

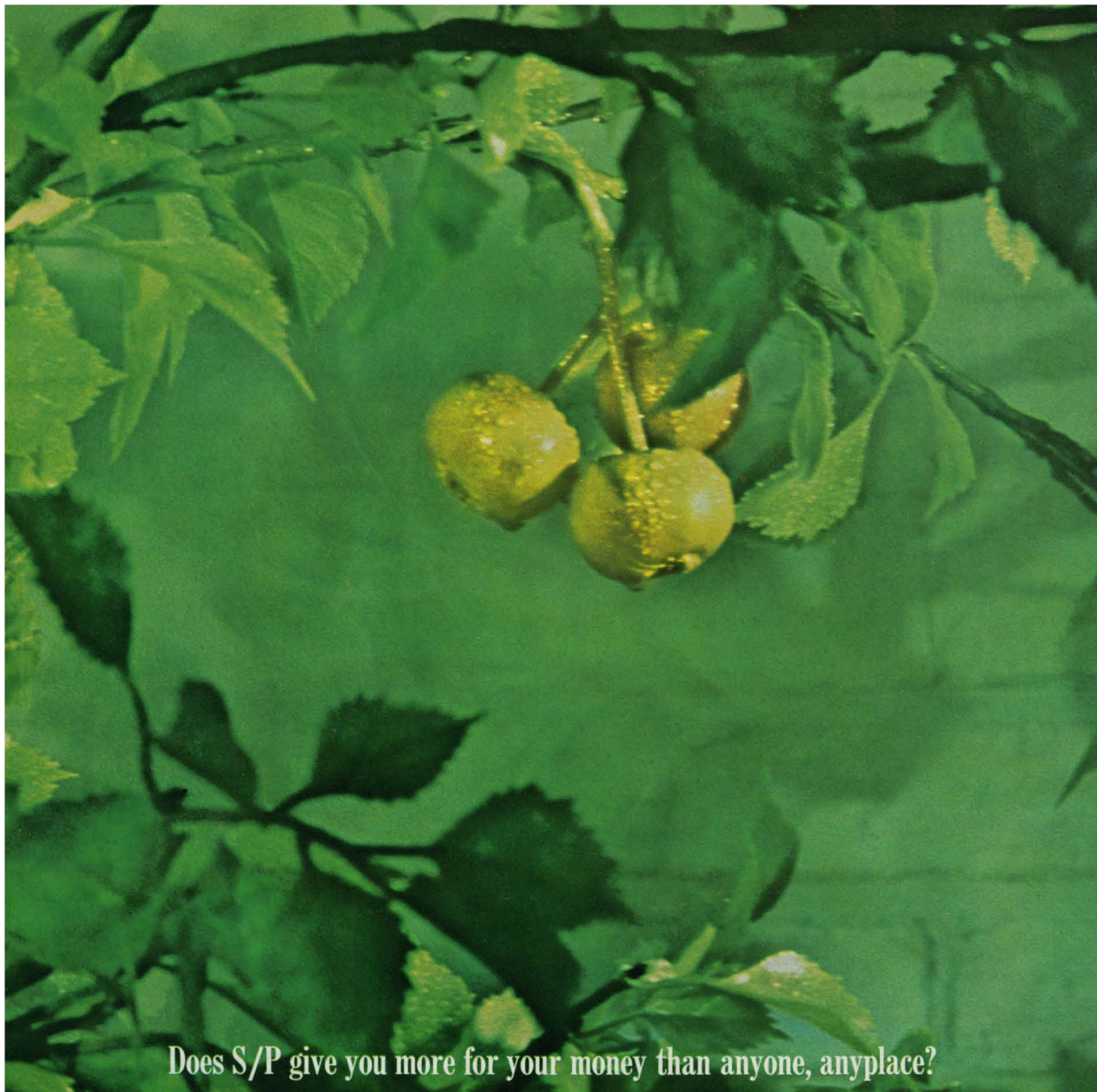
SCIENCE

7 May 1971

Vol. 172, No. 3983

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





Does S/P give you more for your money than anyone, anyplace?

Does God make little green apples?

You might just expect to pay the same price for the same laboratory product from any distributor, right? Wrong! The only thing a distributor really has to sell is *service*. That's why S/P gives you more for your money than anyone else. More laboratory-trained representatives than anyone else. Over 300 of them working out of 17 strategically located distribution centers. More servicemen than anyone else, 150 to be exact, including manufacturer-trained technical specialists. More warehouse space than anyone else. 13,553,000 cubic feet or about 4 Madison Square Gardens. More items in stock than anyone else. 129,000. An inventory worth \$28,000,000. And our computer system makes our entire national stock available to every customer. More delivery service than anyone else. All major carriers and our own fleet of 43 S/P trucks. And more backup people than anyone else. 1,580. Our prices are competitive. But, if you can get a better price from anyone else, better look into service. You'll find S/P gives you more for your money. Just as sure as God makes little green apples.

To take advantage of our More-For-Your-Money Service, call your S/P Representative or write Scientific Products, Division of American Hospital Supply Corporation, 1430 Waukegan Road, McGaw Park, Illinois 60085. S/P...a single source for laboratory equipment, supplies and scientific instruments.



