



# Cancer Research

**Editor**  
Peter N. Magee

**Managing Editor**  
Margaret Foti

**Assistant Managing Editor**  
Mary Anne Mennite

**Senior Staff Editor**  
Heide M. Pusztay

**Staff Editor**  
Ellen M. McDonald

**Editorial Assistants**  
Mark G. Hall  
Martha Michael

**Administrative Secretary**  
Margaret A. Pickles

**Editorial Secretaries**  
Sandra E. Pettie  
Robin E. Felder  
Elaine Robinson  
Theresa A. Griffith  
Diane Cardwell

*American Association for  
Cancer Research, Inc.*

**Executive Director**  
Margaret Foti

**Executive Assistant**  
Adam D. Blistein

**Executive Secretaries**  
Ruth E. Fortson  
Elizabeth A. Moore

**Secretary**  
Robin E. Felder

*Cancer Research* is sponsored by the American Association for Cancer Research, Inc. and receives major support from the American Cancer Society, Inc. Publication costs are also met by a grant from the Elsa U. Pardee Foundation.

## Associate Editors

Stuart A. Aaronson  
Samuel Abraham  
William M. Baird  
Allan Balmain  
Mariano Barbacid  
J. Carl Barrett  
Stephen B. Baylin  
John M. Bennett  
Michael Bennett  
Bijoy K. Bhuyan  
June L. Biedler  
Alexander Bloch  
Clara D. Bloomfield  
Peter M. Blumberg  
G. Tim Bowden  
Luther W. Brady  
Norman Breslow  
Edward Bresnick  
Garrett M. Brodeur  
Ronald N. Buick  
C. Patrick Burns  
Ed Cadman  
Stephen K. Carter  
Judith K. Christman  
Samuel M. Cohen  
David Colcher  
Allan H. Conney  
Geoffrey M. Cooper  
Edward M. Copeland, III  
Joseph G. Cory  
Etienne de Harven  
Eugene R. DeSombre  
Daniel L. Dexter  
Ralph E. Durand  
Alan Eastman

Gertrude B. Elion  
Rose Ruth Ellison  
M. Essex  
Nelson Fausto  
Isaiah J. Fidler  
Kenneth A. Foon  
Joseph F. Fraumeni, Jr.  
Philip Frost  
Mark E. Furth  
Eugene W. Gerner  
Leo E. Gerweck  
David M. Goldenberg  
Stanley Goldfarb  
Sidney H. Golub  
Saxon Graham  
Joel S. Greenberger  
J. W. Grisham  
Daniel P. Griswold  
Arthur P. Grollman  
F. Peter Guengerich  
Sen-itiroh Hakomori  
Uli Hammerling  
Philip C. Hanawalt  
Nabil Hanna  
Curtis C. Harris  
John C. Harshbarger  
Stephen S. Hecht  
Brian E. Henderson  
Maureen M. Henderson  
Ronald B. Herberman  
Russell Hilf  
Vincent P. Hollander  
Eliezer Huberman  
John T. Isaacs  
Mark A. Israel

Robert C. Jackson  
Rakesh K. Jain  
Peter A. Jones  
V. Craig Jordan  
R. L. Juliano  
Robert F. Kallman  
David G. Kaufman  
Ann R. Kennedy  
Robert S. Kerbel  
Young S. Kim  
Alfred G. Knudson, Jr.  
Kurt W. Kohn  
Laurence N. Kolonel  
Hilary Koprowski  
Margaret L. Kripke  
Donald W. Kufe  
Lloyd W. Law  
John S. Lazo  
Brigid G. Leventhal  
Jay A. Levy  
Shutsung Liao  
Victor Ling  
Martin Lipkin  
Gerald Litwack  
Kenneth O. Lloyd  
Daniel S. Longnecker  
Dan L. Longo  
Diana M. Lopez  
Reuben Lotan  
James W. Lown  
Veronica M. Maher  
Tak W. Mak  
Laurence J. Marton  
Michael J. Mastrangelo  
Alvin M. Mauer

Kenneth B. McCredie  
Daniel Medina  
Myron R. Melamed  
John Mendelsohn  
Thomas C. Merigan  
Christopher J. Michejda  
Enrico Mihich  
John D. Minna  
John A. Montgomery  
Harold L. Moses  
Franco M. Muggia  
Paul Nettesheim  
A. Munro Neville  
Garth L. Nicolson  
Thomas G. O'Brien  
Peter J. O'Dwyer  
Gilbert S. Omenn  
C. Kent Osborne  
Robert F. Ozols  
Michael A. Palladino, Jr.  
Peter L. Pedersen  
Angel Pellicer  
Sidney Pestka  
G. Barry Pierce  
W. J. Pledger  
Janardan K. Reddy  
Donald J. Reed  
Ralph A. Reisfeld  
Richard A. Rifkind  
Joseph L. Roti Roti  
Berish Y. Rubin  
Avery A. Sandberg  
Dante G. Scarpelli  
Jeffrey Schlom  
David Schottenfeld

