

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

Founded 1908

Incorporated 1915

The APS Council

President, RICHARD E. FORD, University of Illinois, Urbana 61801
President-Elect, R. JAMES COOK, USDA, ARS, Washington State University, Pullman 99164
Immediate Past President, J. ARTIE BROWNING, Texas A&M University, College Station 77843
Vice-President, JOHN L. LOCKWOOD, Michigan State University, East Lansing 48824
Secretary, ANNE K. VIDAVER, University of Nebraska, Lincoln 68583
Treasurer, H. RONALD CAMERON, Oregon State University, Corvallis 97331
Editor-in-Chief, K. J. LEONARD, USDA, ARS, North Carolina State University, Raleigh 27650
Publications Coordinator, THOR KOMMEDAHL, University of Minnesota, St. Paul 55108

Councilors:

DERALD A. SLACK, University of Arkansas, Fayetteville (At Large)
DONALD E. MATHRE, Montana State University, Bozeman (At Large)
ALBERT R. WEINHOLD, University of California, Berkeley (At Large)
JULIA MIGNUCCI-HEPPERLY, University of Puerto Rico, Mayaguez (Caribbean)
RICHARD L. KIESLING, North Dakota State University, Fargo (North Central)
RICHARD A. ROHDE, University of Massachusetts, Amherst (Northeastern)
MAURY V. WIESE, University of Idaho, Moscow (Pacific)
F. M. LATTERELL, U.S. Department of Agriculture, Frederick, MD (Potomac)
ROBERT H. LITRELL, University of Georgia, Coastal Plain Station, Tifton (Southern)

Staff:

R. J. TARLETON, Executive Vice-President; The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121

DIVISIONS OF THE SOCIETY

Caribbean: Pres. MELQUIADES ROJAS, Ministerio de Desarrollo Agropecuario, David, Panamá; Vice-Pres. MANUEL F. JIMÉNEZ, BASF, San José, Costa Rica; Sec.-Treas. GUILLERMO E. GALVEZ, CIAT/IICA, San José, Costa Rica.
Northeastern: Pres. WILLIAM J. MANNING, University of Massachusetts, Amherst; Vice-Pres. ALAN R. GOTLIEB, University of Vermont, Burlington; Sec.-Treas. CARL H. BECKMAN, University of Rhode Island, Kingston.
North Central: Pres. GAYLE L. WOLF, University of Wisconsin, Madison; Vice-Pres. ABRAHAM H. EPSTEIN, Iowa State University, Ames; Sec.-Treas. JAMES V. GROTH, University of Minnesota, St. Paul.
Pacific: Pres. ALBERT L. WEINHOLD, University of California, Berkeley; Vice-Pres. JOSEPH M. OGAWA, University of California, Davis; Sec.-Treas. LARRY W. MOORE, Oregon State University, Corvallis.
Potomac: Pres. LAURENCE D. MOORE, Virginia Polytechnic Institute & State University, Blacksburg; Vice-Pres. STANLEY A. OSTAZESKI, USDA, Beltsville, MD; Sec.-Treas. ROBERT W. GOTH, USDA, Beltsville, MD.
Southern: Pres. JAMES M. McGUIRE, University of Arkansas, Fayetteville; Vice-Pres. T. A. KUCHAREK, University of Florida, Gainesville; Sec.-Treas. W. E. BATSON, Jr., Mississippi State University, Mississippi State.

EDITORIAL AND BUSINESS STAFF

Publisher and Business Manager, R. J. TARLETON; Director of Publications and Communications, STEVEN C. NELSON; Graphic Services Manager, MILES WIMER; Senior Technical Editor, VERA BAKER; Technical Editor, ROBERT J. MINTEER; Editorial Assistant, SUSAN CASEY; Editorial Records Coordinator, JANICE SAMPSON.

Subscriptions: Communications should be addressed to The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121. **Nonmember subscription price:** \$125.00 per year domestic, \$150.00 per year foreign (including Canada and Mexico). All prices include postage. **Single current numbers** (within 60 days of publication): \$13.00. (Price of back volumes and separate numbers on request.) **Airmail rates for delivery outside of North America quoted on request.** **Ten-Year Index** (Vol. 31-40, 1941-1950): paper cover, \$10.00. **Ten-Year Index** (Vol. 41-50, 1951-1960): paper cover, \$10.00. Claims for copies lost in domestic mails must be received within 90 days of the date of issue, otherwise the replacement charge will be \$13.00. Deliveries overseas are not guaranteed; foreign mailings are made at the subscriber's risk. No endorsement or any statement of claims made in advertisements is assumed by this journal or by The American Phytopathological Society. **Membership in The American Phytopathological Society:** Information concerning membership in The American Phytopathological Society and special publication rates for members are available from the business office of the Society.

Published monthly at The American Phytopathological Society
3340 Pilot Knob Road, St. Paul, MN 55121
(612) 454-7250

Second class postage paid at St. Paul, MN. PUB 431540

Copyright © 1983 by The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121.

The appearance of the code at the bottom of the first page of each article in this journal indicates that—except where direct copying licenses have been granted by the copyright owner—the copyright owner requires the user to pay the stated per-copy fee through the Copyright Clearance Center, Inc., 19th Floor, One Park Avenue, New York, NY 10016, for any copying beyond that permitted under Sections 107 and 108 of the U.S. Copyright Law.