We want to be useful ...and even interesting

Kodak

Renovated facilities

London's Royal Institution, where mankind in the person of Michael Faraday first saw clearly the principles of electromagnetic induction, has given the name Eastman Laboratory to certain recently renovated facilities. It commemorates an American entrepreneur who had Lord Kelvin on his board of directors.

NOTE DATE

We'll also be at
"Electro-Optics East" in
N.Y. Coliseum Sept. 14, 15, and 16

In person

On May 18, 19, and 20 in the Anaheim Convention Center at Anaheim, Calif., at a trade fair called "Electro-Optics West," we shall be on hand to discuss any of the following:

Photographic problems in laboratory or field biology, including photomicrography and direct infrared photography.

Photographic materials for astronomy and physics

EASTMAN Organic Chemicals, including reagents and supplies for all manner of laboratory techniques and procedures in the bio-medical field, in organic synthesis, and in analytical chemistry

Counseling on photomaterials for advanced technologies still in the planning stages

Look-up service from largest commercially accessible bank of published and unpublished infrared spectra, from which, no later than next working day after receipt of submitted spectrum, we send names of closest matching compounds in decreasing order of match.

KODAK WRATTEN Filters to modify spectral distribution in and near the visible; also neutral density wedges, step tablets, and other gelatin light attenuators of high precision

KODAK IRTRAN Infrared-transmitting Materials and Optics: 6 materials to cover out to 30 μ m, polycrystalline, with a broad choice of index, immune to cold flow, retaining strength and clarity despite heat, without cleavage planes, insoluble, grindable, polishable

Infrared Interference Filters on substrates of KODAK IRTRAN Material

IR Phosphor for seeing and photographing beam structure from GaAs diodes or other infrared lasers, 0.7 to 1.3 μ m, on paper or transparent base, in sizes up to 20 x 24 in.

Q-Switch Solutions and Cells for neodymium and ruby lasers: stabilized saturable dyes and antireflection-coated, cement-free, high-precision cells to contain them

Laser Dyes: Rhodamine 6G and many others; production lots tested in actual dye laser systems and supplied as solutions for dilution

Photochromic Compounds

White Reflectance Paint and Standard of unsurpassed nonselective diffuse reflectance from 200 nm to 2500 nm; purified BaSO₄ that stays white longer than MgO smoke

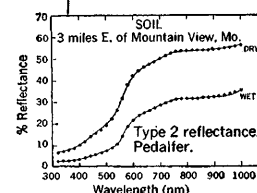
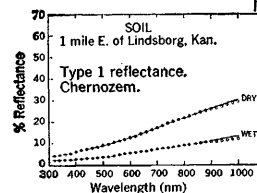
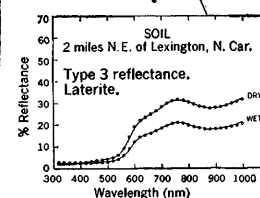
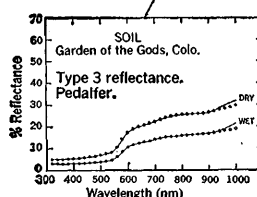
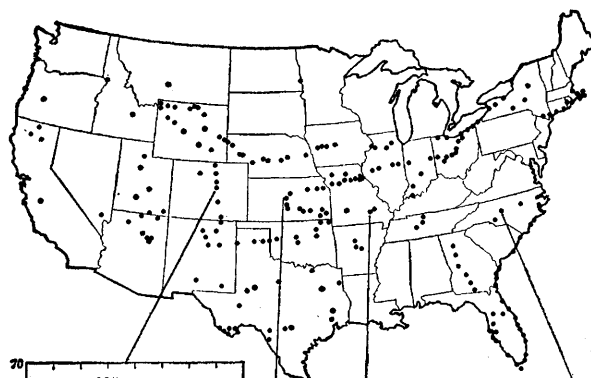
Neutral Density Circular Wedges (Inconel alloy-Coated) on glass from stock, glass or quartz to order, nonselective over long spectral range covering UV, visible, IR

Liquid Crystal Mixtures from a constantly expanding list

Optical Cements, six different formulations for optical parts, three for instrument assembly

MgF₂, ZnS, CaF₂, MgO, ZnSe, or CdTe in chunks for well-controlled evaporation

Mail inquiries on any of the above can be directed to the same address as given at end of adjacent column.



The colors of America

Both standardized wet and standardized dry, we have measured spectral reflectance of soils, sands, and silts predominant at each of 160 places in the U.S.A. We have then tried some taxonomy on the curves. They seem to fall into three types, one of which splits again.

Our work suggests that a spectrophotometer may not always be needed. Our study of the curves indicates that a good-to-excellent match of most of them can be calculated from reflectances measured at just five wavelengths. This can be done from aloft with readily available Kodak aerial film, narrow-band interference filters, and targets of known spectral reflectance. There are places where one click of the shutter provides more data than a thousand hand-collected samples like ours. The camera is mightier than the trowel.

Talk of collecting data from aloft has been leading to arguments. How far aloft? How much data. How much is it worth? Who decides? On what grounds?

While awaiting reasonable answers we felt that a study of the photographically accessible spectrophotometric variability of soil was something we ought to do, so H. R. Condit of the Kodak Research Laboratories did it.

