

JOURNAL OF VIROLOGY

VOLUME 51 • OCTOBER 1984 • NUMBER 1

Edward M. Scolnick, *Editor in Chief* (1987)

Merck Sharp & Dohme Research Laboratories
West Point, Pa.

David T. Denhardt, *Editor* (1987)
University of Western Ontario
London, Ontario, Canada

Bernard N. Fields, *Editor* (1988)
Harvard Medical School
Boston, Mass.

Robert M. Krug, *Editor* (1987)
Sloan-Kettering Institute
New York, N.Y.

Michael B. A. Oldstone, *Editor* (1988)
Scripps Clinic & Research Foundation
La Jolla, Calif.

Thomas E. Shenk, *Editor* (1989)
Princeton University
Princeton, N.J.

Robert A. Weisberg, *Editor* (1988)
National Institute of Child Health and Human Development
Bethesda, Md.

EDITORIAL BOARD

David Baltimore (1984)
Amiya K. Banerjee (1985)
Andrew Becker (1985)
Tamar Ben-Porat (1984)
Kenneth I. Berns (1985)
Michael Botchan (1986)
David Botstein (1985)
Dennis T. Brown (1984)
Ahmad I. Bukhari (1984)
Barrie J. Carter (1984)
Purnell Choppin (1986)
John M. Coffin (1986)
Geoffrey M. Cooper (1984)
Richard Courtney (1986)
Walter Doerfler (1986)
Peter Doherty (1986)
Harrison Echols (1984)
Elvera Ehrenfeld (1986)
Robert N. Eisenman (1985)
Suzanne U. Emerson (1986)
S. Jane Flint (1984)
Yasuhiro Furuichi (1985)
Costa Georgopolous (1986)
Walter Gerhard (1986)
Larry M. Gold (1985)
Peter Gruss (1985)

Hidesaburo Hanafusa (1986)
William S. Hayward (1984)
Martin Hirsch (1986)
John J. Holland (1984)
Ian H. Holmes (1986)
Robert W. Honess (1986)
Nancy Hopkins (1986)
Peter M. Howley (1984)
Alice S. Huang (1984)
Tony Hunter (1986)
Masayori Inouye (1985)
Robert Kamen (1985)
Thomas J. Kelly, Jr. (1985)
George Khoury (1984)
Elliott Kieff (1984)
Jonathan A. King (1984)
Daniel Kolakofsky (1986)
Robert Lamb (1985)
Robert A. Lazzarini (1984)
Myron Levine (1985)
Douglas R. Lowy (1986)
Robert Martin (1984)
Thomas Merigan (1986)
George Miller (1984)
Lois K. Miller (1985)
Peter Model (1986)

Bernard Moss (1986)
Fred Murphy (1986)
Nancy G. Nossal (1984)
Abner Notkins (1986)
J. Thomas Parsons (1986)
Ulf G. Pettersson (1986)
Lennart Philipson (1984)
Lewis I. Pizer (1984)
Craig R. Pringle (1986)
Carol Prives (1986)
Robert Purcell (1986)
Fred Rapp (1984)
Dan S. Ray (1986)
M. E. Reichmann (1985)
Gordon M. Ringold (1984)
Harriet Robinson (1985)
William S. Robinson (1986)
Bernard Roizman (1985)
Naomi Rosenberg (1986)
Roland R. Rueckert (1985)
Norman P. Salzman (1984)
Joseph Sambrook (1985)
Charles E. Samuel (1986)
Priscilla A. Schaffer (1984)
Sondra Schlesinger (1986)
June R. Scott (1986)

Bart Sefton (1985)
Phillip A. Sharp (1985)
Charles J. Sherr (1984)
Saul J. Silverstein (1985)
Lee D. Simon (1984)
Ann Skalka (1985)
Patricia G. Spear (1984)
Nat Sternberg (1986)
Mark F. Stinski (1986)
F. William Studier (1984)
Lawrence S. Sturman (1985)
Jesse Summers (1985)
William Summers (1985)
John M. Taylor (1984)
Howard M. Temin (1985)
George F. Vande Woude (1986)
Inder Verma (1986)
Edward K. Wagner (1986)
Eckard Wimmer (1985)
Owen Witte (1986)
Charles Hamish Young (1986)
Julius S. Youngner (1986)

