

The Journal of PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

A Publication of The American Society
for Pharmacology and Experimental Therapeutics

Founded by John J. Abel 1909

EDITOR

Eva King Killam

ASSISTANT EDITOR

Mannfred A. Hollinger

EDITORS FOR SPECIFIC FIELDS

Analgesia and Drug Abuse
Joseph Cochlin

Autonomic Pharmacology
Joseph J. McPhillips
Robert E. Stitzel

Behavioral Pharmacology
John A. Harvey

Cardiovascular Pharmacology
Henry R. Besch, Jr.
Theodore M. Brody
Donald V. Priola

Cell Pharmacology
Toshio Narahashi
George B. Weiss

Chemotherapy
H. George Mandel

Developmental Pharmacology
Bernard L. Mirkin

Drug Metabolism and Disposition
Edward Bresnick
Jordan L. Holtzman

Endocrine Pharmacology
Paula H. Stern

Gastrointestinal Pharmacology
Thomas F. Burks

Immunopharmacology
Sydney Spector

Neuropharmacology
S. J. Enna
A. James Hance
Charles O. Rutledge

Prostaglandins and Leukotrienes
John C. McGiff

Pulmonary Pharmacology
Mannfred A. Hollinger

Renal Pharmacology
William O. Berndt

Toxicology
Curtis D. Klaassen

EDITORIAL ADVISORY BOARD

Martin W. Adler
Edson X. Albuquerque
Edmund G. Anderson
Lewis Aronow
Leslie E. Bailey
Michael D. Bailie
Robert L. Balster
Paul Bass
John A. Bevan
C. Paul Bianchi
Leslie C. Blaber
David A. Blake
Floyd E. Bloom
Gary Brooker
Carl K. Buckner
David B. Bylund
Theodore J. Cicero
Doris H. Clouet
Leonard Cook
Charles R. Craig
E. E. Daniel
William C. de Groat
Louis Diamond
Walter R. Dixon
James S. Douglas
J. W. Downie
Sue Piper Duckles
Linda Dykstra

Hugh L. Evans
James A. Ferrendelli
Gregory D. Fink
Lawrence J. Fischer
William W. Fleming
Ray W. Fuller
Timothy S. Gaginella
Gerard L. Gebber
James W. Gibb
Shri N. Giri
Dora B. Goldstein
Frank R. Goodman
Charles W. Gorodetzky
Theodore E. Gram
Garrett J. Gross
T. Kendall Harden
Harold F. Hardman
Louis S. Harris
Richard J. Head
Philip C. Hoffmann
Stephen G. Holtzman
Jerry B. Hook
David M. Jacobowitz
Donald R. Jasinski
Alain F. Junod
S. M. Kirpekar
Conan Kometzky
Edwin A. Kroeger

Wayne Levin
Louis Levy
Roberto Levi
George E. Lindenmayer
Stephen L. Lipsius
Walter Lovenberg
Benedict R. Lucchesi
K. U. Malik
Thomas A. McCalden
Donald E. McMillan
Jerry Mitchell
Perry B. Molinoff
W. H. Morse
Kevin Mullane
Jose M. Musacchio
Mary J. Mycek
Robert A. Neal
Philip Needleman
Achilles J. Pappano
William A. Pettinger
Larissa A. Pohorecky
Russell A. Prough
James W. Putney, Jr.
Arthur Raines
G. Alan Robison
C. R. Ross
Carl E. Rosow
Ronald P. Rubin

Robert R. Ruffolo, Jr.
Betty I. Sasyniuk
Arnold Schwartz
Lewis S. Seiden
Eric J. Simon
Roger P. Smith
John L. Sutko
Boris Tabakoff
Robert I. Taber
A. E. Takemori
Robert E. Ten Eick
Thomas R. Tephly
Richard E. Tessel
C. D. Thron
U. Trendelenburg
Betty M. Twarog
Norman J. Uretsky
Ladislav Volicer
Martin A. Wasserman
I. M. Weiner
Benjamin Weiss
Richard M. Welch
David P. Westfall
Grant R. Wilkinson
Martin M. Winbury
Barry B. Wolfe
Ben G. Zimmerman

