

25 MARCH 1983 • VOL. 219 • NO. 4591

\$2.50

# SCIENCE

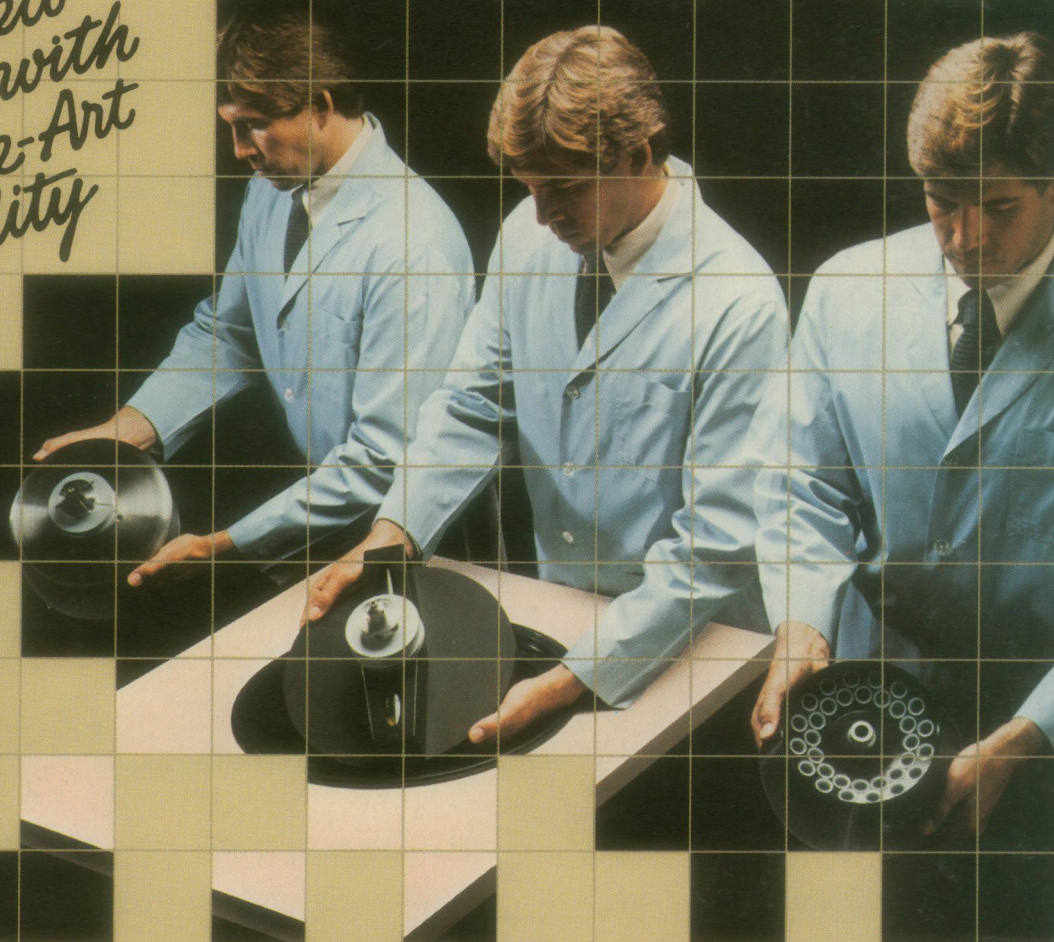
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





## INNOVATION:

*Now, a  
High-Speed  
Centrifuge with  
State-of-the-Art  
Flexibility*



The J2-21M: the microprocessor-controlled, high-speed centrifuge with *brushless* induction drive, a 10-program memory, and a rotor for every application. It's flexible enough for the '80s and beyond.

The J2-21M is fully programmable, so there's no chance for error on repeat runs. Or you can manually set run conditions with unbeatable precision. Speed is accurate to 10-rpm, time to 1/10 minute, temperature to 1°C.

There's an audible end-of-run signal. And a diagnostics readout that signals power failure, rotor imbalance, over-speed and over temperature.



A 2-step accel/decel system reduces run times to a minimum, yet still gives you high quality separations. Every time. You have 10 rates to choose from, and positive frequency control gets rotors to speed smoothly and fast.

Ultra-Smooth induction drive, based on Beckman ultracentrifuge technology, has no brushes to change. So the J2-21M is inexpensive to maintain, and comes with a never-before 3-year motor warranty.

For experimental flexibility, you can spin 11 different rotors. And virtually all of them offer higher forces or volumes than competitive models. There's the JCF-Z continuous flow rotor, and the unique elutriator rotor for gentle, living cell separations.

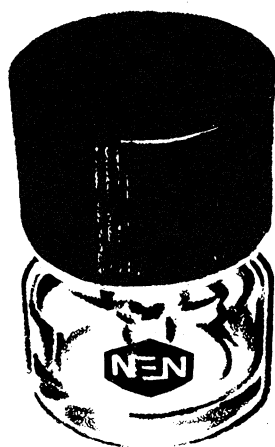
The J2-21M. With 35 years of Beckman centrifuge expertise behind it. For full details write: Beckman Instruments, Inc., Spinco Division, P.O. Box 10200, Palo Alto, CA 94304.



# BECKMAN

Circle No. 336 on Readers' Service Card





# Moments of Truth

When your research project is complete, you have undoubtedly resolved some important questions with new answers. You will certainly document the results, possibly publish them.

That's the moment of truth—the point when you should feel confident that all of your results were derived from rigorous methods and reliable materials. And we can reassure you that if any of our labeled compounds were involved, your confidence is well placed, because they had already experienced their own moment of truth before you received them—the testing, the data analysis, and the documentation.

All of our 1100-plus radiochemicals are qualified for research use in this way. By taking these extra steps, we like to feel we are sharing with you the responsibility for publishing reproducible results.

With this attitude we can have only one standard of quality—the highest.

## The NEN extras are the biggest bargain in labeled compounds

 **New England Nuclear®**



# SCIENCE

<b>LETTERS</b>	Allocation of EPA Funds: <i>W. K. Talley</i> ; AMA's Technology Assessment: <i>J. H. Sammons</i> ; Nuclear Plant Availability: <i>G. A. Huhn</i> ; <i>E. Marshall</i> ; Residential Radiological Standards: <i>H. Hurwitz, Jr.</i> . . . . .	1375
<b>EDITORIAL</b>	The Two Faces of Genetic Engineering in Man: <i>B. D. Davis</i> . . . . .	1381
<b>ARTICLES</b>	The Cretaceous-Tertiary Transition: <i>Charles B. Officer</i> and <i>Charles L. Drake</i> . . . . .	1383
	Protons and Anaerobiosis: <i>P. W. Hochachka</i> and <i>T. P. Mommsen</i> . . . . .	1391
	Science and Technology in Mexico: Toward Self-Determination: <i>E. Flores</i> . . . . .	1398
<b>NEWS AND COMMENT</b>	EPA's Troubles Reach a Crescendo . . . . .	1402
	Congress Investigates Malfeasance at EPA . . . . .	1404
	A New Chairman for Senate Science Panel . . . . .	1407
	<i>Briefing:</i> Would Uncle Sam Sell the Farm?; President Tells Agencies to Lower Patent Bars; Science, Math Education Legislation on Track; History of Science Group Wins NEH Challenge Grant . . . . .	1408
	Landsat Plan Hits Stormy Weather . . . . .	1410
<b>RESEARCH NEWS</b>	Finches Show Competition in Ecology . . . . .	1411
	When Is a Metal Not a Metal? . . . . .	1413
	Inflation and the Arrow of Time . . . . .	1416
<b>BOOK REVIEWS</b>	Betrayers of the Truth, reviewed by <i>M. Angell</i> ; Ant-Plant Interactions in Australia, <i>J. F. A. Traniello</i> ; The Hunger for Salt, <i>R. J. Contreras</i> ; The Sun, Our Star, <i>R. Howard</i> ; Books Received . . . . .	1417

## BOARD OF DIRECTORS

D. ALLAN BROMLEY Retiring President, Chairman	E. MARGARET BURBIDGE President	ANNA J. HARRISON President-Elect	LAWRENCE BOGORAD EDWARD E. DAVID, JR.	NANCIE L. GONZALEZ DAVID A. HAMBURG
--	-----------------------------------	-------------------------------------	--	--

## CHAIRMEN AND SECRETARIES OF AAAS SECTIONS

MATHEMATICS (A) Felix E. Browder Lynn Arthur Steen	PHYSICS (B) Donald N. Langenberg Rolf M. Sinclair	CHEMISTRY (C) Charles G. Overberger William L. Jolly	ASTRONOMY (D) Irwin I. Shapiro Donat G. Wentzel
PSYCHOLOGY (J) Eleanor J. Gibson Bert F. Green	SOCIAL, ECONOMIC, AND POLITICAL SCIENCES (K) Thomas C. Schelling David L. Sills	HISTORY AND PHILOSOPHY OF SCIENCE (L) Erwin N. Hiebert David L. Hull	ENGINEERING (M) Robert W. Dunlap W. Edward Lear
EDUCATION (Q) Elaine W. Ledbetter Roger G. Olstad	DENTISTRY (R) Paul Goldhaber Harold M. Fullmer	PHARMACEUTICAL SCIENCES (S) Louis A. Luzzi Robert A. Wiley	INFORMATION, COMPUTING, AND COMMUNICATION (T) Marilyn C. Bracken Madeline M. Henderson

## DIVISIONS

ARCTIC DIVISION	PACIFIC DIVISION	SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION
Arthur M. Pearson President	Gunter E. Weller Executive Secretary	Herbert Baker President
		Alan E. Leviton Executive Director
		Klaus D. Timmerhaus President
		M. Michelle Balci Executive Office

**SCIENCE** is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Second-class postage (publication No. 484460) paid at Washington, D.C., and at an additional entry. Now combined with **The Scientific Monthly**® Copyright © 1983 by the American Association for the Advancement of Science. Domestic individual membership and subscription (51 issues): \$48. Domestic institutional subscription (51 issues): \$85. Foreign postage extra: Canada \$24, other (surface mail) \$27, air-surface via Amsterdam \$55. First class, airmail, school-year, and student rates on request. Single copies \$2.50 (\$3 by mail); back issues \$3 (\$3.50 by mail); Biotechnology issue, \$5 (\$5.50 by mail); classroom rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$1 per copy plus \$0.10 per page is paid directly to CCC, 21 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 \$1 + .10. **Postmaster:** Send Form 3579 to *Science*, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.



# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

<b>REPORTS</b>	Plant Cover and Biomass Response to Clear-Cutting, Site Preparation, and Planting in <i>Pinus elliottii</i> Flatwoods: <i>B. F. Swindel, L. F. Conde, J. E. Smith</i> .....	1421
	Pleistocene Sea Levels from Raised Coral Reefs of Haiti: <i>R. E. Dodge et al.</i> .....	1423
	Residential Firewood Use in the United States: <i>F. W. Lipfert and J. L. Dungan</i> .....	1425
	Activation of 2-Aminofluorene by Cultured Plant Cells: <i>M. J. Plewa et al.</i> .....	1427
	Quaternary Pollen Record from Laguna de Tagua Tagua, Chile: <i>C. J. Heusser</i> .....	1429
	Spasmodic Tremor and Possible Magma Injection in Long Valley Caldera, Eastern California: <i>A. Ryall and F. Ryall</i> .....	1432
	Salt-Induced Conversion of B-DNA to Z-DNA Inhibited by Aflatoxin B1: <i>A. Nordheim et al.</i> .....	1434
	Regulation of Carcinogen Metabolism in the Rat Ovary by the Estrous Cycle and Gonadotropin: <i>M. Bengtsson and J. Rydström</i> .....	1437
	Tension Transients in Single Isolated Smooth Muscle Cells: <i>D. M. Warshaw and F. S. Fay</i> .....	1438
	Overproduction and Elimination of Retinal Axons in the Fetal Rhesus Monkey: <i>P. Rakic and K. P. Riley</i> .....	1441
	A Developmentally Regulated Neuraminidase Activity in <i>Trypanosoma cruzi</i> : <i>M. E. A. Pereira</i> .....	1444
	Biological Control of Yellow Nutsedge with the Indigenous Rust Fungus <i>Puccinia canaliculata</i> : <i>S. C. Phatak et al.</i> .....	1446
	Cell Growth on Liquid Microcarriers: <i>C. R. Keese and I. Giaever</i> .....	1448
	Proglumide: Selective Antagonism of Excitatory Effects of Cholecystokinin in Central Nervous System: <i>L. A. Chiodo and B. S. Bunney</i> .....	1449
	Midbrain Microinfusions of Prolactin Increase the Estrogen-Dependent Behavior, Lordosis: <i>R. E. Harlan, B. D. Shivers, D. W. Pfaff</i> .....	1451
	Tolerance Develops to the Disruptive Effects of $\Delta^9$ -Tetrahydrocannabinol on Primate Menstrual Cycle: <i>C. G. Smith et al.</i> .....	1453

TER E. MASSEY E. SAWYER	SHEILA E. WIDNALL HARRIET ZUCKERMAN	WILLIAM T. GOLDEN Treasurer	WILLIAM D. CAREY Executive Officer
LOGY AND GEOGRAPHY (E) A. Socolow omas Dutro, Jr.	BIOLOGICAL SCIENCES (G) Carl Gans Walter Chavin	ANTHROPOLOGY (H) John W. Bennett Priscilla Reining	
CAL SCIENCES (N) M. Tepperman M. Lowenstein	AGRICULTURE (O) Duane Acker Coyt T. Wilson	INDUSTRIAL SCIENCE (P) Ward J. Haas Robert L. Stern	
ISTICS (J) R. Rosenblatt Glaser	ATMOSPHERIC AND HYDROSPHERIC Frederic Sanders Glenn R. Hilst	GENERAL (X) Daniel Alpert S. Fred Singer	

## COVER

Cliff face of a Haitian raised reef (designated as "Mole") dated at 81,000 years ago. Visible in the upper portion are fossil corals (*Acropora palmata*). See page 1423. [Richard E. Dodge, Nova University Oceanographic Center, Dania, Florida 33004]

American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to prove 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.



# Catecholamines and Metabolites

or other neurochemically significant compounds

## WITHIN

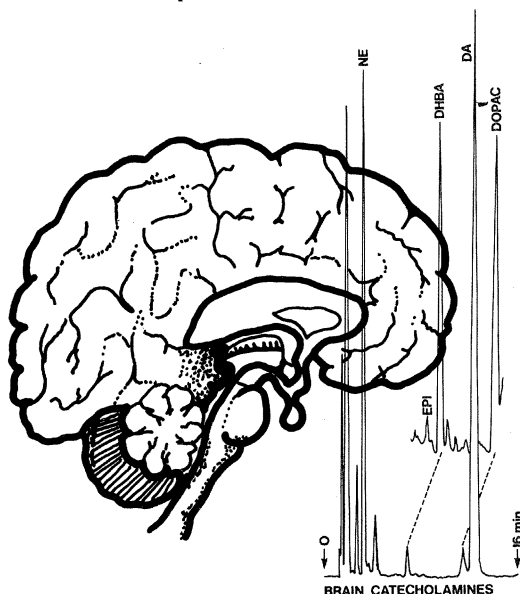
Brain Tissue  
Adrenal Tissue  
Body Fluids  
Dosage Forms  
Plant Matter  
Insect Tissue

## WITHOUT

Derivatives  
Radioisotopes  
Fluorescence  
Gas Chromatography  
Mass Spectrometry  
A Rich Uncle

BAS Analyzers based on liquid chromatography/electrochemistry (LCEC) have replaced radiochemical and fluorescence procedures in all of the above areas. Detailed procedures, sample preparation, materials, and support from our own analytical laboratory complement each complete instrument package. These systems are capable of monitoring many phenolic natural products and drugs. All of the catecholamine metabolites and many tryptophan metabolites can be determined. In addition, the activity of many neurologically important enzymes can be measured. Let us know your specific requirements.

DON'T CIRCLE THE BINGO CARD! Call or write today for a detailed reply!



DOPAMINE • NOREPINEPHRINE • EPINEPHRINE • VMA • HVA • DOPAC • MHPG • M • NM • 3-MT • 5-HT • 5-HIAA • TH • DBH  
COMT • NMT • MORPHINE • PHENOTHIAZINES • TRICYCLIC ANTIDEPRESSANTS • GLUTATHIONE • GABA



**bioanalytical systems**

1205 Kent Ave • West Lafayette • IN 47906 USA • (317) 463-2505  
JAPAN: Tokai Irika SWITZERLAND: Paul Bucher ITALY: Analytical Control

Circle No. 124 on Readers' Service Card

## Science, & Technology, & Human Values

An interdisciplinary quarterly probing the social and ethical implications of today's science and technology

Editor: Marcel Chotkowski La Follette, MIT

Praised for its scholarly commitment to confronting the critical issues shared by scientists and humanists, **Science, Technology, & Human Values** brings you some of the finest writing and thinking by leading academicians and by researchers in private foundations, industry and government. Whether probing the social and legal implications of government policy on science, examining the ethical questions raised by medical innovations, or analyzing the current disarmament debate, **Science, Technology, & Human Values** presents new ideas, poses new questions, and offers new perspectives on the interrelationship between science and society. Special issues focus on such controversial themes as "Creationism, Science, and the Law"

and "On Developing Indicators of Quality in Science and Technology." Even more, **Science, Technology, & Human Values** gives you regular features—current reviews of books on science and society, news on government and educational programs, calendars of upcoming conferences and symposia, commentaries, research reports, and so much more. Conceived as a newsletter in 1972, and now an important international journal, **Science, Technology, & Human Values** goes beyond the theories, numbers and equations of pure science to the humanistic values that, as Albert Einstein said, "must always be the chief interest of all technical endeavors." We invite you to join in that experience by subscribing today.

Cosponsored by the John F. Kennedy School of Government, Harvard University, and the Program in Science, Technology, and Society, Massachusetts Institute of Technology, and published by John Wiley & Sons.

Published quarterly  
Volume 8, 1983: \$48 per year  
(Outside U.S. add \$14 surface postage and handling.) Calendar year subscriptions only.



To enter subscription, write:  
**Subscription Dept. 31043**  
**John Wiley & Sons**  
605 Third Avenue  
New York, NY 10158  
Or call toll free (800) 526-5368. In New Jersey call collect (201) 797-7809.



## LETTERS

### Allocation of EPA Funds

Two major thrusts of the Administration are elimination of unnecessary regulation and, more recently, using technology to enhance productivity. As the Environmental Protection Agency (EPA) can contribute to both of these, one would expect that the 1984 research budget would reflect these initiatives. Even a cursory examination, however, reveals at least two inconsistencies with stated policy—and with common sense.

A noncontroversial way to avoid regulation is to show that it isn't needed. Or, if an environmental problem can be discovered while it is still small, it might be resolved with a minimum of social and economic dislocation. The EPA Exploratory Research Program accomplishes both by funding peer-reviewed investigators engaged in problem-definition research. The program has worked because it is managed by EPA's Office of Research and Development (ORD) as a deliberate complement to the problem-solving R & D done by that office. But the 1984 budget shows that, of the \$10 million total, \$4 million is to be "passed through" to the National Science Foundation. Even if one grants no loss through administrative and management problems—an unlikely event—such an arrangement will shift the \$4 million toward *basic* environmental research rather than toward the problem-definition mode needed to avoid future problems.

