophilic microorganism. The peptidoglycan layer gives strength to the cell wall of the gram-negative bacteria. Due to the absence of this layer in **Sulfolobus**-like microorganism, the microorganism is found to collapse easily on air drying. Also the outermost layer in **Sulfolobus**-like microorganism has a well defined crystalline hexagonal array which is not there in **T. ferrooxidans.** This regular array on the outermost surface is considered to consist of glycoprotein subunits and it shows well in the thin sections. These arrays of subunits in a hexagonal symmetry provide a good covering of the cell wall and possibly provide a good protection to the microorganism at high temperatures — up to 80°C.

THE RESPONSE OF THE RAT RENAL PELVIS TO PSEUDOMONAS INFECTION. M.S. Cohen, C.P. Davis, M.M. Warren, University of Texas Medical Branch, Department of Surgery, Division of Urology and Department of Microbiology, Galveston, Texas 77550.

Epithelial cell — bacterial interactions in the bladder have been the subject of recent investigations. In our study, the response of the rat renal pelvis to **Pseudomonas aeruginosa** was examined using scanning electron microscopy. One ml. of a 1×10^7 or 1×10^9 bacterial suspension was injected in a retrograde fashion into the rat bladder which was manipulated in order to promote vesicoureteral reflux. Unobstructed kidneys were examined at intervals up to 1 week after injection. In addition, kidneys from rats in which ureteral ligation was performed immediately after injection were studied up to 5 hours

after inoculation. After 2 hours, in all cases, the urothelium began to exhibit various degrees of microplical alteration and bacterial attachment. Areas of cellular exfoliation and ulceration were noted which were sometimes covered by fibrin-like strands. Amorphous strands were demonstrated to extend from damaged cell surfaces and cell borders. These changes were progressive, with complete loss of normal appearing epithelium 24 hours and 1 week after injection. Ureteral ligation appeared to have little effect on the degree of surface change, but increased amounts of cellular debris with associated bacteria and strand formation was noted in obstructed kidneys. These observations support the hypothesis that bacterial invasion initiates defense mechanisms in the renal pelvis similar to those noted in bladders — that of membrane alteration with increased bacterial attachment, strand formation with further bacterial entrapment and exfoliation of bacteria-laden epithelial cells which are eliminated via voiding.

ULTRASTRUCTURE OF HYPHAE OF THE MYCORRHIZAL FUNGUS PISOLITHUS TINCTORIUS. Charles W. Mims, Department of Biology, Stephen F. Austin State University, Nacogdoches, Texas 75962.

Pisolithus tinctorius is a fungus belonging to the class Basidiomycetes. The organism has recently received considerable attention because of its ability to form mycorrhizal associations with roots of pines as well as other economically important tree species. The purpose of this study was to examine the hyphae of this fungus ultrastructurally in an attempt to determine if the hyphae possessed any distinctive features which might aid in the recognition of the fungus from hyphae alone.

Pisolithus tinctorius possesses a well-developed mycelium consisting of septate hyphae bearing clamp connections. The septa are of the "dolipore type" possessing a barrel-shaped swelling in the center of the septal wall surrounding a central pore. The septum is covered on either side by a dome-shaped, membranous pore cap consisting of modified endoplasmic reticulum. A dark staining region devoid of cellular organelles is present on either side of the pore cap. Lomasomes are common in the hyphae, particularly near the septa. Hyphae contain a typical complement of cellular organelles including nuclei, mitochondria, ribosomes and vacuoles.

MEMBRANE STRUCTURAL DISSIMILARITIES AND FUSION IN TOLUENE-TREATED MITOCHONDRIA. W.A. Shannon, Jr., Veterans Administration Hospital and Department of Cell Biology, Southwestern Medical School, Dallas, Texas.

Isolated mitochondria from rat heart and liver were treated with 2% toluene in 8.5% polyethylene glycol and prepared for electron microscopy.

Mitochondrial cristae were usually vesiculated. Heart mitochondria appeared as fused aggregates wheras liver mitochondria appeared mostly dispersed and as separate entities even when in contact. Both mitochondrial membranes were modified enough to allow the passage, although apparently limited, of native ferritin. This would indicate induced "pores" or other changes allowing the entry. Freeze-etch studies indicated apparently large concentrations of lipids with definite redistribution of protein particles. In the heart mitochondria, membrane modification in the form of a septum with continuous periodic interruptions was frequently observed between the outer membranes. The septum was discontinuous, consisting usually of 1-3 sections, and absent from most of the length of the outer compartment. These appeared similar to structures sometimes seen within cristae, especially in postmortem conditions. However, no such intracristate structures were seen in this study. In the process of fusion, initially membrane "junctions" appeared with a common membrane (outer membrane of each). A single membrane was often seen in the same location in the absence of other membranes. This membrane sometimes appeared to be the inner membrane from one mitochondrion. The final stage of fusion occurred between the matrices.

The differences observed between the liver and heart mitochondrial membranes demonstrate considerable heterogeneity in membrane composition of the same organelle though from different organs. In addition, toluene-treated heart mitochondria may serve as another model for membrane fusion studies.

MORPHOLOGICAL OBSERVATIONS ON STEROID SECRETION BY Y-1 CELLS AND THE HERITABILITY OF THIS PHENOMENON. Mike A. Clark, W.J. Brown and Jerry Shay, Department of Cell Biology, The University of Texas Health Science Center, Dallas, Texas.

The Y-1 cell line originally described by Sato was isolated from a murine adrenal tumor and has been shown to secrete steroids in response to treatment with adrenocorticotropic hormone (ACTH). Utilizing scanning and transmission electron microscopy and indirect immunofluorescence microscopy, the morphological events associated with steroid synthesis and secretion were investigated.