In Photogrammetric Engineering for September, 1970 Condit gives a table of the constants which, when substituted in

$$R_{\lambda} = a_{0,\lambda} + a_{1,\lambda}R_{440} + a_{2,\lambda}R_{540} + a_{3,\lambda}R_{640} + a_{4,\lambda}R_{740} + a_{5,\lambda}R_{860}$$

R_{440} = reflectance at 440 nm, etc,

yields quite a decent fit to actual spectral reflectance, as seen from the dots along the above sample curves. The paper presents curves for 30 locations. Reprint on request from Eastman Kodak Company, Dept. 55W, Rochester, N. Y. 14650.



7 May 1971

Vol. 172, No. 3983

SCIENCE

LETTERS	Problem-Oriented Research: <i>H. Gershinowitz</i> ; Male Bias and Women's Fate: <i>F. Moog</i> ; <i>W. Lockeretz</i> ; <i>R. Rosin</i> ; <i>A. M. Brues</i> ; <i>D. E. Clement</i> ; Amen: <i>F. H. Giles, Jr.</i>	514
EDITORIAL	Changing Attitudes toward Environmental Problems	517
ARTICLES	Crystallography of the Hexagonal Ferrites: <i>J. A. Kohn, D. W. Eckart, C. F. Cook, Jr.</i>	519
	The Control of Photosynthetic Carbon Metabolism: <i>J. A. Bassham</i>	526
	Social Control of Science and Technology: <i>M. S. Baram</i>	535
NEWS AND COMMENT	The National Academy of Sciences: Awkward Moments at Annual Meeting	539
	AAAS (II): Asking How To Be More Than a Meeting and a Magazine	542
RESEARCH TOPICS	Weather Modification: A Technology Coming of Age	548
BOOK REVIEWS	<i>Science in Russian Culture, 1861-1917</i> , reviewed by <i>D. Joravsky</i> ; other reviews by <i>L. B. Mayhew, N. W. Gillham, C. B. van Niel, S. A. Bernhard, W. Sofer, A. O. Allen</i> ; Books Received	550
REPORTS	Glazed Lunar Rocks: Origin by Impact: <i>J. W. Morgan et al.</i>	556
	Acadian Orogeny: An Abrupt and Brief Event: <i>R. S. Naylor</i>	558
	Land Clearance in the Irish Neolithic: New Evidence and Interpretation: <i>J. R. Pilcher et al.</i>	560
	Preparation of High-Crystallinity Polyethylene at Low Pressures: <i>K. Hara and H. Schonhorn</i>	562
	Multiple Genotypes in Individuals of <i>Claytonia virginica</i> : <i>W. H. Lewis, R. L. Oliver, T. J. Luikart</i>	564

BOARD OF DIRECTORS

ATHELSTAN SPILHAUS
Retiring President, Chairman

MINA REES
President

GLENN T. SEABORG
President-Elect

DAVID BLACKWELL
RICHARD H. BOLT

LEWIS M. BRANSCOMB
BARRY COMMONER

VICE PRESIDENTS AND SECTION SECRETARIES

MATHEMATICS (A)
Henry O. Pollak
F. A. Ficken

PHYSICS (B)
Gaylord P. Harnwell
Albert M. Stone

CHEMISTRY (C)
Charles C. Price
Leo Schubert

ASTRONOMY (D)
Laurence W. Fredrick
Arlo U. Landolt

PSYCHOLOGY (I)
James E. Deese
William D. Garvey

SOCIAL AND ECONOMIC SCIENCES (K)
Daniel P. Moynihan
Harvey Sapolsky

HISTORY AND PHILOSOPHY OF SCIENCE (L)
Cyril Smith
Raymond J. Seeger

PHARMACEUTICAL SCIENCES (Np)
Wallace L. Guess
John Autian

AGRICULTURE (O)
Matthias Stelly
Michael A. Farrell

INDUSTRIAL SCIENCE (P)
Burton V. Dean
Jordan D. Lewis

EDUCATION (Q)
J. David Lockard
Phillip R. Fordyce

DIVISIONS

ALASKA DIVISION

Laurence Irving
President
Irma Duncan
Executive Secretary

PACIFIC DIVISION

George E. Lindsay
President
Robert C. Miller
Secretary

SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

John R. Lacher
President
Marlowe G. Anderson
Executive Secretary

SCIENCE is published weekly, except the last week in December, but with an extra issue on the fourth Tuesday in September, 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 © 1971 by the American Association for the Advancement of Science. Annual subscription \$12; foreign postage: Americas \$3; overseas \$5; single copies, \$1 (back issues, \$2) except *Guide to Scientific Instruments* which is \$4. School year subscription: 9 months, \$9; 10 months, \$10. Rates effective 1 May 1971; Annual subscription \$20; foreign postage: Americas \$3; overseas \$5; air freight to Europe, North Africa, Near East \$16. 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

