

MOLECULAR AND CELLULAR BIOLOGY

VOLUME 6 • NOVEMBER 1986 • NUMBER 11

Aaron J. Shatkin, *Editor in Chief* (1990)
*N.J. Center for Advanced
Biotechnology and Medicine
Piscataway, N.J.*

Harvey F. Lodish, *Editor* (1986)
*Whitehead Institute for Biomedical
Research
Cambridge, Mass.*

David J. L. Luck, *Editor* (1987)
*Rockefeller University
New York, N.Y.*

Louis Siminovitch, *Editor* (1990)
*Mount Sinai Hospital
Toronto, Canada*

Joan A. Steitz, *Editor* (1990)
*Yale University
New Haven, Conn.*

Paul S. Sypherd, *Editor* (1990)
*University of California
Irvine*

Robert Tjian, *Editor* (1991)
*University of California
Berkeley*

Harold E. Varmus, *Editor* (1989)
*University of California
San Francisco*

EDITORIAL BOARD

Frederick W. Alt (1987)
Arnold J. Berk (1988)
Alan Bernstein (1987)
Barbara K. Birshtein (1987)
J. Michael Bishop (1987)
Michael R. Botchan (1987)
David Botstein (1987)
Bruce P. Brandhorst (1987)
James R. Broach (1988)
Joan Brugge (1988)
Mario R. Capecchi (1987)
John A. Carbon (1987)
Lawrence A. Chasin (1988)
Nam-Hai Chua (1988)
Don W. Cleveland (1987)
Christopher Coleclough (1987)
Terrance G. Cooper (1987)
Elizabeth A. Craig (1988)
James E. Dahlberg (1987)
James E. Darnell, Jr. (1988)
G. N. Godson (1987)
Michael Green (1988)

Jack F. Greenblatt (1988)
Leonard P. Guarente (1988)
James E. Haber (1987)
Hidesaburo Hanafusa (1986)
Ari Helenius (1987)
Ira Herskowitz (1987)
James B. Hicks (1986)
Alan Hinnebusch (1988)
Michael J. Holland (1987)
Greg Hollis (1987)
Anita K. Hopper (1988)
Peter M. Howley (1988)
Tony Hunter (1986)
Larry Kedes (1988)
Robert S. Kerbel (1988)
Barbara Knowles (1986)
Marilyn Kozak (1988)
Monty Krieger (1986)
Arnold J. Levine (1987)
Susan Lindquist (1987)
Paul T. Magee (1988)
James Manley (1986)

Steven McKnight (1986)
Janet E. Mertz (1987)
Robert L. Metzberg (1988)
Robert K. Mortimer (1988)
Paul Neiman (1986)
Joseph R. Nevins (1987)
Carol Newlon (1988)
Harvey L. Ozer (1988)
Mary Lou Pardue (1988)
Carl S. Parker (1987)
Ira H. Pastan (1988)
David Patterson (1988)
Gianni Piperno (1988)
John R. Pringle (1988)
Jean-Paul Revel (1988)
Daniel B. Rifkin (1988)
G. S. Roeder (1988)
Robert G. Roeder (1988)
Naomi E. Rosenberg (1988)
Norman P. Salzman (1988)
Paul Schedl (1987)
Randy W. Schekman (1988)

Milton J. Schlesinger (1986)
Fred Sherman (1988)
Anna Marie Skalka (1986)
Arthur Skoultchi (1988)
Frank Solomon (1988)
Pamela Stanley (1988)
Bruce Stillman (1988)
Bill Sugden (1988)
Jack Szostak (1987)
Lawrence H. Thompson (1988)
Shirley M. Tilghman (1987)
Jonathan R. Warner (1987)
Alan M. Weiner (1987)
Harold Weintraub (1988)
Reed B. Wickner (1988)
Fred Winston (1988)
Owen Witte (1988)
Elton T. Young (1987)
Michael Young (1988)
Edward Ziff (1988)

Helen R. Whiteley, *Chairman, Publications Board*
Linda M. Illig, *Managing Editor, Journals*

Kirk Jensen, *Director of Publications*
Linda M. Illig, *Production Editor*

Molecular and Cellular Biology (ISSN 0270-7306) is devoted to the advancement and dissemination of fundamental knowledge concerning the molecular biology of eucaryotic cells, of both microbial and higher organisms. Instructions to authors are published in the January issue each year; reprints are available from the editors and the Publications Department. The journal is published monthly, one volume per year. The nonmember subscription price is \$150 per year; single copies are \$21. The member subscription price is \$41 (foreign \$54 [surface rate]) per year; single copies are \$7. Correspondence relating to subscriptions, reprints, defective copies, availability of back issues, lost or late proofs, disposition of submitted manuscripts, and general editorial matters should be directed to the ASM Publications Department, 1913 I St., NW, Washington, DC 20006 (area 202 833-9680).