In addition we have utilized techniques that permit Y-1 cells to be enucleated using cytochalasin B, and the resulting enucleate cells (cytoplasts) are able to respond to ACTH similarly to whole cells. We have also fused Y-1 nuclei to cytoplasts obtained from a cell line that does not respond to ACTH. These viable reconstructed cell lines do not respond to ACTH or secrete steroids even though they have been in continous passage for over three months. These studies may provide useful information concerning the morphological events associated with steroid production and secretion.

AGING IN MANDIBULAR MOLARS AND GINGIVA OF THE MOUSE. Harry Michael Baddour. Department of Anatomy, The University of Texas Health Science Center at San Antonio, San Antonio, Texas 78284.

Twenty-two male mice of the Ajax strain were maintained in a controlled laboratory environment from birth till death. Extraoral mandibulectomies were done and bisected mandibles were studied for age dependent changes with scanning electron and light microscopy. Mandibular mice molars were observed to resemble human molars with a cuspal pattern of six, four and three beginning with the first molar. Also, tooth attrition was not observed to increase noticeably in the older mice. Cemental exposure secondary to gingival recession was not observed until the animal reached 22 months of age, with the rate of gingival recession greatest in the third molar. Clinical crown heights increased significantly with age secondary to the gingival recession. The third molars revealed the greatest increase in crown height with the first molar exhibiting the least. A significant decrease of width of periodontium was noted with age. An increase of width of periodontium was also noted from first molar to third molar in all age groups. Downgrowth of the epithelial attachment was observed histologically to take place after 12 months of age with a significant increase in downgrowth as age increased. Also histologically, a

decrease in distance from gingival crest to CEJ was observed to be significant with age. In conclusion, the literature and the present study indicate that age does cause physical changes in the mouse mandibular molars and associating gingiva.

APPOSITIONAL BONE FORMATION DURING POST-NATAL DEVELOPMENT OF THE PRIMATE FACE. Robert W. Rice and Ordean J. Oyen, Department of Human Anatomy, College of Medicine and Anthropological Research Labs, Texas A&M University, College Station.

Among the various morphologic characteristics of the non-human primate face which develop after birth, two of the most evident are a variable expression of prognathism and the formation of robust supraorbital ridges. Comparably enlarged jaws and browridges relative to those of modern man were features of man's fossil ancestors which have prompted continued inquiry and hypotheses concerning their significance. Explanations for the evolutionary significance of heavy, overhanging brows include a trophic influence of the developing eyes and frontal lobes of the brain, a physical buttress for protection of the eyes from damaging blows, and a response to forces generated by the muscles and teeth of the masticatory system.

To clarify this issue we are analyzing supraorbital ridge development in cross-sectional collections of baboon, macaque and chimpanzee skulls. We have observed that the browridges form through a cyclic deposition on the outer table of the frontal bone of what has been termed fine cancellous bone. The periodicity of its formation correlates closely with the eruption and alignment in the occlusal plane of the molar teeth. During periods between these dental events, the fine cancellous bone is remodeled and assimilated into the brow, which thus enlarges by this recurring accretion of material. The proposed functional significance of this unique osteogenesis will be discussed.

A MORPHOLOGICAL STUDY OF THE ENDOCRINE CELLS OF THE CHANNEL CATFISH. K. Porter and W.A. Shannon, Jr., Veterans Administration Hospital and Department of Cell Biology, Southwestern Medical School, Dallas, Texas.

The channel catfish pancreas consists of a large principal body along with smaller accessory nodes. The principal body, Brockmann body, is primarily composed of endocrine cells encapsulated in connective tissue surrounded by exocrine tissue. Although the exocrine cells appear similar to mammalian exocrine cells, the endocrine cells vary in granule morphology.

The most salient A-cell granule contains a small electron-dense core of variable shape with a flocculent periphery usually extending to the limiting membrane of the granule. In a second type, dense material fills the granule and is surrounded by a thin halo. A third smaller granule also was observed in the A-cell corresponding in structure and density to the second type. The B-cell granule is unlike that of mammalian and even some teleost granules which consist of crystalline or fibrillar cores within clear vacuoles. In the catfish, they are composed of irregular, loosely arranged granular material of lesser density than A-granules. The granule of the D-cell is usually round, homogeneous and larger than the other granules. Basically, two densities of granules are apparent. Although analogous to the mammalian D-cell, the catfish pancreatic D-cells are more abundant. A fourth cell type which has been previously described was not found. However, another cell resembling the mammalian EC-cell and containing granules appearing similar to the A-cell second and third type granule was observed.

Different densities of cytoplasm were observed throughout the endocrine tissue. Darker cells exhibited extensive rough ER and Golgi and many secretory granules. Lighter cells appeared depleted with large irregular vacuoles. Supported in part by The Veterans Administration.

ULTRASTRUCTURE OF THE DERMAL CHROMATOPHORES IN THE TAIL SKIN OF THE FIVE LINED SKINK, EUMECES FASCIATUS. M. Lynn Davis, Department of Biology, Stephen F. Austin State University, Nacogdoches, Tx. 75962.

The five lined skink, **Eumeces fasciatus,** is a lizard native to the eastern United States. Juveniles possess a bright, blue tail which becomes brown in adults.

The integument of the tail includes two major subdivisions, the epidermis and the dermis. The dermis consists of a ground matrix of collagen in which the color producing cells (chromatophores) are located.

Two types of chromatophores are found in juveniles, whereas three types occur in adults. Both juveniles and adults possess iridophores and melanophores, but a third type of chromatophore is discovered superficial to the iridophores in adults. This cell type and its pigment (if any) are as yet unidentified. Ultrastructurally, these cells resemble neither the xanthophores nor the erythrophores described in this region in other lizards.

