



# Cancer Research

OFFICIAL JOURNAL OF THE AMERICAN ASSOCIATION FOR CANCER RESEARCH

## Editor-in-Chief

Carlo M. Croce

## Managing Editor

Margaret Foti

## Assistant Managing Editor

Mary Anne Mennite

## Senior Staff Editor

Heide M. Pusztay

## Staff Editors

Ellen M. McDonald

Mark G. Hall

## Editorial Assistant

Martha Michael

## Administrative Secretary

Margaret A. Pickels

## Editorial Secretaries

Theresa A. Griffith

Mary Ellen Pirring

Erica Henry

Eleanor Avery

June A. Holloway

*American Association for  
Cancer Research, Inc.*

## Executive Director

Margaret Foti

## Senior Administrator

Adam D. Blistein

## Senior Accountant

Anthony P. Biengino

## Financial Assistant

George L. Moore

## Meetings and Development Coordinator

Jeffrey M. Ruben

## Executive Secretaries

Ruth E. Fortson

Elizabeth A. Moore

## Secretary for Member Services

Robin E. Felder

## Associate Editors

Stuart A. Aaronson

Samuel Abraham

David S. Alberts

William M. Baird

Charles M. Balch

Allan Balmain

Mariano Barbacid

J. Carl Barrett

Stephen B. Baylin

William T. Beck

John M. Bennett

Michael Bennett

Bijoy K. Bhuyan

June L. Biedler

Peter M. Blumberg

G. Tim Bowden

A. R. Bradwell

Luther W. Brady

Murray F. Brennan

Norman Breslow

Edward Bresnick

Garrett M. Brodeur

Sam C. Brooks

Ronald N. Buick

C. Patrick Burns

Ed Cadman

Robert L. Capizzi

Stephen K. Carter

Judith K. Christman

Samuel M. Cohen

Nancy H. Colburn

David Colcher

Allan H. Conney

Geoffrey M. Cooper

Joseph G. Cory

Eugene R. DeSombre

## Cover Editorial Board

Sidney Weinhouse,  
*Cover Editor*

T. Michael Dexter

Ralph E. Durand

Harold F. Dvorak

Alan Eastman

Gertrude B. Elion

Lois B. Epstein

M. Essex

Nelson Fausto

Isaiah J. Fidler

Robert A. Floyd

Kenneth A. Foon

Joseph F. Fraumeni, Jr.

Errol C. Friedberg

Philip Frost

Eugene W. Gerner

Leo E. Gerweck

David W. Golde

David M. Goldenberg

Charles T. Gombar

Joel S. Greenberger

J. W. Grisham

Daniel P. Griswold

F. Peter Guengerich

Sen-itiroh Hakomori

Uli Hammerling

Philip C. Hanawalt

Nabil Hanna

Curtis C. Harris

John C. Harshbarger

Stephen S. Hecht

Ingegerd Hellstrom

Brian E. Henderson

Gloria H. Heppner

Ronald B. Herberman

Russell Hilf

Daniel C. Ihde

John T. Isaacs

Mark A. Israel

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

John M. Kirkwood

Alfred G. Knudson, Jr.

Kurt W. Kohn

Laurence N. Kolonel

Hilary Koprowski

Donald W. Kufe

John S. Lazo

Brigid G. Leventhal

Jay A. Levy

Shutsung Liao

Michael W. Lieberman

Victor Ling

Martin Lipkin

Marc E. Lippman

Gerald Litwack

Leroy F. Liu

Kenneth O. Lloyd

Lawrence A. Loeb

Dan L. Longo

Diana M. Lopez

Reuben Lotan

James W. Lown

David B. Ludlum

Tak W. Mak

Laurence J. Marton

Michael J. Mastrangelo

Kenneth B. McCredie

Myron R. Melamed

John Mendelsohn

Thomas C. Merigan

Christopher J. Michejda

John D. Minna

Malcolm S. Mitchell

Richard R. Monson

John A. Montgomery

Harold L. Moses

Franco M. Muggia

Sharon B. Murphy

Paul Nettesheim

Garth L. Nicolson

Thomas G. O'Brien

Peter J. O'Dwyer

Gilbert S. Omenn

C. Kent Osborne

Robert F. Ozols

Lester Packer

Michael A. Palladino, Jr.

Peter L. Pedersen

Anthony E. Pegg

Angel Pellicer

Sidney Pestka

W. J. Pledger

George K. Radda

Janardan K. Reddy

Donald J. Reed

Ralph A. Reisfeld

Richard A. Rifkind

Joseph L. Roti Roti

Berish Y. Rubin

Avery A. Sandberg

Jeffrey Schlom

Beatrice Singer

Francis M. Sirotnak

Michael A. Sirover

Helene S. Smith

Arthur A. Spector

Robert A. Squire

Martha R. Stampfer

Eric J. Stanbridge

Gary S. Stein

Bernard S. Strauss

James A. Swenberg

Paul Talalay

James E. Talmadge

David Tarin

Armen H. Tashjian

Douglas D. Taylor

Snorri S. Thorgeirsson

Douglass C. Tormey

Jeffrey M. Trent

Teresa J. Vietti

Ellen S. Vitetta

Bert Vogelstein

Barbara K. Vonderhaar

Daniel D. Von Hoff

Peter A. Ward

Michael D. Waterfield

Lee W. Wattenberg

George Weber

I. Bernard Weinstein

Clifford W. Welsch

Gerald N. Wogan

Sheldon Wolff

Sandra R. Wolman

Charles W. Young

Stuart H. Yuspa

Harald zur Hausen

Joseph H. Burchenal  
Nancy H. Colburn

Hugh J. Creech  
George H. Hitchings

Edwin A. Mirand  
John H. Weisburger

*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.

## 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 April 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, MD 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 \$265.00 (individual nonmembers) or \$295.00 (institutional nonmembers) per annual volume, including postage. Institutional and individual nonmembers outside of the United States should add \$60.00 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. Changes of address notification should be sent 60 days in advance and include both old and new addresses. Member subscribers should send address changes to: Member Services, American Association for Cancer Research, Inc., 330 Market Street, 2nd Floor, Philadelphia, PA 19106. Nonmember subscribers should notify Waverly Press of changes of address. Copies of the journal which are undeliverable because of address changes will be destroyed.