BOARD OF PUBLICATIONS TRUSTEES

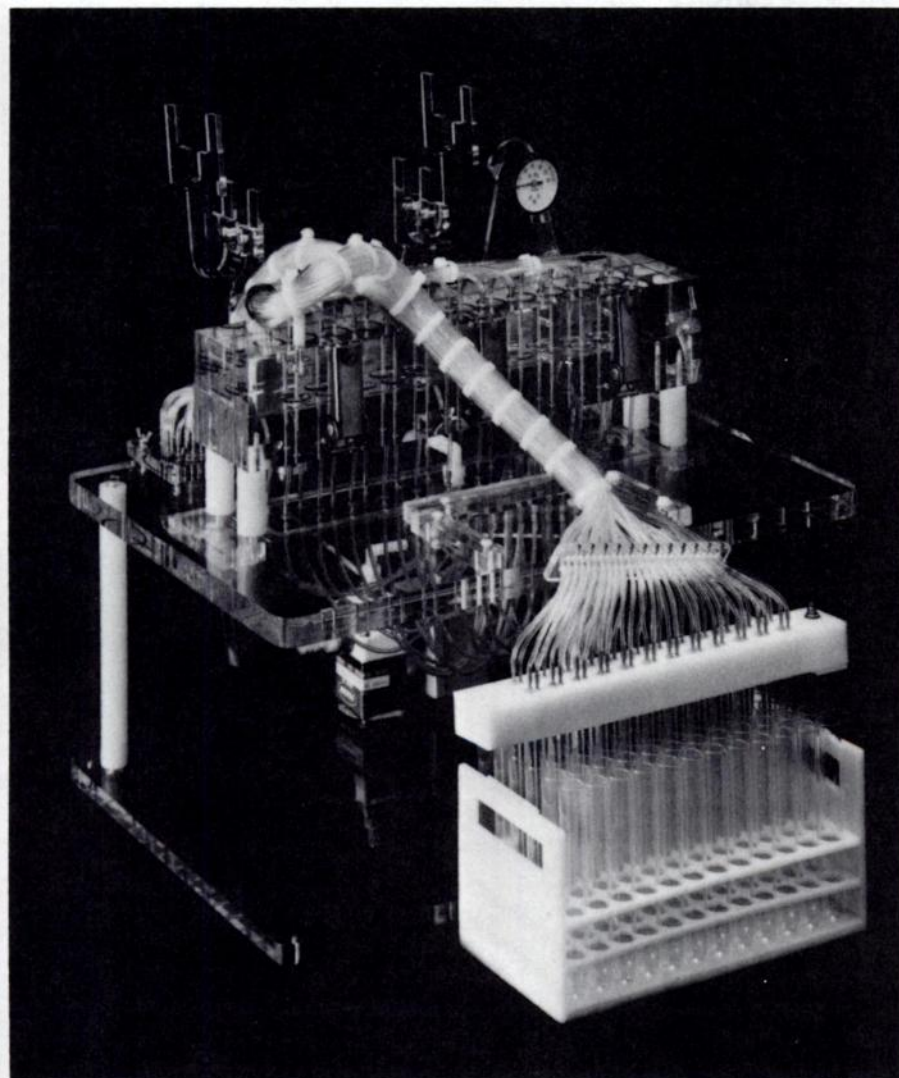
Norman Weiner, *Chairman*: James A. Bain, Joseph R. Bianchine, William W. Fleming (ex officio), Joel G. Hardman, Eva King Killam, Bettie Sue Masters, Jerry R. Mitchell, Clement A. Stone, Palmer W. Taylor, Vincent G. Zannoni

