

SCIENCE

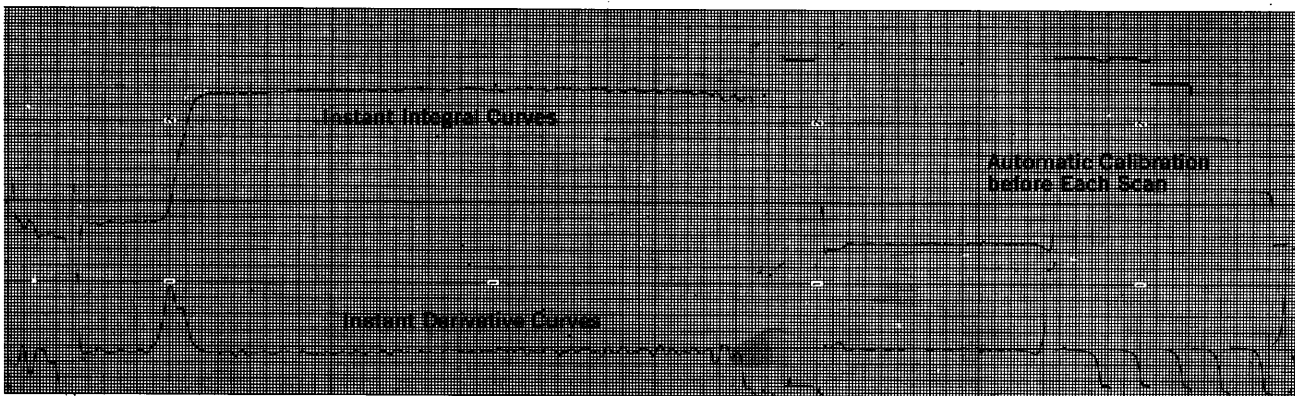
12 January 1968

Vol. 159, No. 3811

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



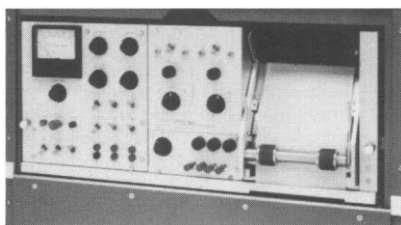
BONE TOOL



Boundary Velocity Experiment, two DNA's, 44,000 rpm, 265 mμ

Direct Scanning...the new era in analytical ultracentrifugation

The Photoelectric Scanner permits investigators, for the first time, to take full advantage of the highly discriminating absorption optical system of the Model E. It provides split-beam photometry—during centrifugation, at wavelengths selectable at will from 440 mμ down to 236 mμ. You can see what is happening in the cell as it happens because you get an immediate written record, and both integral and derivative curves are recorded simultaneously.



Recorder and controls for Photoelectric Scanner

Thus direct scanning frees you from the tedious procedures associated with the camera; provides "direct viewing" of sedimentation processes, electronic precision and discrimination in scanning the cell, and a variety of

wavelengths at which to work. The precision and versatility that this new tool brings to biochemical research will inevitably open new areas of study. Already two investigators working with a scanner have been able to distinguish the catalytic and regulatory protein subunits of an enzyme in an association-dissociation study that augurs well for exciting work ahead.

What that work will be, what more will be accomplished in the era of direct scanning, only time and the ingenuity of investigators will tell.

Inherent advantages of the Scanner

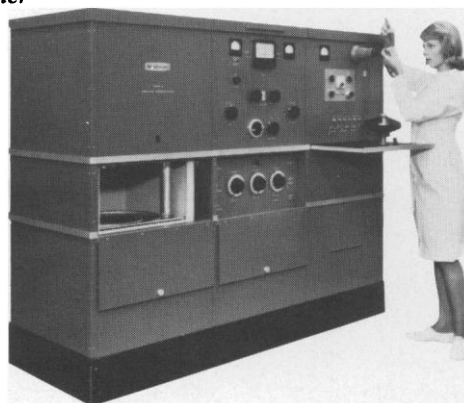
- Because the Scanner utilizes the split-beam principle, two samples in a double sector cell can be subjected to identical experimental conditions—an important factor in studying extremely small differences in sedimentation coefficients, for example. Or sample solution and solvent can be used in the double sector cell, with solvent

reading automatically subtracted from the sample solution.

- With the Scanner classical sedimentation equilibrium measurements at extremely low concentrations in the UV are significantly easier to make. And they are more accurate because calibration steps are recorded before each scan.

- Having both curves simultaneously is a real advantage. For example: the derivative curve can show the presence of secondary components not readily recognizable from the integral curve; the integral curve can show heterogeneous material not revealed by the derivative curve.

For more information about the Photoelectric Scanner, write to Spinco Division at the address below.



Beckman

INSTRUMENTS, INC.

SPINCO DIVISION

PALO ALTO, CALIFORNIA • 94304

INTERNATIONAL SUBSIDIARIES: GENEVA; MUNICH; GLENROTHES, SCOTLAND; TOKYO; PARIS; CAPE TOWN; LONDON; MEXICO CITY

Current Texts in Chemistry

New 3rd Edition In Press

Fischer & Peters:

QUANTITATIVE CHEMICAL ANALYSIS

By ROBERT B. FISCHER, Ph.D., *California State College at Dominguez Hills*, and DENNIS G. PETERS, Ph.D., *University of Indiana*.

Now in press, the New (3rd) Edition of this widely used and respected textbook presents a well balanced treatment of the theory and practice of analytical chemistry. The authors discuss gravimetric, volumetric, optical, and electrical methods of analysis, as well as several important techniques of separation. Heavy reliance is placed upon equilibrium calculations to explain and justify analytical procedures. The authors present thorough and detailed discussions of examples that demonstrate the application of each method, and a wide selection of varied and challenging problems.

About 800 pages, illustrated.

Ready Spring, 1968.

Banks: NAMING ORGANIC COMPOUNDS

A Programed Introduction to Organic Chemistry
By JAMES E. BANKS, Ph.D., *U.S. Air Force Academy*

This programed study guide is invaluable for developing a fast, sure comprehension of the rules by which chemists name organic compounds and represent their structure—a subject that most textbooks leave for the student to acquire on his own. *Naming Organic Compounds* is more than a drill book; it conveys basic information as it presents nomenclature (following the IUPAC-Chemical Abstracts rules) in a logical, easy-to-understand manner. Phenols, amides, and heterocyclics are included. The various groups of compounds are illustrated with examples from everyday life—DDT, 6-12, benzedrine, adrenalin, etc. Each right hand page presents information and a multiple-choice question. The following page gives appropriate comments for both correct and incorrect answers, so that the student learns immediately whether he is right or wrong and why. No prior knowledge of organic chemistry is required.

276 pages, illustrated. \$4.50. New—Published September, 1967.

Masterton & Slowinski: CHEMICAL PRINCIPLES

By WILLIAM L. MASTERTON, *University of Connecticut*, and EMIL SLOWINSKI, *Macalester College*.

This major new text for the full-year introductory college course in general chemistry maintains a careful balance between the theoretical and the descriptive. It is organized around types of reactions (oxidation-reduction, acid-base, precipitation, etc.) rather than families of elements. It does not rely on higher mathematics, but emphasizes experimental proof of principles and concepts, and quantitative calculations that promote a logical approach to problem solving and laboratory practice. Imaginative problems help to develop the student's reasoning ability. Instructor's Manual available.

668 pages, 150 figures. \$8.75. Published April, 1966.

A New Book

Mazur & Harrow:

BIOCHEMISTRY

A Brief Course

By ABRAHAM MAZUR, Ph.D., and BENJAMIN HARROW, Ph.D. (Emeritus), *both of City College of the City University of New York*.

This new text presents the core of biochemistry in a one-semester course. It is designed for undergraduates majoring in physics, chemistry, or chemical engineering, as well as those who will go on to graduate study in medicine, dentistry, biology, or biochemistry. Students will appreciate the clear presentation, logical organization, and abundant illustrations. Instructors will value the concise reviews of chemical and biological principles, the balance of emphasis between chemistry and metabolism, and the ease with which this text can be adapted to different teaching plans. Although material on applications of biochemistry has been omitted, the authors have related biochemical events to a particular cell or organelle whenever possible.

About 450 pp., illustrated. About \$8.00.

Ready March, 1968.

Texts Gladly Sent to Teachers on Approval

W. B. SAUNDERS COMPANY, West Washington Sq., Philadelphia, Pa. 19105

12 January 1968

Vol. 159, No. 3811

SCIENCE

LETTERS	Reducing Imports of Rare Wildlife: <i>H. R. Gregg</i> ; Scientific Responsibility in Modern Life: <i>J. H. Steward</i> ; Can the Ends Justify the Means?: <i>L. Lykken</i> ; <i>A. M. Shapiro</i> ; Care for Indigents in Bolivia: <i>R. W. Tichauer</i> ; Computer Costs: A Reasonable Approach: <i>C. W. Bastable</i> ; Farming Success in India: <i>R. B. Davis</i>	147
EDITORIAL	The Only Earth We Have	155
ARTICLES	Preservation of Coast Redwood Alluvial Flats: <i>E. C. Stone</i> and <i>R. B. Vasey</i>	157
	Paramutation: Directed Genetic Change: <i>R. A. Brink</i> , <i>E. D. Styles</i> , <i>J. D. Axtell</i> ...	161
	How May Congress Learn?: <i>A. Etzioni</i>	170
NEWS AND COMMENT	Expansion of Idaho Reservoir: Indians, Scientists on Warpath	173
	American Science Policy: OECD Publishes a Massive Critique	176
	Budgeting for Research: British Study the Cost of "Sophistication"	178
	New AAAS Committee To Study Chemical Defoliants	179
	CERN II: Still Not Past the Starting Line	180
BOOK REVIEWS	<i>Background to Evolution in Africa</i> , reviewed by <i>G. G. Simpson</i> ; other reviews by <i>H. Jupnik</i> , <i>R. Zwanzig</i> , <i>W. E. Nance</i> , <i>W. L. Brown, Jr.</i> , <i>P. Handler</i> ...	182
REPORTS	Mammoth-Bone Shaft Wrench from Murray Springs, Arizona: <i>C. V. Haynes</i> and <i>E. T. Hemmings</i>	186
	Glaciation in Taylor Valley, Antarctica, Older than 2.7 Million Years: <i>R. L. Armstrong</i> , <i>W. Hamilton</i> , <i>G. H. Denton</i>	187
	Cosmic Ray-Produced Radionuclides as Tracers of Atmospheric Precipitation Processes: <i>N. A. Wogman</i> et al.	189
	Urban Haze: The Extent of Automotive Contribution: <i>W. E. Buchan</i> and <i>R. J. Charlson</i>	192
	Pyrite Group: An Unusual Member: $\text{Cu}_{0.60}\text{Ni}_{0.14}\text{Co}_{0.03}\text{Fe}_{0.23}\text{S}_2$: <i>P. J. M. Ypma</i>	194