Claims for missing issues from residents of the United States, Canada, and Mexico must be submitted within 3 months after publication of the issues; residents of all other countries must submit claims within 6 months of publication of the issues. Claims for issues missing because of failure to report an address change or for issues "missing from files" will not be allowed.

Second-class postage paid at Washington, DC 20006, and at additional mailing offices.

POSTMASTER: Send address changes to *Molecular and Cellular Biology*, ASM, 1913 I St., NW, Washington, DC 20006.

Made in the United States of America.

Copyright © 1986, American Society for Microbiology.

All Rights Reserved.

日本：価格は外貨表示とは関係なく円建。

The code at the top of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal use or for personal use of specific clients. This consent is given on the condition, however, that the copier pay the stated per-copy fee through the Copyright Clearance Center Inc., 21 Congress St., Salem, MA 01970, for copying beyond that permitted by Sections 107 and 108 of the U.S. Copyright Law. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

Author Index

- Abrams, Ezra, 3643
Ahn, Byung-Yoon, 3685
Alliot, Françoise, 3704
Ariga, Hiroyoshi, 3920
Ariizumi, Kiyoshi, 3920
Arnheim, Norman, 3934
Arnot, David E., 3965
Augereau, Patrick, 4117
- Babiss, L. E., 3791, 3798
Baker, Henry V., 3774
Baltimore, David, 4133
Baserga, Renato, 3614
Basilico, Claudio, 4019
Bates, Gillian P., 3826
Battini, Renata, 3614
Benz, Edward J., Jr., 3884
Berg, David T., 3596
Bishop, J. M., 3677
Boeke, Jef D., 3575
Botchan, Michael, 3948
Botstein, David, 3711, 3722, 4046
Boylan, Margaret T., 3621
Brown, Stephen D. M., 3826
Bruckheimer, Sally M., 3807
Buckler, Alan, 4112
Bullock, Peter, 3948
Busslinger, Meinrad, 3746
- Cahill, K., 3606
Calabretta, Bruno, 3614
Calothy, Georges, 3704
Cann, Alan J., 3626
Cardiff, Robert D., 4104
Carlson, Marian, 3569, 3643
Chambon, Pierre, 4117
Charron, Maureen J., 3891
Cheley, Steve, 3582
Chen, Irvin S. Y., 3626
Chin, Janice E., 4039
Clayton, D. F., 3791
Cohen, Stanley N., 3632
Cohen, Stephen M., 3973
Colledge, W. H., 4136
Conklin, Kathleen F., 3999
Cooper, Terrance G., 3954
Costanzo, Maria C., 3694
Courtois, Yves, 3704
Crisanti, Patricia, 3704
Croop, James M., 3785
- Dandekar, Satya, 4104
Darnell, J. E., Jr., 3791, 3798
Decker, R. Scott, 3815
Deininger, Prescott L., 3755
Denis, Clyde L., 4026
DePamphilis, Melvin L., 3815
de Riel, J. Kim, 3614
Diniak, A. Jennifer, 3755
Dougherty, Joseph P., 4117
Dubin, Robert A., 3891
- Edge, M. D., 4136
Eichinger, Daniel J., 3965
- Eissenberg, Joel C., 4126
Elgin, Sarah C. R., 3862, 4126
Emanuel, Janet, 3884
Enea, Vincenzo, 3965
- Faha, Barbara, 3763
Fallows, Dorothy A., 3785
Ferrari, Sergio, 3614
Fink, Gerald R., 3575
Finn, Linda A., 3582
Firak, Thomas A., 3667
Fleissner, Erwin, 4088
Fojo, Antonio, 4039
Fox, Lyle E., 4109
Fox, Thomas D., 3694
Friedman, J. M., 3791, 3798
Fujita, Donald J., 3900
- Gallo, Chris, 4026
Gardinier, Minnetta V., 3755
Genbauffe, Francis S., 3954
Gerondakis, S., 3677
Gilmour, David S., 3984
Glorioso, Joseph C., 3652
Gottesman, Michael M., 4039
Grinnell, Brian W., 3596
Grisafi, Paula, 3711
Gros, Philippe, 3785
Groudine, Mark, 3999
- Hallberg, Elizabeth M., 3854
Hallberg, Richard, 3854
