

# PNAS

Proceedings of the National Academy of Sciences of the United States of America

www.pnas.org

**PNAS** (ISSN-0027-8424) is published weekly in print by the National Academy of Sciences.

**Correspondence:** PNAS, 500 Fifth Street, NW, NAS 340, Washington, DC 20001 USA or 2101 Constitution Avenue, NW, NAS 340, Washington, DC 20418 USA (for courier or express mail). E-mail: PNAS@nas.edu.

**Information for Authors:** See [www.pnas.org](http://www.pnas.org). Editorial Board listing by discipline is available at [www.pnas.org/misc/masthead.shtml](http://www.pnas.org/misc/masthead.shtml).

**Copyright:** Volumes 90–102, copyright © 1993–2005 by the National Academy of Sciences of the United States of America, all rights reserved. Volumes 1–89, copyright as a collective work only; author(s) retains copyright to individual articles.

**Requests for Permission:** See [www.pnas.org/misc/rightperm.shtml](http://www.pnas.org/misc/rightperm.shtml) for details. Address requests to reproduce material published in Volumes 1–89 to the original author(s); e-mail other requests to PNASpermissions@nas.edu, fax 1-202-334-2739, or PNAS Permissions Editor, 500 Fifth Street, NW, NAS 340, Washington, DC 20001 USA. Please cite the exact material to be reprinted and state specifically where it will be used. **Photocopies:** PNAS is registered with the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923 USA, fax 1-978-750-4470, or [www.copyright.com](http://www.copyright.com). Authorization to photocopy items for the internal or personal use of specific clients is granted by the National Academy of Sciences provided that the proper fee is paid directly to CCC. **Microforms:** Contact UMI at [www.umi.com](http://www.umi.com) or P.O. Box 1346, Ann Arbor, MI 48106-1346 USA. This journal is printed on acid-free paper effective with Volume 84, Issue 1.

**Advertising:** Sarah Frances Scarborough, PNAS Advertising Sales, 500 Fifth Street, NW, NAS 340, Washington, DC 20001 USA. Phone 1-202-334-2348, fax 1-202-334-1346, e-mail [sscarborough@nas.edu](mailto:sscarborough@nas.edu).

**Subscriptions:** Address correspondence to: PNAS, % AIP, P.O. Box 50324, St. Louis, MO 63150-3284 USA. For subscription help, e-mail [subs@aip.org](mailto:subs@aip.org), phone 1-516-576-2270, or visit [www.pnas.org](http://www.pnas.org). Subscriptions are entered on a calendar-year basis. The 2005 rates for print are as follows—in the U.S.: personal, \$275; institutional, \$1,395—U.S. by First Class at a surcharge of \$160—elsewhere (institutional includes expedited delivery): personal, \$425; institutional, \$1,725—elsewhere by expedited delivery at a surcharge of \$300. **Exclusive Agent for Subscribers in Japan:** USACO Corporation, 17-12 Higashi-Azabu, 2-Chome, Minato-ku, Tokyo 106-0044, Japan. Phone 81 3 3505 3256, fax 81 3 3505 6282, e-mail [agent@usaco.co.jp](mailto:agent@usaco.co.jp). **Change of Address:** Notify the Circulation Office 6 weeks in advance and list the old and new addresses. PNAS is not responsible for nonreceipt of issues because of an improper address, unless a change of address is on file. **Claims:** Requests for replacement copies will not be honored more than 60 days after the issue date for domestic subscribers and not more than 90 days after the issue date for foreign subscribers. Claims will not be honored for more than 2 issues per calendar year for the same subscriber. **Single Copies:** \$40 per issue in the U.S., \$50 elsewhere. **Canadian GST:** Registration Number R-133130880.

**Postmaster:** Send address changes to PNAS, % AIP, P.O. Box 503284, St. Louis, MO 63150-3284 USA. Periodicals postage paid at Washington, DC, and additional mailing offices.