BOARD OF DIRECTORS

ALFRED S. ROMER
Retiring President, Chairman

DON K. PRICE
President

WALTER ORR ROBERTS
President-Elect

BARRY COMMONER
DAVID R. GODDARD

HUDSON HOAGLAND
GERALD HOLTON

VICE PRESIDENTS AND SECTION SECRETARIES

MATHEMATICS (A)
A. M. Gleason
Wallace Givens

PHYSICS (B)
W. W. Havens, Jr.
Stanley S. Ballard

CHEMISTRY (C)
Herman F. Mark
Milton Orchin

ASTRONOMY (D)
John S. Hall
Frank Bradshaw Wood

ANTHROPOLOGY (H)
Alexander Spoehr
Anthony Leeds

PSYCHOLOGY (I)
Leo J. Postman
Frank W. Finger

SOCIAL AND ECONOMIC SCIENCES (K)
David Truman
Eugene B. Skolnikoff

HISTORY AND PHILOSOPHY OF SCIENCE (L)
Peter J. Caws
Raymond J. Seeger

PHARMACEUTICAL SCIENCES (Np)
Curtis Walden
Joseph P. Buckley

AGRICULTURE (O)
Richard Geyer
Ned D. Bayley

INDUSTRIAL SCIENCE (P)
Allen V. Astin
Burton V. Dean

EDUCATION (Q)
Herbert A. Smith
Frederic B. Dutton

DIVISIONS

ALASKA DIVISION

Richard Hill
President

Irma Duncan
Executive Secretary

PACIFIC DIVISION

Garrett Hardin
President

Robert C. Miller
Secretary

SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Howard J. Dittmer
President

Marlowe G. Anderson
Executive Secretary

SCIENCE is published weekly on Friday and on the fourth Tuesday in November by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with *The Scientific Monthly*. Second-class postage paid at Washington, D.C. Copyright © 1968 by the American Association for the Advancement of Science. Annual subscriptions: \$12; foreign postage: Americas \$3; overseas \$5; single copies, 50¢ (back issues, \$1) except *Guide to Scientific Instruments*, which is \$2. School year subscriptions: 9 months, \$9; 10 months, \$10. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Calcium Carbonate Concretions Formed by the Decomposition of Organic Matter: <i>R. A. Berner</i>	195
Dense-Gas Chromatography of Nonvolatile Substances of High Molecular Weight: <i>L. McLaren, M. N. Myers, J. C. Giddings</i>	197
Infrared Color Photography: Selective Demonstration of Bacteria: <i>L. E. Casida, Jr.</i>	199
Viral Neoplastic Transformation of Hamster Prostate Tissue in vitro: <i>D. F. Paulson, A. S. Rabson, E. E. Fraley</i>	200
Atypical Cholinesterase Gene E_1^a : Rarity in Negroes and Most Orientals: <i>A. G. Motulsky and A. Morrow</i>	202
Selective Solubilization of a Protein Component of the Red Cell Membrane: <i>V. T. Marchesi and E. Steers, Jr.</i>	203
Hemoglobin Hijiama: A New Fast-Moving Hemoglobin in a Japanese Family: <i>T. Miyaji et al.</i>	204
Crystal and Molecular Structure of Adenosine 3',5'-Cyclic Phosphate: <i>K. Watenpaugh et al.</i>	206
Sex Attractant of Sugar Beet Wireworm: Identification and Biological Activity: <i>M. Jacobson, C. E. Lilly, C. Harding</i>	208
Protein Conformation in Solution: Cross-Linking of Lysozyme: <i>G. L. Moore and R. A. Day</i>	210
Durum-Type Wheat with High Bread-Making Quality: <i>P. J. Kaltsikes, L. E. Evans W. Bushuk</i>	211
Membrane Origin of the Fast Photovoltage of Squid Retina: <i>W. A. Hagins and R. E. McGaughy</i>	213
Hexokinase Isoenzymes in Human Erythrocytes: <i>J. C. Kaplan and E. Beutler</i>	215
Macrophage Cultures: An Extracellular Esterase: <i>E. Wiener and D. Levanon</i>	217
Cabbage Aphid: Effect of Isolation on Form and on Endocrine Activity: <i>D. F. White</i>	218
Amnesia: A Function of the Temporal Relation of Footshock to Electroconvulsive Shock: <i>A. M. Schneider and W. Sherman</i>	219
Technical Comment: Lipids and the Assembly of Chloroplast Membrane: <i>S. Patton</i>	221


MEETING REPORTS	Calorimetry: <i>D. L. Hildenbrand</i> ; Calendar of Events	222
------------------------	--	-----

MINA S. REES ATHELSTAN F. SPILHAUS	H. BURR STEINBACH JOHN A. WHEELER	PAUL E. KLOPSTEG Treasurer	DAEL WOLFLE Executive Officer
GEOLOGY AND OCEANOGRAPHY (E) Louis Quam Richard H. Mahard	ZOOLOGICAL SCIENCES (F) Colin S. Pittendrigh David E. Davis	BOTANICAL SCIENCES (G) William C. Steere Warren H. Wagner	
ENGINEERING (M) Paul Rosenberg Newman A. Hall	MEDICAL SCIENCES (N) Julius H. Comroe	DENTISTRY (Nd) Lester R. Cahn Richard S. Manly	
INFORMATION AND COMMUNICATION (T) Phyllis V. Parkins Ileen H. Stewart	STATISTICS (U) George E. P. Box Rosedith Sitgreaves		

COVER

Bone tool, 11,200 years old, from Murray Springs, Arizona. Tool appears to be well suited for straightening wood or bone used for shafts of spears. The tool is 259 millimeters long and 21 millimeters thick. See page 186. [Helga Teiwes, Arizona State Museum, Tucson]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



New opportunities in physical and occupational therapy

1. College program for occupational therapy majors. If you want to become a professionally qualified occupational therapist, the Army

will start helping in your junior year. You can receive a monthly education subsidy while you complete your undergraduate studies at your present school. Then you'll study at one of the Army's modern hospitals in Washington, San Francisco or

San Antonio. There you'll receive clinical training in occupational therapy to fully qualify you for military or civilian practice.

2. Clinical affiliation for occupational therapists. Occupational Therapy Students may be selected for participation in the 36-week Army clinical affiliation. This unique program includes supervised training and experiences second to none. As a second lieutenant, you may accumulate creditable time towards pay and longevity while receiving your training.



3. Physical therapy program for college graduates. The Army offers college graduates one of the finest physical therapy programs in the Nation. As a commissioned officer you will attend the Medical Field Service School at Fort Sam Houston, Texas. After completing this curriculum you will be fully qualified for military or civilian practice.

4. Today's challenge gives therapists valuable new clinical experience. The challenge to professional occupational and physical therapists comes from wounded American soldiers. While serving in the Army Medical Specialist Corps, you can gain valuable professional experience

on cases seldom seen in civilian practice. You will work on the finest professional staffs. You will have broad opportunities for continuing education, professional advancement and travel that are designed to meet your professional and personal interests.

Learn about all the opportunities waiting for you in the Army Medical Specialist Corps. Mail this coupon today.

Army

S-5-35

Medical Specialist Corps
Office of the Surgeon General
Department of the Army
Washington, D.C. 20315
MEDPT-MP

Please send me full details on my opportunities in the Army Medical Specialist Corps.

☐ I am a college student in my _____ year.
My major is _____
I expect to graduate in _____.

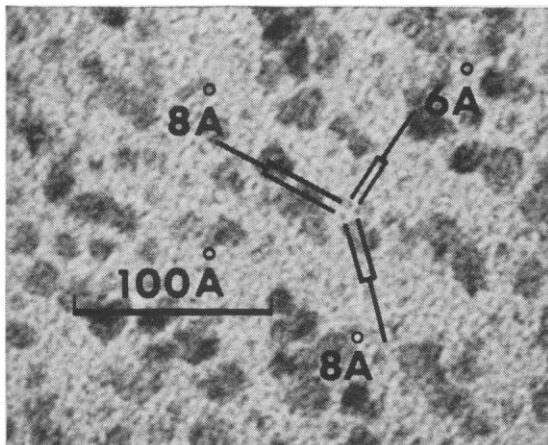
☐ I am a college graduate.
My major was _____
I am interested in
☐ occupational therapy.
☐ physical therapy.

☐ I am a qualified physical therapist.
☐ I am a qualified occupational therapist.

Name _____
Address _____
City _____ State _____
Age _____ Zip Code _____

The new Model HS-8: The most electron microscope for your money.

If you need a high-performance instrument, the new Hitachi Perkin-Elmer Model HS-8 is for you. Its guaranteed resolution is 8 Angstroms, and it costs under \$30,000.



Evaporated gold specimen shows a point-to-point resolution of 6 to 8 Å. Magnification is 2,500,000X.

Here's an instrument that's so easy to align, so easy to use, so compact and reliable, that it far surpasses all other instruments in its price class. It offers high resolution and automatic operation.

Features you've been wishing for

The Hitachi Perkin-Elmer HS-8 is the only instrument in its price range that gives you two accelerating voltages—25 KV for high contrast and 50 KV for general purpose use—at the

touch of a button.