The second inconsistency of budget with policy is less subtle. Industry, hit by regulation, too often responds by Rube Goldberg, bucket-at-the-end-of-the-pipe add-ons or, worse, fights in court while it continues to pollute. For years, ORD's Industrial Research Program has provided a constructive alternative—seed money from the government allows industrial research on "process modification." When successful, a new way to produce a product is found, a way that not only results in less pollution but generally uses less raw material and less energy, is less costly, and sometimes results in useful by-products. Small wonder that the new process can become the industry standard.

While it is true that industry conducts this sort of research on its own, the successful results can be proprietary and not generally available. Or they can be so simple as to be unpatentable and then not worth the development investment. Thus, left to itself, industry does not put a high priority on process modification.

Just at the moment the Administration

is pushing new technology as the key to productivity, the EPA's process modification work and seed money for more efficient control technology have been eliminated from the 1984 budget.

Perhaps in reconsidering EPA's priorities and management, the Administration should weigh the benefits of structuring it as an environmental protection organization with a suite of instruments: research, public information, grants-in-aid, regulation, enforcement, and so forth, rather than as a primarily regulatory organization assisted by supporting functions. If the concept is attractive, a good way to begin would be to examine the research budget for consistency with some laudable policies of the present Administration.

WILSON K. TALLEY

*Department of Applied Science—  
Livermore, College of Engineering,  
University of California, Davis,  
Livermore 94550*

### AMA's Technology Assessment

I take issue with Marjorie Sun's description of a new American Medical Association (AMA) program for technology assessment (News and Comment, 7 Jan., p. 37). The AMA's Diagnostic and Therapeutic Technology Assessment (DATTA) program will provide the best medical opinions of selected procedures and techniques by the professionals responsible for their use. These opinions will be solicited from a representative group of recognized experts drawn from a larger roster of physicians nominated to serve by their various medical specialties or state societies or by the AMA's Council on Scientific Affairs. The DATTA program will not be taking an "opinion" poll of the membership, as suggested by Sun. Instead, a synthesis of the individual responses will be prepared by staff. This synthesis will then be re-evaluated before final review by the Council on Scientific Affairs and the publication of conclusions.

In the DATTA program and in many other ways, the AMA is working to bring to practitioners and patients what Seymour Perry has described (*1*, p. 1097) as "current information concerning the safety, effectiveness, and comparative values of technologies communicated in an understandable form." Considerable effort is also being spent on imbuing in practitioners the cost implications of their decisions.

The AMA believes the exercise of good judgment by physicians in the

# J.T. Baker

## RESEARCH PRODUCTS

One source  
for all your  
Flash  
Chromatography  
needs

Flash Chromatography  
Column Kits

Flow Controllers

Column Reservoirs

Silica Gel and 17  
Bonded Phase  
Sorbents

Now, you have one, direct source for any volume need of quality sorbents, columns and accessories for Flash Chromatography. Baker Flash Chromatography products combine the economy of gravity column chromatography with the speed and efficiency of high pressure preparative systems.

Our full line of products for Flash Chromatography are economical for separating and purifying research quantities of organic compounds, and can save you hours of preparation time. Call or write today.



J.T. BAKER RESEARCH PRODUCTS

222 Red School Lane  
Phillipsburg, NJ 08865 USA  
(201) 859-2151

Outside New Jersey (800) 526-0239

Gross Gerau, W. Germany • Deventer, Holland  
Mexico City, Mexico • Singapore • Sydney, Australia



# Read any good DNA lately?

The new LKB Macrophor DNA/RNA Sequencing System turns a short story into a full-length novel by bringing together all the latest, isolated developments in electrophoretic technology of particular benefit to oligonucleotide electrophoresis. The resulting improvements lengthen reading frames, cut sample loads by over 50%, save precious time casting and running gels – and render existing equipment obsolete.

The LKB Macrophor brochure is also a good read: ask your local LKB representative for a copy or, better still, ask for a demonstration of Macrophor at once.



**Head office:** LKB-Produkter AB, Box 305,

S-161 26 Bromma, Sweden. Tel. 08-98 00 40, telex 10492

**Main US sales office:** LKB Instruments, Inc. 9319 Gaither Road, Gaithersburg, Maryland 20877. Tel. 301-963-3200, telex 909870 (dom.), 64634 (intern.)

**UK sales office:** LKB Instruments Ltd., 232 Addington Road, S. Croydon, Surrey CR2 8YD, England. Tel. 01-657 8822, telex 264414

**Other sales offices in:** Athens (for Middle East), Copenhagen, Ghent, Zoetermeer, Hong Kong, Luzern, Munich, Paris, Rome, Turku, Vienna

Circle No. 159 on Readers' Service Card



course of daily practice will best serve the individual needs of patients while ensuring that our limited health care resources are prudently allocated.

JAMES H. SAMMONS  
*American Medical Association,  
Chicago, Illinois 60610*

#### References

1. S. Perry, *New Engl. J. Med.* **307**, 1095 (21 October 1982).

### Nuclear Plant Availability

In the article "New U.S. (Japanese) reactors" (News and Comment, 21 Jan., p. 266), Eliot Marshall writes that current nuclear plant availability in the United States averages around 75 percent. But, according to *Chemical & Engineering News* (1, p. 16), the averages for all U.S. nuclear plants in 1979 and 1980 were below 60 percent. And Charles Komanoff stated in 1981 that the capacity factor of U.S. nuclear plants ranged from 50 percent to 62 percent during the 5 years from 1975 through 1980.

Is Marshall correct or have U.S. nuclear plant operators suddenly become unusually efficient in a very short time?

GEORGE A. HUHNS  
*Waterloo and Beaumont Roads,  
Devon, Pennsylvania 19333*

#### References

1. E. V. Anderson, *Chem. Eng. News*, **60**, 11 (20 September 1982).

According to the Nuclear Regulatory Commission's "gray book" of January 1982, nuclear plants in the United States were available on average 67.8 percent of the time in 1981. Westinghouse reports that its own plants were available 67 percent of the time in 1982, and it hopes the new pressurized water system will achieve 90 percent availability.

—ELIOT MARSHALL

### Residential Radiological Standards

In discussing criticism of the Environmental Protection Agency (EPA) for considering the adoption of lifetime risk objectives as high as 1 per 10,000 exposed individuals, Eliot Marshall (News and Comment, 3 Dec., p. 975) does not explore the fundamental question of whether society is prepared to apply lower risk objectives with any consistency. We are, of course, all aware of the fervor with which the media, the politi-

cians, and public interest groups bemoan imputed lifetime risks as low as 1 per million when there are convenient scapegoats to bear the blame and the cost of mitigative action and punitive litigation. But even responsible scientific spokesmen are willing to endorse popular public policies that lead to imputed risks as high as 1 per 100 on a comparable basis.

A dramatic case in point is the indoor radiological problem, which is demonstrably exacerbated by government-recommended and government-subsidized reductions in home ventilation to conserve energy. A committee of the National Council on Radiation Protection and Measurements (NCRP) has proposed to rectify the present absence of residential radiological standards by adopting a limit of two working level months (1) per year for public exposure to radon progeny (2, p. 19). The risk from lifetime exposure to two working level months per year is estimated by the same committee to be 18,200 per million (2, p. 38).

HENRY HURWITZ, JR.  
*827 Jamaica Road,  
Schenectady, New York 12309*

#### References and Notes

1. The working level month is a unit used to measure integrated exposure to radon progeny in air. A working level is equivalent to the equilibrium concentration of radon progeny in the presence of radon at a concentration of 100 picocuries per liter. (At one working level, the radon progeny present in 1 liter of air would ultimately emit  $1.3 \times 10^5$  million electron volts of alpha particle energy.) A working level month is defined as exposure to one working level for 170 hours. (EPA standards are expressed in terms of working level, while the NCRP prefers to specify working level months per year. EPA would estimate working level months per year by multiplying the average indoor working level by about 25, while the NCRP uses 50 as the ratio of working level months per year to average working level.)
2. J. H. Harley, testimony before the U.S. House of Representatives, Committee on Armed Services, Subcommittee on Procurement and Military Nuclear Systems (No. 97-55, House Armed Services Committee, Washington, D.C., 17 and 18 August 1982), pp. 15-63.

**Erratum:** In the report "Human endometrial adenocarcinoma transplanted into nude mice: Growth regulation by estradiol" by P. G. Satyaswaroop *et al.* (7 Jan., p. 58), the two tumor grades in Table I should have been I and III, not I and II.

**Erratum:** In the article "Impact of genetic manipulation of society and medicine" by A. G. Motulsky (14 Jan., p. 135), the last part of the sentence beginning on line 8 of the summary should have read "... no new ethical problems arise beyond those presented by any novel therapy."

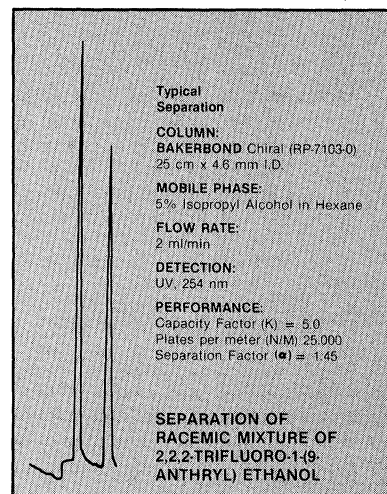
**Erratum:** In the article "Ultrasafe reactors, anyone?" by Eliot Marshall (News and Comment, 21 Jan., p. 265), the location of the Andrew W. Mellon Foundation should have been given as New York, not Pittsburgh.

**Erratum:** In Arthur L. Robinson's article "Berkeley advanced materials center OK'd" (Research News, 18 Feb., p. 827), a line was omitted in the first column of page 828. The second sentence in the second paragraph should have read, "Synchrotron radiation sources are evolving rapidly. The ALS will be the first of the third generation of sources in which most, if not all, the synchrotron radiation comes from special magnets with the generic name 'insertion devices,' rather than from the dipole bending magnets that keep the electron beam in its approximately circular orbit."