Unique Type of Angiosperm Pollen from the Family Annonaceae: <i>J. W. Walker</i>	565
Quadratic Elongation: A Quantitative Measure of Distortion in Coordination Polyhedra: <i>K. Robinson, G. V. Gibbs, P. H. Ribbe</i>	567
Maintenance of Resting Potential in Anoxic Guinea Pig Ventricular Muscle: Electrogenic Sodium Pumping: <i>T. F. McDonald and D. P. MacLeod</i>	570
Lesch-Nyhan Syndrome: Rapid Detection of Heterozygotes by Use of Hair Follicles: <i>S. M. Gartler et al.</i>	572
Deletions in Immunoglobulin Polypeptide Chains as Evidence for Breakage and Repair in DNA: <i>O. Smithies et al.</i>	574
Actinomycin D: Renewed RNA Synthesis after Removal from Mammalian Cells: <i>A. Schluederberg, R. C. Hendel, S. Chavanich</i>	577
Detoxication Enzymes in the Guts of Caterpillars: An Evolutionary Answer to Plant Defenses?: <i>R. I. Krieger, P. P. Feeny, C. F. Wilkinson</i>	579
Mycorrhizal Enhancement of Water Transport in Soybean: <i>G. R. Safir, J. S. Boyer, J. W. Gerdemann</i>	581
Cholinergic Sensitivity: Normal Variability as a Function of Stimulus Background: <i>L. Z. Bito, M. J. Dawson, L. Petrinovic</i>	583
Butterfly-Plant Coevolution: Has <i>Passiflora adenopoda</i> Won the Selectional Race with Heliconiine Butterflies?: <i>L. E. Gilbert</i>	585
Norepinephrine Pools in Rat Brain: Differences in Turnover Rates and Pathways of Metabolism: <i>J. J. Schildkraut, P. R. Draskoczy, P. S. Lo</i>	587
Activity of an NADPH-Dependent Nitroreductase in Houseflies: <i>E. P. Lichtenstein and T. W. Fuhremann</i>	589
Neural Regeneration: Delayed Formation of Central Contacts in Insect Sensory Cells: <i>J. S. Edwards and J. Palka</i>	591
<i>Culex (Melanoconion) aikenii</i> : Natural Vector in Panama of Endemic Venezuelan Encephalitis: <i>P. Galindo and M. A. Grayson</i>	594
Preavoidance Blood Pressure Elevations Accompanied by Heart Rate Decreases in the Dog: <i>D. E. Anderson and J. V. Brady</i>	595
Free Recall and Abstractness of Stimuli: <i>W. Bevan and J. A. Steger</i>	597
Differential Cerebral Processing of Noise and Verbal Stimuli: <i>R. Cohn</i>	599
Acetylcholine Liberation from Cerebral Cortex during Paradoxical (REM) Sleep: <i>H. J. Jasper and J. Tessier</i>	601

MEETINGS	Engineering Foundation Conferences: <i>S. S. Cole</i>	603
-----------------	---	-----

CARYL P. HASKINS
PHYLLIS V. PARKINS

LEONARD M. RIESER
KENNETH V. THIMANN

WILLIAM T. GOLDEN
Treasurer

WILLIAM BEVAN
Executive Officer

GEOLOGY AND GEOGRAPHY (E)
Ellis L. Yochelson
William E. Benson

BIOLOGICAL SCIENCES (FG)
George Sprugel, Jr.
Richard J. Goss

ANTHROPOLOGY (H)
Ward Goodenough
Anthony Leeds

ENGINEERING (M)
Newman A. Hall
Raynor L. Duncombe

MEDICAL SCIENCES (N)
George B. Koelle
F. Douglas Lawrason

DENTISTRY (Nd)
Henry W. Scherp
Sholom Pearlman

INFORMATION AND
COMMUNICATION (T)
Edward L. Brady
Scott Adams

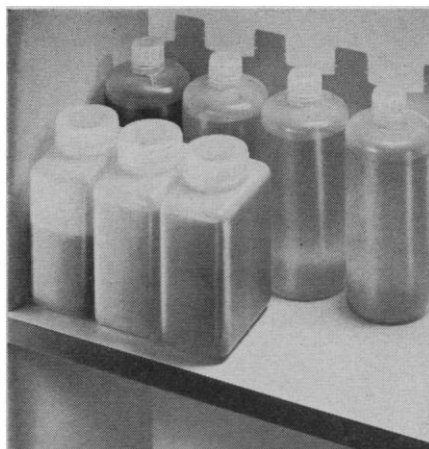
STATISTICS (U)
Elizabeth Scott
Ezra Glaser

ATMOSPHERIC AND HYDROSPHERIC
SCIENCES (W)
Thomas F. Malone
Louis J. Battan

COVER

Green leaves manufacture many chemical products. The details of the control of carbon metabolism are not fully understood, but the results of experiments answer some questions about specific molecular mechanisms. Feedback is apparently involved in the control of certain steps in these processes. See page 526. [Gary Laurish Photography, Washington, D.C.]

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.



The more you use our new rectangular bottles, the more space you have to use our new rectangular bottles!

You get more than 25% added shelf room with these new Nalgene bottles. Unbreakable, wide mouth, made of rigid linear polyethylene so sides won't bulge, with leakproof polypropylene closures. Sizes from 4 to 32 oz. Specify Nalgene Cat. No. 2007 when you order from your Lab Supply Dealer. Ask for our Catalog or write Dept. 4205A, Nalgene Labware Division, Rochester, N.Y. 14602.



Nalgene® Labware...better all the time.