Harashima, Satoshi, 3990
Hayashi, Shigeo, 4130
Helfman, David M., 3582
Hinnebusch, Alan G., 3990
Hirose, Susumu, 3928
Hoffman, Michael L., 3910
Hoffman-Liebermann, Barbara, 3632
Holland, Michael J., 3621
Homa, Fred L., 3652
Housman, David E., 3785
- James, Tharappel C., 3862
Jayaram, Makkuni, 3831
Johnson, Mike R., 4008
Joseph-Silverstein, Jacquelyn, 4060
- Kaczmarek, Leszek, 3614
Kedes, Laurence H., 3632
Keith, Douglas H., 4122
Kemler, Iris, 3746
Kerlakian, Carol B., 3873
Kern, Francis G., 4019
Kikuchi, Yoshiko, 4053
Kinniburgh, Alan J., 3807
Klobutcher, L. A., 3606
Knecht, David A., 3973
Koehne, Charles F., 4088
Kondoh, Hisato, 4130
Korf, Gina M., 3910
Koshland, Marian Elliott, 4031
- Kraus, Kevin W., 3854
Kuempel, Eileen D., 3873
Kuismanen, Esa, 3582
- LeBoeuf, Renee C., 3807
Levenson, Robert, 3884
Levine, Myron, 3652
Levine, Roy A., 4112
Liebermann, Dan, 3632
Lis, John T., 3984
Livingston, Dennis M., 3685
Lodish, Harvey F., 3973
Loomis, William F., 3973
Lörincz, Attila T., 4099
Lorinet, Anne Marie, 3704
Luse, Donal S., 3873
Lusis, Aldons J., 3807
- Ma, Hong, 4046
Macklin, Wendy B., 3755
Marcu, Kenneth B., 4088
Mathey-Prevot, Bernard, 4133
McCormack, James E., 4112
McNamara, Kathleen J., 3910
Mercer, Robert W., 3884
Michels, Corinne A., 3891
Miller, Josh, 3948
Minie, Mark E., 4031
Moscatelli, David, 4060
Moscona, A. A., 4109
- Nabel, Gary, 4133
Neigeborn, Lenore, 3569, 3643
Nishikura, Kazuko, 4093
Norman, Chris, 4008
Nussenzweig, Victor, 3965
- O'Donnell, Paul V., 4088
Otal, Thomas M., 3652
- Palacios, Ronald, 4133
Pastan, Ira, 4039
Payne, Paul A., 4140
Perryman, M. Benjamin, 4140
Pessac, Bernard, 3704
Philiponis, Vincent, 3614
Pillus, Lorraine, 3711
Pittet, Anne-Cecile, 4067
Possenti, Roberta, 3815
Presta, Marco, 4060
Proudfoot, Nick J., 4008
- Reed, Steven I., 4099
Reeve, Mike A., 4008
Reicin, Alise, 4088
Reid, Robert, 3569
Reisman, David, 3838
Ribas-Aparicio, R. M., 3606
Richardson, W. D., 4136
Rifkin, Daniel B., 4060
Riggs, Arthur D., 4122
Rittling, Susan, 3614
Roberts, Robert, 4140
Roninson, Igor B., 4039
- Savitz, Adam, 3884
Schatz, Peter J., 3711, 3722
Schibler, Ueli, 4067
Schneider, Jay W., 3884
Schneider, Michael D., 4140
Schwartzberg, Pamela, 3569
Scully, Jaqueline, 4008
Shah, Neil P., 3626
Shen, Ding-wu, 4039
Shida, Hisatoshi, 3734
Sierra, Felipe, 4067
Simonneau, Lionel, 3704
Singer-Sam, Judith, 4122
Slamon, Dennis J., 3626
Smale, Stephen T., 4077
Smith, Alan E., 4136
Soffir, Rena, 4039
Solomon, Frank, 3711, 3722
Sonenshein, Gail E., 4112
Souza, Larry, 3626
Stillman, Bruce, 3763
Struhl, Kevin, 3847
Stumph, William E., 3910
Styles, Cora A., 3575
Subramanian, Kiranur N., 3667
Sugden, Bill, 3838
Sukumar, Saraswati, 4104
Suzuki, Yoshiaki, 3928
- Tam, James P., 3965
Tanaka, Akio, 3900
Timberlake, William E., 3621
Tjian, Robert, 4077
Toh-E, Akio, 4053
Toth, Susan W., 3873
Treco, Douglas, 3934
Troutt, Anthony, 3632
Tsuda, Masaaki, 3928
- Ueno, Hikaru, 4140
- Vailonis-Walsh, A. M., 3606
Vardimon, Lily, 4109
Velcich, Anna, 4019
- Wachsmann, William, 3626
Wainwright, Brandon J., 3826
Walls, Jenna, 3596
Wei, Jing-Fang, 3614
White, Eileen, 3763
Williams, Simon C., 3807
Williamson, Robert, 3826
- Yamaguchi, Masamitsu, 3815
Yamawaki-Kataoka, Yuriko, 3582
Yang, Jian-qing, 4088
Young, Lawrence J. T., 4104
- Zarbl, Helmut, 4104
Ziff, Edward B., 4019