# J.T. Baker

## RESEARCH PRODUCTS

### Separate thousands of racemic mixtures by chromatography



J.T. Baker Research Products can supply all the appropriate materials you need for chromatographic chiral separations.

**BAKERBOND™** Chiral Phase HPLC Columns use high purity DNBPG ((B)-N-3,5-dinitrobenzoylphenylglycine) bonded to aminopropyl silica to separate a wide range of optical isomers. Up to 10 mg of sample can be applied to the column in a single injection.

Preparative chiral sorbents, in 40 µm particle size, are also available for scale-up of separations. In addition, longer column life can be achieved with our Chiral Column Regenerating Solution. For more information, call or write today.



J.T. BAKER RESEARCH PRODUCTS

222 Red School Lane  
Phillipsburg, NJ 08865 USA  
(201) 859-2151

Outside New Jersey (800) 526-0239

Gross Gerau, W. Germany • Deventer, Holland  
Mexico City, Mexico • Singapore • Sydney, Australia

Circle No. 357 on Readers' Service Card

**HELLMA**  
...tomorrow's designs today!



OS® QH® QS® OF® QU® QI®

Hellma—the largest assortment of highest precision glass and quartz cells.  
Standard • Flow-through • Constant-temperature  
Anaerobic • Special Designs  
Also available—ULTRAVIOLET LIGHT SOURCES  
Deuterium Lamps • Mercury Vapor Lamps  
Hollow Cathode Lamps • Power Supplies

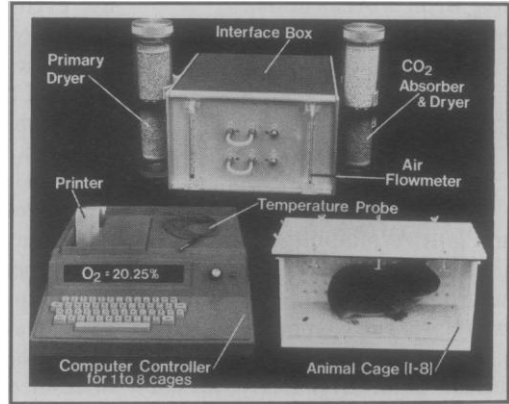
**HELLMA**  
CELLS, INC.

Write for literature  
Box 544  
Borough Hall Station  
Jamaica, New York 11424  
Phone (212) 544-9534

Circle No. 300 on Readers' Service Card

## O<sub>2</sub> CONSUMPTION MONITOR

Simultaneously Monitors Oxygen Consumption of 1 to 8 Animals



**FEATURES**

- One controller for 1 to 8 animal cages • Continuous measurement of Oxygen Consumption over a 24 hour period in ml oxygen/kg of body weight/hour in STP units.
- Printer prints results every four (4) minutes for each of 1 to 8 animals as well as oxygen percent level in each animal cage • System adaptable to small or large animals • Continuous airflow through system with oxygen level measurements at the output and input
- High accuracy, >98% of full measuring range e.g. typical error  $\pm 30$  ml oxygen/kg/hour in 3000 ml oxygen/kg/hour range • User adjustable alarm warns user of possible hypoxia
- Reusable absorbents • Auto reference assures high accuracy, system periodically measures ambient air and corrects itself • Optional RS-232 interface for communication with other computers • Insensitive to temperature variations in the animal cage.

Columbus Instruments also supplies monitors for: Animal Activity, Cardiac Output, Drinking and Feeding, Respiration Rate and Startle Response.

For more information, call or write to:  
**COLUMBUS INSTRUMENTS INTERNATIONAL CORPORATION**  
Supplier of individual instruments and total measuring systems

950 N. HAGUE AVE., COLUMBUS, OHIO 43204 U.S.A.  
PHONE: (614) 488-6176 TELEX: 246514

FASEB, Booth D-9

Circle No. 14 on Readers' Service Card


## Senior Research Fellowships

**THE BURROUGHS WELLCOME FUND**, in collaboration with The Foundation for Advanced Education in the Sciences, are soliciting candidates for Senior Research Fellowships at the National Institutes of Health beginning July 1, 1984. An initial stipend of \$30,000 will be offered with a two year tenure and optional third year.

Applicants must have completed a minimum of three years of post-doctoral research training and be U.S. citizens or permanent residents.

The deadline for receipt of applications is August 1, 1983. For information and application please write: Lois Kochanski, FAES, 9101 Old Georgetown Road, Bethesda, Maryland 20814.

Equal Opportunity Employers



## AAAS Annual Meeting

Westin Hotel, Renaissance Center  
26-31 May, 1983  
Detroit, Michigan

For details about the meeting program, see the 25 February or 1 April issues of *Science* or call (202) 842-9595.



# AT LAST!



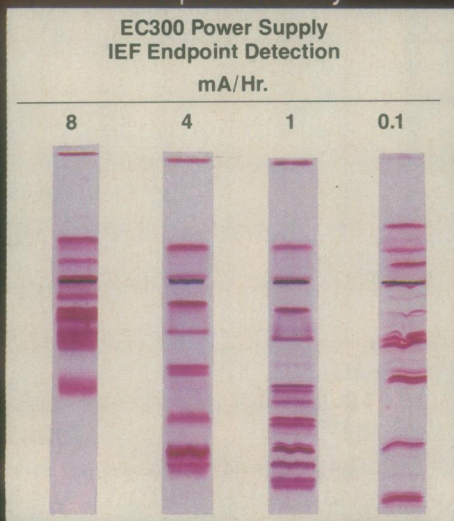
## Automated IEF Endpoint Detection in an *All-New* Constant Power Supply

The new EC300 Constant Power Supply may be the most versatile electrophoresis power supply you can buy—even at its low price of \$1495.\*

With it you can set constant voltage to 2,000 volts, constant current to 150 milliamps, or constant power to 30 watts, with automatic crossover among the three modes. Digital lighted LED readouts show precise conditions of output and set point.

But that's not all. If you do isoelectric focusing, the EC300 has a bonus for you—a revolutionary built-in automated IEF Endpoint Detector.\*\* Its design is based on the finding that, as an IEF run nears its end, the current becomes asymptotic. The EC300

automates the sensing of this gradual current decrease to achieve precise focusing and maximum reproducibility.



Not yet focused, 8 & 4 mA/hr.; correctly focused, 1 mA/hr.; overfocused, 0.1 mA/hr.

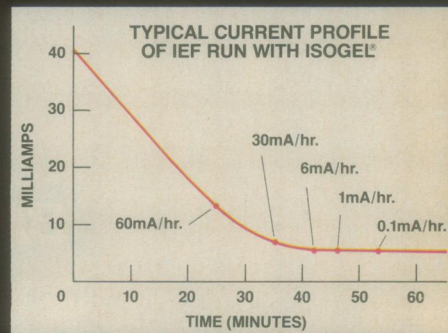
Find out more about the new EC300 with the revolutionary IEF Endpoint Detector. Call Technical Service collect at 813-344-1644 or write for Bulletin EC300.



E-C Apparatus Corporation  
3831 Tyrone Boulevard N.  
St. Petersburg, Florida 33709

\*f.o.b. St. Petersburg, FL

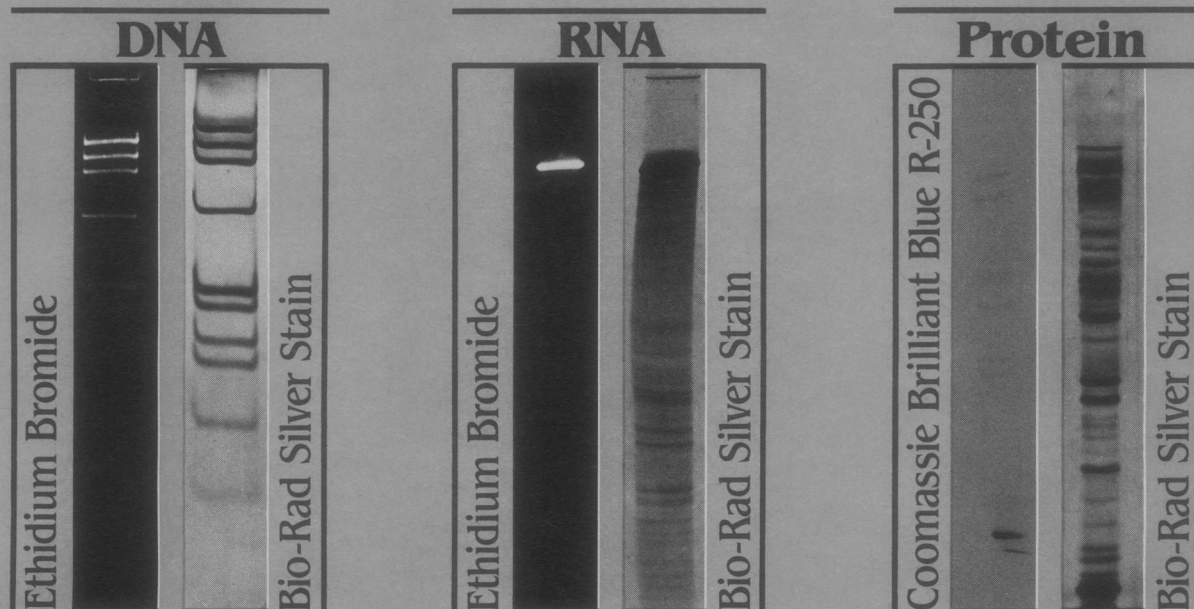
\*\*Patent pending



Asymptotic decrease of current during IEF run.



# DNA/RNA SILVER STAINING



Now DNA/RNA as well as proteins can be detected in polyacrylamide slab gels with high sensitivity using Bio-Rad's Silver Stain. As the separations above show, the Bio-Rad Silver Stain offers a dramatic increase in sensitivity vs. Coomassie Blue R-250 and ethidium bromide.