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

Walter G. Peter III, *Director of Publications*
John P. Evans, *Production Editor*

The *Journal of Virology* (ISSN 0022-538X), a publication of the American Society for Microbiology, 1913 I St., NW, Washington, DC 20006, is devoted to the dissemination of fundamental knowledge concerning viruses of bacteria, plants, and animals. Investigators are invited to submit reports of original research in all areas of basic virology, including biochemistry, biophysics, genetics, immunology, morphology, physiology, and pathogenesis and immunity. Instructions to authors are published in the January issue each year; reprints are available from the editors and the Publications Department. The *Journal* is issued monthly, four volumes per year. The nonmember subscription price is \$249 per year; single copies are \$21. The member subscription price is \$37 (foreign, \$49 [surface rate]) per year; single copies are \$7.00. 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 (phone: 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 *Journal of Virology*, ASM, 1913 I St., NW, Washington, DC 20006.

Made in the U.S.A.

Copyright © 1984, 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, 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

- Ackermann, Mathias, 108
Alarcon, B., 183
Aloni, Yosef, 266, 277
Arnheiter, Heinz, 284
- Ben-Asher, Edna, 266
Ben-Porat, Tamar, 198
Boone, Margaret A., 288
Brackmann, Karl H., 136
Brandt, Walter E., 223
Braun, Daniel K., 108
Bugany, H., 183
Bukowski, Jack F., 119
- Carrasco, L., 183
Cartas, Maria A., 136
Casal, Ignacio, 37
Chatis, Pamela A., 248
Cohen, Lawrence K., 206
Costantino, Robert L., 77
Cote, Paul J., 70
- Dantas, J. R., Jr., 231
Davis, M. L., 290
Davis, Michelle Gall, 129
DeWan, Peggy C., 288
Doerfler, Walter, 255
Domae, K., 231
Dowbenko, Donald J., 154
Dupuis, Kent W., 55
- Eggleton, Katie, 172
Eiden, Joseph, 94
Ellis, Ronald W., 293
Enjuanes, Luis, 37
Ennis, Francis A., 223
- Faden, Howard, 16
- Ford, Eugenie C., 70
Forghani, Bagher, 55
Fredrickson, Torgny N., 248
- García, Bernardo I., 188
Gerin, John L., 70
Giorgi, Colomba, 298
Green, Maurice, 136
- Hallum, Jules V., 288
Hartley, Janet W., 248
Hayward, William S., 1
Hebblewaite, Diane, 223
Helenius, Ari, 281
Holland, Christie A., 248
Holloway, Brian, 215
Hong, Jung J., 16
Hopkins, Nancy, 248
Howett, Mary K., 99
Huang, Eng-Shang, 129
Huang, Ru Chih C., 29
Huber, Anna C., 94
- Jeffrey, Verona M., 300
Jenkins, Frank J., 99
Johnson, David C., 238
- Kaplan, Albert S., 198
Keller, Paul Malcolm, 293
Kessler, Mark, 277
Kielian, Margaret C., 281
Kimelman, David, 136
Kolakofsky, Daniel, 215, 298
Kurane, Ichiro, 223
- Lasky, Laurence A., 154
Leung, Wai-Choi, 300
- Lewis, Marcia E., 300
Lomniczi, Bela, 198
Lübbert, Hermann, 255
Lucher, Lynne A., 136
- Mader, Linda C., 94
Mar, Eng-Chung, 129
Marks, Jeffrey R., 24
Morgan, Jeffrey R., 206
Morgan, Richard A., 29
Moss, Denis J., 88
- Neff, Beverly J., 293
- O'Brien, Stephen J., 164
Ogra, Pearay L., 16
- Paradiso, Peter R., 77, 82
Patterson, Jean L., 215
Patton, J. L., 290
Pepinsky, R. Blake, 145
Pereira, Lenore, 108
Ponzetto, Antonio, 70
Pope, John H., 88
Purcell, Robert H., 70
- Rådén, Benny, 9
Reeves, Roger H., 164
Roberts, Bryan E., 206
Roizman, Bernard, 108
Ron, Dina, 63
Roumillat, L. F., 290
Rutberg, Lars, 9
- Schmidt, Nathalie J., 55
Sculley, Thomas B., 88
Silver, Johnathon E., 248
- Simon, M. Celeste, 1
Smith, Ralph E., 1
Spear, Patricia G., 238
Spector, Deborah H., 24
Spencer, Eugenio, 188
Symington, Janey S., 136
- Takahashi, M., 231
Takahashi, Y., 231
Tal, Jacov, 63
Tanishita, O., 231
Tattersall, Peter, 63
Temin, Howard M., 172
Thornton, Helen, 136
- Viñuela, Eladio, 37
Vogt, Volker M., 145
Vonderfecht, Steven L., 94
- Walker, Peter J., 88
Warren, Kenneth G., 300
Watanabe, Shozo, 198
Welsh, Raymond M., 119
Wiatr, Christopher L., 47
Wilhelmsen, Kirk C., 172
Williams, Kenneth R., 77
Witmer, Heman J., 47
Wittels, Michele, 238
Woda, Bruce A., 119
Wu, Yuan-Ming, 129
Wujcik, Kathleen M., 29
- Yamanishi, K., 231
Yamanouchi, T., 231
Yolken, Robert H., 94
- Zoon, Kathryn C., 284