ALVEOLAR SOFT PART SARCOMA. Bruce Mackay, M.D., Ph.D., M. D. Anderson Hospital and Tumor Institute.

This tumor is known by a purely descriptive name because its histogenesis has never been determined. Fewer than one hundred cases have been reported in the world literature, with ultrastructural studies on ten. The tumor usually arises in skeletal muscle or fascial planes of the leg or arm in adolescents or young adults, and despite an apparently indolent course, it almost invariably metastasizes to lungs, bone or brain. By light microscopy, the tumor cells have an endocrine appearance, being arranged in nests separated by slender connective tissue partitions. Their fine structure is intriguing, but has not provided information to indicate the progenitor cell. The presence of small dense-core granules prompted the suggestion of a relationship to carotid body tumors and related tumors, but structures similar to paraganglia have never been demonstrated within the limb musculature. Our observations on eight cases are interesting rather than illuminating, in that we find granular and agranular endoplasmic reticulum, secretory-type granules, extensive glycogen, lipid and in some cases, distinctive rhomboid crystals that have previously been described and can be identified by light microscopy with the PAS staining procedure.

INCREASE IN THE INTRACELLULAR CONCENTRATION OF Na AND Cl AS HEPATOCYTES TRANSFORM FROM THE NORMAL TO THE NEOPLASTIC STATE. I. L. Cameron, N. R. Smith, B. Grubbs and T. B. Pool, Department of Anatomy, The University of Texas Health Science Center at San Antonio, San Antonio, Texas 78284.

Electron probe microanalysis using energy dispersive x-ray spectroscopy was used on unfixed tissues which were rapidly frozen, sectioned and cryosorbed. Ribbons of dry sections were transferred to a carbon planchet with a hole drilled in the center, and the sections to be analyzed were suspended

over the hole. Spectra were deconvoluted using a Flextran super ML least squares fitting program. Significant differences between means of elemental concentration (mmol/kg dry weight), (i.e. Na, Mg, P, S, Cl and K) were determined by subjecting the data to statistical analysis. Data were collected on the nucleus and cytoplasm in transformed hepatocytes from the transplantable Morris #7777 hepatoma, hepatocytes from the liver of a hepatoma-bearing rat, and hepatocytes from a rat given the hepatic carcinogen hydrazine sulfate. Na and Cl are in relatively low concentration in hepatocytes from the host liver but are in significantly higher concentration in the transformed hepatocytes of the Morris #7777 hepatoma. The hepatocytes from rats given the carcinogen showed values intermediate between the overtly transformed and the non-transformed hepatocyte. Our findings of high Na levels in transformed hepatocytes undergoing rapid cell proliferation and the increased Na in precancerous hepatocytes gives direct support to the hypothesis that the intracellular level of sodium is related to oncogenesis and to mitogenesis. (Supported by USPHS grants CA16831 and SO1 RR 05654.)

ULTRASTRUCTURAL OBSERVATIONS OF THE ARAGONITE CRYSTALS IN THE MOLLUSCAN BIVALVE HINGE LIGAMENT. M. E. Marsh, R. D. Summerall and R. L. Sass, Dept. Biology, Rice University, Houston, Texas.

The molluscan bivalve exoskeleton consists of two valves connected dorsally by an elastic ligament. The ligament is composed of protein and $CaCO_3$ (aragonite) crystals except in the family Pectinidae which has a noncalcified ligament. In other families the needle shaped crystals are oriented perpendicular to the growing margin of the ligament and are distributed in prismatic units similar to molluscan shells and vertebrate dental enamel.

The ligament crystals average 1000A in diameter and are surrounded by an osmiophilic protein sheath which is distinct from the ligament matrix protein. The isolated crystal sheaths have an amino acid composition different than the ligament matrix protein. In both longitudinal and cross sections, the crystals appear as if they had been split down the central (100) plane. Thus what originally appeared to be one crystal is actually two. Although the crystals are physically two, and were probably initially formed as two, they behave crystallographically as one unit, as if a single crystal had been sliced down the center and the two halves moved a few angstroms apart. Both crystals are surrounded by the same sheath. The identity of the material separting the crystals is unknown. When thin sections of the ligament are decalcified with EDTA or acid, only the hollow tubular crystal sheaths remain. The material between the crystals is extracted when the crystals dissolve. Epitaxial and compartment theories of mineralization are discussed in terms of these observations.

ARSENIC LOCALIZATION IN LIVER SUBFRACTIONS. Elsie M. B. Sorensen, Ruben R. Mitchell and Roland E. Henry: Department of Zoology and Mechanical Engineering, Cell Research Institute, The University of Texas, Austin, Texas 78712.

The direct exposure of **Lepomis cyanellus** to arsenic results in the appearance of hepatocyte nuclear inclusions which become more numerous as exposure time increases. Since small quantities of organically bound arsenicals are volatized by an electron beam, X-ray energy dispersive analysis techniques could not be used in these experiments to either qualitatively localize arsenic subcellularly or quantitatively assess the effect of increased exposure to arsenic. For these reasons subcellular isolation methods were employed to determine whether or not the nucleus was accumulating more arsenic as exposure time increased, as previously indicated by morphological data. These data indicated that while at one week 30% of the nuclei contained inclusions, at the end of 3 weeks this number had increased to 60%. In our experiments the level of arsenic in the nuclear fraction increased from 12 to 58% between the second and sixth day of exposure while arsenic in the soluble cytoplasmic fraction decreased from 46 to 17% during the same period. These experiments provide additional evidence that rapid intracellular transport mechanisms result in the localization of arsenic within the nuclear fraction and that arsenic is stored largely in the nucleus.

AORTIC BODY CHIEF CELLS AS PARANEURONS. John T. Hansen and Teri Ord, Department of Anatomy, The University of Texas health Science Center at San Antonio, San Antonio, Texas.