It's the only instrument in its class that has a double condenser lens. The double condenser and objective-intermediate lenses are unitized and pre-aligned.

The HS-8 gives you 20 precalibrated steps of magnification with direct console readout —1000X to 100,000X direct . . . over 1,000,000 photographically. A special, small, fine-grain screen makes focusing easy.

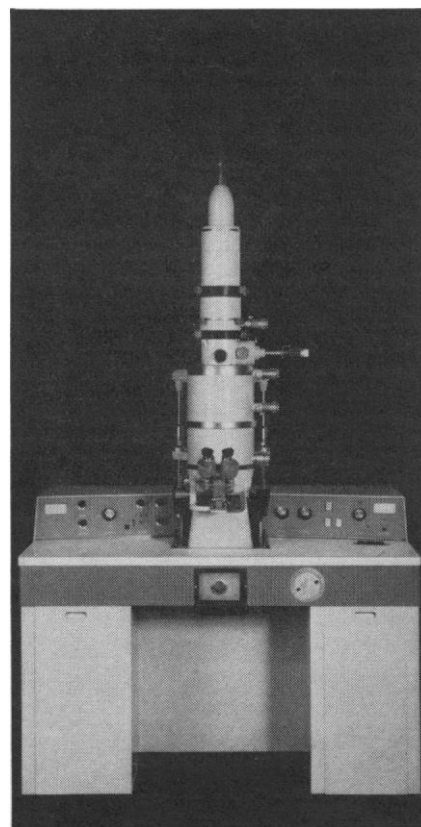
The HS-8 has a new pushbutton vacuum system that practically eliminates specimen contamination. It uses a new non-backstreaming pump oil and a new built in anti-contamination device that traps contamination before it reaches the specimen.

The camera system is also pushbutton. Correct exposure is automatic. You get a pre-pump chamber that can keep 54 photo plates under vacuum, ready for use.

We'd like you to know more about this fine new microscope. In its price range, you won't find an instrument with more consistent high performance or more of the outstanding features

you would expect only in high-priced electron microscopes. Write to: Perkin-Elmer Corporation, Instrument Division, 723 Main Avenue, Norwalk, Conn. 06852 or your nearest Perkin-Elmer sales office.

PERKIN-ELMER



The hope of doing each other some good prompts these advertisements

Kodak

Doesn't everybody know all this?

KODACHROME-X 135 Film and KODACHROME II 135 Film are for processing to 24 x 36mm transparencies. When you buy a KODAK Prepaid Processing Mailer PK36 for \$3.40,* you are paying the same outfit that made the film to process 36 exposures of it, mount them ready for the slide projector, and mail them back directly to you.

Mailer PK20 costs \$1.30 less because used only for 20-exposure cartridges or for the 20-exposure 126 size (28mm square format), such as you need for the KODAK INSTATECH Close-Up Camera.

PK36 and PK20 are also good for EKTACHROME-X 135 and 126 Film, which give a color rendition in the slides that some like better, and for High Speed EKTACHROME 135 and 126 Film.

If you should require a print from one of these transparencies, the dealer can have us make it in one of seven sizes up to 11 x 14" (which lists at \$7.75).

KODACOLOR-X Film is primarily for color prints. Your purchase from the dealer at \$4.40 of Mailer DP20-2R pays us to process a 20-exposure 135 magazine of it and send you the negatives with a 2½ x 3½" KODACOLOR Print from each. For other sizes there are other mailers at other prices. Later the dealer can have us make a projection-mounted KODACOLOR Transparency slide from any of these 35mm negatives for 30¢. KODACOLOR-X Film also comes in 36-exposure 135 magazines, in 126 form, and in roll film sizes. We can even make you 31mm square color slides from any of the roll-film negatives at 40¢ each. Also, KODACOLOR Enlargements are available in sizes to 11 x 14", cropped from standard masks the dealer should be able to show you.

*Prices peppered around here to provide a frame of reference are subject to change without notice. The dealer establishes the actual prices you pay, whether we do the work or you allow it to be sent to a plant that may offer quite different sizes, terms, and quality.

Clean windows in the ir and uv

If you have ever been delayed at a grade crossing while a tankcar of our ethyl acetate or our butyl acetate was being spotted into a siding, forgive us. If the car carried toluene, it wasn't ours. Whatever the names on the cars, you were seeing economic waste if the contents were purer than they needed to be for their purpose.

These same three compounds, when relieved of impurities, become quite different articles—useful in laboratories as spectrophotometric solvents. In 0.03mm path length they offer the following ir windows:

Ethyl Acetate	Butyl Acetate	Toluene
2.0-3.2μ	2.0-3.2μ	2.3-3.2μ
3.6-5.5μ	3.6-5.5μ	3.5-6.2μ
6.2-6.5μ	6.2-6.5μ	7.3-8.4μ
10.2-10.5μ	12.6-13.3μ	8.6-9.1μ
11.1-11.6μ	13.7-15.0μ	9.8-13.2μ
12.1-12.5μ		
13.0-15.0μ		

Uv energy absorption for 1cm path length exceeds ten times that of H₂O at:

255mμ	255mμ	285mμ
-------	-------	-------

For this purpose there will be economic waste and possibly worse unless you can trust the bottler for the purity to keep those windows open. Because we have merited that kind of trust over the years, we can now add to our list of Spectro Grade solvents Ethyl Acetate as EASTMAN S300, Butyl Acetate as EASTMAN S710, and Toluene as EASTMAN S325. They join all the other laboratory necessities that stand out among the items of lesser known utility in the catalog of some 5300 EASTMAN Organic Chemicals.

Place orders for EASTMAN Organic Chemicals with Allied, Curtin, Fisher, Howe & French, North-Strong, Sargent, Van Waters & Rogers, Walker, or Will—prominent laboratory suppliers all.

Eastman Kodak Company
Rochester, N. Y.

Dear Sirs:

In only 7 years hence I expect to be 21 years of age and it will be legal for me to engage in investment and speculation without consent. I am now preparing for that time. It is therefore necessary for me to have certain information about scientific developments that will take place. As I have been interested in photography I would like to know what plans you have for bringing out new kinds of films to work with laser light instead of plain light. I also happen to understand how cathode-ray tubes work and would like to know why you don't make film where the electron beam works right on the film instead of making light on the tube face and then photographing that.

Yours very truly,
Herman Small

("Herman Small" is a composite.)

Dear Mr. Small:


You sound like the sort of person who is going to be taking charge of things in the comparatively near future and we had better not kid around with you.

As a matter of fact we have been working hard for years on film for direct electron recording of cathode-ray images. We have even sold a little of it, but not much. It seems to be a very good way to pack information at megacycle frequencies into far more compact form than magnetic recording permits. (We assume you are familiar with megacycles.) Sale is still small because there is as yet very little equipment around that can make use of such film. To the extent that this development is involved in the planning of the financial program that you intend to launch in 1975, we wish you luck. It may be big then or it may have died. If we knew, we'd be bolder now.

On films for use in the laser art, it is the same old question of how bold to be with funds such as you yourself might have already entrusted to us (if it had not been for the matter of consent). It seems fairly clear that by the time you settle down into the driver's seat, much more of what we have already learned in making the film that has kept you interested in personal photography will have moved from that area into the use of color film technology in dealing with modulated optical frequencies. We have the color film technology in pretty good shape, but we can't afford to bet it on every horse in the race. It costs an awful lot of money to make a few feet of new color film not made before, even if you have a pretty good idea of how to make it. Lots of ideas will doubtless be brought to us in hope of film. We too need a little luck in picking winners.

Very truly yours,

EASTMAN KODAK COMPANY



Investigate Random or Periodic Processes with Correlation Function Computers

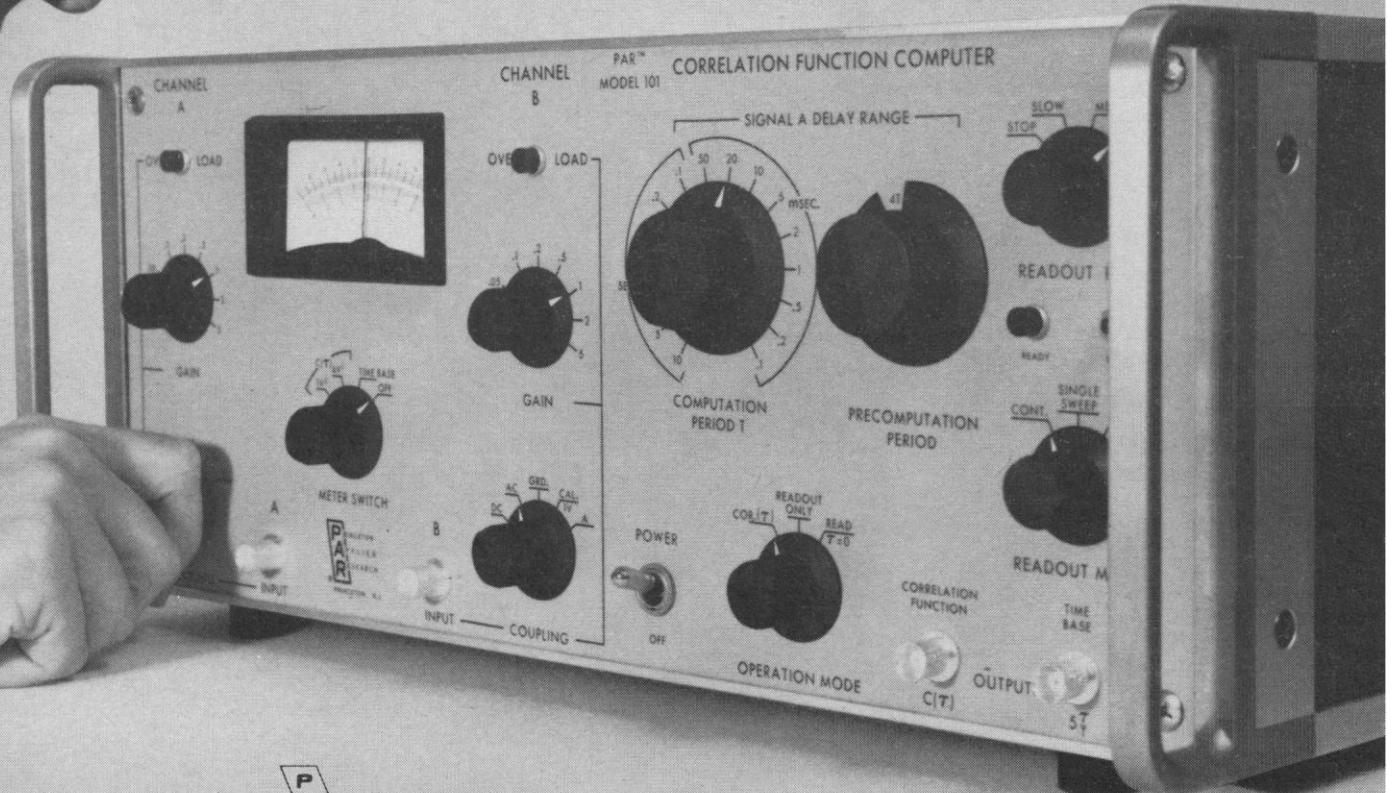
Correlation functions occupy a cardinal position in modern information theory and are basic to the analysis of random or periodic processes and the complex signals they produce. In many application areas, autocorrelation analysis allows noisy periodic or random signals to be defined, whereas crosscorrelation can determine the degree of conformity between two different noisy signals as a function of their mutual delay.