10 reasons

... why you should join your professional colleagues in the American Society for Microbiology, the world's largest single biological science membership organization ...

- 1 A monthly subscription to *ASM News*
- 2 Member rates on ASM's renowned primary research journals
- 3 Member rates on ASM's books
- 4 Special reduced member rates for the ASM Annual Meeting and regional conferences
- 5 An influential voice in Washington with an effective public relations program
- 6 Certification and registration programs through the National Registry of Microbiologists, the American Board of Medical Microbiology and the American Board of Medical Laboratory Immunology
- 7 Outstanding continuing education workshops at member rates and superb educational materials including an extensive slide collection
- 8 A job placement service for a nominal fee
- 9 Optional life, disability and health insurance for qualified members
- 10 Opportunities to participate in the scientific division of your choice and join our 32,000 members in the promotion of the microbiological sciences

If these ten reasons (and there are many more) sound good to you, why not find out how you can join ASM today?

For more information, complete the coupon below and mail to:

Dr. Robert K. Nauman
Chairman, Membership Committee
American Society for Microbiology
Box ASMN 1083 - 1913 I Street, N.W.
Washington, DC 20006

ASM

I'm interested in membership in the American Society for Microbiology. Please send information and a Membership Application to:

Name _____

Address _____

City _____

State _____ Zip Code _____

Country _____

Student: Yes No Date _____

Savant's Speed Vac Pat. 4226669

Evaporator Concentrator

is a natural for
Microcentrifuge
Tubes.

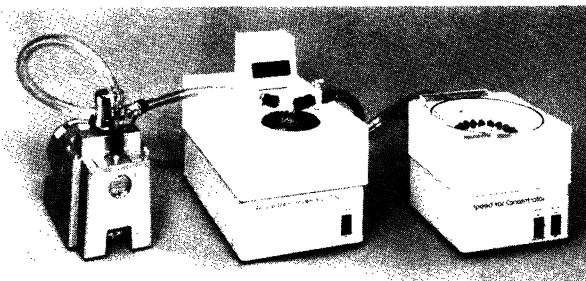
THE SPEED VAC
CONCENTRATOR
is now
widely used with
Microcentrifuge Tubes to
minimize sample loss
and maximize sample
concentration. A
combination of ro-
tary action and vacuum applica-
tion account for the high efficiency
volume reduction of the sample.

100% SAMPLE RECOVERY

NO BUMPING NO DILUTION
NO SMEARING NO TRANSFER
NO WASHDOWN NO LOSSES

The Speed Vac Concentrator has replaced Flash Evaporators, Ultrafiltration, The Bell Jar Dessicator for most applications ... e.g. Eluates, Hydrolysates, Extracts, GLC and HPLC Sample Preparation.

**"No Doubt About It —
This is the Preferred Method".**



Savant can supply the entire system including the SPEED VAC CONCENTRATOR, the Refrigerated Trap and the Vacuum Pump as well as many accessories which makes the laboratory completely operational.

