

# The Journal of PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

Volume 249  
APRIL-JUNE  
1989

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*

William L. Dewey  
Billy Martin

### *Autonomic Pharmacology*

Robert R. Ruffolo, Jr.  
Robert E. Stitzel

### *Behavioral Pharmacology*

John A. Harvey

### *Cardiovascular Pharmacology*

Leslie E. Bailey  
Henry R. Besch, Jr.  
Theodore M. Brody  
Sue Piper Duckles

### *Cellular Pharmacology*

Toshio Narahashi  
Ronald P. Rubin  
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*

Edmund G. Anderson  
David B. Bylund  
S. J. Enna  
Charles O. Rutledge

### *Prostaglandins and Leukotrienes*

Guy C. Le Breton  
John C. McGiff

### *Pulmonary Pharmacology*

Mannfred A. Hollinger

### *Renal Pharmacology*

William O. Berndt

### *Toxicology*

Curtis D. Klaassen

## EDITORIAL ADVISORY BOARD

Margaret Acara  
Martin W. Adler  
Edson X. Albuquerque  
Julius C. Allen  
James B. Appel  
Lewis Aronow  
William D. Atchison  
Albert J. Azzaro  
Robert L. Balster  
Paul Bass  
Michael A. Beaven  
Donald M. Bers  
John A. Bevan  
C. Paul Bianchi  
David A. Blake  
Alan S. Bloom  
Floyd E. Bloom  
Peter G. Bradford  
Carl K. Buckner  
Theodore J. Cicero  
Doris H. Clouet  
Marlene L. Cohen  
Charles R. Craig  
Luigi X. Cubeddu  
E. E. Daniel  
William C. de Groat  
Louis Diamond  
Gerald F. DiBona  
Robert J. Dinerstein  
Walter R. Dixon  
J. W. Downie  
Linda Dykstra

Hugh L. Evans  
Jerry M. Farley  
Harold Feinberg  
Gregory D. Fink  
Stephen K. Fisher  
Garret A. FitzGerald  
Ray W. Fuller  
Timothy S. Gagginella  
Gerard L. Gebber  
James W. Gibb  
C. Norman Gillis  
Shri N. Giri  
Frank R. Goodman  
Thomas P. Green  
Garrett J. Gross  
R. Adron Harris  
Richard J. Head  
J. Paul Hieble  
Stephen G. Holtzman  
Jerry B. Hook  
E. H. Jeffery  
Robert M. Joy  
Alain F. Junod  
George J. Kaloyanides  
Alexander G. Karczmar  
Terry Kenakin  
Conan Kornetsky  
Edwin A. Kroeger  
David D. Ku  
Suzanne G. Laychock  
Tony J.-F. Lee

Roberto Levi  
George E. Lindenmayer  
Horace H. Loh  
Benedict R. Lucchesi  
K. U. Malik  
Thomas A. McCalden  
Robert B. McCall  
Donald E. McMillan  
W. H. Morse  
Hasan Mukhtar  
Kevin Mullane  
L. Charles Murrin  
Jose M. Musacchio  
Allen H. Neims  
Jon A. Norman  
Robert F. O'Dea  
Achilles J. Pappano  
Leslie V. Parise  
Gavril W. Pasternak  
William A. Pettinger  
Larissa A. Pohorecky  
Garth Powis  
Donald V. Priola  
Russell A. Prough  
David Raeburn  
Arthur Raines  
C. R. Ross  
Arnold Schwartz  
Lewis S. Seiden  
Paul J. Silver  
David J. Smith

Roger P. Smith  
Roger D. Speelman  
Janice L. Stickney  
John L. Sutko  
Boris Tabakoff  
A. E. Takemori  
David A. Taylor  
Robert E. Ten Eick  
Thomas R. Tephly  
Richard E. Tessel  
Martin J. M. C. Thoolen  
Pieter B. M. W. M. Timmermans  
Myron L. Toews  
Theodore J. Torphy  
U. Trendelenburg  
Norman J. Uretsky  
Paul M. Vanhoutte  
Ralph Vinegar  
Larry A. Walker  
Martin A. Wasserman  
R. Clinton Webb  
I. M. Weiner  
Richard M. Welch  
Grant R. Wilkinson  
Michael Williams  
Martin M. Winbury  
Raymond J. Winquist  
Barry B. Wolfe  
Henry I. Yamamura  
Ben G. Zimmerman

## BOARD OF PUBLICATIONS TRUSTEES

William W. Fleming, *Chairman*: James A. Bain, Joseph R. Bianchine, Joel G. Hardman, Eva King Killam, Horace Loh, Jerry R. Mitchell, Marcus M. Reidenberg, Irving I. A. Tabachnick, 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 an official publication of The American Society for Pharmacology and Experimental Therapeutics and is published monthly by Williams & Wilkins, 428 E. Preston Street, Baltimore, MD 21202-3993. Second class postage paid at Baltimore, MD and at additional mailing offices. POSTMASTER: Send address changes to THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS, 428 E. Preston St., Baltimore, MD 21202-3993. Indexed by *Current Contents* and *Index Medicus*. Subscription rates \$150.00 (\$205.00 foreign, \$302 Japan); institutions \$240.00 (\$295 foreign, \$392.00 Japan) single copy \$16.00 (\$20.00 foreign). (Japanese rates include air freight.) Prices are subject to change. Copyright © 1989 by The American Society for Pharmacology and Experimental Therapeutics.

**COPYRIGHT © 1989 BY THE AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS**