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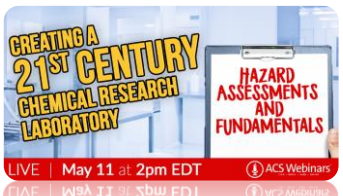

http://bit.ly/ACS21stLab

Fan of the Week

George C. Walton, President, Reactives Management Corporation, ACS member 37 years strong!

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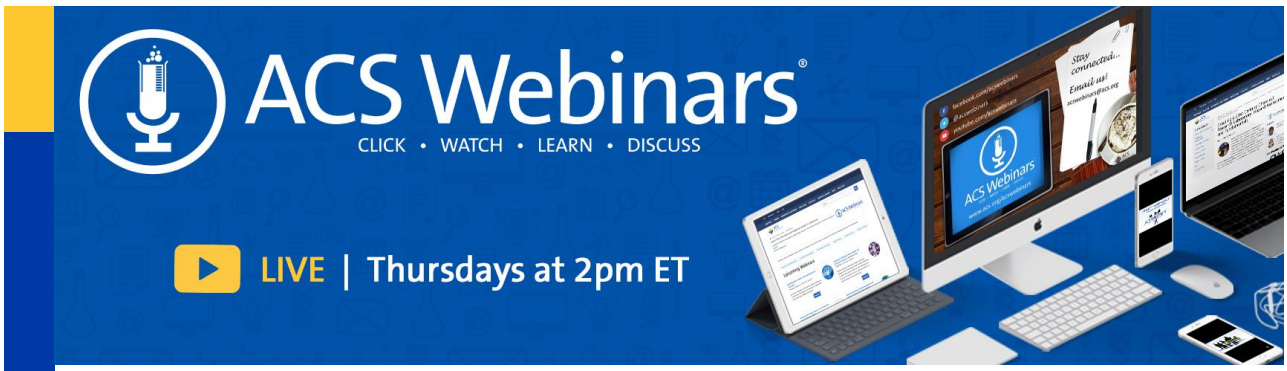

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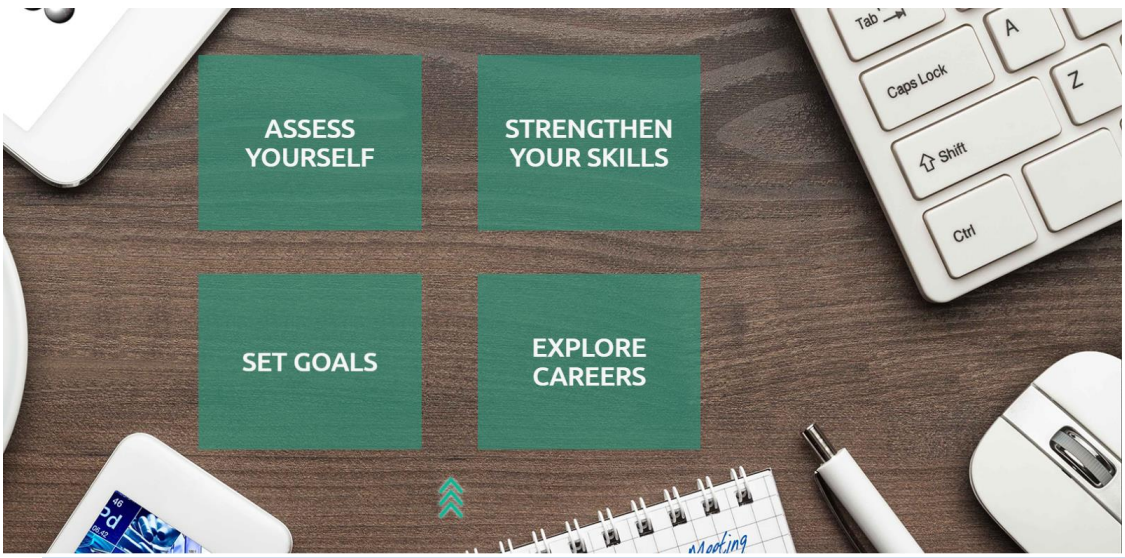

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Upcoming ACS Webinars
www.acs.org/acswebinars