PNAS is available online at [www.pnas.org](http://www.pnas.org). PRINTED IN THE USA

**President of the Academy**  
Bruce Alberts

**Editor-in-Chief**  
Nicholas R. Cozzarelli

**Associate Editors**  
Alan Fersht  
Jack Halpern

**Editorial Board**  
Jan D. Achenbach  
James P. Allison  
Hans C. Andersen  
Kathryn V. Anderson  
Frederick M. Ausubel  
Francisco J. Ayala  
Linda M. Bartoshuk  
Roger N. Beachy  
Barry J. Beaty  
Joseph A. Beavo  
Michael L. Bender  
Stephen J. Benkovic  
May R. Berenbaum  
Bruce J. Berne  
Pamela J. Bjorkman  
Piet Borst  
David Botstein  
Patrick O. Brown  
Charles R. Cantor  
Stephen R. Carpenter  
Anthony Cerami  
Maarten J. Chrispeels  
Thomas W. Cline  
Enrico Coen  
John M. Coffin  
Stanley N. Cohen  
Peter Cresswell  
James E. Dahlberg  
Eric H. Davidson  
Carl de Boer  
Pietro V. De Camilli  
W. Ford Doolittle  
W. G. Ernst  
Stanley Falkow  
Douglas T. Fearon  
Christopher B. Field  
Joseph L. Goldstein  
Harry B. Gray  
Philip P. Green  
Mark T. Groudine  
Jeffrey C. Hall  
Philip C. Hanawalt  
Susan Hanson  
Robert Haselkorn  
Peter M. Howley  
Tony Hunter  
Louis J. Ignarro  
L. L. Iversen  
Rudolf Jaenisch  
H. Ronald Kaback  
Richard V. Kadison

Richard M. Karp  
Thomas J. Kelly  
Robert P. Kirshner  
Alexander M. Klibanov  
Edward D. Korn  
Ramon Latorre  
N. M. Le Douarin  
Michael Levitt  
George H. Lorimer  
Philip W. Majerus  
Tak Wah Mak  
Paul C. Martin  
Joan Massagué  
Diane Mathis  
John J. Mekalanos  
Barbara J. Meyer  
Kiyoshi Mizuuchi  
Paul L. Modrich  
Peter B. Moore  
Nancy A. Moran  
Newton E. Morton  
Bernard Moss  
Shigetada Nakanishi  
Jeremy Nathans  
Masatoshi Nei  
Roger A. Nicoll  
Tomoko Ohta  
Eric N. Olson  
Gordon H. Orians  
Peter Palese  
Richard D. Palmiter  
William E. Paul  
Stanley B. Prusiner  
Dale Purves  
Charles M. Radding  
Marcus E. Raichle  
Douglas C. Rees  
Jeffrey W. Roberts  
R. Michael Roberts  
David D. Sabatini  
Jeremy A. Sabloff  
Randy Schekman  
Matthew P. Scott  
Michael Sela  
Obaid Siddiqi  
David O. Siegmund  
William S. Sly  
Edward E. Smith  
Solomon H. Snyder  
Ralph M. Steinman  
Charles F. Stevens  
M. S. Swaminathan  
Harry L. Swinney  
Joseph S. Takahashi  
Hans Thoenen  
G. David Tilman  
Robert Tjian  
Barry M. Trost  
Nicholas J. Turro  
Inder M. Verma  
Peter K. Vogt  
Kenneth W. Wachter

David C. Ward  
Michael S. Waterman  
Susan R. Wessler  
Sue H. Wickner  
William T. Wickner  
Ryuzo Yanagimachi

**Publisher**  
Kenneth R. Fulton

**Executive Editor**  
Diane M. Sullenberger

**Managing Editor**  
Bridget C. Coughlin

**Deputy Managing Editor**  
Daniel H. Salsbury

**Editorial Staff**  
James B. Allison  
Josiah W. Armour  
Michael Campbell  
Carolyn Elliott  
Cassandra Foster  
Arijit Guha  
Julie Yun-Ju Huang  
Renita M. Johnson  
Tanya D. Johnson  
Karen Keys  
Elise Laffman  
Jaime Lees  
Leslie Malone  
Tom Myers  
Andrew Pillifant  
Evan Redmon  
Sarah B. Tegen  
Yenu Wodajo

**Production, Marketing, and Licensing Manager**  
George Kendall

**Production Staff**  
Barbara A. Bacon  
Timothy Bauer  
Christina L. Colosimo  
Anne C. Field

**Finance Manager**  
Simone Marshall-Campbell

**Business Staff**  
Richard T. Johnson  
Julia A. Little  
Sarah L. Marrone  
Sarah Frances Scarborough

**Media Staff**  
Leikny V. Johnson  
Regina Nuzzo  
Oliver J. Yun