The chief cells of the aortic body arterial chemoreceptors share many morphological, physiological and metabolic characteristics in common with neurons and endocrine cells. For example, chief cells possess numerous 90-120nm dense-cored vesicles which contain dopamine and other catecholamines, as demonstrated by fluorescence histochemistry and biochemical analysis. Examination of both thin section and freeze-fracture preparations has provided evidence for the secretion of at least some of these amines by the process of exocytosis. Additionally, chief cells are of neural crest origin and physiological evidence suggests that they may function as interneuron-like cells which modulate the activity of adjacent sensory nerve endings. Finally, chief cells are in intimate contact with their abundant vasculature and may exert at least a local humoral effect by the secretion of amines or, an as yet unidentified polypeptide hormone, into the bloodstream. In keeping with these characteristics, aortic body chief cells are classified as paraneurons, a unique group of neuroendocrine relatives which are recepto-secretory in function. (Portions of this work were supported by a Grant-in-Aid from the American Heart Association (77 630) and with funds contributed in part by the Texas Affiliate.)

LYMPHOCYTE TUBULAR INCLUSIONS. W.J. Brown, J.D. Cook and W.A. Shannon, Jr., Veterans Administration Hospital and Department of Cell Biology and Neurology, Southwestern Medical School, Dallas, Texas.

The presence of tubuloreticular (TRI), tubulopolygonal (TPI) and virus-like inclusions (VLI) in peripheral blood lymphocytes has been described in various homogeneous patient populations. We investigated the occurrence of such structures in a heterogeneous population and attempted to determine if their presence could be induced in a lymphocyte culture following treatment with lymphocyte mitogens. From a group of 15 patients with non-related disorders, 10 were found to have TPI, 8 VLI and 2 TRI in their circulating lymphocytes. Within the groups exhibiting inclusions, the frequency of occurrence observed ranged from 2.5-16.0% for TPI, 1.6-2.5% for TRI and 1.5-5% for VLI. No correlation could be made between the high frequency of cells with inclusions in some patients and any disease state. The mean number of inclusions per cell as seen

on thin section was found to be: TPI-4.88, TRI-1.2, VLI-1.7. This data was contrasted with that obtained from 3 patients with Kearns-Shy Syndrome (ragged-red fiber disease). Although the absolute number of lymphocytes with TPI was only slightly greater than 5%, the mean number of TPI per cell was 8.1 — a significant increase over the heterogeneous population. The import of this difference is unknown. It has been suggested that TPI result following stimulation of lymphocytes by an unknown antigen. To investigate this possibility, lymphocytes in culture were treated with phytohemagglutinin, pokeweed mitogen and concanavalin A. Under these conditions, the cultured lymphocytes were induced into blast cell formation, the characteristic cell morphology associated with TPI; however, no TPI were detected.

Supported by Muscular Dystrophy Assn. and Veterans Administration.

SUBCLINICAL MYOPATHY DURING PHOSPHATE DEPRIVATION AND REPLACEMENT. R.N. Triplett, W.J. Brown, J.P. Knochel, and W.A. Shannon, Jr., Veterans Administration Hospital and Departments of Cell Biology and Internal Medicine, Southwestern Medical School, Dallas, Texas.

Hypophosphatemia induced by hyperalimentation can produce acute rhabdomyolysis in the dog if it is superimposed upon an existing subclinical myopathy created by phosphorus deprivation and partial starvation. If during hyperalimentation the diet is supplemented with phosphorus, acute rhabdomyolysis is precluded. For morphological analysis, muscle biopsies were taken after a 30% weight loss on a phosphorus and calorie deficient diet (PCD) and from the same animals 72 hours after hyperalimentation supplemented with phosphorus (PCD-HP). Light microscopy of the PCD specimens revealed a normal morphology in general with occasional areas of myofibrillar degeneration and altered banding pattern. EM evaluation of the PCD muscle indicated a normal cell morphology except in localized regions characterized by myofibrillar disorganization. Other cellular constituents appeared normal. The PCD-HP specimens exhibited a wider variation of morphology at the light level from normal to localized areas of myofibrillar degeneration. Banding patterns in the latter areas demonstrated slight "zig zagging" or were indistinct. EM of the PCD-HP tissue revealed normal ultrastructure with focal regions demonstrating myofibrillar degeneration characterized by necrosis, undulating M-lines, distortion of Z-lines and streaming of Z-lines. Nuclei, mitochondria and other cellular components were normal except in areas of extensive degeneration. A substantial accumulation of glycogen was also noted. Thus, even though blood chemistry and muscle biochemistry rapidly returned to normal, ultrastructural signs of myopathic involvement persisted after phosphorus replacement.

Funded by Veterans Administration and Nat. Instit. Alcohol Abuse & Alcoholism.

TSEM e⁻

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_____

Presented to the Council at _____ meeting. Date _____

Action _____

Remarks _____

Send Application to: John Hansen, Secretary
Department of Anatomy
University of Texas Health Science Center
San Antonio, Texas 78284

Regional News

EL PASO: University of Texas at El Paso.
Ultrastructure Laboratory Biological Sciences

Joanne T. Ellzey and John Greggerson received a grant from the El Paso Diabetes Association for ultrastructural studies of diabetic mice.

Joanne T. Ellzey and Elaine Huizar participated in the Mycological Society of America Workshop on Lower Fungi, August 18, 1978.

Joanne T. Ellzey and Elaine Huizar published the first ultrastructural photographs of germinating oospores and gemmae in the Oomycetes in **Lower Fungi in the Laboratory.**

Dr. Richard Salo from Baylor College of Medicine joined the faculty of the Biological Sciences Department, Univ. Texas at El Paso in September, 1978. Mr. George Aliaga is assisting in the Ultrastructure Laboratory as an Electron Microscope Technician.