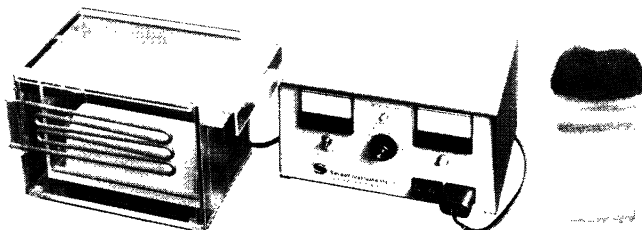
Send for literature today.

Savant Instruments, Inc.

221 Park Ave.
Hicksville, NY 11801
(516) 935-8774

Savant

THIN LAYER SLAB GEL AND PREP ELECTROPHORESIS

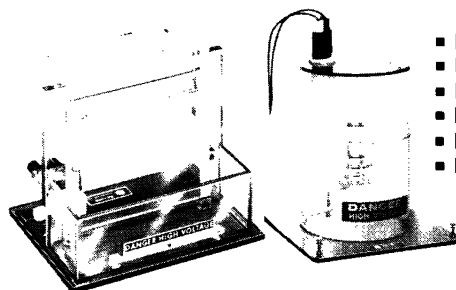


- PEPTIDES
- NUCLEOTIDES
- SUGARS

- AMINO ACIDS
- HORMONE CHAINS
- DANSYL PERIVATIVES

The TLE20 Tank is ideal for running 20 x 20cm Mylar backed TLE plates under varsol and will provide unmatched resolution and reproducibility ... Features removable rack; compact construction; small buffer volume; independent interlock ... Thin Layer Electrophoresis alone or in conjunction with Thin Layer Chromatography offers the researcher unlimited possibilities in the fractionation of a wide variety of molecular species.

Model HV1000 — 1000 Volt 200 Ma Power Supply is ideal for this and most other applications.



- R N A
- PROTEINS
- D N A
- ENZYMES
- RIBOSOMES
- NUCLEIC ACIDS

Savant offers the following variety of cells and other accessories which are now widely used by researchers who depend on Acrylamide Gel for the Analysis and Separation of complex biological mixtures.

Model 1310 Slab Gel Electrophoresis Cell for 13cm x 10cm long gels

Model 1320 Slab Gel Electrophoresis Cell for 13cm x 20cm long gels

Model SGD200 Slab Gel Dryer for two 10cm long gels or one 20cm long gel

Model PAG15WC Preparative Gel Cell ideal for 23S, 26S, 28S RNA Species and others

Model CVR300 Regulated Power Supply constant voltage (300V) or constant current (200Ma)

Write for illustrated literature

SAVANT INSTRUMENTS, INC.

221 Park Avenue, Hicksville, NY 11801 • (516) 935-8774

Savant

Reprint of a small classic - from ASM

Milestones in Microbiology

Translated and edited by Thomas D. Brock

ASM is pleased to be able to offer a reprint of this small classic, which first appeared in 1961, and subsequently went out of print. MILESTONES is a collection of historically significant papers in microbiology, and is intended both as a book of general interest to all microbiologists and as an enlightening, thought-provoking text for students. Many professionals will want to read this book for its value in firmly documenting the great work in microbiology accomplished during the past 400 years. The book should also prove useful in teaching microbiology to students at all levels of development.

Reprinted 1975, 273 pages, \$8.00.
(ASM members may purchase this book for \$6.00. Please enclose payment with order.)

Send your order to:
AMERICAN SOCIETY FOR MICROBIOLOGY
1913 I Street, N.W. Washington, D.C. 20006

ASM CONFERENCE

Virus Attachment and Entry Into Cells

10 through 13 April 1985

Franklin Plaza Hotel, Philadelphia, Pa.

Topics for discussion will include:

- purification of membrane receptors
- characterization of virion attachment proteins
- virus-membrane fusion
- pathways for uncoating of viral genomes
- anti-idiotypic antibodies as probes for receptors
- role of receptors in cellular functions

Contributed short papers are invited.

The preliminary program, preregistration and housing forms, and information about submission of contributed papers have been published in the September issue of *ASM News*.

For further information, contact: Conferences Department, ASM, 1913 I St., N.W., Washington, DC 20006.