



# EVOLUTION OF SAFETY WITHIN THE ACS WORLD

Ralph Stuart, Chair, Committee on Chemical Safety

Robert Hill, Past Chair, CCS, retired

# Safety Considerations in Research Proposals – H.K. Livingston, CCS Chair<sup>1</sup>

- 1<sup>st</sup> CCS Chair gave reasons for his concerns for safety of research students, from the premise that it is unethical for teacher to expose students to danger *that only teacher understands*
- Dr. Livingston's specific concerns at that time
  - Safety takes a "back seat" to financial considerations
  - Lab practice in 1964 gives little consideration to safety in research proposals – nothing required about safety in grant process
  - Emphasis on student responsibility for safety; Faculty felt they are less responsible for safety of research students or discussing with peers
  - Funding agencies incur little liability for research, safety is somebody else's problem

Despite the intrinsic interest of these unusual compounds, this laboratory has provisionally discontinued all experimental work requiring the preparation or use of the dibromides or their hydrolysis products.

There is no *a priori* reason to believe that these particular compounds are more dangerous to man than several related substances widely used as industrial chemicals; however, of the three laboratory workers who have used the dibromides and bromohydrin VII, two later developed similar pulmonary disorders which contributed to their subsequent deaths. The third has exhibited minor skin sensitivity reactions.

DEPARTMENT OF CHEMISTRY  
UNIVERSITY OF CALIFORNIA  
LOS ANGELES 24, CALIFORNIA

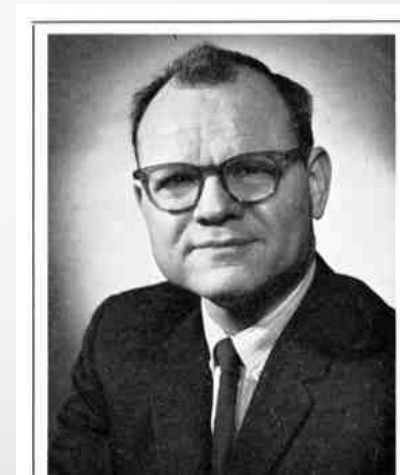
S. WINSTEIN

RECEIVED FEBRUARY 23, 1961

1964

# Safety Considerations in Research Proposals – H.K. Livingston, CCS Chair<sup>1</sup>

- RECOMMENDATIONS:
- (Administration) openly discuss ethical responsibilities with faculty
- Encourage inclusion of safety in informal proposals – especially at time student and faculty agree on research to be performed
- Formal proposals include section of safety considerations
- Ensure financial section contains adequate funding to implement safety considerations



<sup>1</sup> H.K. Livingston  
J Chem Ed, 41(10),  
A785-9 (1964)

1964

# Safety Practice in the Chemical Laboratory –

ACS Committee on Chemical Safety<sup>2</sup>

- Howard Fawcett, Chair (Driver of project) – First Edition of "*Safety in Academic Laboratories*" (survivor of a lab explosion)
- 11-page, doubled spaced, typed, mimeographed (published JCE<sup>2</sup>)
- Requires desire of individual to protect self, need to follow rules
- Provides set of standard rules, recommended equipment and practices
- Special emphasis on eye protection
- Provides practices to instructors and supervisors
- Lists safety reference materials



<sup>2</sup> ACS CCS, J Chem Ed, 50(8), 1973; Reprinted in *Safety in the Chemical Laboratory*, Vol 3, 26-27, 1974, NV Steere (Ed), Div Chem Ed, ACS, Eaton, PA

1972

# ACS Division of Chemical Safety and Health (CHAS)

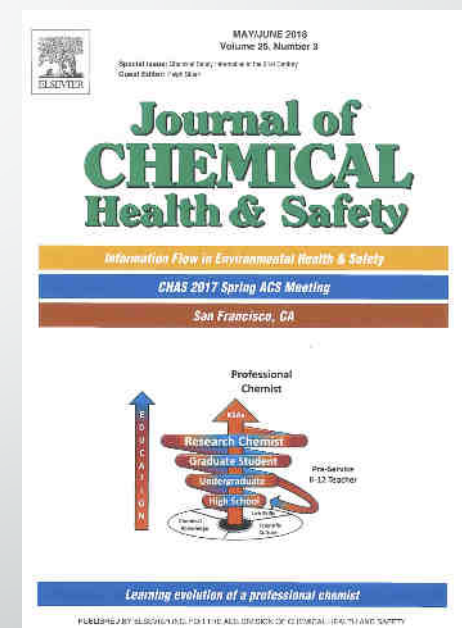
- Established in 1979 after Glenn Seaborg championed full division status for CHAS
  - Dr. Seaborg, renown radiochemist, co-discoverer of plutonium & transuranium elements (up to 102), worked Manhattan Project, ACS President 1976, Nobel Prize winner 1951, President Truman appointed him to Atomic Energy Commission
- Howard Fawcett served Chair – 1978 (provisional); 1979 (full division)
  - E Becker, Secretary/Treasurer 1979; J Young Chair 1980; D Walters Secretary 1980; Lyle Phifer Treasurer 1979 ; H Fawcett Councilor 1980
- 1985: Lyle Phifer, CHAS Chair, sends request to ACS Ex Director, John Crum to establish a full time staff position for chemical safety at ACS



