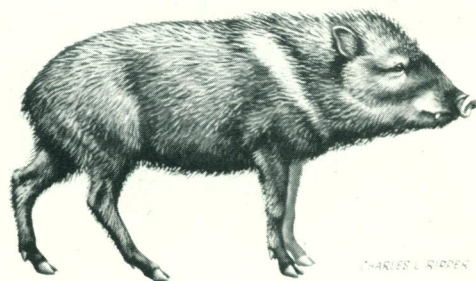
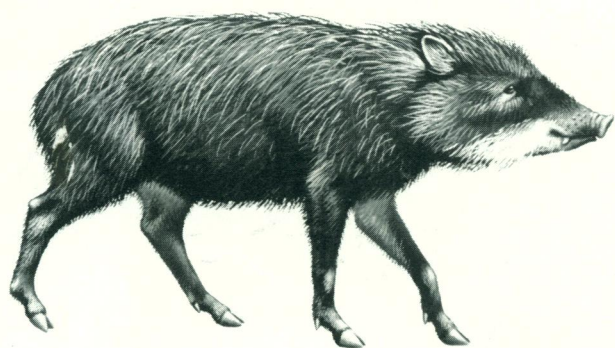
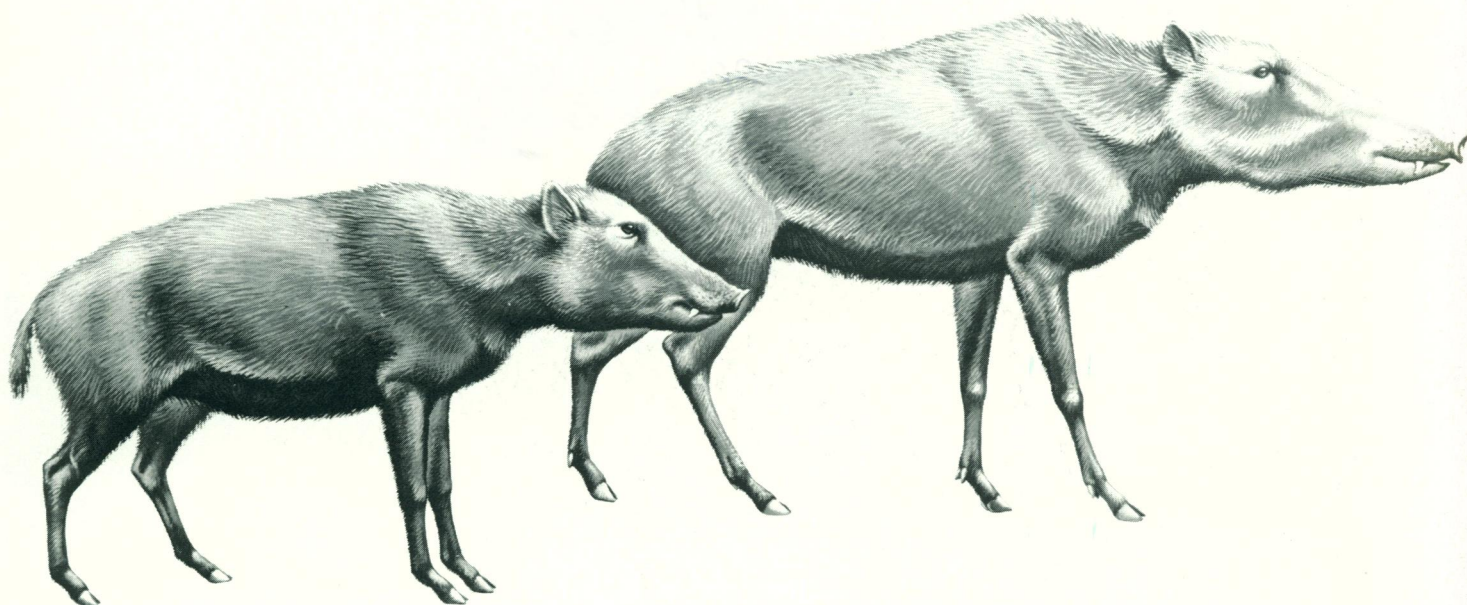


SCIENCE

1 August 1975

Volume 189, No. 4200

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



You can decide today

LKB Ultrogel for high-speed gel filtration



You can make a decision this morning to separate a protein sample and have your result this afternoon with LKB Ultrogel.

