



If this research succeeds, you'll be the next to know

But only if you subscribe to the *Journal of Medicinal Chemistry*! As the leading journal covering drug design and development, it's your best source for up-to-the-minute news about original research, early findings, and critical evaluations.

As a subscriber, you'll gain valuable access to landmark studies exploring the relationship between molecular structure and biological activity. And, cutting-edge information on drug design and allied activities will help you increase your research scope and efficiency. The *Journal of Medicinal Chemistry* spotlights the most significant primary research in the world today, and gives you new information with unprecedented speed!

Be the next in line for critical information.

Subscribe to the *Journal of Medicinal Chemistry* today!

Call Toll-Free 1-800-333-9511

ACS PUBLICATIONS
Essential Resources for the Chemical Sciences

American Chemical Society
1155 Sixteenth Street, N.W.
Washington, DC 20036

Biochemistry

Biochemistry (ISSN 0006-2960) is published weekly except for the first week in January by the American Chemical Society at 1155 16th St., N.W., Washington, DC 20036. Second-class postage paid at Washington, DC, and additional mailing offices. POSTMASTER: Send address changes to *Biochemistry*, Member & Subscriber Services, P.O. Box 3337, Columbus, OH 43210. Canadian GST Reg. No. 127571347. Printed in the USA.

American Chemical Society

1155 16th St., N.W.
Washington, DC 20036
(202) 872-4600
TDD (202) 872-8733; FAX (202) 872-4615

Member & Subscriber Services

American Chemical Society
P.O. Box 3337, Columbus, OH 43210
(614) 447-3776; (800) 333-9511

Journal Publishing Operations

American Chemical Society
2540 Olentangy River Road
P.O. Box 3330, Columbus, OH 43210
(614) 447-3600, Ext 3171
TELEX 6842086; FAX (614) 447-3745

Publications Division

Robert H. Marks, Director

Journal Publishing Operations: Charles R. Bertsch, Director

Editorial Office: Mary E. Scanlan, Manager; Kathleen E. Duffy, Journals Editing Manager; Deborah K. Miller, Senior Associate Editor; Daniel R. Kelsey, Associate Editor; David L. Norris, Barbara I. Taylor, and Beth A. Welch, Assistant Editors

Advertising Office: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881

© Copyright 1995 American Chemical Society.

Copyright permission: Reprographic copying beyond that permitted by Section 107 or 108 of the U.S. Copyright Act is allowed, provided that the appropriate per-copy fee is paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Dr., Danvers, MA 01923, USA. Anyone may excerpt up to 200 words per article for noncommercial, scholarly purposes with appropriate credit to the source. Direct other reprint permission requests to ACS Copyright Office, Publications Division, 1155 Sixteenth St., N.W., Washington, DC 20036. For quotes and information on ordering bulk reprints, call (202) 872-4539 or write to Product Services Department at the ACS Washington address.

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

Editorial Information

Instructions to authors and copyright status form are printed in the first issue of each volume. Please conform to these instructions when submitting manuscripts.

Manuscripts for publication should be submitted to the Editor, Gordon G. Hammes, Duke University Medical Center, Box 3673, 081 Yellow Zone, Duke South, Durham, NC 27710. Correspondence regarding accepted papers and proofs should be directed to the Journal Publishing Operations at the address above. Page charges of \$30.00 per page may be paid for papers published in this journal. Payment does not affect acceptance or scheduling of papers.

The American Chemical Society and its Editors assume no responsibility for the statements and opinions advanced by contributors.

Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

A nine character code that is unique to each article is assigned during the editorial production of the manuscript and appears at the end of the published paper. It serves as a link between the documents in the printed product and the electronic products (CJACS Plus Images and journals on CD-Rom) and facilitates retrieval of the document in electronic form.

1995 Subscription and Ordering Information

Members may share/donate their personal subscriptions with/to libraries and the like but only after 5 years from publication.