1979

# ACS Division of Chemical Safety and Health (CHAS)

- Provides technical programming for ACS National and Regional meeting on chemical and laboratory safety
- Provides workshops on laboratory safety, laboratory waste management, chemical hygiene officers, leadership skills in safety, incident investigation
- Journal of Chemical Health and Safety (1993-2019); **becomes ACS Chemical Health & Safety in 2020**
- Provides DCHAS-L Listserv – an on-line communication system for CHAS members that allows members to ask and answer questions about chemical and laboratory safety

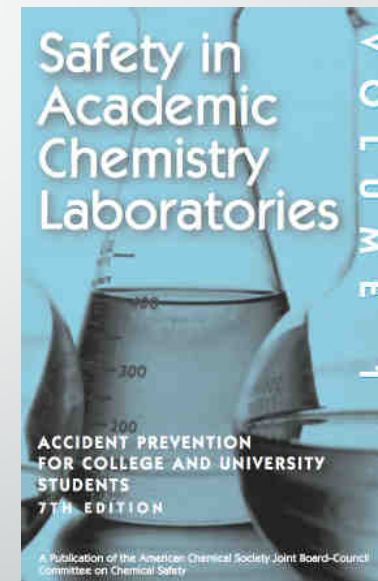


1993



# Safety in Academic Chemistry Laboratories – 7<sup>th</sup> Edition, V.1, 2003

- Reported from 1972 publication to 2003, > 1 million SACL distributed
- Emphasis on Personal Responsibility for Accident Prevention
  - Need for PPE, standard procedures
- Provided Guide to Chemical Hazards
  - Toxicity, exposure limits; MSDSs, labels, reading; Properties of chemicals: solvents, acids, bases, toxic chemicals, organic peroxides
- Recommended Laboratory Techniques
  - Lab equipment: hoods, electrical equipment, centrifuges,



2003

# Serious lab incidents causes rethinking about safety at ACS

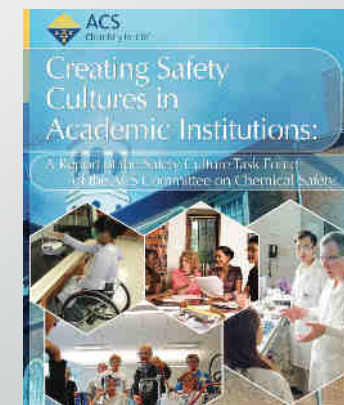
- 2008 (Dec 29) Sheri Sangji seriously burned by t-butyllithium in UCLA lab; dies 2 ½ weeks later
- 2010 (Jan 7) 5<sup>th</sup> yr Texas Tech graduate student seriously injured in explosion while handling nickel hydrazine perchlorate;
  - Incident immediately investigated by U.S. Chemical Safety Board (CSB)
  - CSB asks ACS to help
- 2010 (Jun 2) Lab fire, minor injury to 1 student, est \$1 million damage
- 2010 (Jun 28) Hydrogen explosion, U Missouri injures 4, damages lab
- 2011 Fires during chemical demonstrations using flammable alcohols causing serious injuries to students





# Committee on Chemical Safety Suggests New Approach to Safety

- 2010 CCS accepts on behalf of ACS request from US Chemical Safety
  - To develop good practical guidance to assess and control hazards in research laboratories
- 2012 CCS releases *Creating Safety Cultures in Academic Institutions*
  - Recognizes need for strong safety culture
  - Recognizes leaders and managers key to building strong safety culture
  - Recognizes need for chemical laboratory safety education through continuous, spiral learning throughout studies
  - Long-term effort to build positive safety awareness, attitudes, ethics
  - Learning from incidents



2012

# R.A.M.P Up for Safety

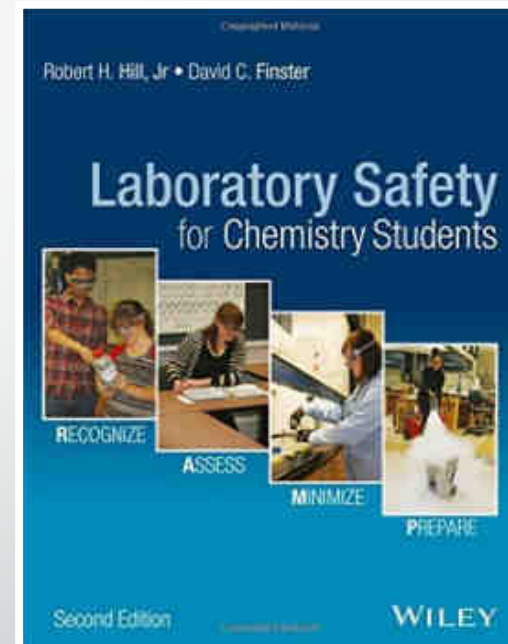
RAMP introduced in 2010 in LSCS

## Four Principles of Safety

- Recognize hazards
- Assess risks of hazards
- Minimize risks of hazards
- Prepare for emergencies