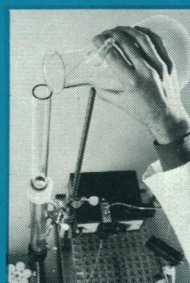
Ultrogel is a *prepared* polyacrylamide/agarose gel medium consisting of small, very rigid and uniform, spherical beads pre-swollen to a controlled particle diameter of 60 to 140 μm .

Ultrogel comes ready-to-use. You only have to choose your fractionation range. No weighing of dry beads, no calculation of buffer volume, no swelling time, no fine particle removal.

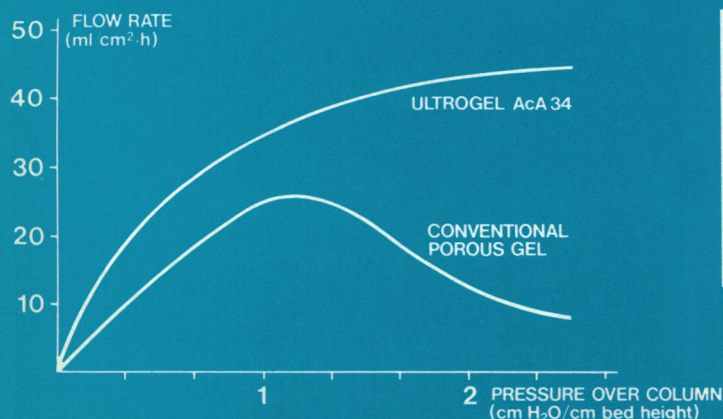
Ultrogel is *unique* because *now* you can have *both* high resolution and high flow rates with low dilution and low sample zone diffusion. And column packing is *easy* and *fast*.

Ultrogel comes in 1 liter bottles of four fractionation ranges from 6000 to 1,000,000 daltons.

For more information on Ultrogel write to us today, or better yet, decide today and order Ultrogel from the types listed in the table below.



In one step, measure out the amount of Ultrogel needed for the gel bed height. Then after deaeration, simply pour this amount of Ultrogel into your column.



Ultrogel type	Max. Flow Rate (ml/cm ² .h)	Fractionation Range* (daltons)
AcA 22	18	60,000 – 1,000,000
AcA 34	40	20,000 – 400,000
AcA 44	45	12,000 – 130,000
AcA 54	50	6000 – 70,000

*for globular proteins

LKB

LKB Instruments Inc.

12221 Parklawn Drive, Rockville MD. 20852
 11744 Wilshire Blvd. Los Angeles CA 90025
 6600 West Irving Park Road, Chicago Ill. 60634
 260 North Broadway, Hicksville N.Y. 11801
 3700 Chapel Hill Blvd., Durham N.C. 27707

Population: Dynamics, Ethics, and Policy



"A serious perusal of these papers, in all their variety, should lead to some very thought-provoking consideration of how an interdisciplinary and international approach might begin to give us a firmer grip on the problems of population balance . . ."

Margaret Mead, from the preface

These words bring into focus the unique contribution of *Population: Dynamics, Ethics, and Policy*, a new compendium of articles, research reports, and policy debates that originally appeared in *Science* during a 10-year time span beginning in 1966. Together these papers give you

- a close look at population research as conducted and reported by such American scientists as Bernard Berelson, Ansley Coale, Kingsley Davis, Garrett Hardin, Amos Hawley
- a glimpse at the continuing debate between those who advocate the dissemination of contraceptives and those who advocate more drastic methods of population control

But perhaps even more important, this compendium vividly reveals the ethnocentrism that has pervaded the American population debate.

If we want to solve the problems of population growth and control, we must recognize and deal with the extraordinary complexity of relationships between culture, nationhood, type of technological change, and ideological preoccupations . . .

If we want to go beyond where we are today, we must recognize and correct the defective theoretical basis on which national and international action has been taken for more than four decades . . .

If you want to know more about these and other aspects of population research and policy planning, be sure to read *Population: Dynamics, Ethics, and Policy*. Send for your copy today, available in your choice of casebound or paperbound editions. Preface by Margaret Mead. Edited and with an introduction by Priscilla Reining and Irene Tinker. Retail price \$12.95 casebound, \$4.95 paperbound; AAAS member price, prepaid \$11.95 casebound, \$4.45 paperbound.