Analytical Cytology will provide graduate instruction in electron microscopy for students at UT El Paso, Fall, '78. The course is taught by Dr. Joanne T. Ellzey.

EL PASO: William Beaumont Army Medical Center.

Dr. E. Duke (University of Texas at El Paso) and Dr. B.E.F. Reimann (out of New Mexico State University in Las Cruces, N.M.) published Chapter 3, entitled "The Ultrastructure of the Diatom Cell," pp. 65-109, in Botanical Monographs Vol. 13, D. Werner editor, Blackwell Scientific Publications, Oxford, London, Edinburgh, Melbourne (University of California Press, Berkeley, CA, here in the U.S.) 1977, which was recently reviewed in **Science (200,** 196, 1978).

Another book chapter which to write our team has been invited has been completed and is now in press: "Fixation, embedding, sectioning, and staining of algae for electron microscopy" by Duke, G. F. Floyd, Ohio State University, Columbus, Ohio, and myself as senior author, to appear in Handbook of Phycological Methods Vol. 3, E. Gantt editor.

The laboratory for electron microscopy which I am heading at William Beaumont Army Medical Center is involved in a number of research projects: One is concerned with the ultrastructural identification of prostaglandins within tissues; others deal with glomerular changes in various sytemic diseases.

Together with V. K. Berry (U.T. Health Center, San Antonio) and L. E. Murr (New Mexico Institute of Mining & Technology, Socorro, N.M.) work is done on **Thiobacillus ferroxidans,** part of which is accepted for presentation at the International Meeting in Toronto this year under the title "An Ultrastructure Comparison of Bacteria in Relation to their Catalytic Function in Leaching of Sulfide Minerals."

GALVESTON: University of Texas Medical Branch
Division of Cell Biology

Jeffrey Chang traveled to Taipei, Taiwan this past July to attend the annual meeting of Academia Sinica. He also presented lectures at Medical Schools in Kyoto and Tokyo, Japan.

Paul Baur has completed moving into a laboratory at the Shriners Burns Institute and reports that his new JELCO 100CX has been installed.

Some recent publications: Moller, P. C., Chang, J. P.: Redistribution of cell surface anionic sites on hepatoma cells after treatment with Concanavalin A, Eur. J. Cancer (1978) (In Press).

Department of Anatomy

Dr. Donald Duncan will be going to the Department of Structural Biology, Division of Human Anatomy, Stanford University School of Medicine as Visiting Professor of Structural Biology for four months this fall.

Department of Physiology

Recent publications include: Krauhs, J. M., Long, J. L., Baur, P. S.: Ultrastructure of microsporidian spores found in **Aplysia** neurons, J. Protozool. (1978) (In Press).

Anderson, M. C., Krauhs, J. M., Brown, A. M.: Relationship of aortic wall and baroreceptor properties during development in normotensive and spontaneously hypertensive rates, Circ. Res. (1978) (In Press).

NEW ORLEANS: Tulane University Medical School
Department of Anatomy

Grants Awarded:

Dr. Frank Olivito received a Schleider Foundation Grant to investigate the effects of protein deficiency on the CNS. Senior graduate student Craig Knox was awarded a grant from American Heart to continue his research with hypertensive rats and the blood brain barrier. Mr. Knox recently won the top award for graduate student research at the annual meeting of LSEM.

Publications:

Klara, P.M., Brizzee, K.R., Chen, I-li and Yates, R.D. Ultrastructural localization of ATPase activity in the dog area postrema. Brain Res., 146: 165-171, 1978.

Knox, C. and Mascorro, J.A. Age related changes in the cerebral cortex of spontaneously hypertensive rats as revealed by light and electron microscopy. (abstract). LSEM Spring Meeting, 1978.

New Equipment:

Samdri PV3 freeze dryer
Polaron SEM coating unit
MT2-B Ultramicrotome

New Faculty:

Two new members have joined the department: Dr. Mary Lou Anderson from Vanderbilt University and Dr. Frank Olivito from New Jersey College of Medicine. Dr. Mohindra Ogra from Southern University of New Orleans was a Visiting Professor during the summer and engaged in hypertension research.

Departmental Seminars:

Dr. Thomas Marino, Temple University; Dr. Thomas Pool, Univ. of Texas Health Science Center at San Antonio; Dr. Thomas Kwasigroch, Freie Universitat, Berlin; Dr. H. Melvin

Hunkle, Baylor College of Medicine; Dr. Marcia Welsh, Univ. of Texas Health Science Center at San Antonio; Dr. W. Geoffrey McAuliffe, University of Cincinnati Medical Center; Dr. Mark Van Houten, McGill University; Dr. Douglas Gross, Temple University.

SAN ANTONIO: University of Texas Health Science Center Department of Anatomy

Grants Awarded:

Dr. Hansen: National Institutes of Health. "Program of Research in Spinal Cord Injury." Section I: Project III: "Monoaminergic Control of Locomotion in Cats." (3 years) Co-Principal Investigator.

Publications:

Hansen, J.T. 1978. Development of the rabbit subclavian glomera (aortic bodies). A light, fluorescence and electron microscopic study. Am. J. Anat. (In Press)

Hansen, J.T. 1978. The Arterial Chemoreceptors. Scientific American. (In Press)

Hansen, J.T. 1978. Effects of 6-hydroxydopamine on rat carotid body chief cells. **Experientia** (In Press)

Morgan, W.W., and J.T. Hansen 1978. Time course of the disappearance of pineal noradrenalin following superior cervical ganglionectomy. Exp. Brain Res. (In Press)

Herbert, D.C., Ishikawa, H., Shino, M., and Rennels, E.G. 1978. Prolactin secretion from clonal pituitary cells following incubation with estradiol, progesterone, thyrotrophin releasing hormone and dopamine. Proc. Soc. Exp. Biol. Med. 157: 605-609.