Phytopathology

EDITORIAL BOARD

Editor-in-Chief:

K. J. LEONARD, USDA, ARS, North Carolina State University, Raleigh

Senior Editors:

R. H. LAWSON, USDA, Beltsville Agricultural Research Center, Beltsville, MD
J. E. MITCHELL, University of Wisconsin, Madison
G. E. SHANER, Purdue University, West Lafayette, IN
R. T. SHERWOOD, USDA, ARS, Pennsylvania State University, University Park

ASSOCIATE EDITORS

- P. B. ADAMS, USDA Plant Protection Institute, Beltsville, MD
W. J. BLOOMBERG, Pacific Forest Research Center, Victoria, BC, Canada
M. R. BONDE, USDA Plant Disease Research Laboratory, Frederick, MD
E. BROWN, Florida Dept. of Citrus, Lake Alfred
E. L. CIVEROLO, USDA Fruit Lab., Horticultural Science Institute, Beltsville, MD
C. CLARK, Louisiana State University, Baton Rouge
J. A. DODDS, University of California, Riverside
R. L. DODMAN, Department of Primary Industries, Queensland, Australia
L. V. EDGINGTON, University of Guelph, Guelph, Ont., Canada
W. C. FULTON, Purdue University, West Lafayette, IN
C. C. GILL, Agriculture Canada Research Station, Winnipeg, Man.
J. M. HALLOIN, USDA National Cotton Pathology Research Lab., College Station, TX
J. H. HART, Michigan State University, East Lansing
M. C. HEATH, University of Toronto, Toronto, Ont., Canada
J. P. HELGESON, University of Wisconsin, Madison
H. C. HOCH, New York State Agricultural Experiment Station, Geneva
H. W. ISRAEL, Cornell University, Ithaca, NY
N. KEEN, University of California, Riverside
A. KERR, Waite Institute, Glen Osmond, South Australia
L. R. KRUSBERG, University of Maryland, College Park, MD
E. G. KUHLMAN, USDA Forest Service, Research Triangle Park, NC
L. C. LANE, University of Nebraska, Lincoln
S. M. LIM, University of Illinois, Urbana
S. E. LINDOW, University of California, Berkeley
D. R. MacKENZIE, Pennsylvania State University, University Park
D. J. MITCHELL, University of Florida, Gainesville
G. W. PETERSON, University of Nebraska, Lincoln
R. G. PRATT, Mississippi State University, Mississippi State
C. P. ROMAINE, Pennsylvania State University, University Park
E. G. RUPPEL, Colorado State University, USDA Crop Research Laboratory, Fort Collins
N. W. SCHAAD, University of Idaho, Moscow
G. S. SIDHU, University of Nebraska, Lincoln
G. D. STATLER, North Dakota State University, Fargo
J. TUIE, Purdue University, West Lafayette, IN
J. K. UYEMOTO, Kansas State University, Manhattan
N. VAN ALFEN, Utah State University, Logan
C. P. VANCE, University of Minnesota, St. Paul
T. C. WEIDENSAUL, Ohio Agricultural Research and Development Center, Wooster
T. D. WYLLIE, University of Missouri, Columbia
E. L. ZEHR, Clemson University, Clemson, SC

GENERAL PUBLICATION POLICIES

Manuscripts may be submitted for consideration of publication in PHYTOPATHOLOGY by members of The American Phytopathological Society and by nonmembers. Membership in the society is not a prerequisite for publication in the journal, but page charges are higher for nonmembers than for members.

Submission of manuscripts: Submit all new manuscripts to The American Phytopathological Society, Editorial Office, 3340 Pilot Knob Road, St. Paul, MN 55121. Do not submit new manuscripts to the Editor-in-Chief. Submission implies nonsubmission elsewhere and (if accepted) no publication elsewhere in the same form without consent.

Content: Contributions should fall into the following categories: 1) Original research on some aspect of plant pathology or brief accounts of techniques or phytopathological history of general importance. Subject matter is not a criterion for judging the merit of an article for publication in PHYTOPATHOLOGY. It is, however, the author's duty to establish relevancy to the science of plant pathology. 2) Review papers developing a new concept, hypothesis, theory, or other integration of plant pathology. 3) Letters to the Editor: These may explain, amplify, or otherwise comment upon research published in the journal or elsewhere. Letters to the editor are reviewed in the same manner as other contributions, and the Editorial Board reserves the right to reject or to publish letters of rebuttal when appropriate. If possible, the opportunity will be provided for a letter of rebuttal to appear in the same issue as the letter to which it is directed.

Page charges: Because of the high cost of publishing articles in PHYTOPATHOLOGY, payment of page charges is mandatory. Page charges are subject to change and will not be finalized until an author receives galley proofs. Current charges are \$80 per printed page for members of the Society and \$150 per printed page for nonmembers. An author will be billed after the article is printed in the journal. **A letter confirming that the author or the author's institution, company, or research sponsor will honor the page charges must accompany each manuscript submitted.**

Separates: No free copies supplied. Reprints will be available at a nominal cost; an estimate will be sent with proof. Orders for reprints must be received within the year after publication of an article.

For style details, follow: Author's Guide for Manuscript Preparation, PHYTOPATHOLOGY 73:4-6, 1983. Authors are urged to have one or more colleagues read the manuscript *critically* prior to submission.

Use of material from this journal: PHYTOPATHOLOGY is copyrighted, and those who wish to borrow illustrations or data appearing in PHYTOPATHOLOGY for use in other publications should obtain the permission from The American Phytopathological Society and the author of the paper and provide a line crediting PHYTOPATHOLOGY as the source of the material.