ORDER FORM

Please send me **Population: Dynamics, Ethics, and Policy** (1975, viii + 184 pages):

_____ casebound copies. Retail \$12.95; AAAS member, prepaid, \$11.95. ISBN 0-87168-214-1.

_____ paperbound copies. Retail \$4.95; AAAS member, prepaid, \$4.45. ISBN 0-87168-225-7.

- ☐ Check or money order enclosed (payable to AAAS — no cash).
☐ Please bill me.

Name _____

Address _____

City _____

State _____ Zip _____

Send to Dept. PC
**AMERICAN ASSOCIATION
FOR THE ADVANCEMENT
OF SCIENCE**
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

1 August 1975

Volume 189, No. 4200

SCIENCE

LETTERS	Geothermal Power Plants: Environmental Impact: <i>T. F. Gesell</i> and <i>J. A. S. Adams</i> ; <i>L. B. Church</i> ; <i>J. Barnea</i> ; <i>R. C. Aximann</i> ; Citation Analysis Studies: <i>E. Garfield</i> and <i>A. E. Cawkell</i>	328
EDITORIAL	Peer Review Revisited	331
ARTICLES	Droplet Chondrules: <i>S. W. Kieffer</i>	333
	Compartments and Polyclones in Insect Development: <i>F. H. C. Crick</i> and <i>P. A. Lawrence</i>	340
	Intracellular Aspects of the Process of Protein Synthesis: <i>G. Palade</i>	347
NEWS AND COMMENT	Discovery of Pulsars: A Graduate Student's Story	358
	<i>Briefing</i> : Land Use Legislation Defeated in Committee; ACDA Scotches Rumors of Argentine Nuclear Theft; United States Neglects Civilian R & D; CEQ Relaxes Stand on Predator Poisoning—Biter Beware	360
	Problems with the Enrichment Program	363
	Energy: A Strategic Oil Reserve as a Hedge Against Embargoes	364
	North Pole, South Pole Resources Eyed.	365
RESEARCH NEWS	Crib Death: Some Promising Leads But No Solution Yet	367
	Nitrogen Fixation in Maize	368
	Energy: ERDA Stresses Multiple Sources and Conservation	369

BOARD OF DIRECTORS					
ROGER REVELLE Retiring President, Chairman		MARGARET MEAD President	WILLIAM D. MC ELROY President-Elect	RICHARD H. BOLT KENNETH B. CLARK	EMILIO Q. DADDARIO EDWARD E. DAVID, JR.
CHAIRMEN AND SECRETARIES OF AAAS SECTIONS					
MATHEMATICS (A) Victor L. Klee Truman A. Botts		PHYSICS (B) Victor F. Weisskopf Rolf M. Sinclair	CHEMISTRY (C) William E. Hanford Leo Schubert	ASTRONOMY (D) Carl Sagan Arlo U. Landolt	
PSYCHOLOGY (J) Richard C. Atkinson Edwin P. Hollander		SOCIAL AND ECONOMIC SCIENCES (K) Seymour M. Lipset Daniel Rich		HISTORY AND PHILOSOPHY OF SCIENCE (L) Roger C. Buck George Basalla	ENGINEERING (M) Edward Wenk, Jr. Paul H. Robbins
EDUCATION (Q) F. James Rutherford Phillip R. Fordyce		DENTISTRY (R) Clifton O. Dummett Sholom Pearlman	PHARMACEUTICAL SCIENCES (S) James T. Doluisio Raymond Jang	INFORMATION, COMPUTING, AND COMMUNICATION (T) Martin Greenberger Joseph Becker	
DIVISIONS					
ALASKA DIVISION William E. Davis Chairman, Executive Committee		IRMA DUNCAN Executive Secretary	GEORGE A. ZENTMYER President	PACIFIC DIVISION Robert T. Orr Secretary-Treasurer	SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION Michelle Baker President Max P. Dunford Executive Officer

SCIENCE is published weekly, except the last week in December, but with an extra issue 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. and additional entry. Copyright © 1975 by the American Association for the Advancement of Science. Member rates on request. Annual subscription \$50; foreign postage: Americas \$7, overseas \$8, air lift to Europe \$30. Single copies \$2 (back issues \$3) except Food Issue (9 May 1975) is \$3 and *Guide to Scientific Instruments* is \$6. School year subscription: 9 months \$37.50; 10 months \$41.75. Provide 6 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