Here are some of the key advantages for silver staining of nucleic acids:

- Two to five times more sensitive than ethidium bromide.
- Stains both single and double stranded DNA and RNA.
- Avoids the use of ethidium bromide/UV light detection which causes photo-nicking of DNA.
- Fully reversible.
- Silver stain is an alternative to end-labeling techniques and autoradiography.
- Silver stain yields stable gels, affording a permanent record.

For details on silver staining of nucleic acids and proteins request Bulletin 1089.



Bio-Rad Laboratories • 2200 Wright Avenue • Richmond, California 94804  
Phone (415) 234-4130 • Also in Rockville Centre, N.Y., Australia, Austria, Canada,  
England, Germany, Italy, Japan, The Netherlands and Switzerland.

Circle No. 341 on Readers' Service Card



# In Biotechnology, one name stands out.

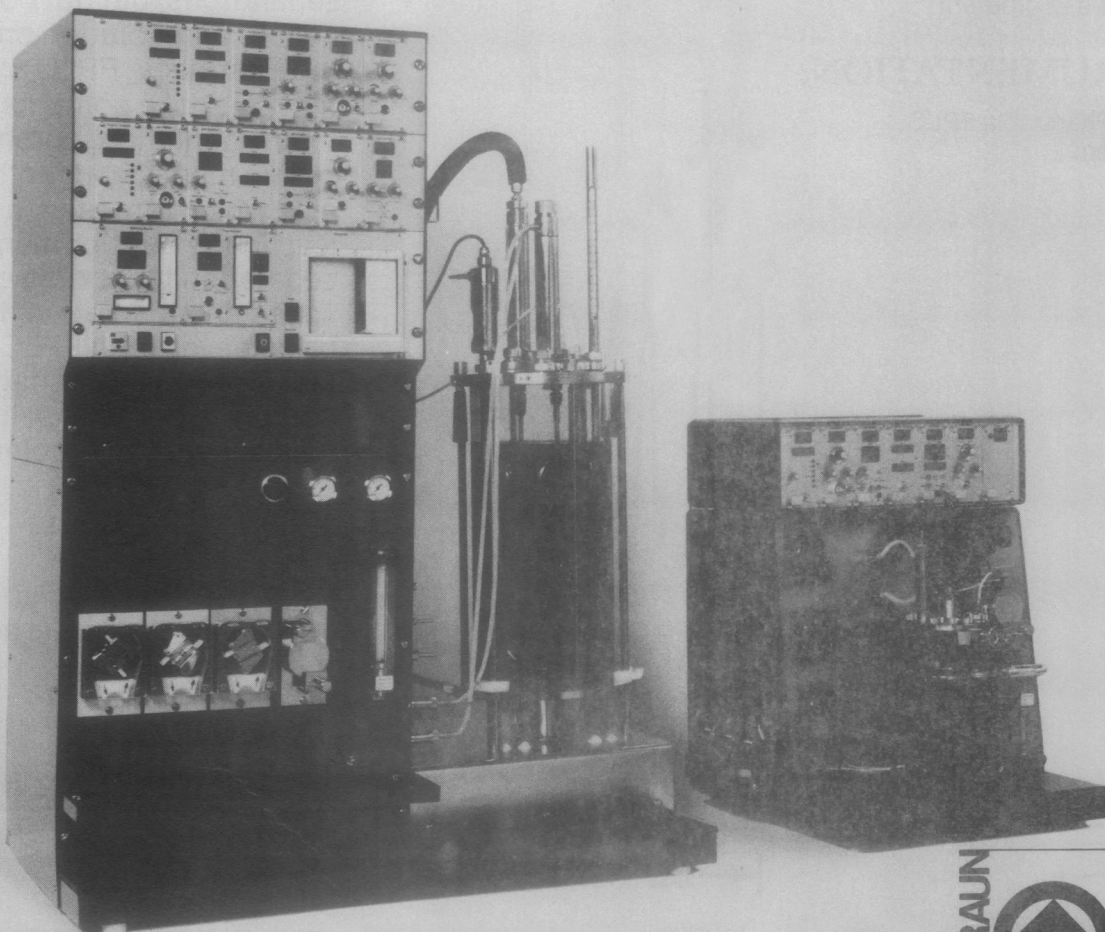
Since introducing the first BIOSTAT® FERMENTER, B. Braun has established itself as a leader in bioengineering.

We've done it by racking up an impressive list of firsts: first modular control system, first full digital display, first sterilizable membrane pump, first microcarrier to grow mammalian cells, first nutrient thermo trap, first temperature stabilization of the gassing system, first multiple choice harvesting system, first time-proportioning of antifoam, first fermenter capable of changing configuration within the vessel and the first to provide a multipoint recorder.

Now our latest innovation is a modular system with the capacity for set point control (SPC) operation—the first computerized process control of a fermenter.

What does all this mean to you? Just this. If you want the finest fermenter on the market today, buy a B. Braun BIOSTAT.

We can tell you right now it's going to cost a little more. But a BIOSTAT has no—*repeat no*—competition. From innovative design and precision engineering, to supervised installation and quality service, we designed it that way!



For further information please contact:

B. Braun Instruments • 875 Stanton Road • Burlingame, CA 94010 • 415/692-6022

Circle No. 316 on Readers' Service Card



# Pharmacia Introduces FPLC Fast Protein Liquid Chromatography

## SAMPLE MIXTURE:

Carbonic Anhydrase  
Conalbumin II  
 $\alpha$  Lactalbumin  
Bovine Serum Albumin  
 $\beta$  Lactoglobulin B

## GEL:

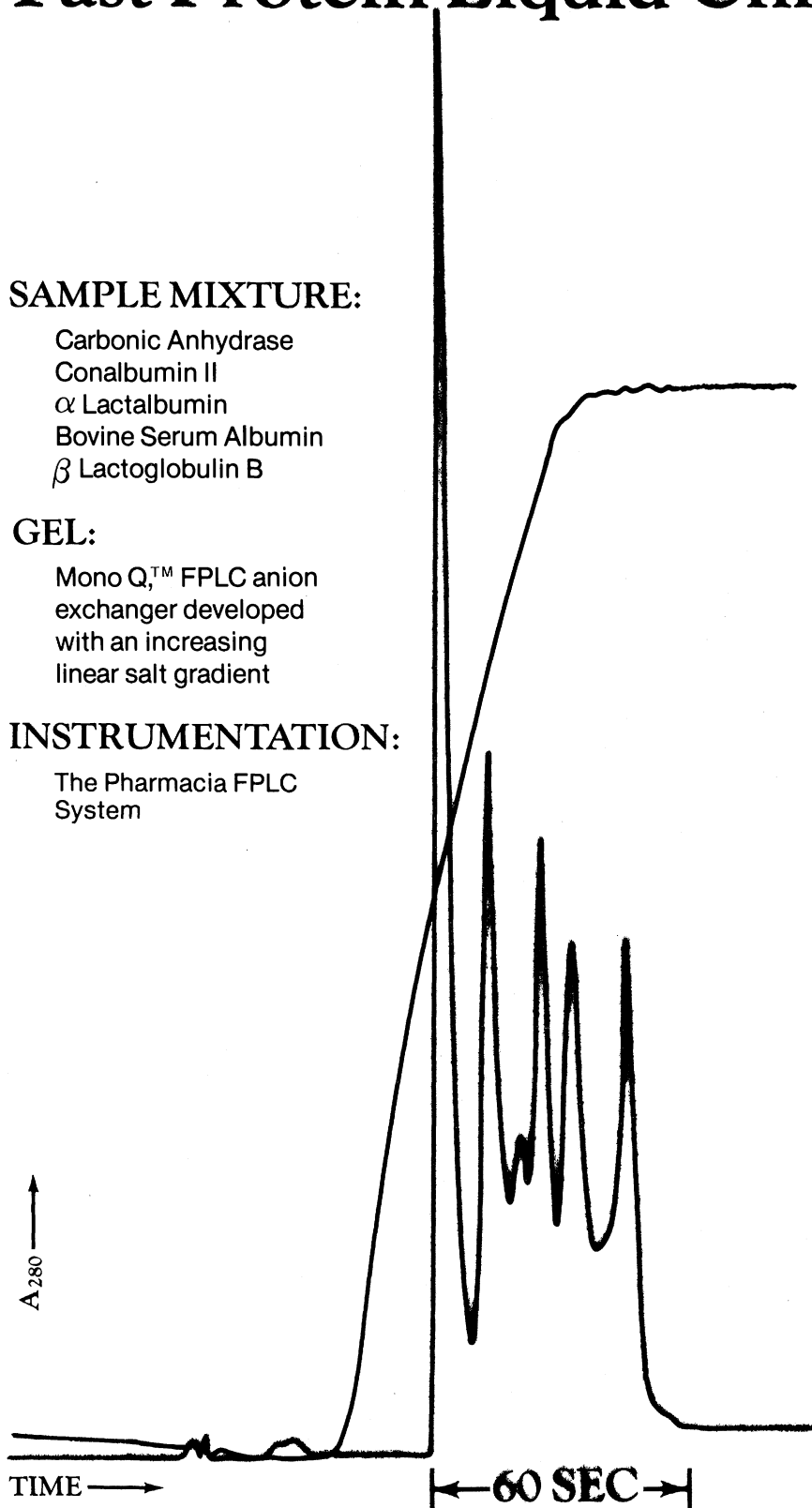
Mono Q,<sup>TM</sup> FPLC anion  
exchanger developed  
with an increasing  
linear salt gradient

## INSTRUMENTATION:

The Pharmacia FPLC  
System

- Radically short run times
- Fine structure resolution
- Complete instrumentation and gels designed specifically for biomolecular separations in aqueous solvents

Significant advances in chromatography of biomolecules have in the past provided either higher resolution or faster separations, but not both. The degree of resolution provided by the Pharmacia FPLC System is the result of a combination of instrumentation, chromatographic media, and methodologies which represent a quantum leap in the development of separation technology. The speed and resolution that can be achieved with FPLC create fast, previously unattainable, and completely unique solutions to your separation problem.