LETTERS

Problem-Oriented Research

In his editorial (12 Mar.), Long has omitted an important issue—the relationship of applied research to the application of research. The application of research is not a simple process, but rather an interdisciplinary activity of great complexity. It takes place at the interface between knowledge and action. At that interface there are differences of language, psychology, and values.

The experience of industry, and of such mission-oriented agencies as National Aeronautics and Space Administration and the Department of Defense, has shown that successful application of applied research is very difficult if there is not a close and continuous interaction between those who are doing the research and those who are expected to use the results of research. The possible consequences of such interactions and their effect on the freedom and independence of the university and its programs should be carefully considered by those who would like to see more applied research for the public good done in universities.

HAROLD GERSHINOWITZ

Rockefeller University,
New York 10021

Male Bias and Women's Fate

In a letter (12 Feb.) Demorest Davenport defends the widespread discrimination against women in science on the grounds that women are (for a variety of reasons kindly supplied by M. B. Jensen in a following letter) too irresolute to be trusted to succeed in the opportunities that might be offered to them. The paucity of good openings for female scientists, and the substandard character of those that are available, is proof that the male scientists who run the establishment are largely in agreement with Davenport's views.

Yet the argument is one that could be made in better conscience by a physicist or a geologist than by a biologist. The physical scientists keep their female graduate students down to a tiny minority, and thus avoid the paradox of training those whom they would not employ. Biologists, however, have not been so fastidious. Beguiled by lavish federal funds for graduate student

training, the men who run our graduate biology departments have played a shameless numbers game, eagerly enticing women students to swell departmental rolls and bring in the money. The inconvenient fact that winning a Ph.D. would be unlikely to entitle a girl to more than second-class citizenship in the scientific world has, of course, gone unmentioned. The acceptance of this situation is to many men merely a matter of being realistic, though some are honest enough to admit that "cynical" would be a better word. The best word for it would be stronger.

During the 1960's, the percentage of Ph.D.'s in biology awarded to women ranged from 16 percent in the 11 most prestigious institutions to more than 30 percent in numerous others. I should like to ask Davenport who was a department chairman during that decade: How many members of my unreliable sex has his department admitted in recent years? How many have been awarded doctorates? Why?

FLORENCE MOOG

Department of Biology, Washington
University, St. Louis, Missouri 63130

In their attempts to justify lower salaries for women scientists, both Davenport and Jensen assume that there are "no data" on the relative scientific productivity of men and women and that such comparisons are only "theoretically possible." As readers of *Science*, they should not have to rely on what they "have heard" or would be "willing to bet" on what they "think the results would be," since a recent article on this subject noted the *higher* productivity of women in science (1). Or do they feel that an obligation to consider all available evidence only applies in the laboratory, and may conveniently be discarded when one is dealing with trivial matters like human aspirations?

WILLIAM LOCKERETZ

Department of Physics, Harvard
University, Cambridge, Massachusetts

Reference

1. M. S. White, *Science* 170, 413 (1970).

By resorting to hearsay in the absence of data, Jensen has himself already refuted at least one prejudice against women which assigns gossip to the female domain.

RUTH ROSIN

Department of Zoology,
Hebrew University of Jerusalem,
Jerusalem, Israel

Davenport and Jensen have alluded to a situation which is present in many fields . . . if the expectation of less job mobility in males is considered an important asset, over and above the current performance for which pay is ostensibly given, an easy solution is possible. At present, what happens if the male, paid at a preferred rate because of statistical expectation of longer employment, leaves for another job after a couple of years? Well, for one thing, he gets to keep the extra money.

If there is going to be a differential in rate of pay, it should be based on an enforceable expectation. That is, a bonus rate should be paid to anyone, male or female, who is willing to sign a long-term contract binding him or her to remain with the employer for a period of years, barring involuntary physical disability (this wouldn't include pregnancy), with a penalty clause providing that the extra pay over and above that of persons not signing such a contract, must be repaid to the employer if he defaults.

Some persons might be reluctant to sign such a contract, feeling that they were selling themselves into slavery. But at least it would mean that the person who claims a right to preferential pay on the basis of hypothetically greater job stability would have to either deliver or forfeit the extra proceeds.

The principle which Davenport and Jensen appear to accept is reminiscent of the man who gave his three sons a good whipping every day after breakfast, on the grounds that they were sure to do something to deserve it before the day was over. If we are going to punish occupational infidelity, it would be better to adopt the more generally accepted corrective principle of exacting the penalty after rather than before the crime is committed.

ALICE M. BRUES
Department of Anthropology,
University of Colorado, Boulder 80302

Some hypothesis might be tested to the satisfaction of all participants. Assume the validity of the following statements: (i) women receive lower salaries than men, all things but gender being equal; (ii) such a situation would be rational if, in fact, the "job mortality" would be higher for women than for men (due to sex-specific factors). Both of these statements should receive grudging agreement from all parties. Further, assume that past and present behavior is the best predictor available

for future behavior (most behavioral scientists would accept this); specifically, it should be possible to stipulate a period of employment (N years, say, where $N = 4$ or 5) which would indicate that a specific woman had a "job mortality" factor at least as low as that of a typical man in the same position.