AAAS NEWS Science Education at AAAS: *A. H. Livermore*; Gerald Holton Selected as AAAS Representative to UNESCO Commission; Call for Nominations; Communications Department Holds Alabama Seminar: *A. M. Goldman*; Notes from Other Offices . . . 371

BOOK REVIEWS The Volunteer Subject, reviewed by *D. W. Fiske*; Contemporary Developments in Mathematical Psychology, *W. H. Batchelder*; Biology and Neurophysiology of the Conditioned Reflex and Its Role in Adaptive Behavior, *J. W. Moore*; Perception, *S. M. Ebenholtz*; The Wild Canids, *D. G. Kleiman* . . . 373

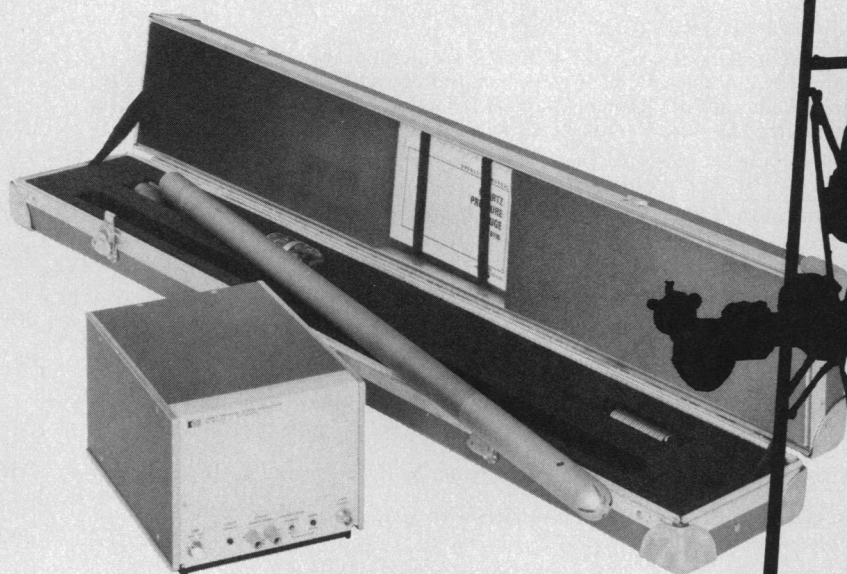
REPORTS Past Orientation of the Lunar Spin Axis: *W. R. Ward* . . . 377
Catagonus, an "Extinct" Peccary, Alive in Paraguay: *R. M. Wetzel et al.* . . . 379
 Locomotory Adaptations in a Free-Lying Brachiopod: *J. R. Richardson and J. E. Watson* . . . 381
 Far-Field Acoustic Response: Origins in the Cat: *J. S. Buchwald and C.-H. Huang* . . . 382
 Tetrahedral Intermediate in a Specific α -Chymotrypsin Inhibitor Complex Detected by Laser Raman Spectroscopy: *G. P. Hess et al.* . . . 384
 Anthopleurine: A Sea Anemone Alarm Pheromone: *N. R. Howe and Y. M. Sheikh* . . . 386
 Suppression of a Field Population of Houseflies with *Spalangia endius*: *P. B. Morgan et al.* . . . 388
 Peptide Inhibition of the Prausnitz-Küstner Reaction: *R. N. Hamburger* . . . 389
 Glomerular Epithelium: Structural Alterations Induced by Polycations: *M. W. Seiler, M. A. Venkatachalam, R. S. Cotran* . . . 390
 2,3-Diphosphoglycerate in Erythrocytes of Chick Embryos: *R. E. Isaacks and D. R. Harkness* . . . 393
 Technical Comments: Meteor-Generated Infrasound: *D. O. ReVelle; W. L. Donn and N. K. Balachandran* . . . 394