ANNOUNCING

1987

Nonmember Individual

Subscription Rate

for

MOLECULAR

AND

CELLULAR

BIOLOGY

Use the attached postage-paid coupon and receive 12 issues of MCB for only \$60 (domestic) or \$75 (foreign).

1987 Nonmember Individual Rate

Please enter my personal 1-year subscription to *Molecular and Cellular Biology* at the special nonmember individual rate of:

- \$60 (domestic) \$75 (foreign)
 Add \$145 for foreign airmail shipment (total: \$220)
 Payment enclosed MasterCard VISA

Card number _____ Expiration date _____

Signature _____

Name _____

Address _____

City _____ State/Province _____

Zip/Postal code _____ Country _____

All orders from outside the United States must be accompanied by payment in U.S. dollars, drawn on a U.S. bank located within the continental United States, or charged to MasterCard or VISA.

1987 Nonmember Individual Rate

Please enter my personal 1-year subscription to *Molecular and Cellular Biology* at the special nonmember individual rate of:

- \$60 (domestic) \$75 (foreign)
 Add \$145 for foreign airmail shipment (total: \$220)
 Payment enclosed MasterCard VISA

Card number _____ Expiration date _____

Signature _____

Name _____

Address _____

City _____ State/Province _____

Zip/Postal code _____ Country _____

All orders from outside the United States must be accompanied by payment in U.S. dollars, drawn on a U.S. bank located within the continental United States, or charged to MasterCard or VISA.

1987 Nonmember Individual Rate

Please enter my personal 1-year subscription to *Molecular and Cellular Biology* at the special nonmember individual rate of:

- \$60 (domestic) \$75 (foreign)
 Add \$145 for foreign airmail shipment (total: \$220)
 Payment enclosed MasterCard VISA

Card number _____ Expiration date _____

Signature _____

Name _____

Address _____

City _____ State/Province _____

Zip/Postal code _____ Country _____

All orders from outside the United States must be accompanied by payment in U.S. dollars, drawn on a U.S. bank located within the continental United States, or charged to MasterCard or VISA.

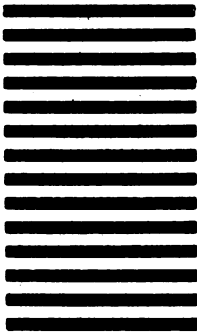


NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 15666 WASHINGTON, DC

POSTAGE WILL BE PAID BY ADDRESSEE

Finance Department
**AMERICAN SOCIETY
FOR MICROBIOLOGY**
1913 I St., N.W.
Washington, DC 20077

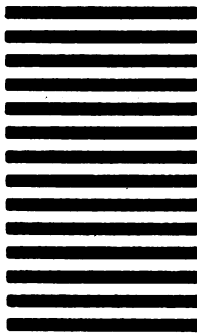


NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 15666 WASHINGTON, DC

POSTAGE WILL BE PAID BY ADDRESSEE

Finance Department
**AMERICAN SOCIETY
FOR MICROBIOLOGY**
1913 I St., N.W.
Washington, DC 20077

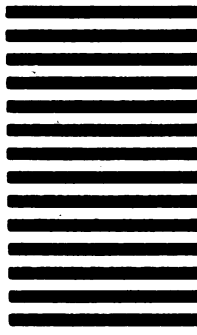


NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 15666 WASHINGTON, DC

POSTAGE WILL BE PAID BY ADDRESSEE

Finance Department
**AMERICAN SOCIETY
FOR MICROBIOLOGY**
1913 I St., N.W.
Washington, DC 20077



1987
APPLICATION FOR FULL MEMBERSHIP IN THE
AMERICAN SOCIETY FOR MICROBIOLOGY
1913 I Street, NW • Washington, D.C. 20006 • (202) 833-9680

COMPLETE ALL INFORMATION REQUESTED AND RETURN FORM WITH REMITTANCE IN U.S. FUNDS

Eligibility ASM welcomes to full membership anyone who is interested in its objectives and has a minimum of a bachelor's degree or equivalent in microbiology or a related field.