If the above assumptions are accepted, then an employer should be willing to give parity to prospective or current women employees (in terms of hiring preference or salary) if such employees had completed N years of continued performance as a professional. Do the employers who write to *Science* have salary parity for women who have been employed N years? Are they as likely to hire women with N years of employment as men with equivalent experience? If the answer is "yes," then the employers are behaving rationally, and women must argue the tenability of the "job mortality" assumption. If the answer is "no," then the employers are merely rationalizing irrational behavior in their letters to *Science*, and are hoist by their own petards (in the Middle French meaning of the term). Empirical tests can discriminate the good guys or gals from the bad.

DAVID E. CLEMENT
Department of Psychology,
University of South Florida,
Tampa 33620

Amen

Several letters dealing with the properties, preparation, and use of yogurt have appeared in *Science* during the past few months (1). I have recently been informed of some less technical studies which the researcher has compiled and plans to publish in a modest manual entitled "60 Things You Can Do With Yogurt" (2). Then too, his research assistants have prepared a short follow-up paper entitled "One More Thing You Can Do With Yogurt" (3).

FREDERICK H. GILES, JR.
Department of Physics,
University of South Carolina,
Columbia 29208

References

1. E. F. Segal, *Science* 169, 425 (1970); M. Krogger, *ibid.*, p. 816; J. Goodman, *ibid.* 170, 123 (1970); B. H. Bagdikian, *ibid.*, p. 582; G. A. Garabedian, *ibid.* 171, 847 (1971).
2. Private communication.
3. An even more private communication.

The Brinkmann Gel Column

Slicing It Pretty Thin

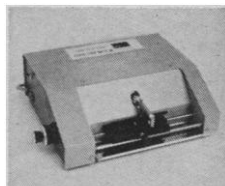
It's a safe bet you won't find one in every household. Or in every laboratory. But if you're moving in the sort of specialized area of electrophoretic analysis of RNA, for example, and you have to serve up slices of polyacrylamide gels, a lot of laboratory types think the MICKLE GEL SLICER is the best thing since delicatessens.

It figures.

How else can you cut a frozen gel column up to 10 cm long and 1 cm thick into flawless slices of less than 1.0 mm, in increments of 0.1 mm, and leave the rest of the column undisturbed?

Cutting force and blade angle are adjustable for hard-frozen dilute gels, or softer, concentrated cylinders. Slices are easily collected for processing and scintillation counting.

Twenty cuts per minute. Foot switch leaves hands free. Electromagnetic counter keeps score on slices. Write for complete details.



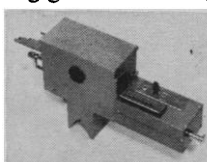
How To Look Good, Fast.

Costs being what they are today, the guy (or gal) who can save a few dollars gets the hero medal. Here's a way to look good while you're looking good and fast (while you're rapidly scanning polyacrylamide gel columns optically, that is).

Be the first to recommend purchase of the

VICON LINEAR GEL SCANNER—the attachment that fits right into your Zeiss PMQ II Spec. cell compartment without modification (and avoids costly instrument duplication).

It scans at 6 mm/min—even faster (25 mm/min) for coarser separations—in either direction. Resolution? Slit aperture is 100 μ thin to catch those narrow bands. Columns to 10 x 100 mm can be handled. Wavelength is variable from 200 to 750 m μ . And there are a host of options available to meet your specific needs. Want to scan fast? Want to look good? Get the details. Write:



Dept. B.G.C.
Brinkmann Instruments, Inc.
Cantiague Road,
Westbury, N.Y. 11590
(516/334-7500)

Brinkmann Instruments
(Canada), Ltd.
50 Galaxy Boulevard,
Rexdale (Toronto), Ontario



World's highest specific activity: Thymidine-H³ 40-60c/mM

Thymidine-methyl-H³ 40-60c/mM

A technological breakthrough, multiple labeling of the methyl-moiety with tritium, has permitted the preparation of tritium labeled thymidine at specific activities of 40-60 curies per millimole.

Thymidine-methyl-H ³	NET-027Z	40-60c/mM
Thymidine-methyl-H ³	NET-027X	20c/mM
Thymidine-methyl-H ³	NET-027	6.7c/mM
Thymidine-methyl-H ³	NET-027A	2c/mM

Standard package prices: \$15/250 μ c, \$35/1mc, \$100/5mc

Packaging: Sterile aqueous solution in combi-vial

Also Available:

Uridine-5, 6-H³ 35-50c/mM

Uridine-5, 6-H ³	NET-367	35-50c/mM
Uridine-5-H ³	NET-174	>20c/mM
Uridine-H ³ (G)	NET-028	>2c/mM

Standard package prices: \$20/250 μ c, \$40/1mc, \$105/5mc

Packaging: Sterile aqueous solution in combi-vial

All orders are shipped in our new leakproof combi-vial with the convenient multi-dose/screw-cap closure.

Place your order collect.