Morgan, W.W., and Herbert, D.C. 1978. Elevation of serum prolactin levels following the inhibition of serotonin uptake. Endocrinology. (In Press)

Herbert, D.C. 1978. Identification of the LH and TSH-secreting cells in the rhesus monkey pituitary gland. Cell Tis. Res. 190: 151-161.

Herbert, D.C., Burke, R.E., and McGuire, W.L. 1978. Casein and a-lactalbumin detection in breast cancer cells by immunocytochemistry. Cancer Res. 38:2221-2223.

News Briefs:

Robert L. Schelper, M.D., just received his Ph.D. in Anatomy under the guidance of Dr. Adrian. The title of his Doctoral Dissertation was "A Study of Reactive Cells in Two Types of Nervous Tissue Injury Using Radioautography, Histochemistry and Electron Microscopy."

Marcia Welsh received her Ph.D. in Anatomy under the guidance of Dr. Reiter. The title of her Doctoral Dissertation was "Ultrastructural and Histophysiological Studies of the Pineal Gland of the Gerbil, **Meriones** unguiculatus."

New Faculty and/or Staff Members:

Dr. Thomas B. (Rusty) Pool, Assistant Professor of Anatomy. Ph.D. from Virginia.

Dr. Robert Gulley, Assistant Professor of Anatomy. Ph.D. from Minnesota.

Dr. Nick Grimes, Assistant Professor of Anatomy. Ph.D. from Brown University.

Dr. Linda Johnson, Instructor of Anatomy. Ph.D. Univ. Texas H.S.C.S.A.

HOUSTON: Baylor College of Medicine, Department of Medicine, Section of Cardiovascular Sciences

Dr. Margaret Ann Goldstein has been awarded the following grants for studies of Z bands and microtubules in striated muscle: 1) "Analysis of Z Bands in Heart by Optical Diffraction" (04-06, NHLBI), 2) "Microtubules and Related Structures in Heart Muscle" (01-02, AHA), 3) Differentiation of Skeletal Muscle: Structural Studies" (01, MDA). Dr. Goldstein is also co-investigator on a 3 year grant recently awarded for studies on ischemic heart muscle.

Mr. John Bucher has joined our research team and is working on the microtubule project with Dr. M.A. Goldstein, Dr. M.L. Entman, Mr. David Murphy and Ms. Cherie Gorman. John comes to us from Albany, N.Y. and from St. Lawrence University.

HOUSTON: Univ. of Texas Health Science Center

The Department of Neurobiology and Anatomy came into being in 1975 when it was composed of 5 faculty members housed in temporary quarters in the Center Pavilion Hospital. Over these past 3-4 years the faculty has quadrupled in size, now totalling 20. Today, after spending approximately 4 years in temporary quarters in the Center Pavilion Hospital and in the John H. Freeman Building, the Department of Neurobiology and Anatomy has relocated to its new permanent facilities. The department's new address and phone number are as follows:

Department of Neurobiology and Anatomy
The University of Texas Medical School at Houston
7.174 Medical School Main Building
P.O. Box 20708
Houston, Texas 77025
Ph. No. (713) 792-5700,01

Dr. Joe G. Wood, Professor and Chairman of the Department of Neurobiology and Anatomy is located in room 7.046 Medical School Main Building, phone number (713) 792-5702.

The facilities include approximately 25,000 sq. ft. on the 7th floor of The University of Texas Medical School Main Building. Each faculty member has approximately 1,000 sq. ft. of laboratory and office space, the remainder of the square footage being common equipment areas, student rooms, cold rooms, and the new electron microscopy facilities.

The department's electron microscope facilities total approximately 1,728 sq. ft. Equipment presently available in these facilities includes: a JEOL 100B EM, a JEOL 100CX EM with Kevex energy dispersive X-ray analysis, a microtomy suite housing 4 ultramicrotomes, and 2 dark rooms.

Projects currently utilizing the EM facilities include:

Michael Oberdorfer, Ph.D.
- — examination of the interaction between neural and pigmented epithelia in the embryonic mammalian eye
- — EM-autoradiographic study of the thalamic reticular nucleus in the rat
- — examination of induced myopathy and its effects on the neuromuscular junction (with Brad Schwab, Graduate Student)

Dianna A. Redburn, Ph.D. and Cindy Keiller, Graduate Student
- — examination of morphological damage caused by kainic acid on vertebrate retina

Dianna A. Redburn, Ph.D. and Susan Picologlou, Ph.D.
- — autoradiographic study on neurotransmitters and their agonists in vertebrate retina

JoAnn McConnell, Ph.D.

— analysis of the autonomic innervation of human male pelvic viscera (urogenital system)

Joe G. Wood, Ph.D. and Marilyn Munkres, director of EM facilities

— cytochemical localization of biogenic amines in the central and peripheral nervous system
— X-ray analysis of amine storage sites

EM education possibilities currently available involve tutorials for graduate students in EM techniques.