PARTM Models 100 or 101 Correlation Function Computers simultaneously compute 100 points of the auto- or crosscorrelation function in real time over delay spans from 100 microseconds to 10 seconds. The Model 101 includes the capability for insertion of fixed delay increments ahead of the 100 computed points of the function, thereby providing greater resolution. The correlation function readout which may be obtained continuously as it is computed, is available at various rates consistent with the speed of the external readout device, e.g. oscilloscope or X-Y recorder.

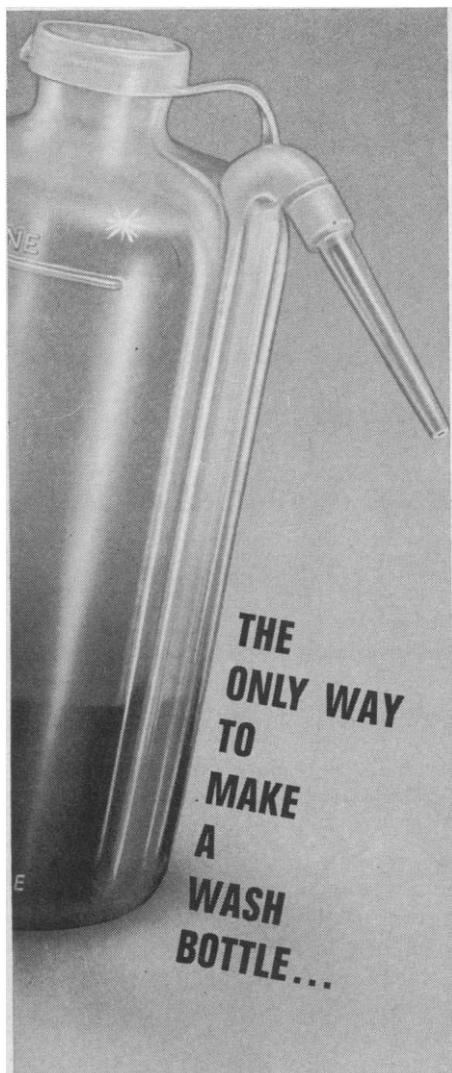
Vibration analysis, radio astronomy, laser research, geophysics, radar, plasma physics, aero- and hydrodynamics, and biophysics are only a few of the fields where correlation techniques are useful.

Price of the Model 100 is \$8,500. The Model 101 is priced at \$9,500 to \$12,900. Export prices are approximately 5% higher (except Canada).

For additional information, write Princeton Applied Research Corporation, Department G, P.O. Box 565, Princeton, New Jersey 08540 or call 609-924-6835.



PRINCETON APPLIED RESEARCH CORPORATION



... with unitary construction—like the Nalgene® Unitary Wash Bottle. Dispensing tube and body are precision molded as a single unit—no seams, no leaks. And, it's easier to use—just squeeze to dispense to the very last drop. It's the only way to make a wash bottle—and we're the only people who make one this way. That's one of the reasons we've been the innovators in the plastic labware business since the beginning.

Specify Nalgene Labware from your lab supply dealer. Ask for our 1968 Catalog or write Dept. 2113, Nalgene Labware Division, Rochester, N. Y. 14602.

Also available: Teflon® Wash Bottles (4-32 oz.); Safety Wash Bottles, red polyethylene, vertical ribbing. (8 and 16 oz.).

*DuPont Trademark



killed and more cities leveled than occurred with the bomb on Hiroshima. The more basic, and difficult, problem therefore was why the nature of warfare changed at this time.

Research in the physical and biological sciences is not likely to cease. The use to which it is put will have far-reaching and usually unexpected consequences. It should be the task of the social scientist to develop a methodology that will permit predictive hypotheses rather than to make moral exhortations. This is not to say that all conflicting values and ideologies can be eliminated, but understanding is a step toward resolution by peaceful means. This basic point, I think, applies across the board. In international affairs, the first need is to understand the nature of free enterprise, communism, and all the intermediate ideologies rather than to deal in stereotypes, and, on the domestic scene, it is to comprehend the reasons for attitudes toward minority groups as well as the nature of these groups. Such understandings can best be achieved from a neutral position, no matter how deeply anguished the scientist may be.

JULIAN H. STEWARD

*Department of Anthropology,
Center for Advanced Study,
University of Illinois, Urbana 61801*

Can the Ends Justify the Means?

The goals of students in higher education are not the cause of unrest in our universities ("Student unrest," 27 Oct., p. 443). The real problem is the manner in which a minority of students, along with fellow travelers, seek to attain these goals, laudable or not. I am sure that the present-day student can, if he really tries, obtain freedom of thought and commitment, be treated as an individual, acquire the skill or art of learning, have a voice in establishing priorities for educational practices, and participate (to a reasonable degree) in policy-making. In every university that I know of, the student has ample opportunity to participate in making rules, in ways and means of enforcing them, and in becoming involved in activities that are important to him. Trouble comes when the vociferous minority, lacking parental and faculty experience, demands that its desires be realized by means which often disregard existing rules and laws and the rights of others. Yet these changes could, in a large

part, be made if legitimate tactics were used in an intelligent manner. To many observers, it seems that the very tactics used to force a change demonstrate that those utilizing these tactics do not merit the goals they seek and that they do not have the intelligence to use, in a sane way, new freedoms and responsibilities.

In my opinion, the administrators of our universities would be remiss indeed if they allow students to have a greater say in their education without first making certain that the majority of the students really want the changes sought by the minority, and without having definite assurance, by past action, that the majority of them have the sense and ability to utilize greater freedom. In such "reforms," haste often leads to chaotic situations and little real progress, whereas deliberate action generally assures worthwhile gains.

LOUIS LYKKEN

*Division of Entomology,
University of California, Berkeley 94720*

... Despite the universal appeal of such cliches as "freedom" and "democracy," the powers demanded by students are frequently neither reasonable nor constructive, nor do they enhance the quality or quantity of freedom on the campus. As a graduate student on the scene, I know that Wolfe's "bright, articulate, committed, influential, activist student leaders" want as much as they can get, and the educational process be damned. Many of them seek the power to impose a political position on the university from their position as self-appointed, but officially recognized, "spokesmen" of the student body. This is not democracy but a gross form of elitism.

The ultimate goal of "student power" would seem to be a North American equivalent of the 1918 University Reform Movement which swept Latin America from the University of Córdoba, Argentina. What has the URM accomplished? It has gravely impaired the quality of Hispano-American education; created a class of professional students subsidized by the government and a disproportion between "intellectuals" and technicians which is tragic for an underdeveloped region. It is largely responsible for the political volatility which has so hindered the improvement of the lives of the peoples of the countries affected.

The traditional purposes of the American university have been teaching and research. To surrender blindly

**Wouldn't it be great if
someone designed a 160 g
top-loader with 1 mg accuracy
and all-digital readout?**

**Someone has.
Sartorius.**

There are other top-loading balances with 160g capacity, but none is as accurate and easy to read as the new Sartorius 2255... and none is as stable.

To eliminate interpolation error with 'between the line' results, the Model 2255 provides all-digital readout to 1 mg. To further insure accuracy, there is absolutely no discernible swing—this balance stays at the indicated weight. There's no need to squint, either. Its huge new optical scale is a pleasure to read, even under the most adverse lighting conditions.

At only \$725, the above features alone would make the 2255 a great buy, but there are more. The Taramatic® single knob taring system and below-balance weighing accessories are included at no extra cost.

For research, quality control, student use, or any other application requiring 1 mg weighing accuracy at loads up to 160g, this is

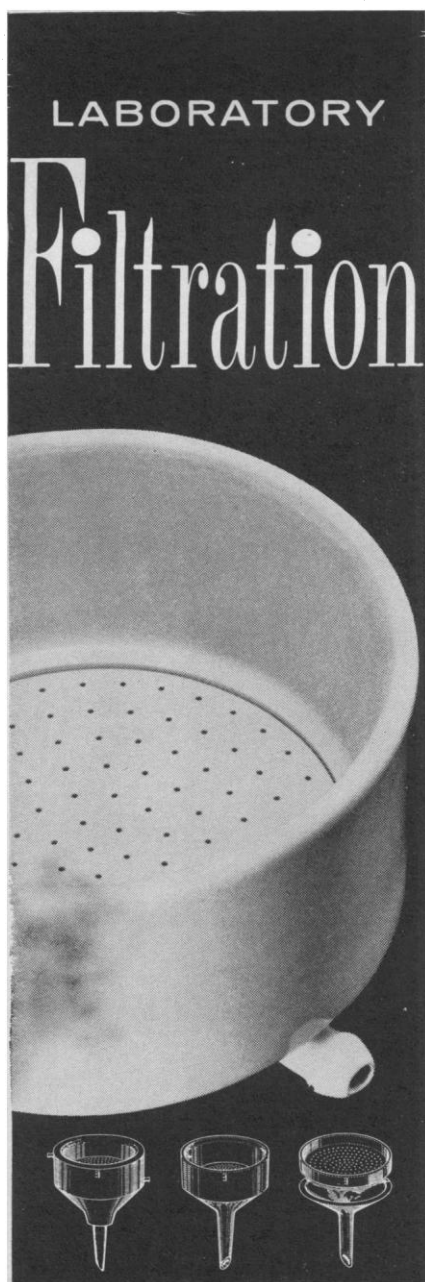


the simplest, yet most advanced top-loading balance available.