RUTH M. DAVIS WARD H. GOODENOUGH	FREDERICK MOSTELLER CHAUNCEY STARR	WILLIAM T. GOLDEN Treasurer	WILLIAM D. CAREY Executive Officer
GEOLOGY AND GEOGRAPHY (E) William E. Benson Ramon E. Bisque	BIOLOGICAL SCIENCES (G) Hans Laufer Jane C. Kaltenbach	ANTHROPOLOGY (H) Ruth L. Bunzel Philleo Nash	
MEDICAL SCIENCES (N) Robert Austrian Richard J. Johns	AGRICULTURE (O) Paul E. Waggoner J. Lawrence Apple	INDUSTRIAL SCIENCE (P) Jordan D. Lewis Robert L. Stern	
STATISTICS (U) Carl A. Bennett Ezra Glaser	ATMOSPHERIC AND HYDROSPHERIC SCIENCES (W) Charles E. Anderson Stanley A. Changnon, Jr.	GENERAL (X) Athelstan F. Spilhaus Joseph F. Coates	

COVER

Four genera of peccaries. (Upper right) Extinct, long-nosed peccary (*Mylohyus nasutus*), late Pleistocene, North America; (upper left) extinct, flat-headed peccary (*Platygonus compressus*), late Pleistocene, North America; (lower left) living, white-lipped peccary (*Tayassu pecari*), South and Central America; (lower right) living, collared peccary (*Dicotyles tajacu*), South and Central America north to Arizona. See page 379. [Drawings by Charles L. Ripper; courtesy of Carnegie Museum of Natural History, Pittsburgh, Pennsylvania]

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. Postmaster: Send Form 3579 to SCIENCE, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.



Ultrasensitive quartz pressure gauge helps boost oil production

Able to measure a change as small as 0.01 psi at wellbore pressures up to 11,000 psi, the HP 2811B helps engineers evaluate reservoir parameters for optimal oil recovery.

One of the most effective methods of determining the production capacity of an oil reservoir is called pulse testing. By applying a series of pressure changes in a well and measuring the response in an adjacent observation well, engineers can determine the height and drainage characteristics of the underlying reservoir and thus calculate how to optimize its production.

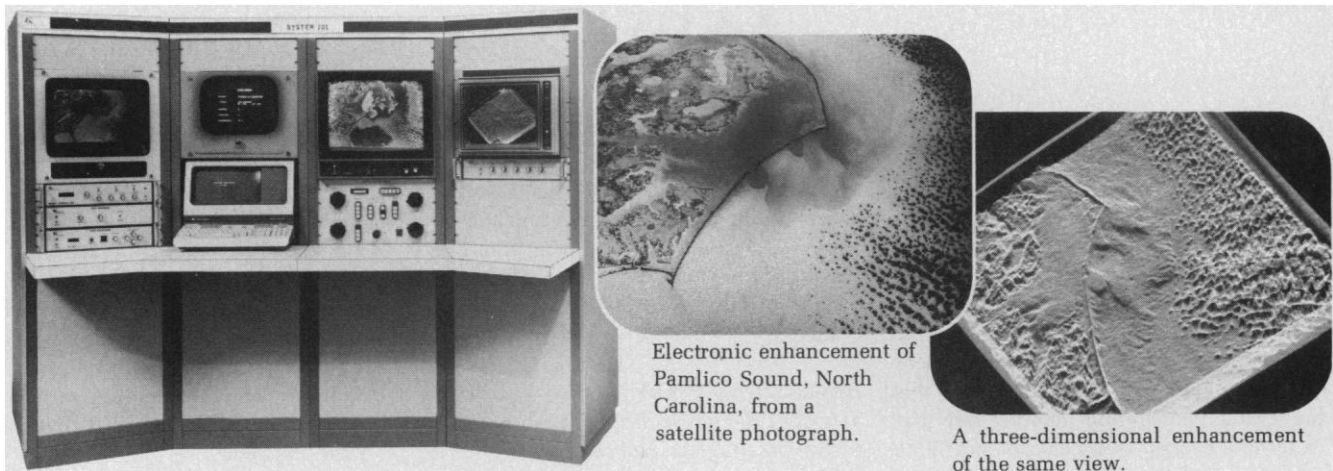
Although pulse testing theory has been thoroughly understood for ten years, it has not been widely used, for want of an adequately sensitive pressure gauge. With ordinary instruments, large pulses have to be applied over long cycle times in order to detect the greatly attenuated response in the observation well. The test therefore takes a long time, typically one or more weeks, and the loss in oil



production is considerable since both wells are "shut-in" during the test.

The HP 2811B Quartz Pressure Gauge has changed things dramatically for the better. Because it can accurately measure a change as small as 0.01 psi at any reservoir pressure up to 11,000 psi—compared to 0.5 psi with ordinary instruments—the pressure changes can be much smaller, cycle times much shorter, and the duration of the test cut to a few days, depending on reservoir conditions.

Reservoir engineers find many other reasons to prefer the 2811B as a "bottom hole" pressure gauge for pulse testing. Strip chart recorder and digital printer options provide an instant and direct read-out of pressure changes on the surface, even when the measuring probe lies 20,000 feet down the hole. The gauge maintains resolution and accuracy at any well pressure to 12,000 psia and any temperature to 300°F. And it holds its calibration for at least a full year despite mechanical vibration and rough handling. Cost of the complete gauge without recording options is \$11,375*.



Digital image processing system unlocks earth's secrets from satellite data.

Stanford Technology Corporation chooses HP 3000CX computer system to convert radio signals from the LANDSAT (ERTS) satellites into useful pictures of the earth's resources.

One of NASA's least known spacecraft is well on the way to making some of the most important "civilian" contributions of the space program.

Since 1972, the first Earth Resources Technology Satellite has been looking at the whole earth through a multispectral optical scanner. A second LANDSAT satellite has been in service since January 1975. When properly processed, the digital data transmitted to earth from these satellites provides spectral "signatures" of classes of objects on earth that can be used to inventory many of the world's resources. Agronomists have used the pictures to measure the total acreage of various crops and to project their yields; foresters, to detect timberland insect infestation; planners, to outline land-use patterns and flood-prone areas; geologists, to locate mineral deposits.

The potential usefulness of these pictures in many fields has created a great demand for equipment to

interpret them. A new development by Stanford Technology Corporation—the System 101—is being offered to meet this demand.

This powerful new multi-user digital image processing system is configured around the HP 3000CX, chosen by STC engineers as the computer system best suited to the application.

While the HP 3000CX is fast and powerful enough to satisfy the full range of LANDSAT requirements, it is much easier to use than larger computers, especially by nonspecialists. Many scientists can use it at the same time, some processing images on-line while others develop programs. An extremely simple language with a "menu-prompting" mode is provided for inexperienced users, while advanced users can use a high-level language with efficient command lists.

The STC System 101 should go a long way in reducing the LANDSAT image-processing bottleneck. For more information on System 101, write or call Stanford Technology Corporation in Mountain View, California 94043.

System prices for the HP 3000CX start at \$99,500*.

For more information on these products, write to us, Hewlett-Packard, 1507 Page Mill Road, Palo Alto, California 94304.



Sales and service from 172 offices in 65 countries

Mail to: Hewlett-Packard, 1507 Page Mill Road, Palo Alto, CA 94304.
Please send me further information on

- ☐ HP 3000CX Computer System
- ☐ HP 2811B Quartz Pressure Gauge

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

*Domestic USA prices only.

00547

A radioactive compound which must be kept frozen but is delivered thawed is useless. So when dry ice is indicated, we pack in enough to guarantee a frozen product delivered to your receiving department. We expedite shipments in specially designed packaging, too.

Delivery is the last link in the chain of quality at New England Nuclear, where no link is considered unimportant.



NEN New England Nuclear

549 Albany Street, Boston, Massachusetts 02118
Customer Service 617-482-9595

Canada: NEN Canada Ltd., Dorval, Quebec, H9P-1B3, Tel: (514) 636-4971, Telex: 05-821808
Europe: NEN Chemicals GmbH, D6072 Dreieichenhain, W. Germany, Siemensstrasse 1. Tel: Langen (06103) 85035

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

1975

H. S. GUTOWSKY	DONALD LINDSLEY
N. BRUCE HANNAY	RUTH PATRICK
DONALD KENNEDY	RAYMOND H. THOMPSON
DANIEL E. KOSHLAND, JR.	

1976

ALFRED E. BROWN	FRANK PRESS
JAMES F. CROW	FRANK W. PUTNAM
HANS LANDSBERG	MAXINE SINGER
EDWARD NEY	ARTHUR M. SQUIRES

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher

WILLIAM D. CAREY

Business Manager

HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

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

Assistant to the Editors: PATRICIA ROWE

News and Comment: JOHN WALSH, LUTHER J. CARTER, DEBORAH SHAPLEY, ROBERT GILLETTE, NICHOLAS WADE, CONSTANCE HOLDEN, BARBARA J. CULLITON, SCHERRAINE MACK

