

**Division of Chemical Health and Safety**  
Executive Committee

**Chair**

Barbara L. Foster  
West Virginia University  
C. Eugene Bennett Department of  
Chemistry  
PO Box 6045  
Room 217 Clark Hall  
Prospect Street  
Morgantown, WV 26506-6045  
(W) 304-293-2729  
(F) 304-293-4904  
bfoster@wvu.edu

**Chair-Elect**

Erik Talley  
Weill Medical College of Cornell  
University  
418 E. 71st St-Suite 62  
New York, NY 10021  
(212) 746-6201  
erikt@etalley.com

**Secretary**

Ralph Stuart  
Environmental Safety Facility  
University of Vermont  
Burlington, VT 05405  
(W) 802-656-5403  
(F) 802-656-5407  
rstuart@uvm.edu

**Treasurer**

Neal Langerman  
Advanced Chemical Safety  
7563 Convoy Court, San Diego,  
CA 92111  
(W) 858-874-5577  
(F) 858-874-8239  
neal@chemical-safety.com

**Immediate Past Chair**

Jim Kapin  
Advanced Chemical Safety  
7563 Convoy Ct  
San Diego, CA 92111  
(W) 858 874 5577  
(F) 858 874 8239  
jim@chemical-safety.com

**Councilors**

Kathryn Benedict  
Grand Valley State University  
1 Campus Dr  
Allendale, MI 49401  
(616) 331-5000  
benedika@gvsu.edu

Eileen B. Segal  
2701 Liberty St  
Easton, PA 18045-2620  
(W/F) 610-258-2656  
ebsegal@aol.com

**Alternate Councilors**

George H. Wahl, Jr.  
Box 8204, Dept of Chem  
North Carolina State University  
Raleigh, NC 27695-8204  
(W) 919-515-2941  
(F) 919-515-5486  
george\_wahl@ncsu.edu

Frankie K. Wood-Black  
ConocoPhillips  
TA 3002  
600 N. Dairy Ashford  
Houston, TX 77079  
(281) 293-4598  
(281) 293-5464  
frankie.k.wood-black@  
conocophillips.com

**Members-at-Large**

Ken Fivizzani  
Nalco Company  
One Nalco Center  
Naperville, IL 60563  
(W) 630 305 2032  
kfivizzani@nalco.com

Harry J. Elston  
Midwest Chemical Safety  
P.O. Box 79  
Buffalo, IL 62515  
(W) 217 971 6047  
helston@midwestchemsafety.com

**JCHAS Editor**

Harry Elston

**Committees**

*Audit*  
Barbara L. Foster

*Awards*  
Doug Walters

*Long Range Planning*  
Laurence Doemeny  
4922 Armin Way  
San Diego, CA 92115-1002  
(H) 619-265-8154  
ldoemeny@cox.net

*Membership*

*Nominations*  
Russell W. Phifer

*Program*  
Debbie M. Decker (Spring)  
Stefan Wawzyniecki (Fall)

*Publications*  
Eileen Segal

*Public Relations*  
Wayne Brown

*Regional Meetings Coordinator*  
Russell W. Phifer

*Regulatory & Public Affairs*  
Michele R. Sullivan

*Social*  
John Palmer

*Training and Workshops Coordinator*  
Russ Phifer

*Web Page Administrator*  
Ralph Stuart

# Journal of CHEMICAL Health & Safety

*A publication of the ACS Division of  
Chemical Health and Safety*

**Volume 14, Number 2**

**EDITOR** Harry J. Elston  
**FOUNDING EDITOR** Warren K. Kingsley  
(1929–2004)  
**EDITOR EMERITUS** W. Carl Gottschall

**BOARD OF EDITORS**

Louis DiBerardinis, *Cambridge, MA*  
John DeLaHunt, *Colorado Springs, CO*  
Douglas Walters, *Raleigh, NC*  
Robert Alaimo, *Lincoln, CA*  
Kenneth Fivizzani, *Naperville, IL*  
Neal Langerman, *San Diego, CA*  
Ralph Stuart, *Burlington, VT*  
Frankie Wood-Black, *Ponca City, OK*  
William E. Luttrell, *Oklahoma City, OK*  
Robert H. Hill, Jr., *Atlanta, GA*  
Diane Grob Schmidt, *Cincinnati, OH*  
Ron Stout, *Mason, OH*  
Stefan Wawzyniecki, *Storrs, CT*  
Laurence Doemeny, *Cincinnati, OH*  
Eileen Mason, *Murray, KY*  
Kathy Benedict, *Ann Arbor, MI*  
Barbara Foster, *Morgantown, WV*  
Jean-Louis Gustin, *Saint-Fons Cedex, France*  
David Rainer, *Raleigh, NC*  
Dennis Hendershot, *Croydon, PA*  
Norman Henry, *Wilmington, DE*