New and renewal subscriptions should be sent with payment to American Chemical Society, Department L-0011, Columbus, OH 43268-0011.

Microforms and Back Issue orders should be sent to Microforms & Back Issues Office at the ACS Washington address.

	U.S.	Canada, Mexico	Europe*	All Other Countries*
Printed				
Members—1 yr	\$ 115	\$ 224	\$ 384	\$ 468
Nonmembers	\$1517	\$1626	\$1786	\$1870
Microfiche				
Members—1 yr	\$ 115	\$ 115	\$ 163	\$ 163
Nonmembers	\$1517	\$1517	\$1565	\$1565
Supporting information on microfiche	\$ 50	\$ 80	\$ 80	\$ 80

* Air service included.

Nonmember subscribers in Japan must enter subscription orders with Maruzen Company Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211.

Claims for missing numbers will not be allowed if loss was due to failure of notice of change of address to be received in the time specified; if claim is dated (a) North America, more than 90 days beyond issue date; (b) all other foreign, more than 180 days beyond issue date. Claims are handled by Member & Subscriber Services.

Supporting Information is noted in the table of contents with a "box". It is available as photocopy (\$12.00 for up to 3 pages and \$1.50 per page for additional pages, plus \$2.00 for foreign postage) or as 24x microfiche (\$12.00, plus \$1.00 for foreign postage). Canadian residents should add 7% GST. See Supporting Information notice at the end of journal article for number of pages. Orders must give complete title of article, names of authors, journal, issue date, and page numbers. Prepayment is required and prices are subject to change. In 1995, electronic Supporting Information is available to current journal subscribers via the Internet using either gopher or World Wide Web protocols. Most often, the material is available as PDF files, which may be viewed using Adobe's Acrobat Reader, a program which is freely available on the Internet. However, some articles may include computer programs, PostScript files, word processing files, experimental data in a standard format (e.g., crystallographic parameters in CIF format), etc. In order to download the Supporting Information, users will need to enter their journal subscriber number, which can be found on the mailing label. Detailed instructions for using this service can be found on the Internet. With gopher, connect to pubs.acs.org, go to the "ACS Publications" selection, then to the "Supporting Information" selection. Read the README file in this directory for detailed instructions. When using a WWW client (e.g., Mosaic, Netscape), connect to the URL "<http://pubs.acs.org/>", select the "Supporting Info. for Journals" link. For further information on electronic access, send electronic mail to gopher@acsinfo.acs.org or phone (202) 872-4434. For information on microforms, contact Microforms & Back Issues at the ACS Washington address or phone (202) 872-4554. Supporting Information except structure factors also appears in the microfiche edition.

Cover based on the structure of myosin subfragment-1, courtesy of A. Steinberg and I. Rayment.

Biochemistry

EDITOR: GORDON G. HAMMES

Duke University Medical Center, Box 3673, 081 Yellow Zone, Duke South, Durham, North Carolina 27710
[Phone (919) 681-3250; FAX (919) 681-8344 or (800) 334-0892]

ASSOCIATE EDITORS:

Mary D. Barkley, Louisiana State University
Marc G. Caron, Duke University Medical Center
Earl W. Davie, University of Washington
Perry A. Frey, University of Wisconsin
Arno L. Greenleaf, Duke University Medical Center

William W. Parson, University of Washington
James F. Riordan, Harvard Medical School
Joseph J. Villafranca, Bristol-Myers Squibb
Leslie Wilson, University of California, Santa Barbara