New England Nuclear

575 Albany Street, Boston, Mass. 02118
Customer Service: (617) 482-9595

Canada: NEN Canada Ltd., Dorval, Quebec, TEL: (514) 636-4971

Europe: NEN Chemicals GmbH, Dreieichenhain bei Frankfurt, Germany, TEL: Langen (06103) 8353

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

1971

THOMAS EISNER	NEAL MILLER
AMITAI ETZIONI	BRUCE MURRAY
EMIL HAURY	JOHN R. PIERCE
DANIEL KOSHLAND, JR.	MAXINE SINGER

1972

ALFRED BROWN	FRANK PRESS
JAMES F. CROW	FRANK W. PUTNAM
THOMAS KUHN	WALTER O. ROBERTS
ELLIOTT W. MONTROLL	

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher

WILLIAM BEVAN

Business Manager

HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

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

Assistant to the Editor: NANCY TEIMOURIAN

News and Comment: JOHN WALSH, PHILIP M. BOFFEY, ROBERT J. BAZELL, DEBORAH SHAPLEY, ROBERT GILLETTE, CONSTANCE HOLDEN, SCHERRAINE MACK

Research Topics: ALLEN L. HAMMOND

Book Reviews: SYLVIA EBERHART, KATHERINE LIVINGSTON, MARLENE GLASER

Cover Editor: GRAYCE FINGER

Editorial Assistants: MARGARET ALLEN, ISABELLA BOULDIN, BLAIR BURNS, ELEANORE BUTZ, RONNA CLINE, BARBARA GUARIN, CORRINE HARRIS, OLIVER HEATWOLE, ANNE HOLDSWORTH, ELEANOR JOHNSON, MARSHALL KATHAN, MARGARET LLOYD, DANIEL RABOVSKY, PATRICIA ROWE, LEAH RYAN, LOIS SCHMITT, BARBARA SHEFFER, RICHARD SOMMER, YA LI SWIGART, ALICE THEILE, MARIE WEBNER

Membership Recruitment: LEONARD WRAY; Subscriptions: BETT SEEMUND; Addressing: THOMAS BAZAN

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

BONNIE SEMEL

Advertising Sales Manager: RICHARD L. CHARLES

Sales: NEW YORK, N.Y. 10036: Herbert L. Burkland, 11 W. 42 St. (212-PE-6-1858); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); MEDFIELD, MASS. 02052: Richard M. Ezequelle, 4 Rolling Lane (617-444-1439); CHICAGO, ILL. 60611: John P. Cahill, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772)

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phones: (Area code 202) Central office: 467-4350; Book Reviews: 467-4367; Business Office: 467-4411; Circulation: 467-4417; Guide to Scientific Instruments: 467-4480; News and Comment: 467-4430; Reprints and Permissions: 467-4483; Research Topics: 467-4455; Reviewing: 467-4440. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page xv, *Science*, 26 March 1971. ADVERTISING CORRESPONDENCE: Room 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

Changing Attitudes toward Environmental Problems

During 1970 public concern about pollution reached an emotional peak. Many people became convinced that the environment was deteriorating rapidly and that all of us were about to choke to death from pollution. Politicians of the two major parties scrambled to establish positions on the antipollution bandwagon. Federal legislative and administrative actions that were taken will eventually result in substantial improvement in our air and waters. Convinced that the public demands cleaner air and cleaner water, American industry will spend billions of dollars on antipollution measures.

An emotional peak, such as that witnessed in 1970, cannot be sustained. Earth Day activities this year were a pale shadow of those of a year ago. The mass media are beginning to diminish their coverage of environmental matters, and debunking stories are starting to appear. More important for the long haul is a growing recognition that environmental improvement is going to cost a lot of money and that the costs are going to be paid by everyone.

The emotional peak of 1970 was built in part on a solid base but it was also built in part on erroneous information and bad judgment. We must achieve and maintain a livable environment, but we are not about to choke to death from pollution, and the world is not going to run out of oxygen.

One of the odd features of the emotional peak was that it occurred at a time when most of the important components of pollution had leveled off or declined. For example, suspended particulate matter over some large cities had already decreased and carbon monoxide and sulfur dioxide content had diminished in others.

Contributing heavily to the timing and the shape of the emotional peak was the behavior of the mass media. Reporters selectively quoted people who gave them the scary kind of story that their editors would print, or that radio and TV would use. Public emotion quickly rose. However, after a time the public interest began to level off, and the mass media are now turning elsewhere. Typically, a period of inattention will be followed by another phase in which low-key, sober assessments will provide a more realistic picture to the public.

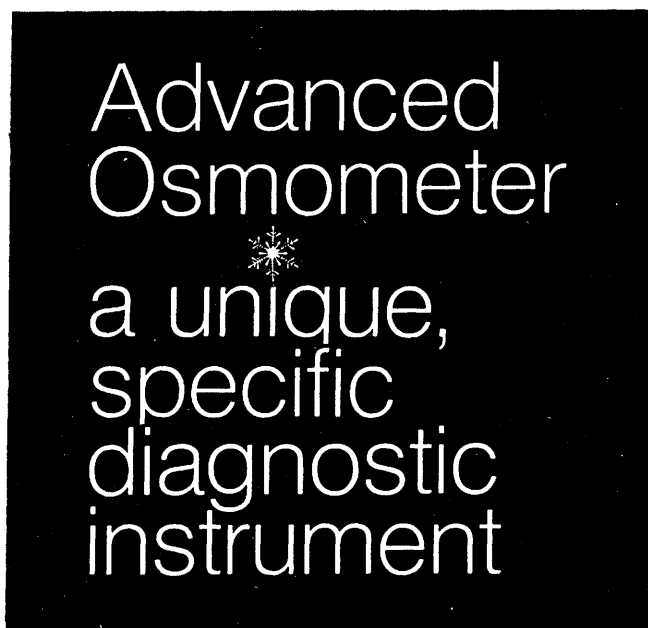
One of the misapprehensions of many people is that they can enjoy a perfect environment but that somebody else will pay for it. The cost of attaining even a moderately decent environment will be in the tens of billions of dollars and will be borne by everyone. Experience with abatement of sulfur dioxide pollution is illustrative. The added costs of low-sulfur fuels are in excess of a billion dollars a year. But the public will pay far more in the form of increased costs for electricity and other items.