Research News: ALLEN L. HAMMOND, WILLIAM D. METZ, THOMAS H. MAUGH II, JEAN L. MARX, ARTHUR L. ROBINSON, GINA BARI KOLATA, FANNIE GROOM

Book Reviews: KATHERINE LIVINGSTON, LYNN MANFIELD, JANET KEGG

Cover Editor: GRAYCE FINGER

Editorial Assistants: MARGARET ALLEN, JOHN BAKER, ISABELLA BOULDIN, ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, JUDITH GIVELBER, CORRINE HARRIS, NANCY HARTNAGEL, OLIVER HEATWOLE, CHRISTINE KARLIK, MARGARET LLOYD, JEAN ROCKWOOD, LEAH RYAN, LOIS SCHMITT, RICHARD SEMIKLOSE, YA LI SWIGART, ELEANOR WARNER

Guide to Scientific Instruments: RICHARD SOMMER

Membership Recruitment: GWENDOLYN HUDDLE; *Subscription Records and Member Records:* ANN RAGLAND

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

MARGARET STERLING

Advertising Sales Manager: RICHARD L. CHARLES

Sales: NEW YORK, N.Y. 10036: Herbert L. Burklund, 11 W. 42 St. (212-PE-6-1858); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); CHICAGO, ILL. 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 11 N. La Cienega Blvd. (213-657-2772); DORSET, VT. 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581)

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 News: 467-4321; Reviewing: 467-4443. Cable: Advancesci. Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page xv, *Science*, 28 June 1974. ADVERTISING CORRESPONDENCE: Room 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

Peer Review Revisited

Has the peer review system performed well or poorly as a method for helping government research administrators to ration research support? What can be said for its reliability and objectivity? Has peer review, over the years, tended to go stale? Have administrators used it so much as a crutch that their own judgment is clouded? Is it enough to know that research has scientific merit but not whether it has social value and merit? Some light may be shed on these and other matters when the Symington subcommittee of the House of Representatives turns its attention to the peer review system.

An odor of sanctity surrounds peer review. Rather too much has been claimed for it, considering how human and potentially fallible it is. Stripped of its elegance, it is simply a sensible arrangement for enlisting volunteer referees to call balls and strikes on proposals pitched to the funding agencies. Its credibility and durability rest on the integrity and responsibility of the referees. That in itself is no small thing, and indeed is the center beam which holds up the house of science. From this standpoint, peer review is a proxy for assaying the standards of the scientific community.