LECTURES, PRESENTATIONS AND COLLABORATION

**S.J. Enna, Ph.D., Associate Professor, Departments of Neurobiology & Anatomy, and Pharmacology

Date: April, 1978
Place: National Institute of Health, Bethesda, Maryland
Symposium: "Autosomal Dominant Neurological Disorders"
Presentation: "Molecular Biology of Huntington's Disease"

Date: May, 1978
Place: Copenhagen, Denmark
Symposium: Alfred Benzon Symposium, "GABA — Neurotransmitter"
Presentation: "Pharmacological Characteristic of GABA Receptors in Human Brain"

Date: May, 1978
Place: Merck Sharpe & Dohme Pharmaceutical Co., Westpoint, Pennsylvania
Presentation: "Receptor Binding Techniques in Pharmacology"

Date: June, 1978
Place: Clarke Institute, University of Toronto, Canda, Department of Pharmacology
Presentation: "Pharmacology of GABA"
Place: same, Department of Psychiatry
Presentation: "GABA in Neuropsychiatric Disorders"

Date: July-August, 1978
Place: Hoffman LaRoche, Basel, Switzerland
Presentation: "Recent Studies on the Biochemistry of GABA"

Place: Strasbourg, France
Symposium: "GABA — Biochemistry and CNS Function"
Presentation: "GABA Receptor — Regional Variation"

Place: Paris, France
Meeting: 7th International Congress of Pharmacology
Presentation: "Regional Variation of GABA Receptors in Mammalian Brains"

**Michael Oberdorfer, Ph.D. Assistant Professor

Date: July, 1978
Place: Madison, Wisconsin, University of Wisconsin
Collaborated with colleagues on an examination of neural connections between the visual cortex and the LP-pulvinar complex in the cat. This collaborative effort resulted in a manuscript now in preparation for publication in **Brain Research.**

**Dianna A. Redburn, Ph.D., Assistant Professor

Date: May, 1978
Place: Osaka, Japan
Meeting: International Meeting of the Association for Research in Vision and Ophthalmology
Collaborated with colleagues and enjoyed an extended tour of Japan

**Nachum Dafny, Ph.D., Professor

Date: July 3-5, 1978
Place: Janssen Pharmaceutica, Beerse, Belgium
Symposium: First International Symposium on Drugs as Discriminative Stimuli
Presentation: *(1) "Morphine discrimination of unit activity patterns recorded from central gray, caudate nucleus and parafasciculus thalami"
*(2) "Morphine discrimination sensory input recorded from several brain sites"

*These projects are the result of collaborative effort with Benjamin S. Rigor, Sr., M.D., Department of Anesthesiology, University of Texas Medical School at Houston

Date: July 24, 1978
Place: Instituto Mexicano del Seguor Social,
Mexico City, Mexico
Presentation: "Is the pineal an endocrine gland or neuronal modulator?"

NEW FACULTY AND STAFF MEMBERS

David McCandless, Ph.D. Assistant Professor
Gerald Kozlowski, Ph.D., Associate Professor
Jack Waymire, Ph.D., Assistant Professor
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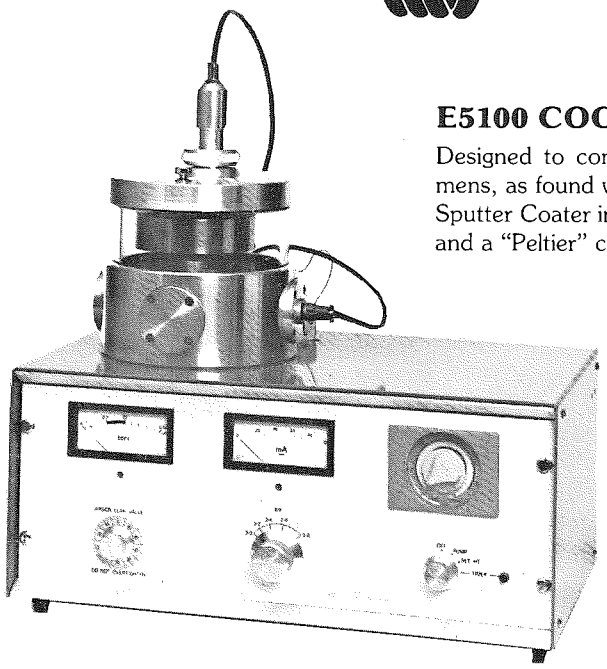
Michael E. Miner, M.D., Associate Professor (joint appointment from Neurosurgery)
Heyl G. Tebo, D.D.S., Professor (joint appointment from Anatomy, UT Dental Branch)
Lisa Arbisser, M.D., Postdoctoral Fellow
Susan Picologlou, Ph.D., Research Associate
C. M. Prasad, Ph.D., Research Associate, (joint appointment from Anesthesiology)
Adriana Maggi, Ph.D., Teaching Associate
Donna Harrison, EM Technician
Barbara Bate, Administrative Secretary
Pat Viviano, Research Technician

Pat Viviano has recently joined the Department of Neurobiology and Anatomy as the Skin Bank coordinator for the Skin Transplant Center for Burns at the University of Texas Health Science Center at Houston. The Skin Transplant Center for Burns ia satellite project of the Skin Bank at The University of Texas Southwestern in Dallas.

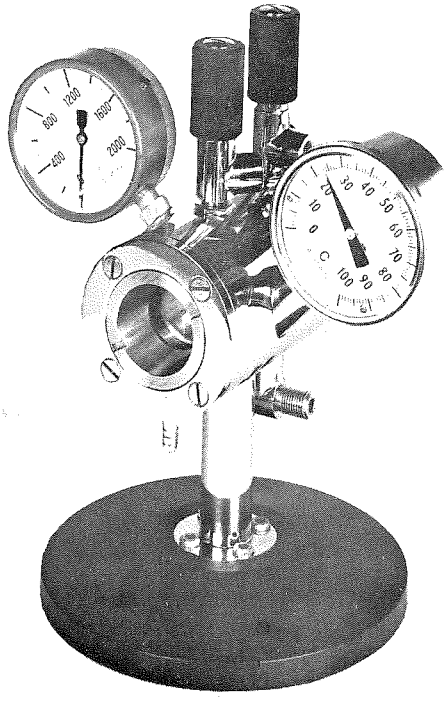
Polaron Instruments Inc.



E5100 COOL SPUTTER COATER

Designed to completely eliminate thermal damage of biological specimens, as found with other sputtering systems, the POLARON "COOL" Sputter Coater incorporates a unique combination of Electron Deflection and a "Peltier" cooled specimen stage.