EDITORIAL ADVISORY BOARD

ROBERT H. ABELES
Brandeis University
DAVID S. AULD
Harvard Medical School
JOSEPH AVRUCH
Massachusetts General Hospital
GERALD T. BABCOCK
Michigan State University
BARBARA A. BAIRD
Cornell University
ROBERT L. BALDWIN
Stanford University
ROBERT M. BELL
Duke University Medical Center
STEPHEN J. BENKOVIC
The Pennsylvania State University
E. MORTON BRADBURY
University of California, Davis
MICHAEL J. CHAMBERLIN
University of California, Berkeley
JOSEPH E. COLEMAN
Yale University
MINOR J. COON
The University of Michigan
DAVID R. DAVIES
National Institutes of Health
WILLIAM F. DEGRADO
Du Pont Merck Pharmaceutical Company
JACK E. DIXON
The University of Michigan
RUSSELL F. DOOLITTLE
University of California, San Diego
RAYMOND A. DWEK
University of Oxford
MAURICE R. EFTINK
University of Mississippi
JULI FEIGON
University of California, Los Angeles
ALAN R. FERSHT
Cambridge University Chemical Laboratory
IRWIN FRIDOVICH
Duke University Medical Center
ERROL C. FRIEDBERG
University of Texas Southwestern
Medical Center
CARL FRIEDEN
Washington University School of Medicine
MARTIN GELLERT
National Institutes of Health
LILA M. GIERASCH
University of Massachusetts

IRVING H. GOLDBERG
Harvard Medical School
JACK GORSKI
University of Wisconsin—Madison
ANGELA M. GRONENBORN
National Institutes of Health
HEIDI E. HAMM
University of Illinois
ROBERT HASELKORN
University of Chicago
CLAUDE HÉLÈNE
Museum National d'Histoire Naturelle,
Paris
JOHN W. B. HERSHEY
University of California, Davis
GEORGE P. HESS
Cornell University
STEFAN HIGHSMITH
University of the Pacific
PETER C. HINKLE
Cornell University
DICK HOEKSTRA
University of Groningen
BARRY HONIG
Columbia University
TONY E. HUGLI
Scripps Clinic & Research Foundation
LINDA JEN-JACOBSEN
University of Pittsburgh
ROBERT L. JERNIGAN
National Institutes of Health
HANS JÖRNVALL
Karolinska Institutet
NEVILLE R. KALLENBACH
New York University
CLAUDE B. KLEE
National Institutes of Health
JUDITH P. KLINMAN
University of California, Berkeley
ROBERT J. LEFKOWITZ
Duke University Medical Center
TOMAS LINDAHL
ICRF Clare Hall Laboratories
PHILIP W. MAJERUS
Washington University School of Medicine
ROWENA G. MATTHEWS
The University of Michigan
THOMAS J. MCINTOSH
Duke University Medical Center

CHRISTOPHER MILLER
Brandeis University
PAUL L. MODRICH
Duke University Medical Center
LUCIANO MUELLER
Bristol-Myers Squibb
GARY L. NELSESTUEN
University of Minnesota
BERT W. O'MALLEY
Baylor College of Medicine
ARTHUR PARDI
University of Colorado, Boulder
IVAN RAYMENT
University of Wisconsin
M. THOMAS RECORD, JR.
University of Wisconsin
GARY RUDNICK
Yale University School of Medicine
DAVID W. RUSSELL
University of Texas Southwestern
Medical Center
J. EVAN SADLER
Washington University School of Medicine
HAROLD A. SCHERAGA
Cornell University
PAUL R. SCHIMMEL
Massachusetts Institute of Technology
JOACHIM SEELIG
University of Basel
G. GRAHAM SHIPLEY
Boston University School of Medicine
ANTERO G. SO
University of Miami
LINDA L. SPREMULLI
University of North Carolina, Chapel Hill
JOANNE STUBBE
Massachusetts Institute of Technology
IGNACIO TINOCO, JR.
University of California, Berkeley
OLKE C. UHLENBECK
University of Colorado, Boulder
BERT L. VALLEE
Harvard Medical School
JANE M. VANDERKOOI
University of Pennsylvania
TERESA S.-F. WANG
Stanford University
PETER E. WRIGHT
Scripps Clinic & Research Foundation
CHENG-WEN WU
Academia Sinica