EXECUTIVE OFFICER OF THE SOCIETY

Kay A. Croker

THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS (ISSN 0022-3565) is published monthly by The American Society for Pharmacology and Experimental Therapeutics, 428 E. Preston Street, Baltimore, MD 21202. Annual dues includes \$60.00 for journal subscription. Second class postage paid at Baltimore, MD and at additional mailing offices. POSTMASTER: Send address changes (Form 3579) to Williams & Wilkins, 428 E. Preston St., Baltimore, MD 21202. Indexed by *Current Contents* and *Index Medicus*. Subscription rates \$140.00 (\$165.00 foreign); institutions \$220.00 (\$245 foreign) single copy \$16.00 (\$19.00 foreign). Copyright © 1984 by The American Society for Pharmacology and Experimental Therapeutics

Harvester for Receptor Binding Assays



Advantages

- Eliminates need for individual filter discs
- Works from small or large test tubes
- 24 samples done at one time
- Ability to collect radioactive waste separately

For more information, call or write to:

BRANDEL

Biomedical Research and Development Laboratories
16632 Oakmont Avenue
Gaithersburg, MD 20877
(301) 948-6506

AUTHOR INDEX

- Abernethy, D. R., 702
Adamski, S. W., 756
Agrawal, D. K., 831
Akaike, A., 859
Barbaccia, M. L., 782
Barrett, R. J., 756
Bartsch, W., 787
Belghiti, Jacques, 845
Bendesky, R. J., 706, 775
Bianchi, C. P., 696
Bildstein, C., 738
Bishop, C. M., 690
Bowyer, J. F., 671
Boyd, M. R., 658
Breese, G. R., 731
Brown, M. J., 803
Burks, T. F., 641
Capetola, R. J., 690
Chait, L. D., 636
Chen, X., 649
Clineschmidt, B. V., 775
Compton, S., 654
Cone, E. J., 768
Conway, E. L., 803
Costa, E., 782
Coyle, S., 731
Cullinan, G. J., 681
Danan, G., 845
Daniel, E. E., 831
Degott, C., 851
Dietmann, K., 787
Dollery, C. T., 803
Ebersole, B. J., 865
Fitzpatrick, T., 654
Fleisch, J. H., 681
Flejou, J-F., 851
Fouin-Fortunet, H., 845, 851
Fowler, P. J., 712
Frye, G. D., 731
Fuchino, K., 809
Fujii, T., 809
Fujisawa, K., 793
Galligan, J. J., 641
Gandolfi, O., 782
Gillis, C. N., 649
Gorodetzky, C. W., 768
Greenblatt, D. J., 702
Grega, G. J., 756
Griendling, K. K., 887
Griffiths, R. R., 636
Grous, M., 712
Haisch, K. D., 681
Hedli, C. C., 690
Hichens, M., 775
Hironaka, T., 809
Hruby, V. J., 641
Hurst, R., 641
Iacopino, V. J., 654
Inoue, T., 793
Itoh, T., 793
Joost, Hans G., 839
Jusko, W. J., 719
Kanmura, Y., 793
Kawasaki, H., 816
Khalafallah, N., 719
King, Stella W., 775
Kot, P., 654
Ku, D. D., 664
Kuriyama, H., 793
Langer, S. Z., 823
Letteron, P., 845, 851
Levinson, S. L., 690
Liu, D., 738
Lokhandwala, M. F., 756
Maayani, S., 865
Mamelok, R. D., 738
Mangel, A. W., 775
Marshall, W. S., 681
Martin, G. E., 706, 775
Matthews, W. D., 712
McCown, T. J., 731
Medgett, I. C., 823
Meezan, E., 664
Milnor, W. R., 887
Moalli, R., 649
Morkin, E., 872
Mosberg, H. I., 641
Mueller, R. A., 731
Müller-Beckmann, B., 787
Narayan, S. R., 696
O'Donnell, J. M., 629
Pessayre, D., 845, 851
Pitt, B. R., 649
Price, W., 712
Quentin, S. H., 839
Ramwell, P., 654
Remy, D. C., 775
Rinkema, L. E., 681
Ritchie, D. M., 690
Robinson, J. L., 775
Roeske, W. R., 747
Rose, J., 654
Rosenfeld, G. C., 763
Rusher, M. M., 887
Rutledge, C. O., 880
Sasa, M., 859
Sastre, A., 887
Schmidt, M. J., 681
Schoepp, D. D., 880
Seiden, L. S., 629
Shader, R. I., 702
Shannon, H. E., 768
Sheer, D., 872
Sierchio, J. N., 690
Smith, a. C., 658
Spaethe, S. M., 681
Sponer, G., 787
Spuhler, K. P., 671
Strein, K., 787
Strong, R., 726
Takaori, S., 859
Takasaki, K., 816
Taylor, D. A., 775
Tinel, M., 845, 851
Totaro, James A., 775
Towle, A. C., 731
Triggle, C. R., 831
Tse, S. S., 738
Vickroy, T. W., 747

