



Cancer Research

The Official Organ of the American Association for Cancer Research, Inc.

Editor

Peter N. Magee

Managing Editor

Margaret Foti

Assistant Managing Editor

Mary Anne Mennite

Senior Staff Editor

Heide M. Puzstay

Staff Editor

Ellen M. McDonald

Editorial Assistants

Mark G. Hall

Peter A. Wells

Martha Michael

Administrative Secretary

Margaret A. Pickels

Editorial Secretaries

Sandra E. Pettie

Robin E. Felder

Elaine Robinson

Theresa A. Griffith

*American Association for
Cancer Research, Inc.*

Executive Director

Margaret Foti

Executive Assistant

Adam D. Blistein

Executive Secretaries

Ruth E. Fortson

Elizabeth A. Moore

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

Richard H. Adamson

Corrado Baglioni

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

Norman Breslow

Edward Bresnick

Garrett M. Brodeur

Sam C. Brooks

Ronald N. Buick

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

Joseph E. De Larco

Daniel L. Dexter

Ralph E. Durand

Alan Eastman

Lawrence H. Einhorn

Gertrude B. Elion

Mortimer M. Elkind

Rose Ruth Ellison

M. Essex

Nelson Fausto

Kenneth A. Foon

Joseph F. Fraumeni, Jr.

Philip Frost

Mark E. Furth

Eugene W. Gerner

Leo E. Gerweck

John H. Glick

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

DuPont Guerry, IV

Sen-itiroh Hakomori

Uli Hammerling

Philip C. Hanawalt

Robert E. Handschumacher

Nabil Hanna

Gordon C. Hard

Curtis C. Harris

Stephen S. Hecht

Ingegerd Hellström

Brian E. Henderson

Maureen M. Henderson

Gloria H. Heppner

Ronald B. Herberman

Russell Hilf

Vincent P. Hollander

Eliezer Huberman

John T. Isaacs

Robert C. Jackson

Rakesh K. Jain

Peter A. Jones

V. Craig Jordan

R. L. Juliano

David G. Kaufman

Ann R. Kennedy

Robert S. Kerbel

Young S. Kim

Charles M. King

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

Michael W. Lieberman

Victor Ling

Martin Lipkin

John B. Little

Gerald Litwack

Kenneth O. Lloyd

Daniel S. Longnecker

Dan L. Longo

Diana M. Lopez

Reuben Lotan

James W. Lown

David B. Ludlum

Veronica M. Maher

Tak W. Mak

Laurence J. Marton

Michael J. Mastrangelo

Alvin M. Maurer

Kenneth B. McCredie

Daniel Medina

Myron R. Melamed

John Mendelsohn

Thomas C. Merigan

Christopher J. Michejda

Enrico Mihich

John D. Minna

Malcolm S. Mitchell

John A. Montgomery

Harold L. Moses

Franco M. Muggia

Paul Nettesheim

A. Munro Neville

Thomas G. O'Brien

Peter J. O'Dwyer

C. Kent Osborne

Robert F. Ozols

Peter L. Pedersen

Anthony E. Pegg

Carl Peraino

Sidney Pestka

G. Barry Pierce

W. J. Pledger

Morton D. Prager

Janardan K. Reddy

Donald J. Reed

Lola C. M. Reid

Ralph A. Reisfeld

Richard A. Rifkind

Joseph L. Roti Roti

Berish Y. Rubin

Avery A. Sandberg

Dante G. Scarpelli

Jeffrey Schlom

Robert B. Scott

Robert E. Scott

Robert Silber

Beatrice Singer

Francis M. Sirotnak

Michael A. Sirover

Eric J. Stanbridge

Gary S. Stein

Bernard S. Strauss

Louise C. Strong

James A. Swenberg

Paul Talalay

James E. Talmadge

Ian F. Tannock

David Tarin

Armen H. Tashjian

Douglass C. Tormey

Jeffrey M. Trent

Paul O. P. Ts'o

Teresa J. Vietti

Ellen S. Vitetta

Barbara K. Vonderhaar

Daniel D. Von Hoff

Peter A. Ward

Lee W. Wattenberg

George Weber

Sidney Weinhouse

I. Bernard Weinstein

Clifford W. Welsh

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

Roswell K. Boutwell

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 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 \$120.00 (individual nonmembers) or \$230.00 (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 1987-1988

President: Enrico Mihich, Roswell Park Memorial Institute, 666 Elm Street, Buffalo, NY 14263

Vice President: Lawrence A. Loeb, University of Washington, Seattle, WA 98195

Secretary-Treasurer: Robert E. Handschumacher, Yale University School of Medicine, 333 Cedar Street, New Haven, CT 06510

Executive Director: Margaret Foti, Temple University School of Medicine, West Building, Room 301, Philadelphia, PA 19140

Annual Dues

The annual dues of active members of the American Association for Cancer Research are \$85.00 and they include a subscription to the journal *Cancer Research*. The regular subscription price of *Cancer Research* for members of the Association is \$60.00 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 the office of the American Association for Cancer Research, c/o Margaret Foti, Executive Director, American Association for Cancer Research, Temple University School of Medicine, West Building, Room 301, Philadelphia, Pa. 19140 (215-221-4565).

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*, Fels Research Institute, Temple University School of Medicine, Philadelphia, PA 19140 (215-221-4720). 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 \$40.00 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, 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 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 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 *Cancer Research* 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 0008-5472/87 \$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 Cancer Research, Inc., 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 \$60 per year (for members of the American Association for Cancer Research) or \$120 and \$230 per year (for nonmembers) by 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 1987 by Cancer Research, Inc.