Robert B. Scott  
Robert E. Scott  
Beatrice Singer  
Michael A. Sirover  
Arthur A. Spector  
Eric J. Stanbridge  
Gary S. Stein  
Bernard S. Strauss  
James A. Swenberg  
Paul Talalay  
James E. Talmadge  
Ian F. Tannock  
David Tarin  
Armen H. Tashjian  
Douglass C. Tormey  
Jeffrey M. Trent  
Teresa J. Vietti  
Ellen S. Vitetta  
Bert Vogelstein  
Barbara K. Vonderhaar  
Daniel D. Von Hoff  
Peter A. Ward  
Lee W. Wattenberg  
George Weber  
I. Bernard Weinstein  
Clifford W. Welsch  
Gerald N. Wogan  
Sheldon Wolff  
Sandra R. Wolman  
Flossie Wong-Staal  
Charles W. Young  
Stuart H. Yuspa  
Harald zur Hausen

## Cover Editorial Board

Sidney Weinhouse,  
Cover Editor

Joseph H. Burchenal  
Nancy H. Colburn

Hugh J. Creech  
George H. Hitchings

Edwin A. Mirand  
Michael B. Shimkin

Howard E. Skipper  
John H. Weisburger

## Subscription Information

*Cancer Research* is published twice a month, one volume per year, by the American Association for Cancer Research, Inc. Subscriptions include the *Proceedings of the American Association for Cancer Research*, issued in March of each year. Except for members of the American Association for Cancer Research, all subscriptions are payable in advance to Waverly Press, Inc., 428 E. Preston Street, Baltimore, Maryland 21202, to which all business communications, remittances (in United States currency or its equivalent), and subscription orders should be sent. In Japan, send orders and inquiries to (sole agent): USACO Corporation, Tsutsumi Bldg., 13-12, 1-chome, Shimbashi, Minato-ku, Tokyo 105, Japan; Tel. (03) 502-6471. Nonmembers of the American Association for Cancer Research within the United States may subscribe to the journal *Cancer Research* at the rate of \$130.00 (individual nonmembers) or \$260.00 (institutional nonmembers) per annual volume, including postage. Institutional and individual nonmembers outside of the United States should add \$50.00 to their respective rates to offset second-class postage costs. Air mail and other means of delivery are available at extra charge; contact Waverly Press for information. Waverly Press should be notified of changes of address 60 days in advance; subscribers should give both their old and new addresses. Copies of the journal which are undeliverable because of address changes will be destroyed.

## Notice to Members of the American Association for Cancer Research

### Officers for 1988-1989

*President:* Lawrence A. Loeb, University of Washington, Seattle, WA 98195  
*President-Elect:* Harris Busch, Baylor College of Medicine, Houston, TX 77030  
*Treasurer:* Thomas J. King, Georgetown University Medical Center, Washington, DC 20007  
*Executive Director:* Margaret Foti, AACR, 530 Walnut Street, 10th floor, Philadelphia, PA 19106.

### Annual Dues

The annual dues of active members of the American Association for Cancer Research are \$100.00 and they include a subscription to the journal *Cancer Research*. The regular subscription price of *Cancer Research* for members of the Association is \$65.00 per annual volume. Corresponding members of the Association should add \$50.00 to this rate to offset postage costs. Payment of dues and changes of address of members of the Association should be sent promptly to Margaret Foti, Executive Director, American Association for Cancer Research, 530 Walnut Street, 10th floor, Philadelphia, PA 19106 (215) 440-9300.

---

### Back Issues and Single Copy Sales of the Journal

Copies of back stock of the journal *Cancer Research* may be ordered from Waverly Press, Inc. As long as supplies permit, single copies of *Cancer Research* will be sold by this company at \$22.00 per copy for regular issues and \$22.00 per copy for Supplement issues which contain material from conferences on topics related to cancer. The annual *Proceedings of the American Association for Cancer Research* is available at \$20.00 per copy. Orders outside the U. S. and Canada add \$2.00/copy to offset postage costs.

---

### Advertisements in *Cancer Research*

Advertisement insertion orders and copy must be received 60 days prior to the date of issue in which the advertisement is to be published. The journal is mailed approximately 7 days preceding the date of issue. Inquiries about advertising should be directed to: Gary A. Walchli, Williams and Wilkins, 428 E. Preston Street, Baltimore, Maryland 21202. Telephone: 301-528-4280.

---

### Historical Cover Themes

Readers are invited to submit themes (events, persons, institutions) for consideration for the illustrated covers of *Cancer Research*. Correspondence regarding suggested cover themes, or other matters regarding covers, should be addressed to the Cover Editor, *Cancer Research* Editorial Office.