Initiation Memberships are initiated and renewed in January each year. **Unless there are directions to the contrary**, membership nominations received prior to September 1 are credited to the current year, and back issues of the selected publications for the current year are furnished, if available. **Nominations received after September 1 will become effective the following January.**

NAME ^{MISS DR.}_{MS} _____ | _____ | _____
(CIRCLE ONE) MRS. MR. FIRST INITIAL LAST

MAIL NAME _____
AS YOU WANT IT TO APPEAR ON YOUR MAILING LABEL

ADDRESS _____
WHERE YOU WANT TO RECEIVE YOUR SUBSCRIPTIONS

CITY _____
STATE/PROVINCE ZIP/POSTAL CODE COUNTRY

PHONE (_____) _____ (_____) _____ YEAR OF BIRTH _____ SEX _____
OFFICE (01) HOME (02)

HIGHEST DEGREE _____ SUBJECT AREA _____ YEAR EARNED _____

EMPLOYER _____ PRESENT POSITION _____

SIGNATURE OF APPLICANT _____ DATE _____

*NOMINATED BY _____ MEMBER #

--	--	--	--	--	--	--	--	--

SIGNATURE OF ASM MEMBER

*If you are not associated with an ASM nominating member, you can still apply for membership and we will contact you.

Member Information How did you learn about the ASM? (Check one):
 A colleague An advertisement in a journal Presenting a paper at an ASM meeting
 A professor Direct mail inquiry An ASM Branch
 An ASM journal A workshop, conference or meeting Student membership in ASM
 None of the above

Dues Annual dues for 1987 are \$65. Dues include ASM News (monthly) and a \$43 credit which may be deducted from the total cost of the journal(s) you purchase at the special membership rates indicated below.

Journals Please check:
 Enclosed is my dues payment (U.S. dollars only) **\$65**
 Please send me the following ASM journal(s) at Member Price(s):

	U.S.	Non-U.S.	Amount
Antimicrobial Agents and Chemotherapy	\$35	\$51	\$ _____
Applied and Environmental Microbiology	35	51	_____
Molecular and Cellular Biology	43	57	_____
Infection and Immunity	41	56	_____
International Journal of Systematic Bacteriology	35	35	_____
Journal of Bacteriology	41	56	_____
Journal of Clinical Microbiology	35	51	_____
Journal of Virology	41	56	_____
Microbiological Reviews	16	28	_____

- | |
|----|
| AA |
| AE |
| CB |
| IA |
| IJ |
| JB |
| JC |
| JV |
| MR |

Total Journal Fees \$ _____
Subtract your **\$43** Member Journals Credit **- \$43**
Subtotal (if less than zero, enter zero) \$ _____
Add your \$65 Membership Dues **+ \$65**
Total (Dues plus Journals). If total is less than \$65.00, enter \$65 \$ _____

PAYMENT IN U.S. DOLLARS MUST ACCOMPANY APPLICATION

A membership card, voting registration form, ASM Placement Service information and the journal(s) of your choice will be sent within 90 days upon completion of processing. Dues for individual membership in ASM are tax deductible. **Rates are for 1987 only.**

Applicants **must** remit in U.S. dollars by check or draft payable to ASM through a U.S. bank located within the Continental U.S. Applicants from Canada may use check made out in U.S. dollars and drawn on a Canadian bank or applicants may choose to pay with VISA or MasterCard. If that is your preference, please fill in the box below.

<input type="checkbox"/> VISA # <input type="checkbox"/> MASTERCARD #	<table style="display: inline-table; border-collapse: collapse;"><tr><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td><td style="width: 15px;"> </td></tr></table>																					EXPIRATION DATE: <table style="display: inline-table; vertical-align: middle;"><tr><td style="width: 15px; text-align: center;"> </td><td style="width: 15px; text-align: center;"> </td><td style="width: 15px; text-align: center;"> </td></tr><tr><td style="font-size: 8px;">MO</td><td style="font-size: 8px;">YR</td><td style="font-size: 8px;"> </td></tr></table>				MO	YR	
MO	YR																											
TODAY'S DATE _____ SIGNATURE _____																												
<small>MONTH DAY YEAR</small>	<small>MINIMUM CHARGE \$15.00</small>																											