A further advantage of the POLARON unit is the superior coating coverage of specimens with very irregular surface topography. This is achieved by utilizing a high accelerating voltage in conjunction with a low pressure vacuum system, giving rise to target atoms having longer mean-free paths.



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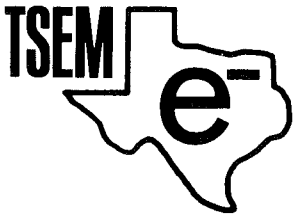


Questionnaire For Readers of TSEM Newsletter

1. What do you read in the TSEM newsletter?

   _____ everything
   _____ advertisements
   _____ a. in general — to see what is available
   _____ b. for specific items such as:
   _____ 1. new accessories for equipment you have
   _____ 2. new equipment by your favorite manufacturer
   _____ 3. new types of equipment
   _____ abstracts
   _____ feature articles(s)
   _____ letters to editor
   _____ regional news
   _____ President's letter
   _____ job descriptions and applications
   _____ by-laws
   _____ notices for future meetings

2. What do you look at in the TSEM newsletter?

   _____ advertisements
   _____ featured electron micrographs
   _____ names of new members or new addresses for current members
   _____ news from EMSA

3. What do you like most about the newsletter?

4. What do you like least?

5. What special features would you like to see in future issues?

6. What items would you like to see eliminated?

7. Do you think we should have a Library of Congress number?

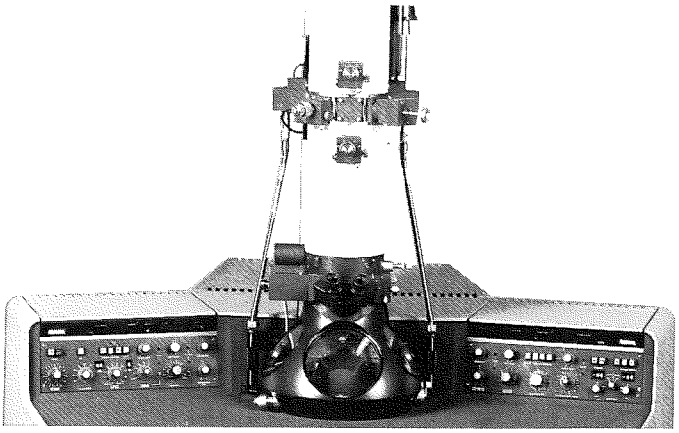
8. If so, do you think the name should be changed to Proceedings of the TSEM?

9. If so, do you think that the personal news items should be sent out as a separate mimeographed sheet?

10. Specific comments you wish to see in print:

Philips *versatility:*
performance for any TEM requirement

Philips EM400 Systems



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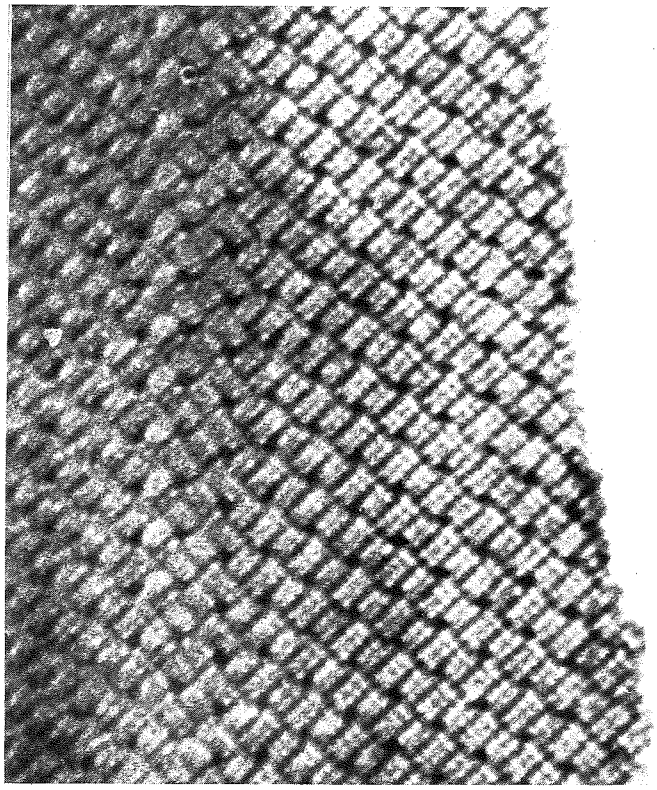

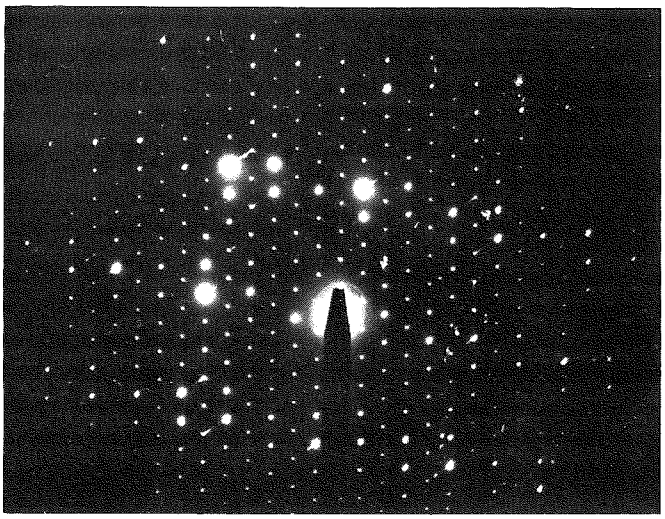

Block lattice image of high temperature Nb_2O_5, 3.300.000
Diffraction pattern imaged in the objective aperture

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