Sartorius all-digital top-loaders also come with higher capacities. Our 40-page catalog describes them all. For your copy, just write: Sartorius Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590.

sartorius balances





Coors can help you with laboratory filtration by providing you with a complete range of filtration equipment in many sizes and styles, all immediately available through your local laboratory supply dealer. Coors filters come in 15 styles, with a total of 74 sizes matched to meet your exacting requirements. Coors filtering devices include the #220 and #221 Filter cones; #270, #290, #291, #300 Gooch crucibles; #765, #767, #769 Porous Bottom crucibles; #490 fixed plate Buchner funnels; #491 loose plate Buchner funnels. Special Buchner funnels include the double-wall #495, two-piece #496 and table type #497 and #498; #510 Hirsch funnel; #511 Conical funnel; #775 Emich micro-filtersticks and various porous cups, plates and cylinders. Write for Bulletin No. 498, showing filters.

INSIST THAT YOUR LABORATORY PORCELAIN WARE CARRY THIS MARK OF DEPENDABILITY

**COORS
U.S.A.**

COORS PORCELAIN COMPANY, GOLDEN, COLORADO

to the changes now being urged in the structure of the academic community would mean far more than the expansion of faculty-administration committees to include student representatives. It would mean surrendering the institutional detachment from political controversy which is necessary to sustain a climate for objective, factual inquiry. It would mean the systematic alienation of an "intellectual" class from the body politic. . . . Certainly some of the student demands are justified, but those in a position to do so must have the courage to say "no" to those which are not.

ARTHUR M. SHAPIRO

*Department of Entomology and
Limnology, Cornell University,
Ithaca, New York 14850*

Care for Indigents in Bolivia

Our treatment of the Aymara Indians of Bolivia furnishes proof that the interprofessional approach toward meeting the needs of a developing people answers many of the multiple problems discussed by Taylor and Hall in their article, "Health, population, and economic development" (11 Aug., p. 651). Our patients see their problems as exclusively medical. Yet how could we persuade a mother of six who is suffering from rheumatic fever to have her infected teeth treated if we referred her to a dentist halfway across town? Or who would best relieve another patient, the victim of a heart attack, who has been locked out of her room with her rent several months in arrears—the doctor with an oxygen tank—or the lawyer who can help get her rent paid and home restored? A man is unable to buy medicine because he is unlawfully paid only in food and shelter instead of in cash—a woman and her children suffer from malnutrition because the husband has deserted—a mine worker with tuberculosis has not received his pension and cannot buy food—an ignorant teacher excludes a child from school because of a rash that according to the physician's diagnosis is not contagious—these are problems that require legal as well as medical help. During the Indians' early periods of acquaintance with the modern world, the lawyer also assists the physician in treating their psychosomatic illnesses—headaches and gastric ulcers—which occur when the techniques of daily living cannot be assimilated quick-

ly enough. Immense relief comes when professional assistance shows them how to secure employment contracts, housing contracts, formalization of common law marriages, property settlements, divorces, alimony, and the substitution of lawsuits for personal methods of revenge.

Our dentists provide the care necessary to cope with the rapidly increasing rate of caries among the Aymaras, perhaps due to their changing diet which is now higher in refined carbohydrates and sugar—a trend that further aggravates a new tendency toward rheumatic and arthritic diseases caused by poor housing and flimsy city clothing.

Thus a patient who comes to the clinic for medical care may receive dental and legal care as well. We have 20 or more specialists available and communications are fast. Also results of x-ray and lab tests are quickly secured. Our publications naturally reflect the same interprofessional theme. Some recent titles are "Phases, physiology, and pathology of the cultural transition period" and "Violent aggression as a health hazard in La Paz, Bolivia." This service, now 21 years old, is recommended as a replacement of an exclusively medical service for developing populations.

RUTH W. TICHAUER

Casilla 483, La Paz, Bolivia

Computer Costs:

A Reasonable Approach

Although I have not been involved in the matter personally, I understand that cost recovery for computer centers has been the subject of considerable controversy between universities and government representatives and that some universities have argued unsuccessfully that cost recovery on government contracts should be achieved through indirect-cost allowances. I understand that the government's position is that computer usage should be handled as a direct cost; that is, the cost of a computer center for a period should be divided by time used in order to get a billing rate to charge each user (government contracts included). I further understand that full utilization of computer centers is not expected to be the case. Given the high cost of centers, prohibitive time rates also are expected. If this is correct, I should like to point out that



Character Actor

Beckman's veteran DK® Spectrophotometer:
fits a dozen UV roles, never type-cast, never obsolete,
easily adaptable, no prima donna price.

Major credits for this double-beam ratio-recording performer of thirteen years' experience: Linear transmittance. Linear absorbance. Differential analysis. Direct energy recording. It's a past master at handling the lights—for analyses ranging from far ultraviolet to near infrared (160 $m\mu$ to 3500 $m\mu$, a bonus talent unique to the DK alone). And it co-stars with Beckman accessories in other feature roles—flame photometry, fluorescence, spectroradiometry, reaction rate studies, and reflectance.

The DK works with minimum direction—one or two control adjustments

for successive routine analyses—and works on single-beam as well. A special servo device delivers precise pen and wavelength alignment and registration—one of eleven up-dating modifications of the DK's original makeup since 1954.

To name just a few feature attractions: Automatic slit programming ...low stray light...high resolution ...wide choice of chart speeds (flat-bed or strip-chart)...and computer compatibility. But why not see the entire picture? Contact your local Beckman Sales Representative for an audition...or write for Data File 101G.

*The people out front
in background and back-up...*

Beckman®

INSTRUMENTS, INC.
SCIENTIFIC INSTRUMENTS DIVISION
FULLERTON, CALIFORNIA • 92634

INTERNATIONAL SUBSIDIARIES: GENEVA; MUNICH; GLENROTHES,
SCOTLAND; TOKYO; PARIS; CAPE TOWN; LONDON; MEXICO CITY

NEW FROM CANALCO...

3 high-resolution electrophoresis microdensitometers

for disc, agar, cellulose acetate, cleared starch and acrylamide slabs

Only Canalco offers you a choice from three versatile, high-resolution microdensitometers for all *modern* electrophoresis techniques.

And these are the *only* instruments on the market which can resolve and accurately report the fine bands found in Disc Electrophoresis of serum, spinal fluid, and other complex protein systems.

Select the low-cost Model D to use with the recorder you already have, as well as with its own optical density meter. For faster scans, choose the Model E with high-speed built-in recording system. For wide-chart presentation, you'll want the Model F, featuring a full ten-inch chart.

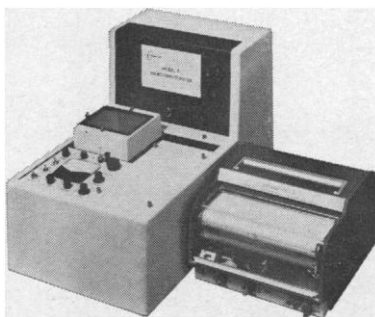
All three models give you *true high resolution*—only possible with multi-lensed, multi-slit optical systems—plus many other exclusive features vital to accurate densitometry.

All three models have *15-micron resolution*; they can actually see and record bands only 15 microns thick, invisible to other densitometers. They let you view and photograph enlarged images without accessories or added cost. All three *include* integrators as standard equipment. Illumination with parallel light, plus the ability to align fine bands parallel to the measuring slit, give you accurate measurements free from artifacts caused by band overlap. The Model E and Model F have unique normalizing systems that let you equalize chart records from specimens of unequal length and band intensity for direct, side-by-side comparison.

In addition to their utility for electrophoresis, the Model D, E and F are equally suitable for densitometry of ultracentrifuge UV films and similar transparent samples up to 1 x 3 inches overall.

If you're planning now to buy an electrophoresis densitometer that will not be obsolete when you switch to the Disc technique, ask us for an interesting brochure that describes the Model D, E and F in detail. We'll include a test film strip you can use yourself to compare the performance of the Canalco microdensitometers with any other instrument.

Whatever your needs, you'll find a Canalco microdensitometer the best investment. Challenge us to prove it to you! Write:



The Model F Microdensitometer comes with a special variable-speed recorder that gives you a full ten inches of chart width for highest precision of measurement. Also available are the low-cost Model D, to use with your own recorder, and the Model E with fast-response built-in recorder.



CANAL INDUSTRIAL CORPORATION
5635 Fisher Lane Dept. S-1 M
Rockville, Maryland 20852/(301) 427-1515

Sales Offices in • Boston • Chicago • Cincinnati • Cleveland • Denver
• Houston • Los Angeles • Minneapolis • New York • Ottawa •
Philadelphia • Pittsburgh • San Francisco • Washington, D.C.

this situation is not unique and that there is a reasonable alternative.

There is justifiable concern that a high rate for computer usage will drive potential users away from the computer with the effect that rates will go still higher. Not to be overlooked is the fact that contracts themselves may not be able to bear the cost of escalated rates for computer time. The problem is not unlike that of the apocryphal entrepreneur with idle capacity who prices on the basis of cost. Failing to sell his entire output, he cuts production in the future. This increases his unit cost, so, in turn, he raises his price only to find that he still does not sell his current output. Theoretically, and assuming that the entrepreneur had unlimited funds with which to pursue this fantasy, he would wind up at some future time producing one unit that he could not sell because he had long since priced himself out of the market.

In both situations idle capacity should be recognized. Cost for both the entrepreneur and computer centers should be based upon the future volume of business envisioned when facilities were acquired. A computer center should determine its monthly rate on the basis of normal expected usage. (In order not to jeopardize the concept, I shall not labor the problem of identifying normal expected usage.) Until a normal level is achieved, the resulting rate would, of course, be lower than the one currently authorized.

The difference between amounts billed to all users and the actual cost of a computer would be a measure of the cost of idle capacity. Assuming that there is not *prima facie* evidence that potential capacity is unreasonably high, the cost of idle capacity could then come under consideration for inclusion in the pool of indirect costs. There are valid grounds for so treating it, particularly during the formative period in the life of computer centers.

Again, I am handicapped by not having had personal involvement. However, I have dealt with representatives of government and I have found them to be fair in dealing with reasonable proposals. If the universities now find themselves saddled with an unsatisfactory ruling, I must wonder whether they put proposals to the government on an either-or basis and now must content themselves with the "or."

C. W. BASTABLE

*Graduate School of Business,
Columbia University, New York 10027*

Farming Success in India

Your review of *The World Food Problem*, published by the President's Science Advisory Committee (News and Comment, 23 June, p. 1578), emphasizes the growing gap between world population and food supply. In India we have a family planning expert as our Health Minister, and the goal of family planning seems to be in sight. Our position regarding food production is a less happy one. Yet some facts related to increased food production in India and Pakistan are worth consideration: (i) crops can be grown all year round, compared with 6 months or less in developed countries; (ii) crops grow more quickly due to higher temperatures and more intense sunlight; (iii) during dry seasons, sufficient water is available for irrigation (if properly conserved) from local monsoon rains or Himalayan snow; and (iv) manpower is unlimited.

By taking advantage of these factors, we have proved on the small experimental farm attached to this institute (Davis Institute of Neuropsychiatry) that it is possible to grow at least ten times more food per acre than the average for this area on land which was considered so poor when we bought it that nobody wanted to cultivate it. Our techniques during the last 5 years have included:

- 1) Digging wide diameter wells and installing electric pumps of 1 to 2 horsepower (we have six pumps for 17 acres). At one point we pump water from a stream. As the stream serves to irrigate 4 acres, we require one well for about 2 acres. In this rocky area, tube wells are impossible and there are no canals, nor is there enough land to construct dams and reservoirs.

- 2) Use of high-yield seed.

- 3) Mixed farming so as to produce manure and utilize waste plant products for animal feed. Chemical fertilizers, correctly used, are added.

- 4) Hand digging. We should like to have a small tractor, a luxury which we cannot yet afford.

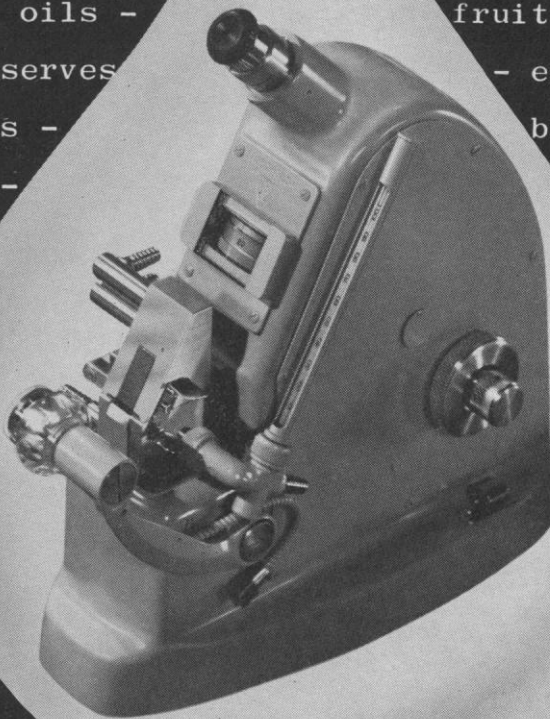
If most of the land in India now under cultivation were cultivated only half as effectively as we have proved it possible, we Indians should be able to close the world food gap for many years to come, and banish the specter of famine. All we need is a vision of this goal, good leadership from within, and some outside help with fertilizers.

ROBERT B. DAVIS

Boreya Road, Kanke, Bihar, India

12 JANUARY 1968

petroleum derivatives - chlorinated solvents -
peroxide solutions - ethylantracene - salt
solutions - polymers - fruit butters - maple
syrup - acetic acid hydrogenated fats
oil contaminants - hydraulic fluids
essential oils - fruit preserves
berry preserves - egg solids -
aliphatics - biologicals
solvents - alcohols -
flours - jellies
pentane coffee
solids honey
- oils jams
waxes cocoa
nylon fruit
juices maple
syrup - plastic
soybeans flaxseed
plasticizers naphthalene
bromonaphthalene ethylantracene -
tomato products - fluorinated hydrocarbons - ext
dense flint glass - organic chemicals - silicone
- polyester resins - borosilicate crown glass -



20-second quality control

Holding to rigid quality control standards is fast and easy with a Bausch & Lomb Abbe 3-L Refractometer. You just *load, light and look* . . . get your answer in 20 seconds. Horizontal, up-front prisms load in *10 seconds*—wipe off easily. Light-up takes *2 seconds* . . . with built-in, push-button scale illuminator. *8 seconds* to read . . . any product within the range of ND 1.30-ND 1.71, or percent total solids from 0-85%. Accuracy is to 1 unit in the fourth decimal place. Operation is fast, easy and so comfortable there's no fatigue . . . even after all day production use. This most widely used refractometer is priced right at just \$850*.

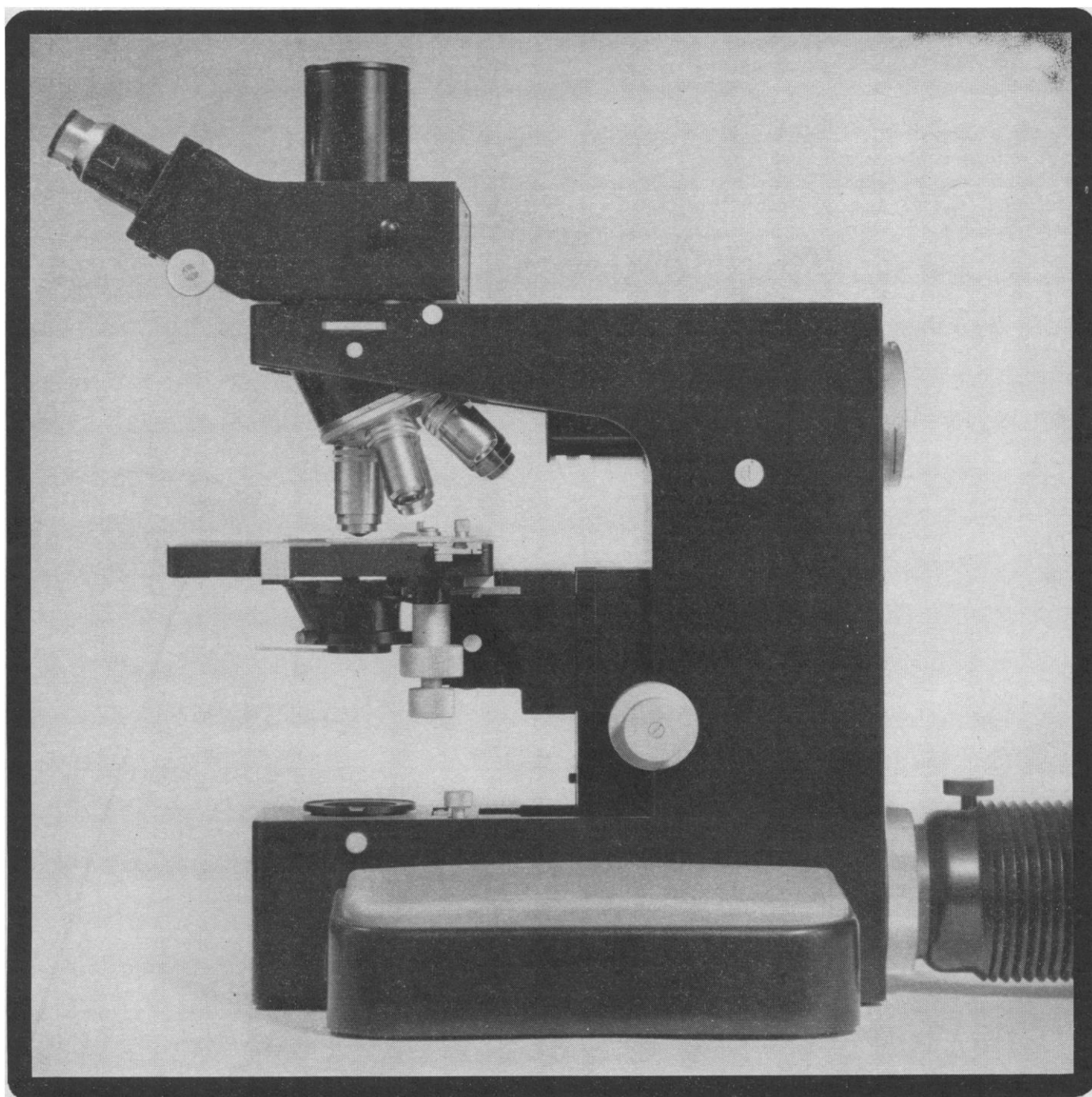
For the utmost accuracy over a wide index range, your ultimate choice should be the B&L Precision Refractometer. Three models with different ranges cover a total range of ND 1.20-ND 1.70. Under proper working conditions, it's possible to get index readings to 3 units in the fifth decimal place. And the price is just \$1840*.

Send for our Catalog 33-202, Bausch & Lomb, 75901 Bausch Street, Rochester, New York 14602.