We are entering a new phase in efforts to attain a better environment. In future, emotional appeals based on inaccurate information are not so likely to be effective. As it becomes apparent that the public must pay for improvements, new criteria will enter discussions concerning the environment. Benefits will be weighed against costs. Intellectual leadership in environmental matters will be shared by economists who are already beginning to hold useful symposia on these topics. Changes in political attitudes that are already occurring will continue as ghetto congressmen find their constituents feeling the costs of pollution abatement. The constituents are unaware of much improvement for their money. They have not been fully informed, and they are unable to detect small changes in sulfur dioxide. At the same time their eyes and their noses tell them that garbage collection has not improved.

—PHILIP H. ABELSON

The background for much of this discussion was a symposium organized by Resources for the Future and held in Washington, D.C., on 20 and 21 April.

Exact measurement of concentration in biological solutions



A two-minute test by an Advanced freezing-point osmometer provides highly accurate information for the diagnosis of electrolyte imbalance, renal function, ADH secretion, total body water, dehydration and other metabolic disturbances.

Research applications include water purity, column chromatography, fixative media, molecular weight and physiological and biological experimentation.

Models are available for high precision research or everyday routine, and range from single-sample manual to multi-sample automatic.

Users enjoy continuous 24-hour collect-call **Hot Line®** service.

Write today for applications literature, or call collect for **Hot Line®** information.



**ADVANCED
INSTRUMENTS, INC.**

1000 Highland Avenue / 617-449-3000
Needham Heights, Massachusetts, 02194

WRITE FOR LITERATURE PACKAGE #341

Science Reprints

Reprints of the following selected articles from *Science* are for sale to our readers. They may be ordered from AAAS Reprints, 1515 Massachusetts Ave., NW, Washington, D.C. 20005.

	Copies Ordered
J. D. Carroll, "Participatory Technology" (19 Feb. 1971), 8 pages	_____
G. Hardin, "The Tragedy of the Commons" (13 Dec. 1968), 8 pages	_____
B. L. Crowe, "The Tragedy of the Commons Revisited" (28 Nov. 1969), 8 pages	_____
J. Platt, "What We Must Do" (28 Nov. 1969), 8 pages	_____
L. W. Moncrief, "The Cultural Basis for Our Environmental Crisis" (30 Oct. 1970), 8 pages	_____
B. Berelson, "Beyond Family Planning" (7 Feb. 1969), 12 pages	_____
C. Djerassi, "Birth Control after 1984" (4 Sept. 1970), 12 pages	_____
B. D. Davis, "Prospects for Genetic Intervention in Man" (18 Dec. 1970), 8 pages	_____
L. Marx, "American Institution and Ecological Ideals" (27 Nov. 1970), 12 pages	_____
P. A. Graham, "Women in Academe" (25 Sept. 1970), 8 pages	_____
L. B. Lave and E. P. Siskin, "Air Pollution and Human Health" (21 Aug. 1970), 12 pages	_____
P. H. Abelson, "Death from Heroin" (12 June 1970), 1 page, 50¢ per copy	_____
E. Land, "Addiction as a Necessity and Opportunity" (15 Jan. 1971), 4 pages	_____
A. Crancer, Jr., <i>et al.</i> , "Comparison of the Effects of Marijuana and Alcohol on Simulated Driving Performance" (16 May 1969), 4 pages	_____
L. Lemberger <i>et al.</i> , "Marihuana: Studies on the Disposition and Metabolism of Delta-9-Tetrahydrocannabinol in Man" (18 Dec. 1970), 4 pages	_____
H. L. Lennard <i>et al.</i> , "Hazards Implicit in Prescribing Psychoactive Drugs" (31 July 1970), 4 pages	_____
R. E. Schultes, "Hallucinogens of Plant Origins" (17 Jan. 1969), 8 pages	_____
A. T. Weil, N. Zinberg, and J. M. Nelson, "Clinical and Psychological Effects of Marihuana in Man" (13 Dec. 1968), 12 pages	_____

When ordering, identify each article by author, title, page numbers, and issue date. Enclose payment with order; do not send currency.

Prices and Terms

	One reprint—\$1.00	Two to nine reprints—60¢ each			
		10 reprints	25 reprints	50 reprints	100 reprints
4 pages	\$4.00	\$ 8.00	\$15.00	\$25.00	
8 pages	\$5.00	\$11.00	\$20.00	\$35.00	
12 pages	\$5.50	\$13.00	\$25.00	\$45.00	

Reprints—Reprints—Reprints—Reprints—Reprints—Reprints—Reprints—Reprints