Take The Resolution And Run With...

**The Pharmacia FPLC System**

## Pharmacia Fine Chemicals

Division of Pharmacia, Inc./Piscataway, N.J. 08854

Orders Only: (NJ) 201-457-8150 (Toll free) 800-526-3593

Information: 201-457-8000

Pharmacia products will be on display at the FASEB Show—Booth No's E35, 37, 39 & 41



**Pharmacia  
Fine Chemicals**



We put more in, you get more out.



## Falcon Tissue Culture Products.

Whatever you need in tissue culture labware, Falcon probably has it. There's so much more in our disposable tissue culture products, pipets, tubes, filters and general labware because, when laboratory workers talked to us, we listened.

We applied our particular brand of innovative thinking to their problems in such specializations as hybridomas, clinical immunology/virology, genetic engineering and traditional tissue culture.

We pioneered homogeneous tissue culture treatment on plastics, and are a leader in the use of

gamma irradiation and highest quality plastics. And along the way we've grown to be the undisputed leader in an industry that accepts only the highest standards.

More new products are coming, all made with the same Falcon care, craftsmanship and rigorous quality control. So when you're looking for something in tissue culture, look at Falcon first. You may not have to look anywhere else.

Falcon Tissue Culture Products, from Becton Dickinson. Call us and let's talk.

### **Becton Dickinson Labware**

1950 Williams Drive, Oxnard, California 93030.  
Call toll-free (800) 235-5953 (outside California);  
(805) 485-8711 (collect, in California).

**BECTON  
DICKINSON**

Circle No. 310 on Readers' Service Card

Falcon is a registered trademark of Becton Dickinson and Company.

## CHEMICAL INDUCTION OF CANCER

**Volume 3A/STRUCTURAL BASES AND  
BIOLOGICAL MECHANISMS**

JOSEPH ARCOS, YIN-TAK WOO, MARY F. ARGUS  
with the collaboration of DAVID Y. LAI

Volume 3A presents extensive discussion of the metabolic aspects and mechanisms of carcinogenic action; physicochemical properties; mutagenicity and teratogenicity; modification of carcinogenicity by endogenous or exogenous factors; environmental formation and occurrence; and potential human exposure.

**1982, 752 pp., \$74.50 ISBN: 0-12-059303-3**  
**Subscription price: \$65.00\***

## ADVANCES IN CANCER RESEARCH

Edited by GEORGE KLEIN  
and SIDNEY WEINHOUSE

From the Reviews of Previous Volumes: "The volume should thus take its place, along with its predecessors in the series, as a valuable reference book for all readers interested in cogent aspects of contemporary cancer research."

—THE QUARTERLY REVIEW OF BIOLOGY

**Volume 38**

**CONTENTS:** *Benjamin Bonavida*, The SJL/J Spontaneous Reticulum Cell Sarcoma: New Insights in the Fields of Neoplasia, Host-Tumor Interactions, and Regulation of Tumor Growth. *George W. Teebor* and *Krystyna Frenkel*, The Initiation of DNA Excision Repair. *George W. Sledge, Jr.* and *William L. McGuire*, Steroid Hormone Receptors in Human Breast Cancer. *Motoo Hozumi*, Fundamentals of Chemotherapy of Myeloid Leukemia by Induction of Leukemia Cell Differentiation. *Eli Kedar* and *David W. Weiss*, The *in Vitro* Generation of Effector Lymphocytes and Their Employment in Tumor Immunotherapy. *G. Yogeaswaran*, Cell-Surface Glycolipids and Glycoproteins in Malignant Transformation. Index.

**May/June 1983, in preparation ISBN: 0-12-006638-6**

**Volume 37**

**CONTENTS:** *J. Michael Bishop*, Retroviruses and Cancer Genes. *Elisabeth Gately*, Cancer Genes and Development: The *Drosophila* Case. *Arnold J. Levine*, Transformation-Associated Tumor Antigens. *Kari Alitalo* and *Antti Vaheri*, Pericellular Matrix in Malignant Transformation. *Carmita Borek*, Radiation Oncogenesis in Cell Culture. *Jan Klein* and *Zoltan A. Nagy*, Mhc Restriction and *Ir* Genes. *Kenneth Nilsson* and *George Klein*, Phenotypic and Cytogenetic Characteristics of Human B-Lymphoid Cell Lines and Their Relevance for the Etiology of Burkitt's Lymphoma. *George Klein* and *Gilbert Lenoir*, Translocations Involving 1g Locus-Carrying Chromosomes: A Model for Genetic Transposition in Carcinogenesis. Index.

**1982, 416 pp., \$52.00 ISBN: 0-12-006637-8**

## METHODS IN CANCER RESEARCH

**Volume 20**

**TUMOR MARKERS**

Edited by HARRIS BUSCH and LYNN C. YEOMAN  
**CONTENTS** (Section Headings): Tumor Immunogenicity and Cellular Immunity. Immunochemical Localization and Quantitative Assays. Monoclonal Antibodies and the Tumor Cell Surface.

**1982, 400 pp., \$48.50 ISBN: 0-12-147680-4**  
**Subscription price: \$41.50\***

**Volume 19**

**CONTENTS:** (Section Headings): Cell Surface Markers for Neoplasia. Antigen Markers of Tumor Cells and Nuclei. Models and Methods for Diagnosis and Therapy.

**1982, 423 pp., \$56.00 ISBN: 0-12-147679-0**  
**Subscription price: \$48.00\***

## LYMPHOKINES A FORUM FOR IMMUNOREGULATORY CELL PRODUCTS

Edited by EDGAR PICK  
with Advisory Editor: MAURICE LANDY

**Volume 8**

**TENTATIVE PARTIAL CONTENTS:** Transfer Factor. IgE-Binding Factors from Rat T Lymphocytes. A Polyclonal B Cell Activating Lymphokine and Its Natural Inhibitor: Possible Role in Antibody Formation and Autoimmune Disease. Lymphokines and Antigen-Specific T Cell Products in Contact Sensitivity. Studies on the Activation of Cytotoxicity and/or Suppressor Activity in Murine Macrophages by Lymphokines, Lipopolysaccharide, and Poly Inosinic-Poly Cytidilic Acid. (Plus eight additional chapters.)

**1983, 480 pp., \$57.00 ISBN: 0-12-432008-2**

## INTERFERON 1982

**Volume 4**

Editor-in-Chief: ION GRESSER

**CONTENTS** (Section Headings): How Many Human Interferons Are There? Interferon and Cyclic Nucleotides. Mechanisms of Interferon Action: Biochemical and Genetic Approaches. Can Interferon Induce Disease? The Importance of Having Gamma. Some Thoughts on the Clinical Exploitation of Interferon in Infectious Diseases. Interferon in Ocular Viral Diseases.

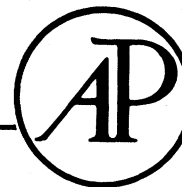
**1982, 212pp., \$18.50 ISBN: 0-12-302253-3 (Paper)**

## INTERFERON 1981

**Volume 3**

**1981, 154 pp., \$19.50 ISBN: 0-12-302252-5 (Paper)**





A Volume in the BRISTOL-MYERS CANCER  
SYMPOSIA Series

## MALIGNANT LYMPHOMAS

ETIOLOGY, IMMUNOLOGY, PATHOLOGY,  
TREATMENT

Edited by SAUL A. ROSENBERG  
and HENRY S. KAPLAN

This comprehensive volume reviews the etiology, immunology, pathology, and treatment of Hodgkin's Disease and the non-Hodgkin's Lymphomas. The chapters, by leading investigators, discuss • current knowledge of immunologic markers, including monoclonal antibody techniques to understand lymphoid neoplasms • the results of an international comparison of the major pathologic classification systems • a working formulation that permits translation among the classification systems • the latest treatment methods for adults and children with Hodgkin's disease and non-Hodgkin's lymphomas • the long-term complications of therapy and proposed methods to reduce these complications.

1982, 712 pp., \$47.50 ISBN: 0-12-597120-6

## Methods in Enzymology

Editors-in-Chief: SIDNEY P. COLOWICK  
and NATHAN O. KAPLAN

Volume 78

## INTERFERONS, Part A

Edited by SIDNEY PESTKA

CONTENTS (Section Headings): Definition of the Interferons. Induction and Production of Interferons. Viral and Nonviral Inducers of Interferons: Preparation and Characterization. Assay of Interferons. Purification and Characterization of Interferons.

1981, 632 pp., \$59.00 ISBN: 0-12-181978-7

Volume 79

## INTERFERONS, Part B

Edited by SIDNEY PESTKA

CONTENTS (Section Headings): Techniques for Chromatography and Analysis of Interferons. Isolation and Translation of Interferon Messenger RNA. Methods to Study Mode of Interferon Action: General Methodology and Considerations; Phosphorylation and cAMP in Interferon Action; Synthesis and Assay of (2'—5') Oligoadenylic Acid and Related Events; Effect of Interferon on Protein Synthesis and Other Cellular Processes. Methods to Study Interferon Activity at the Cellular Level. Effects of Interferon on the Cell Membrane, Cell Surface, and Cytoskeleton. Relationships of Interferon to the Immune System. Somatic Cell Genetics of Interferons. Preparation and Assay of Antibodies against Interferons. Cloning of the Interferon Genes and Complementary DNAs.

1982, 677 pp., \$59.00 ISBN: 0-12-181979-5

## THE CELL NUCLEUS

Edited by HARRIS BUSCH  
and LAWRENCE ROTHBLUM

FROM THE PREFACE: Volume 10 deals first with the ribosomal RNA genes of *Escherichia coli* (Morgan), algae (Berger and Schweiger), fungi (Bollon), *Dictyostelium* and *Physarum* (Weiner and Emery), and other protozoans (Blackburn). Special features of the rRNA product of *Tetrahymena* are discussed by Cech *et al.* The rDNA of higher organisms is reviewed for insects (Beckingham), sea urchins (Wilson and Stafford), and humans (Wilson.)

Recent developments in the structural analysis of 18 S rRNA and rDNA, the evolutionary patterns of 28 S rDNA, and the mitochondrial rDNA are presented in the chapters by Maden, Gerbi *et al.* and Grant and Lambowitz.

Volumes 11 and 12 of this treatise deal with the 5 S DNA, nucleolar, and other rDNA-containing chromatin as visualized by light and electron microscopy and with the organization of rDNA in chromatin. In addition, the important subjects of transcription and transcriptional control of the rDNA genes, the amplification of rDNA, and the controls of ribosomal genes will be presented.

Volume 10/rDNA, Part A

1982, 448 pp., \$57.00 ISBN: 0-12-147610-3  
Subscription price: \$48.50\*

Volume 11/rDNA, Part B

1983, 328 pp., \$45.00 ISBN: 0-12-147611-1  
Subscription price: \$38.50\*

Volume 12/rDNA, Part C

1983, 288pp., \$42.00 ISBN: 0-12-147612-x  
Subscription price: \$36.00\*

\*Subscription prices are valid only on purchase of all volumes before publication of the last volume. Subscription prices are not valid on orders from Australia or New Zealand.

Continuation Orders authorize us to ship and bill each volume in a series, or "Advances" type publication automatically, immediately upon publication. This order will remain in effect until cancelled. Specify the volume number or title with which your order is to begin.

Send payment with order and save postage and handling.  
Prices are in U.S. dollars and are subject to change without notice.

## ACADEMIC PRESS, INC.

A Subsidiary of Harcourt Brace Jovanovich, Publishers  
New York • London • Toronto • Sydney • San Francisco  
111 FIFTH AVENUE, NEW YORK, N.Y. 10003

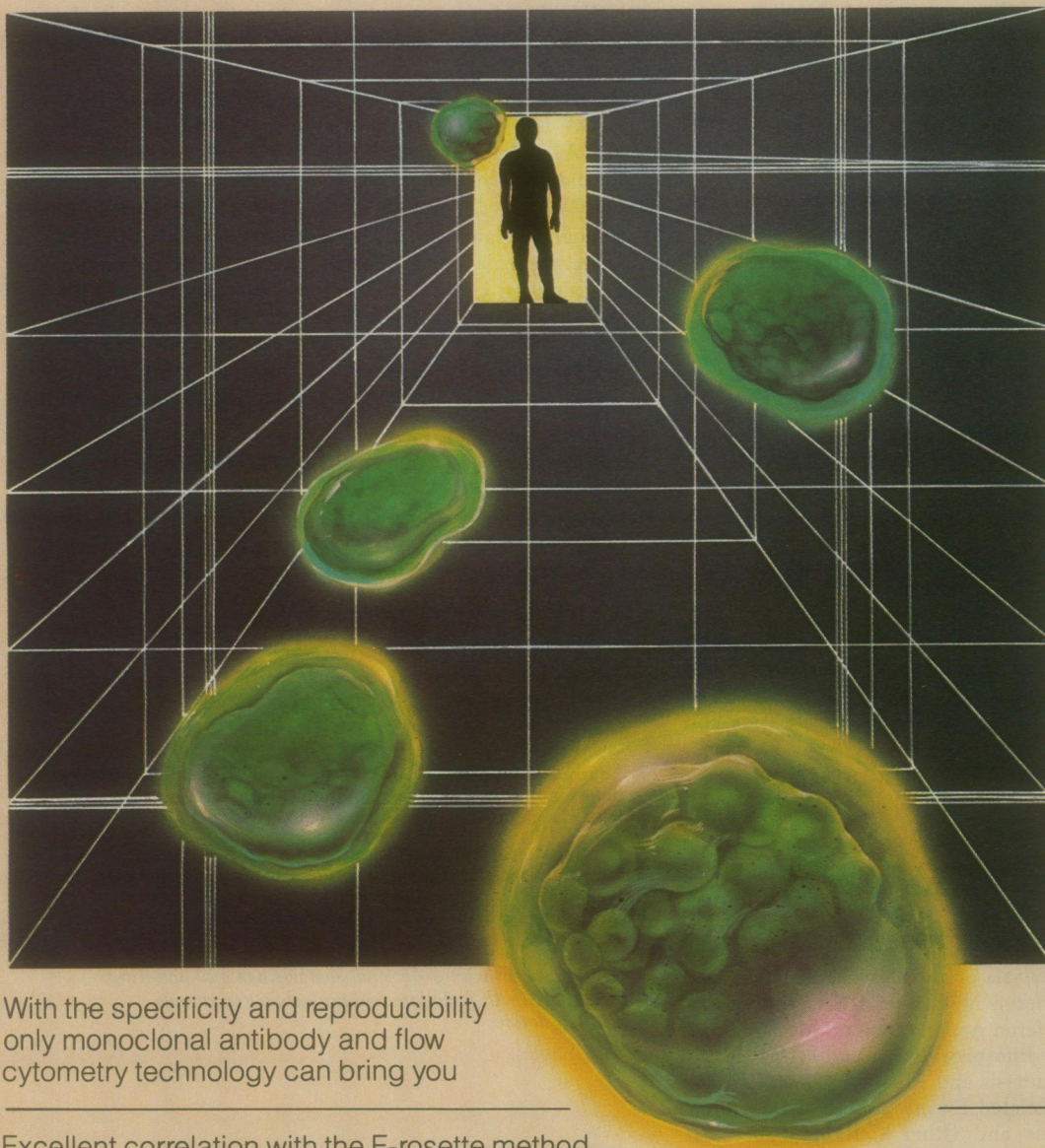
313312

Circle No. 21 on Readers' Service Card



# Announcing Ortho-mune\* OKT\*11

Monoclonal Antibody FITC Conjugate  
Anti-Human T Cell and ORTHO SPECTRUM III\*  
Laser Flow Cytometry System,  
**the first T cell testing system for  
in vitro diagnostic use**



With the specificity and reproducibility  
only monoclonal antibody and flow  
cytometry technology can bring you

Excellent correlation with the E-rosette method

For rapid automated analysis in the clinical laboratory

Ask your Ortho Representative for details or, to place  
your order, call 800-631-5807; in New Jersey, call 201-524-2374.



**Ortho Diagnostic Systems Inc.**

Raritan, New Jersey 08869

Patent Pending

© O.D.S. 1982 \*Trademark

Circle No. 284 on Readers' Service Card

Ortho Diagnostic Systems: At the leading edge in immunology



---

# VWR presents:

---

## The most complete catalog of cocktails and supplies. And it's free!

VWR and Beckman have teamed up to deliver the best of both worlds. High quality Altex brand liquid scintillation cocktails manufactured by Beckman and fast convenient delivery from VWR's national distribution facilities. Ordering your free 96-page catalog is the first step to putting these quality products to work for you.

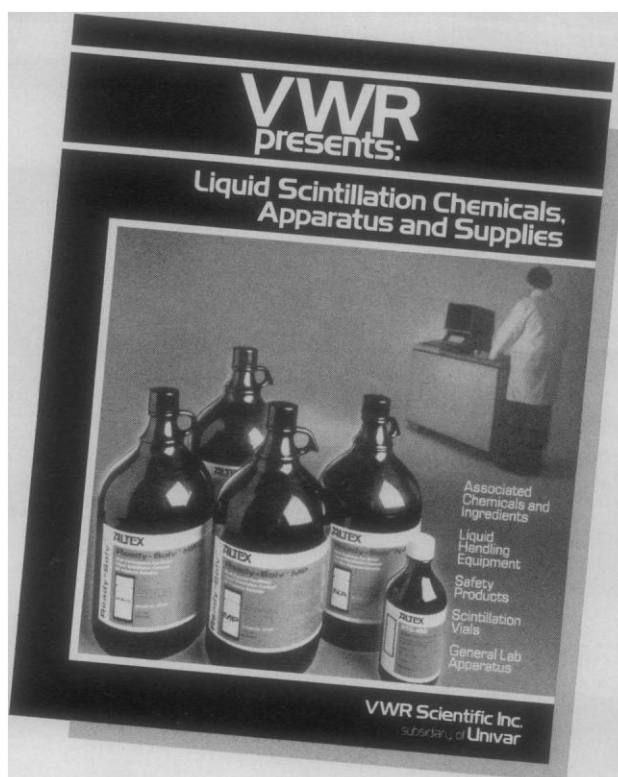
This unique publication features the entire Altex line of aqueous and non-aqueous cocktails. You will find all-purpose cocktails, as well as cocktails made for specific applications. It also contains the industry's most complete listing of L.S. related apparatus and supply items. Everything from applicators to vortex mixers plus detailed listings of cocktails, scintillation vials and chemicals.

Beckman, the leading name in liquid scintillation technology has applied its

experience to the research and development of the highest quality cocktails. All Altex brand cocktail formulations contain pseudocumene, the most effective solvent currently known for scintillation cocktails. Not only is pseudocumene more efficient, it is less hazardous than the typical solvents, toluene and xylene.

For added safety, bottles are plastic-coated to help prevent breakage.

Now, these cocktails are in stock and available through VWR's network of 29 sales offices. Order your catalog today simply by circling the reader service number below or contacting the VWR sales office near you! **VWR delivers.**



**VWR Scientific Inc.**  
subsidiary of **Univar**

P.O. Box 7900, San Francisco, CA 94120

Circle No. 367 on Readers' Service Card



# We can do everything in liquid scintillation counting



## RackBeta Liquid Scintillation Counters Models 1211, 1212, 1217, 1218

The new Wallac range of RackBeta counters has everything that you could imagine you might need. From a basic and really inexpensive counter for only the most essential needs, to a rugged and really handy instrument to stand up to the demands of severe everyday use, to the most extreme research oriented instrument for essentially everything in the field of beta counting.