*Suggested list

BAUSCH & LOMB

ADVANCING ELECTRONIC/OPTICAL
INSTRUMENTATION



LEITZ ORTHOPLAN MICROSCOPE stimulates your zest for research

An image area up to $2\frac{1}{2}$ times greater than that possible with conventional wide-field instruments, is only part of the exciting "Bonus" that is yours with the new Leitz ORTHOPLAN Research Microscope. Full advantage is taken of the Plano objectives pioneered by Leitz to provide apochromatic image quality—with *unequaled flatness* throughout the field.

The ORTHOPLAN is ideally functional. Modular interchangeability of units and accessories provides for unlimited research capabilities and *protects against obsolescence*.

Modern facilities are provided for all forms of illumination, transmitted and reflected light, and photomicrography.

If you must have the finest research microscope in this world, only ORTHOPLAN can meet your need. You are buying a versatile precision instrument, not an integrated machine. Complete information on this new "standard" in microscopy will be sent on request.

61266



E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK, N.Y. 10016
Distributors of the world-famous products of
Ernst Leitz G.m.b.H., Wetzlar, Germany—Ernst Leitz Canada Ltd.
LEICA AND LEICINA CAMERAS • LENSES • PROJECTORS • MICROSCOPES

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Science serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

Editorial Board

ROBERT L. BOWMAN	EVERETT I. MENDELSON
JOSEPH W. CHAMBERLAIN	NEAL E. MILLER
JOHN T. EDSALL	JOHN R. PIERCE
EMIL HAURY	KENNETH S. PITZER
ALEXANDER HOLLAENDER	ALEXANDER RICH
WILLARD F. LIBBY	DEWITT STETTIN, JR.
GORDON J. F. MACDONALD	CLARENCE M. ZENER

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher

DAEL WOLFE

Business Manager

HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

Assistant Editors: ELLEN E. MURPHY, JOHN E. RINGLE

Assistant to the Editor: NANCY TEIMOURIAN

News Editor: DANIEL S. GREENBERG

News and Comment: JOHN WALSH*, LUTHER J. CARTER, BRYCE NELSON, ROBERT J. SAMUELSON, PHILIP M. BOFFEY, KATHLEEN SPERRY, GILLIAN PARRILLO. Contributing correspondents: ELINOR LANGER, NIGEL CALDER, VICTOR K. MCELHENY

Book Reviews: SYLVIA EBERHART

Editorial Assistants: JOANNE BELK, ISABELLA BOULDIN, ELEANORE BUTZ, BEN CARLIN, HELEN CARTER, GRAYCE FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, KONSLYNNIETTA HUTCHINSON, ELEANOR JOHNSON, PAULA LECKY, KATHERINE LIVINGSTON, HELEN OLNEY, SANDRA RATTLE, LEAH RYAN, BARBARA SHEFFER

*European Office: Lime Tree Farm, East Hagbourne, Berkshire, England. Telephone Didcot 3317

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

ROSE MARIE ROMAGNOLO

Advertising Sales Manager: RICHARD L. CHARLES
Sales: New York, N.Y., 11 W. 42 St. (212-PE-6-1858); ROBERT S. BUGBEE

Scotch Plains, N.J., 12 Unami Lane (201-889-4873): C. RICHARD CALLIS

Medfield, Mass. 02052, 4 Rolling Lane (617-359-2370): RICHARD M. EZEQUELLE

Chicago, Ill. 60611, 919 N. Michigan Ave., Room 426 (312-DE-7-4973): HERBERT L. BURKLUND

Los Angeles 45, Calif., 8255 Beverly Blvd. (213-653-9817): WINN NANCE

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: *Advancesci*, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

The Only Earth We Have

The AAAS Board of Directors has established a major new committee for the purpose of conducting a continuing review and evaluation of the intrusions man makes into the environment on which life depends. With dams, pesticides, bulldozers, cities, chemical fertilizers, noise, defoliants, power plants, garbage dumps, automobiles, huge construction projects, and other means, man changes the land, the waters, and the atmosphere, in ways he intends and often in ways he does not intend. Widespread realization that man's intrusions into the environment sometimes bring results that are clearly undesirable and often bring results that are not understood has led a number of recent committees, commissions, and planning groups to consider the problems of improving the quality of life and of protecting our planet from the ravages of man. It is not because no other group is actively studying these problems that the Board of Directors decided to create the new AAAS committee, but rather because the problems are of such widespread importance that many groups must be involved.

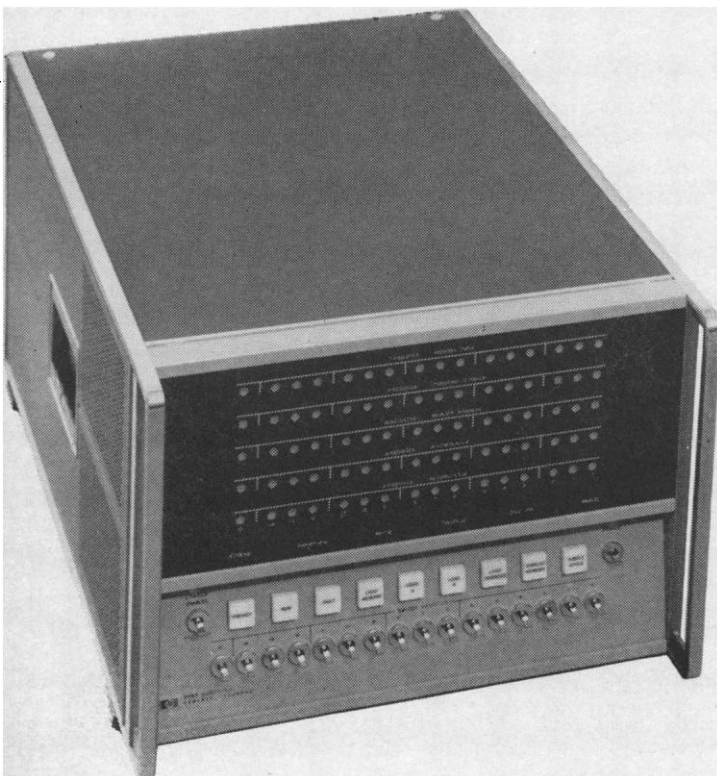
Part of the background of the new committee is related by Luther Carter in the News and Comment section of this issue of *Science*. Because of the previously expressed concern of the AAAS Council over the unknown amount and persistence of ecological damage, in Vietnam and elsewhere, which results from the use of chemical and biological agents that alter the environment, the new committee is being asked to give initial attention to these questions.

The committee's responsibility is wider, however. It is expected to keep under review the various and changing technological developments and proposals that are likely to lead to substantial changes in the environment. The two most recent expressions of concern within the AAAS are two resolutions adopted by Council at the 1967 annual meeting. One called for restudy of the plan to dam the Red River of Kentucky. (A *New York Times* editorial entitled "Dam Nonsense in Kentucky" damned the project in its entirety.) The other deplored the loss of productive agricultural land, precious mineral and water resources, and sites of unusual scenic beauty or of rare geological, botanical, or zoological significance that are being gobbled up by highways, airstrips, suburbs, and industrial buildings when, with more careful planning, less valuable or less rare land could be employed for these purposes.

David Goddard, University of Pennsylvania, will be chairman of the new committee. Serving with him will be Barry Commoner, Washington University; Rene Dubos, Rockefeller University; Athelstan Spilhaus, Franklin Institute; and several other members still to be appointed. The members of the committee themselves, or the staff that will be appointed to aid the committee, may be given responsibility for some studies. In other instances the committee may establish special commissions to analyze particular problems, as the Association did in 1961 in appointing the Commission on Air Conservation.

One of the most significant aspects of the committee's prospective work is its commitment to consider environmental problems and population problems together. Some problems of population and some problems of environmental change can be studied in isolation, but the interactions are so intimate that many must be studied together. Man is the major creator of pollution, the only species likely to destroy the only Earth we have, or capable of planning its preservation. Problems of environmental change and problems of population size, growth, and quality will therefore be considered together.—DAEL WOLFE

the new name in high-performance, low-priced computers



This new computer is the easiest
to program and interface of all
high-speed computers.

It has 16-bit words, 4K expandable
memory, 2 microsecond cycle time, plug-in
I/O cards, multichannel priority
interrupt, relocatable software and both
FORTRAN and ALGOL compilers. Plug-in
options including direct memory access
and hardware multiply and divide are
available. Peripherals such as high-speed
disc memory and magnetic tape are
standard. The price, with 4K memory and
ASR-33 teletype: \$16,500.

To find out how easy the 2115A is
to use—and its big brother, the 2116A,
write to Hewlett-Packard, Palo Alto,
California 94304; Europe: 54 Route
des Acacias, Geneva.