KEEPING CURRENT

♦ ♦ ♦ **is it important to you?**

Two journals that guarantee you'll be told what's happening
NOW in pharmacology, physiology, and biochemistry.

PHARMACOLOGICAL REVIEWS

A Publication of
the American Society for
Pharmacology and Experimental
Therapeutics, Inc.

Editor: **James A. Bain, Ph.D.**,
Emory University

Pharmacological Reviews is a showcase journal for ideas that would otherwise be buried in the mass of pharmacological literature. Important review papers on the current status of a given topic are allotted plenty of space (from 10 to 40 pages) to exhaustively cover that topic. A fine balance is achieved in these articles, which are written in a clear, simple and concise fashion so as to be intelligible to non-specialists, yet are precise and detailed enough to be of great interest to experts in the field.

At various times, **Pharmacological Reviews** has addressed such subjects as biochemical and cellular pharmacology, drug metabolism and disposition, renal pharmacology, neuropharmacology, behavioral pharmacology, clinical pharmacology, and toxicology. Designed specifically as a medium through which those interested in these topics can communicate directly, **Pharmacological Reviews** serves the entire pharmacological community and is vital reading for physiologists, pharmacologists, and biological chemists.

THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

A Publication of the American
Society for Pharmacology and
Experimental Therapeutics, Inc.

Editor: **Eva King Killam, PhD**,
School of Medicine, University of
California, Davis

Founded by John J. Abel in 1909.

this is one of the most prestigious journals in scientific research. Publishing original research articles on all aspects of the interactions of chemical and biological systems, **The Journal of Pharmacology and Experimental Therapeutics** is extremely useful for the academic or clinical pharmacologist. In addition, it has broad relevance for pharmaceutical research laboratories and anesthesiologists. Readers will find full coverage of autonomic, behavioral, cardiovascular, cellular, clinical, developmental, gastrointestinal, immuno-, neuro-, pulmonary, and renal pharmacology. Other areas include analgesia, drug abuse, drug metabolism and distribution, chemotherapy, and toxicology. Each issue of this monthly periodical *averages over 200 pages* and presents the best in research being published in pharmacology and therapeutics.

Please enter my new subscription to the journals checked below.
(Orders outside the U.S. must be prepaid.)

Pharmacological Reviews (quarterly)

- Personal: \$35.00/yr.
- Institutional: \$70.00/yr.
- In-training: \$25.00/yr.
- Foreign: add \$10.00/yr.

The Journal of Pharmacology and Experimental Therapeutics (monthly)

- Personal: \$140.00/yr.
- Institutional: \$220.00/yr.
- Foreign: add \$30.00/yr.

(In-training rates apply to residents, fellows, interns, and students. When requesting this rate, which is limited to three years, please give training status and name of institution.)

Members of the American Society for Pharmacology and Experimental Therapeutics should order subscriptions to the official society journals through the American Society for Pharmacology and Experimental Therapeutics, 9650 Rockville Pike, Bethesda, MD 20014

name

address

city state zip code

- check enclosed bill me

CREDIT CARD PURCHASE

(Check one) VISA MasterCard

card #

expiration date

TOLL-FREE TELEPHONE ORDERING (9 am to 4 pm)

Now, subscribing to any of these journals is as easy as making a phone call. To order WITH OR WITHOUT CHARGE CARD, call 1-800-638-6423 from anywhere in the continental U.S. Maryland residents CALL COLLECT, 528-4105.

Williams & Wilkins
P.O. Box 1496
Baltimore, Maryland 21203



PT PTSFIL