**R.A.M.P.** up for **SAFETY**

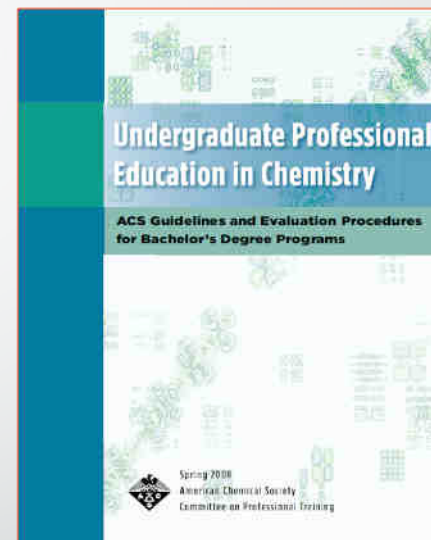
R Hill, D Finster. *Laboratory Safety for Chemistry Students*, 2<sup>nd</sup> Edition, John Wiley & Sons, Hoboken, NJ, 2016



2010

# ACS Committee on Professional Training – Guidelines for Bachelor Degrees

- 2008 Lab safety as a skill (paragraph)
  - Safety conscious culture, students understand safety practices, programs train students to needed level in chemical safety
- 2012 & 2017 Lab safety as a skill (expanded to 3 pages)
  - Focus on using RAMP to develop areas of emphasis – Recognize hazards, Assess Risks, Minimize Hazards, Prepare for Emergencies
  - Safety culture - Faculty/staff must be leaders in safety, teaching safety, promoting safety, demonstrating safety by their actions, accepting responsibility for safety.
  - Curricular approaches – Lab safety education continuous process, integrated into every lab course



2012

# ACS Committee on Chemical Safety

- 2011 *Safety in the Elementary Science Classroom*
- 2014 *Safety Alert: The Rainbow Demonstration; Safety Alert: Tornado Experiment*
- 2015 Publishes *Identifying and Evaluating Hazards in Research Laboratories* – ACS Response to CSB request for assistance
  - 2016 Launches website for *Hazard Assessment in Research Laboratories*
- 2016 *ACS Guidelines for Chemical Laboratory Safety in Academic Laboratories; ACS Guidelines for Chemical Laboratory Safety in Secondary Schools*
- 2017 *Safety in Academic Chemistry Laboratories, 8<sup>th</sup> Edition*

2017

# American Chemical Society 2018 Strategic Plan

- 2017 – ACS establishes FT safety position
- Includes new Core Value: Professionalism, Safety, and Ethics
  - *We support and promote the safe, ethical, responsible, and sustainable practice of chemistry coupled with professional behavior and technical competence. We recognize a responsibility to safeguard the health of the planet through chemical stewardship.*
- Established list from this Core Value to: Chemical & Laboratory Safety (found at: <https://www.acs.org/content/acs/en/chemical-safety.html>)



#### Division of Chemical Health and Safety

- National and Regional Meeting technical programs
- *J of Chemical Health and Safety* and DCHAS-L e-mail list
- Professional Development Workshops
- Innovative Project Grants
- Technical division partnerships, particularly CHED and CINF
- Connections to other professional networks



#### Committee on Chemical Safety

- Education Subcommittee
- Communication Subcommittee
- Safe Practices Subcommittee
- Safety Advisory Panel



#### ACS Safety Program Office Coordination

- NSTA outreach
- CPSC support on flame-jetting education
- ACS Regional meeting workshops
- Document library maintenance
- Support for ACS outreach staff on safety issues

2018



# American Chemical Society Presidents Sponsor Safety Summits

- 2018 Safety Summit – ACS Strategic Goals through a Safety Lens
  - Dr. Peter Dorhout, ACS President, Sponsor
- 2019 Safety Summit – Strategic Opportunities in Chemical Safety Education
  - Dr. Bonnie Charpentier, ACS President, Sponsor
  - Dr. Peter Dorhout, Immediate Past ACS President, Sponsor

2019



# ACS Division of Chemical Education (CHED)

- Journal Chemical Education – Occasional Contributions on Safety
- 2016 Establishes CHED Safety Committee
- 2017 Issues revised *Safety Guidelines for Chemical Demonstrations*
- 2019 Exams Institute Issues revised *Chemical Health and Safety*

2019

# American Chemical Society Safety Connections

- Committee on Chemical Safety
- Division of Chemical Health and Safety
- Committee on Professional Training
- Division of Chemical Education Safety Committee
- *Chemical & Engineering News* reports, podcasts & *The Safety Zone Blog* by C&EN
- ACS Webinars - 2 a year, reaching over 500 people per session
- *2020 ACS Chemical Health & Safety*

2020