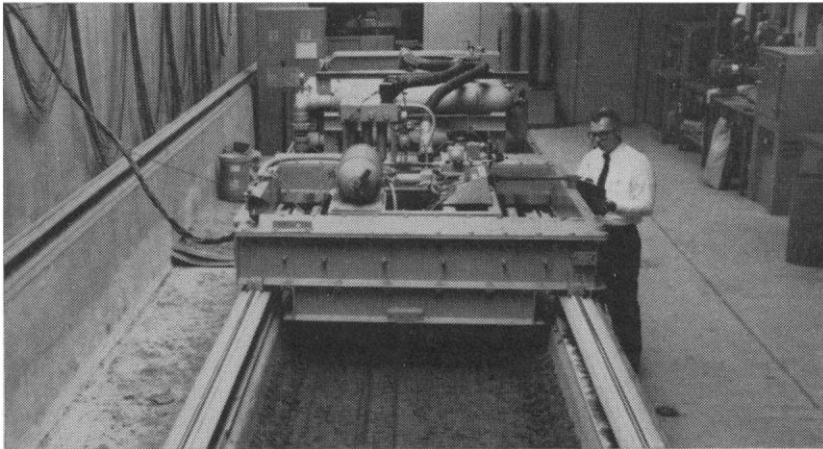
06714

HEWLETT  PACKARD

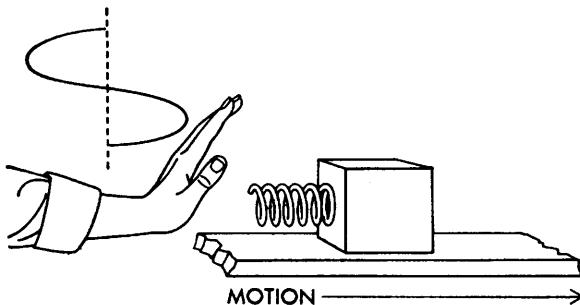
Report from

**BELL
LABORATORIES**

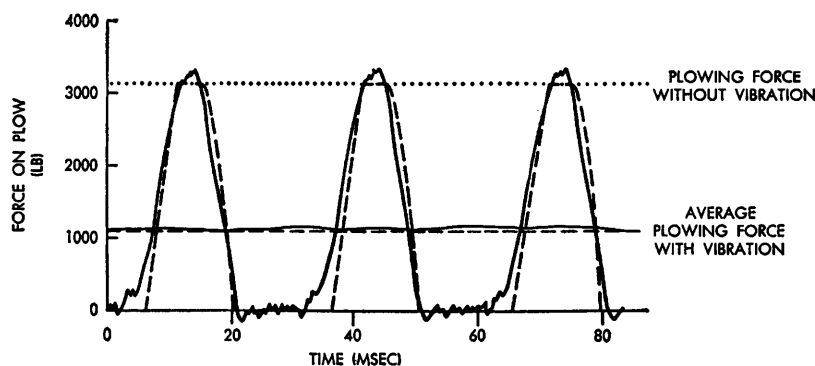
Equations for plowing



Soil dynamics laboratory at the Bell Telephone Laboratories location in Chester, N. J. Test soils of various kinds are placed in the long bin (foreground). A plow blade, not visible in this photo, rides under the carriage frame. The blade can be vibrated over a wide range of frequencies and amplitudes as the carriage is driven along the length of the bin.



According to Bell Laboratories' mathematical model, soil reacts to a vibrating plow blade much like an elastic object being pushed against friction over a surface (sketch above). The hand moves sinusoidally and, during part of each cycle, contacts the spring. The resulting theoretical force-time plot (dashed line in the graph below) shows how vibration reduces plowing force. Superimposed is a solid line showing typical test results with a vibrating blade in a test bin (photo above) filled with silty sand. The blade vibrates front to back 30 times per second. The mathematical model, based on the above analogy, has allowed computer simulation of such soil-plowing systems.



It has long been known that vibrating a plow blade makes it easier to force through soil. But what kind of vibration is most effective? That is, how much power should be applied to the blade and in what manner should the blade be vibrated?

We at Bell Telephone Laboratories are accumulating considerable information on this subject because we need a small, highly efficient plow that will bury telephone wires across lawns and up to houses with minimum draw-bar pull. Unlike agricultural plows, which are built for maximum disturbance of the earth, Bell System plows must bury cable and wires with least possible marring of the property.

Recently, this work has been aided by a mathematical model of plow blade-soil interaction. Bell Laboratories engineers R. J. Boyd and C. L. Nalezny found that forcing a vibrating blade through the ground is analogous to pushing periodically on a spring, attached to a block on a frictional surface (left).

This simple model has helped us design a prototype plow that buries telephone wires two feet deep at speeds up to 75 feet per minute. With most of its power applied to the blade, it can cut through rocky soil and tree roots where conventional machines might stall.



Bell Telephone Laboratories
Research and Development Unit of the Bell System

PRIMITIVE PEOPLE COMPLEX SOCIETIES



THE CURSE OF SOUW

Principles of Dariibi Clan Definition and Alliance in New Guinea by *Roy Wagner*. The social structure of a little-known mountain tribe which sees the shaming of its hero Souw as the original cause of evil. The myth resembles, in some aspects, the Genesis story of the Fall of Man. Photographs and drawings. \$11.50

MORALS AND MERIT

A Study of Values and Social Controls in South Asian Societies by *Christoph von Fürer-Haimendorf*. Do various tribes, and indeed all of humanity share a common moral language? "... A pioneer study of a neglected aspect of South Asian social anthropology by one eminently suited to undertake it."—*The Times Literary Supplement* \$6.00

KWAKIUTL ETHNOGRAPHY

by *Franz Boas*, edited, abridged and with an introduction by *Helen Codere*. His unpublished last work, with supplementary material, the whole of which sums up Boas's lifetime of affectionate study of the Kwakiutl Indian tribe—a study that made him one of the founders of modern anthropology. \$12.50

THE EVOLUTION OF SOCIETY

Selections from Herbert Spencer's *Principles of Sociology*. Edited and with an introduction by *Robert L. Carneiro*. Basic writings of the great thinker on cultural evolution. Spencer was the first to organize evolutionary concepts as they applied to — and made intelligible — the broad sweep of human history. *Classics in Anthropology Series*. \$10.95

UNIVERSITY OF
CHICAGO PRESS



that a new journal in this field (and such an appearance seems imminent) should be one of the highest scientific standard.

O. J. Kleppa served as general chairman of the meeting; local arrangements were handled by W. V. Johnston (NAA Science Center). There are no published proceedings of the conference, but much of the reported material will appear later in scientific journals.

The Twenty-third Calorimetry Conference will be held in August 1968 in Midland, Michigan, with the Dow Chemical Company serving as host. Inquiries about program and attendance should be directed to the program chairman: C. E. Vanderzee, Department of Chemistry, University of Nebraska, Lincoln, Nebraska 68506.

D. L. HILDENBRAND

*Douglas Advanced Research
Laboratories, Huntington Beach,
California 92646*

Calendar of Events

National Meetings

January

20-25. American Academy of **Orthopaedic Surgeons**, annual mtg., Chicago, Ill. (J. K. Hart, AAOS, 29 E. Madison, Chicago 60602)

22-23. **Industrial Research**, 3rd annual, Chicago, Ill. (V. H. Disney, IIT Research Inst., 10 W. 35 St., Chicago 60616)

22-24. **Aerospace Sciences** mtg., New York, N.Y. (Meetings Manager, American Inst. of Aeronautics and Astronautics, 1290 Ave. of the Americas, New York 10019)

22-24. **Coal and Coke**, Philadelphia, Pa. (American Soc. for Testing and Materials, 1916 Race St., Philadelphia 19103)

22-24. **Radioisotopes and Radiation Effects**, New Orleans, La. (American Soc. for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103)

22-26. **Basic Electronics**, Hopatcong, N.J. (Saul Gordon Associates, Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)

22-26. **Marine Sciences Instrumentation**, 4th natl. symp., Cocoa Beach, Fla. (M. Reed, Instrument Soc. of America, 530 William Penn Pl., Pittsburgh, Pa. 15219)

22-26. **Powder X-Ray Diffractometry**, Austin, Tex. (D. E. Griffith, Program Director, Taylor Hall 153, College of Engineering, University of Texas, Austin 78712)

22-27. **Air Conditioning Principles and Practices**, Austin, Tex. (D. E. Griffith, Program Director, Taylor Hall 153, College of Engineering, University of Texas, Austin 78712)

23. **Industrial Associates Research Re-**

view, Houston, Tex. (D. E. Griffith, Program Director, Taylor Hall 153, College of Engineering, University of Texas, Austin 78712)

23. **Preventive and Therapeutic Aspects of Coronary Heart Disease**, conf., New York, N.Y. (Conference Planning Committee, New York Heart Association, 10 Columbus Circle, New York 10019)

23-26. Council on **Social Work Education**, Minneapolis, Minn. (P. Stickney, Council on Social Work Education, 345 E. 46 St., New York 10017)

23-26. **Water**, Technical Committee mtg., West Palm Beach, Fla. (American Soc. for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103)

23-27. **American Mathematical Soc.**, 74th annual, San Francisco, Calif. (G. L. Walker, American Mathematical Soc., Box 6248, Providence, R.I. 02904)

24-25. **Health Physics**, 2nd midyear symp., Augusta, Ga. (C. M. Patterson, E. I. duPont, Savannah River Lab., Aiken, S.C. 29801)

25-27. **Mathematical Assoc. of America**, 51st annual, San Francisco, Calif. (H. M. Gehman, MAA, Executive Director, c/o SUNY at Buffalo, N.Y. 14214)

25-27. **Symmetry Principles** at High Energy, 4th conf., Coral Gables, Fla. (Conference on Symmetry Principles at High Energy, Center for Theoretical Studies, University of Miami, Coral Gables)

27-1. **American Group Psychotherapy Assoc.**, conf., Chicago, Ill. (M. Schiff, AGPA, Room 702, 1790 Broadway, New York 10019)

28. **Fourth Mössbauer Symp.**, Chicago, Ill. (P. A. McNulty, New England Nuclear Corp., 575 Albany St., Boston, Mass. 02118)

28-2. **Institute of Electrical and Electronics Engineers**, winter power mtg., New York, N.Y. (J. W. Bean, American Electric Power, 2 Broadway, New York 10008)

28-2. **Testing and Materials**, winter mtg., Atlantic City, N.J. (T. A. Marshall, Jr., American Soc. for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103)

29-31. **National Assoc. of Private Psychiatric Hospitals**, 35th annual mtg., Miami Beach, Fla. (The Association, 353 Broad Ave., Leonia, N.J.)

29-31. **Society of Thoracic Surgeons**, annual mtg., New Orleans, La. (F. X. Byron, Executive Secretary, Society for Thoracic Surgeons, City of Hope Medical Center, 1500 E. Duarte Rd., Duarte, Calif. 91010)

29-1. **American Assoc. of Physics Teachers**, annual mtg., Chicago, Ill. (S. S. Ballard, Univ. of Florida, Gainesville 32603)

29-1. **American Meteorological Soc.**, 48th annual, San Francisco, Calif. (K. C. Spengler, AMS, 45 Beacon St., Boston, Mass. 02108)

29-1. **American Physical Soc.**, annual mtg., Chicago, Ill. (R. G. Sachs, Box 344, Argonne, Ill. 60440)

29-3. **Bio-Physical Techniques**, Hopatcong, N.J. (Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)