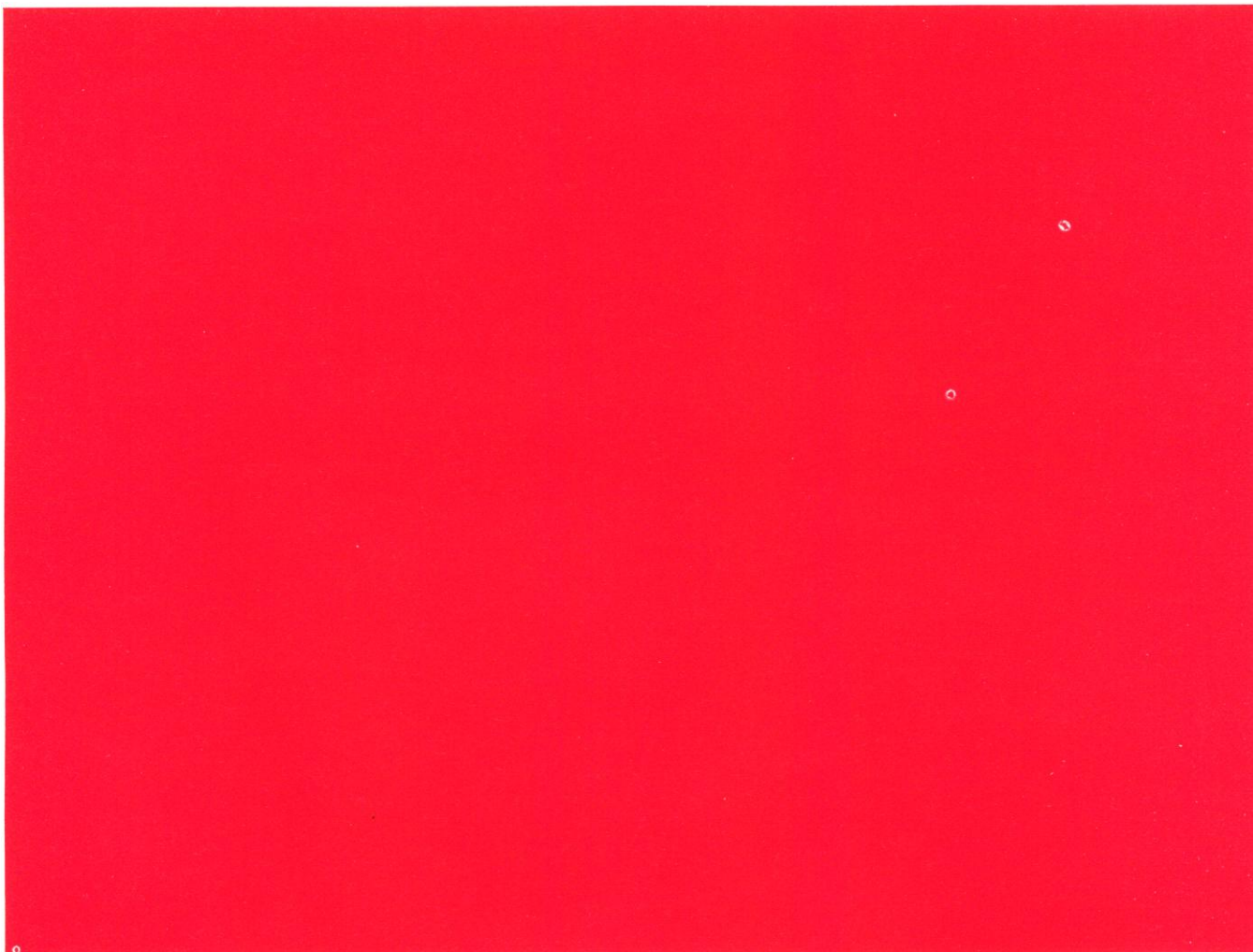
The Congress apparently is troubled as to how sensitive peer review is to considerations of public taste, concern for how public funds are spent, and equitable distribution of research awards. With this goes concern for the public accountability of the peer review machinery, which some think to be an insider system aimed at keeping out the unprivileged. All these questions need to be flushed into the open and answered by the evidence. That is the function of legislative oversight.

When all is said and done, peer review is likely to emerge with good marks. This is not to say that it has been perfect, or that it does not need some new premises. Peer review is a form of insurance on which administrators have relied as one of the stages in making choices. It does not preempt the judgment of administrators; neither should it intimidate them nor excuse them from being accountable. But bureaucratic life, these days, puts a larger burden on peer review than it was ever meant to carry. The sheer volume of proposals constitutes a tidal wave which overwhelms the agencies' reviewing process and brings it close to rote and insensitivity.

Some corrections to the peer review system probably are in order. The views of referees should be a matter of record and shared candidly with the originators of the research proposals, but the identities of the reviewers should be held in confidence. The practice of permitting potential grantees to nominate qualified reviewers for their proposals is understandable up to a point, but it has connotations of conflict of interest. If the selection of "peers" were to include others than field specialists, considerations of the social value of the research might, with profit, be injected into the criteria of choice from the start.

Beyond this, one is troubled to know whether peer review stacks the deck against younger and nonestablishment scientists whose credentials are no match for those of more imposing competitors. If the system shuts out the bright beginners and independents in order to ration scarce support only to scientists whose reputations are already made, we will come to regret it.

Peer review has its advocates and its critics. Its profound merit is that it broadens and diffuses the process through which government makes up its mind. That alone goes far to commend it. If government can learn that the world will not come to a bad end when decision-making is decentralized and made participative, something important will have emerged from peer review. As the Congress takes up the matter, more is at issue than a summary judgment. The real questions go to the vitality, the design, and the right uses of peer review as a bridge over the troubled waters of science and its relations with government.—WILLIAM D. CAREY



Dependable service. We promise you'll never see red.

Mettler knows how to take care of its balances.
We have 40 factory-trained service
specialists located throughout
the country. Plus a toll-free number you can call
to get emergency trouble-shooting help.
If a Mettler employee performs the service, you
get a one-year warranty on the work. If the service
fails within a year, we do it again—free.
That we promise.



Mettler

always gives you so much more.

METTLER INSTRUMENT CORPORATION, PRINCETON, NJ 08540