---

### Submission of Manuscripts

Manuscripts should be sent to the attention of: Dr. Peter N. Magee, Editor, *Cancer Research* Editorial Office, American Association for Cancer Research, 530 Walnut Street, 10th floor, Philadelphia, PA 19106 (215) 440-9300. If accepted, they will be listed under one of ten categories in the Table of Contents. Please specify in a covering letter which category applies to your submission: Basic Sciences section—biochemistry and biophysics, carcinogenesis, endocrinology, immunology, molecular biology and genetics, preclinical pharmacology and experimental therapeutics, tumor biology, virology; Clinical Investigations section—clinical studies, epidemiological studies. (Final categorization in the Table of Contents is at the discretion of the Editor.) Consult the "Instructions for Authors" printed in the January issue of the journal for other submission requirements. Reprints of the "Instructions" are available upon request.

#### *Manuscript Processing Fee*

Journal policy requires that a manuscript processing fee of \$75.00 be assessed for each paper to defray the expenses incurred in the editorial review process. Each manuscript submitted for publication should be accompanied by a check (drawn on a U.S. bank) or purchase order for \$75.00 in U. S. currency, payable to *Cancer Research* at the above address. Note: If an author resubmits a manuscript that our Editors previously found unacceptable for publication, it is journal policy to consider it a new submission, assign it a new manuscript number, and charge the author another \$75.00 handling fee to cover the cost of review.

#### *Page Charges*

Accepted manuscripts will be published with the understanding that the author(s) will pay a charge of \$55.00 per printed page. Under exceptional circumstances, when no source of grant or other support exists, the author(s) may apply to Dr. Peter N. Magee, Editor, at the time of submission, for a waiver of the page charges. All such applications must be countersigned by an appropriate institutional official stating that no funds are available for the payment of page charges.

#### *Copyright and Copyright Clearance Center*

The Copyright Revision Act (PL 94-553), which became effective January 1, 1978, states that the copyright of a work is vested in the author from the moment of creation. Therefore, all authors who wish to publish in *Cancer Research* must formally transfer copyright to the proprietor of the journal, the American Association for Cancer Research, Inc. It is understood by this transfer that the authors relinquish all exclusive rights of copyright ownership, including the rights of reproduction, derivation, distribution, sale, and display.

Authors who prepared their articles as part of their official duties as employees of the U. S. Federal Government are not required to transfer copyright to the American Association for Cancer Research, Inc., since these articles are considered to be in the public domain. However, it is necessary for these authors to sign the appropriate section of the transfer form. In the case of articles supported by federal grants or contracts, copyright transfer to the American Association for Cancer Research, Inc., is required. The federal government may retain a nonexclusive license to publish or republish such material.

The duly authorized agent of a commercial firm or commissioning organization must sign the transfer form if the author prepared the article as part of his or her official duties as an employee.

Appropriate forms for transfer of copyright will be sent routinely with acknowledgment of receipt of manuscripts for review. They may also be requested from the *Cancer Research* Editorial Office. The journal will not publish a paper unless the form is properly completed and signed.

Copies of articles for which the American Association for Cancer Research, Inc. owns the copyright may be made for personal or internal use, provided that the copier pay the per-copy fee of \$2.00 through the Copyright Clearance Center, Inc. This Center is a nonprofit organization through which individuals and institutions may reimburse a copyright owner for photocopying journal articles beyond what is defined as "fair use" in Sections 107 and 108 of the Copyright Revision Act of 1978.

Those who wish to photocopy *Cancer Research* articles may report the number of copies they have made, together with the fee code 0008-5472/88 \$02.00, to: Copyright Clearance Center, Inc., 27 Congress St., Salem, Mass. 01970. Remittances may be sent to the Center at the time of reporting or the Center will bill the user on a monthly basis. Deposit accounts and prepayment plans may also be arranged.

Between June 1978 and August 1983, a fee code appeared on the first page of all articles for which *Cancer Research* owned the copyright. For those issues, it is understood that any articles which did not carry this code are in the public domain.

---

*Cancer Research* is abstracted or indexed in *Biological Abstracts*, *Chemical Abstracts*, *Index Medicus*, *Science Citation Index*, and by the *International Cancer Research Data Bank*.

---

No responsibility is accepted by the Editors, by the American Association for Cancer Research, Inc., or by Waverly Press, Inc. for the opinions expressed by contributors or for the content of the advertisements.

*Cancer Research* (ISSN 0008-5472) is published twice a month for \$65 per year (for members of the American Association for Cancer Research) or \$130 and \$260 per year (for nonmembers) by the American Association for Cancer Research, Inc. Second-class postage paid at Baltimore, Md. and additional mailing offices. POSTMASTER: Send address changes to *Cancer Research*, c/o Waverly Press, Inc., 428 E. Preston Street, Baltimore, Md. 21202.

Copyright 1988 by the American Association for Cancer Research, Inc.