The Rackbeta range with its comprehensive series of hardware and software options, allows you to choose just what is needed for your

applications. No need to buy expensive but unwanted gimmicks. And of course if you should need more... automatic quench calibration and DPM results, refrigeration, 3-level interrupt, spectrum analysis, fraction plot, and many more, - you can always add it later.

Just ask us we have an answer to your needs!

For more information contact your local LKB representative or Wallac directly.  
Wallac Oy, P.O. Box 10, 20101 Turku 10, Finland  
Tel. 921-366 444. Telex 62333.



Circle No. 337 on Readers' Service Card



## 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

1983: FREDERICK R. BLATTNER, BERNARD F. BURKE, CHARLES L. DRAKE, ARTHUR F. FINDEIS, E. PETER GEIDUSCHEK, GLYNN ISAAC, MILTON RUSSELL, WILLIAM P. SLICHTER, JOHN WOOD

1984: ARNOLD DEMAIN, NEAL E. MILLER, FREDERICK MOSTELLER, ALLEN NEWELL, RUTH PATRICK, BRYANT W. ROSSITER, VERA C. RUBIN, SOLOMON H. SNYDER, PAUL E. WAGGONER

Publisher: WILLIAM D. CAREY

Associate Publisher: ROBERT V. ORMES

Editor: PHILIP H. ABELSON

### Editorial Staff

Assistant Managing Editor: JOHN E. RINGLE

Production Editor: ELLEN E. MURPHY

Business Manager: HANS NUSSBAUM

News Editor: BARBARA J. CULLITON

News and Comment: COLIN NORMAN (deputy editor), CONSTANCE HOLDEN, ELIOT MARSHALL, R. JEFFREY SMITH, MARJORIE SUN, JOHN WALSH

European Correspondent: DAVID DICKSON

Contributing Writer: LUTHER J. CARTER

Research News: ROGER LEWIN (deputy editor), RICHARD A. KERR, GINA KOLATA, JEAN L. MARX, THOMAS H. MAUGH II, ARTHUR L. ROBINSON, M. MITCHELL WALDROP

Administrative Assistant, News: SCHERRAINE MACK; Editorial Assistant, News: FANNIE GROOM

Senior Editors: ELEANORE BUTZ, MARY DORFMAN, RUTH KULSTAD

Associate Editors: SYLVIA EBERHART, CAITILIN GORDON, LOIS SCHMITT

Assistant Editors: MARTHA COLLINS, STEPHEN KEPPEL, EDITH MEYERS

Book Reviews: KATHERINE LIVINGSTON, Editor; LINDA HEISERMAN, JANET KEGG

Letters: CHRISTINE GILBERT

Copy Editor: ISABELLA BOULDIN

Production: JOHN BAKER, SUSANNAH BORG; HOLLY BISHOP, ELEANOR WARNER; BEVERLY DURHAM, JEAN ROCKWOOD, SHARON RYAN

Covers, Reprints, and Permissions: GRAYCE FINGER, Editor; GERALDINE CRUMP, CORRINE HARRIS

Guide to Scientific Instruments: RICHARD G. SOMMER

Assistant to the Editor: SUSAN ELLIOTT

Assistant to the Associate Publisher: ROSE LOWERY

Assistant to the Managing Editor: NANCY HARTNAGEL

Membership Recruitment: GWENDOLYN HUDDLE

Member and Subscription Records: ANN RAGLAND  
EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Area code 202. General Editorial Office, 467-4350; Book Reviews, 467-4367; Guide to Scientific Instruments, 467-4480; News and Comment, 467-4430; Reprints and Permissions, 467-4483; Research News, 467-4321. Cable: Advancesci, Washington. For "Information for Contributors," write to the editorial office or see page xi, *Science*, 24 December 1982.

BUSINESS CORRESPONDENCE: Area Code 202. Membership and Subscriptions: 467-4417.

### Advertising Representatives

Director: EARL J. SCHERAGO

Production Manager: GINA REILLY

Advertising Sales Manager: RICHARD L. CHARLES

Marketing Manager: HERBERT L. BURKLUND

Sales: NEW YORK, N.Y. 10036: Steve Hamburger, 1515 Broadway (212-730-1050); 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. (312-337-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772); DORSET, VT. 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581).

ADVERTISING CORRESPONDENCE: Tenth floor, 1515 Broadway, New York, N.Y. 10036. Phone: 212-730-1050.

## The Two Faces of Genetic Engineering in Man

To those who deal with the victims of hereditary defects there can be no question that gene therapy—the use of genetic engineering to correct such defects—is an admirable goal, solidly within the traditions of medicine. Moreover, for the loosely organized cells of the bone marrow (though not for those of most organs) cure by implantation of genes in somatic cells now seems only a few years off. Unfortunately, however, the cold term “genetic engineering” has suggested to the public other, nonmedical potential uses of the techniques, such as reshaping our physiques or our personalities, cloning favored adults, or creating subhuman hybrids.

Two years ago the three main religious groups in this country sent President Carter a joint letter that viewed research in this area as a source more of danger than of benefit. The issue was referred to an excellent presidential commission, with Morris B. Abram as chairman and Alexander Capron as executive director. Its recent draft report, and subsequent congressional hearings under Representative Albert Gore, Jr. (D-Tenn.), strongly supported the conclusion that gene therapy is a thoroughly legitimate goal. The problem has thus been handled in a much more sensible way than the emotional earlier debate over recombinant bacteria. Also encouraging is the restrained response of the major media to the recent announcement that the implantation of a gene for growth hormone into cells of mouse embryos had produced a giant strain. Evidently gene therapy itself, separated from other kinds of genetic engineering, no longer seems to present moral problems different from those of other kinds of experimental therapy, and these are supervised by local bioethics committees.

On the other hand, both the commission and some participants in the hearings viewed changes in the germ plasm as more dangerous than somatic corrections because they tamper with evolution. But, by domesticating animals and extinguishing species, man has been tampering for a long time. Moreover, as a form of preventive medicine, gene therapy in human embryos would have the same effect on the gene pool as an accepted approach: prenatal diagnosis, leading to selection for normal embryos in a family of carriers. The evolutionary argument thus does not carry much weight. However, there is a practical consideration that will deter responsible investigators from altering human embryos for a long time to come: the need for virtually perfect reliability. In somatic cell therapy a 50 percent cure rate would be a triumph, but manipulations of embryo cells that damaged even one child in a thousand would be intolerable.

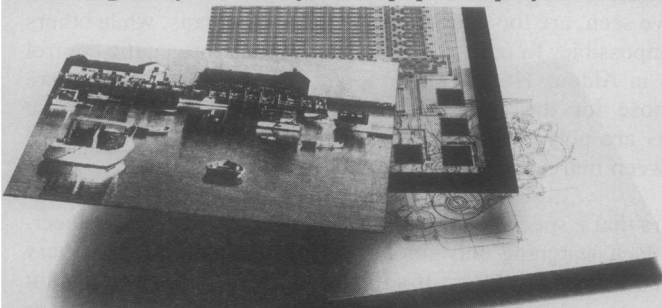
Although the commission did not consider the conceivable nonmedical uses an immediate threat, it recommended the establishment of a body to watch future advances and protect against their misuse. But some interventions, as we have seen, are too dangerous to apply to humans, while others are distant or impossible. In particular, the possibilities for genetic control of behavior, as in Aldous Huxley's *Brave New World*, seem much more limited than those for the cure of monogenic diseases, both because behavioral traits are polygenic and because most genetically determined differences between individuals are laid down in the brain circuitry before birth.

It thus appears that a special continuing commission on genetic engineering might find itself watching only for developments that either are very distant or are too dangerous to try. If so, it would have little to do, and it might then be tempted to become a busybody, imposing federal restrictions on activities that are better regulated on the local scene. On the other hand, the existence of some mechanism for continuing surveillance of genetic engineering could have real value in protecting the public from unwarranted anxiety. Perhaps the best way to achieve this end, while avoiding undue interference, would be to assign the task not to a special body but to one with wider responsibilities for biomedical ethics.—BERNARD D. DAVIS, *Harvard Medical School, Boston, Massachusetts 02115*

# No other printer or plotter does so much for so many.



Only V-80 does so much, so fast, for so many. V-80 is a multi-user printer that delivers drafts at 1000 lines per minute. V-80 is a plot server that draws graphics, maps, even halftone pictures, for a local network. V-80 is a workstation hard copy unit that makes copies direct from your favorite display terminal. It does all these jobs quickly and quietly. And at your option, it gives you those jobs on paper or polyester film.



Print reports, complete with graphics. Draw complex plots that would take hours on a pen plotter, in just seven seconds. Even produce transparent overlays, overheads, and photocopy masters direct from computer or display terminal.

Share your V-80. Nobody waits long at seven seconds per page. And you can place V-80 nearby, because it works without nerve-racking clatter.

V-80 delivers output worth sharing. It prints with three times the character definition of comparably priced impact printers. And with 40,000 points per square inch resolution, it's the choice of leading CAD and graphics workstation suppliers for high speed graphics.

Versatec serial and parallel interfaces, intelligent controllers, and multiplexers link V-80 with a wide range of multi-terminal systems. Available with Ethernet interfacing, V-80 is the ideal plot server for local networks.

Discover how V-80 can help you get more out of your multi-user system or local network. Circle our readers' service number for a free full-color brochure.



2710 Walsh Avenue, Santa Clara, California 95051, (408) 988-2800  
27/35 London Road, Newbury, Berkshire, England (0635) 31221

XEROX® and Ethernet® are trademarks of XEROX CORPORATION V-80 is a trademark of Versatec