*Journal of Chemical Health & Safety* is issued bimonthly by Elsevier Inc. 2006 institutional subscription price: US\$ 428.00; JPY 50,700; EUR 382. Members and affiliates of the Division of Chemical Health and Safety of the American Chemical Society may receive *Journal of Chemical Health & Safety* at reduced rates. Non-institutional subscription to *Journal of Chemical Health & Safety* is at one of 3 rates which also includes membership to the ACS, Division of Chemical Health and Safety: Affiliate \$45.00, ACS Member \$34.00, Student \$29.00. Additional information on subscriptions can be found at the division's website (<http://membership.acs.org/c/chas>) or by contacting the division's Secretary, Barbara Foster at 304 293 2729 or bfoster@wvu.edu POSTMASTER: Send address changes to: *Journal of Chemical Health & Safety*, Elsevier Inc., 655 Avenue of the Americas New York, NY 10010. **Any inquiry relating to institutional subscriptions should be sent to: Orlando:** Elsevier, Customer Service Department, 6277 Sea Harbor Drive, Orlando, FL 32887-4800, USA; phone: (+1) (877) 8397126 [toll free number for US customers], or (+1) (407) 3454020 [customers outside US]; fax: (+1) (407) 3631354; e-mail: [usjcs@elsevier.com](mailto:usjcs@elsevier.com); **Japan:** Elsevier, Customer Service Department, 4F Higashi-Azabu, 1-Chome Bldg, 1-9-15 Higashi-Azabu, Minato-ku, Tokyo 106-0044, Japan; phone: (+81) (3) 5561 5037; fax: (+81) (3) 5561 5047; e-mail: [jp.info@elsevier.com](mailto:jp.info@elsevier.com); **Asia Pacific (excluding Japan):** Elsevier (Singapore), Customer Service Department, 3 Killiney Road, #08-01 Winsland House I, Singapore 239519; phone: (+65) 63490222; fax: (+65) 67331510; e-mail: [asiainfo@elsevier.com](mailto:asiainfo@elsevier.com); **Rest of the World:** Elsevier, Customer Service Department, P.O. Box 211, 1000 AE Amsterdam, The Netherlands; phone: +31 20-485-3757; fax: +31 20-485-3432; e-mail: [nlinfo-f@elsevier.com](mailto:nlinfo-f@elsevier.com). **Editorial Matters:** Harry Elston, Midwest Chemical Safety, P.O. Box 79, Buffalo, IL 62515; (O) 217 971 6047; (F) 217 364 9626; e-mail: [helston@bigfoot.com](mailto:helston@bigfoot.com).

**For Advertising Orders & Inquiries:** James Kenney, 84 Theobalds Road, London WC1X 8RR, UK. Tel.: +44 20 7611 4494; fax: +44 20 7611 4463; e-mail: [j.kenney@elsevier.com](mailto:j.kenney@elsevier.com).

**Copyright Permission:** Single photocopies of single articles may be made for personal use as allowed by national copyright laws. Permission of the Publisher and payment of a fee is required for all other photocopying, including multiple or systematic copying, copying for advertising or promotional purposes, resale, and all forms of document delivery. Special rates are available for educational institutions that wish to make photocopies for non-profit educational classroom use.

Permissions may be sought directly from Elsevier Rights & Permissions, P.O. Box 800, Oxford OX5 1DX, UK; phone: (+44) 1865 843830, fax: (+44) 1865 853333, e-mail: [permissions@elsevier.com](mailto:permissions@elsevier.com)

In the USA, users may clear permissions and make payments through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA; phone: (+1) (978) 7508400, fax: (+1) (978) 7504744, and in the UK through the Copyright Licensing Agency Rapid Clearance Service (CLARCS), 90 Tottenham Court Road, London W1P 0LP, UK; phone: (+44) 171 631 5555; fax: (+44) 171 631 5500. Other countries may have a local reprographic rights agency for payments.

© 2007 by the Division of Chemical Health & Safety of the American Chemical Society