

## OFFICERS

### President

R. L. Sellars  
Chr. Hansen's Lab., Inc.

### Vice President

N. A. Jorgensen  
University of Wisconsin

### Treasurer

D. L. Bath  
University of California

### Past President

H. H. Van Horn  
University of Florida

### Executive Secretary

C. D. Johnson  
Champaign, IL 61820

## DIRECTORS

T. W. Holzinger (90)  
Borden, Inc.

L. D. Muller (90)  
Penn State University

S. E. Gilliland (91)  
Oklahoma State University

J. L. Morrill (91)  
Kansas State University

W. E. Sandine (92)  
Oregon State University

G. H. Schmidt (92)  
Ohio State University

## EDITOR

G. H. Schmidt  
The Ohio State University  
(614/292-6851)

## ASSOCIATE EDITORS

R. L. Richter  
Texas A&M University  
(409/845-4409)

G. R. Wiggins  
Animal Improvement  
Programs Laboratory  
(301/344-2334)

## TECHNICAL EDITOR

Cheryl K. Nimz  
Champaign, IL

## JOURNAL MANAGEMENT COMMITTEE

### Chairperson

C. E. Coppock  
Department of Animal Science  
Texas A&M University  
College Station, TX 77843

C. H. White  
Mississippi State University

L. S. Bull  
North Carolina State University

G. H. Richardson  
Utah State University

S. E. Gilliland  
Oklahoma State University

# JOURNAL OF DAIRY SCIENCE

Since 1917

American Dairy Science Association  
Founded 1906  
309 West Clark Street  
Champaign, IL 61820  
217/356-3182  
FAX: 217/398-4119

## EDITORIAL BOARD

### Research

R. M. Akers (90) VA  
M. J. Arambel (89) UT  
Louis Armentano (91) WI  
R. L. Ax (90) WI  
K. C. Bachman (91) FL  
R. J. Baer (90) SD  
C. R. Baumrucker (90) PA  
D. K. Beede (91) FL  
F. W. Bodyfelt (90) OR  
G. A. Broderick (90) WI  
R. J. Brown (90) UT  
J. C. Bruhn (91) CA  
A. V. Capuco (91) MD  
R. E. Carawan (91) NC  
B. G. Cassell (89) VA  
G. L. Christen (90) TN  
C. E. Coppock (90) TX  
M. A. Cousin (90) IN  
M. R. Dentine (91) WI  
H. A. Garverick (81) MO  
B. A. Glatz (90) IA  
D. G. Grieve (90) ON  
R. R. Grummer (90) WI  
L. B. Hansen (90) MN  
R. J. Harmon (89) KY  
V. R. Harwalkar (91) ON  
R. B. Heppell (89) IL  
C. L. Hicks (91) KY  
J. B. Holter (89) NH  
W. H. Hoover (90) WV  
R. L. Horst (90) IA  
J. T. Huber (89) AZ  
E. H. Jaster (90) IL

I. J. Jeon (91) KS  
J. J. Kennelly (91) AB  
R. L. Kincaid (89) WA  
P. S. Kinstedt (89) VT  
J. K. Kondo (90) UT  
L. L. Larson (90) NE  
D. J. McMahon (91) UT  
H. W. Modler (90) ON  
M. R. Murphy (91) IL  
S. C. Nickerson (90) LA  
D. E. Otterby (90) MN  
Vernal Packard (91) MN  
J. A. Pennington (90) KY  
J. W. Pankey (91) VT  
J. A. Pennington (90) MN  
E. J. Pollak (91) NY  
G. Reineccius (90) MN  
C. G. Schwab (90) NH  
L. R. Schaeffer (91) ON  
R. D. Shanks (90) IL  
J. S. Stevenson (90) KS  
E. R. Vedamuthu (90) FL  
M. Wehr (89) OR  
C. H. White (90) MS  
E. A. Zottola (91) MN

### Our Industry Today

J. R. Bishop (91) VA  
J. V. Chambers (90) IN  
W. L. Crist (90) KY  
G. M. Jones (91) VA  
G. P. Marley (89) GA  
D. E. Pritchard (89) OH

**Manuscripts** offered for consideration should be sent to the ADSA office, 309 West Clark Street, Champaign, IL 61820, in accordance with the instructions to Authors, J. Dairy Sci. 72:305. Reprints of instructions available from ADSA.

**Membership:** \$50 per year. Student affiliate membership \$25.00 per year (\$6.25 without the Journal). Membership in the Association is on a calendar year basis from January through December. Dues should be sent to the ADSA office.

**Institutional Members:** \$85 per volume, one volume per year, January through December. New memberships and renewals begin with the first issue of the current volume and should be sent to the ADSA office.

**Change of address.** All matters pertaining to the receipt of the Journal and changes in the mailing list should be sent to the ADSA office.

**Claims:** Claims for copies lost in the mail must be received within 60 days (120 days foreign) of the date of issue to ensure free replacement.

**Microfilm:** Reprints of articles published in the Journal of Dairy Science, volume 1, 1917 through volume 71, 1988 are available from Xerox University Microfilms, 300 North Zeeb Road, Box 91, Ann Arbor, MI 48106. Rates provided by Xerox University Microfilms upon request.

Journal of Dairy Science (ISSN 0022-0302) is published monthly by the American Dairy Science Association, 309 West Clark Street, Champaign, IL 61820. Second class postage paid at Champaign, IL and at additional mailing offices. Form 3579 to be returned to the American Dairy Science Association, 309 West Clark Street, Champaign, IL 61820.

Printed at Kowa Graphics, Inc., Champaign, IL USA. All rights reserved. Reproduction in whole or part prohibited.

© Copyright 1990  
American Dairy Science Association