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Thursday, March 15, 2018

Exceptional Presentations In Spite of PowerPoint: *How to Communicate in the Digital Age*
Co-produced with the ACS Industry Member Programs and the ACS Committee on Corporation Associates

Experts

Mark Jones
Dow Chemical

Thursday, April 5, 2018

Creating New Models to Combat Neglected Disease Through, Industry, Government, and Public-Private Partnerships
Co-produced with ACS Infectious Diseases

Experts

Michael Pollastri
Northeastern University

Félix Calderón
GlaxoSmithKline

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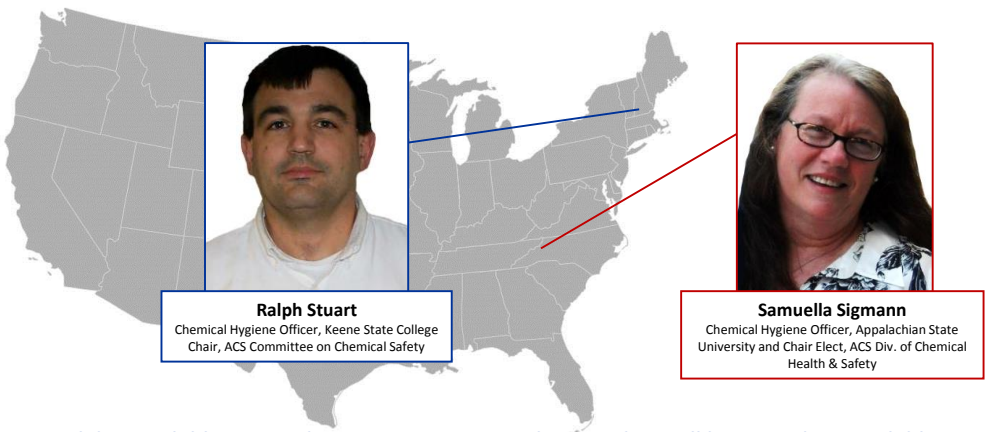
ACS Chemistry for Life®

*"**Reshaping Chemical Lab Safety:** Creating a Dynamic and Adaptive Safety Environment"*



Ralph Stuart
Chemical Hygiene Officer, Keene State College
Chair, ACS Committee on Chemical Safety

Samuella Sigmann
Chemical Hygiene Officer, Appalachian State University and Chair Elect, ACS Div. of Chemical Health & Safety

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ACS Chemistry for Life®

Reshaping Chemical Lab Safety

Creating a Dynamic and Adaptive Safety Environment

Ralph Stuart, Chair, Committee on Chemical Safety

Samuella Sigmann, Chair Elect, Division of Chemical Health and Safety

ACS Chemistry for Life®

STRATEGIC PLAN for 2018 and Beyond

Vision

Improving people's lives through the transforming power of chemistry

Mission

Advancing the broader chemistry enterprise and its practitioners for the benefit of Earth and its people

Core Values

Passion for Chemistry and the Global Chemistry Enterprise

Focus On Members

Professionalism, Safety, and Ethics

Diversity and Inclusion

ACS's Strategic Goals

1. Provide Information Solutions
2. Empower Members and Member Communities
3. Support Excellence in Education
4. Communicate Chemistry's Value

https://www.acs.org/content/acs/en/about/strategicplan.html

The Original CCS Vision

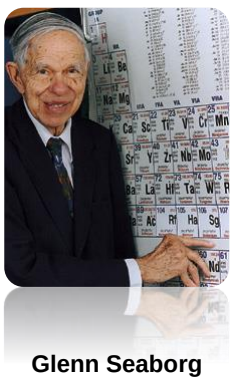
In 1964, the Journal of Chemical Education published an article ***Safety Considerations in Research Proposals*** by Dr. Livingston,the first chair of the Committee on Chemical Safety.

- The article provides a good summary of the research safety challenges that still apply today.
- However he states: ***"Legal requirements… are outside the competence of our committee… Certainly if humanitarian and ethical requirements are met, there are not likely to be any issues that will require legal action."***
- Particularly after the 1980's events in Bhopal and Institute, WV, this "gentleman's club" approach to safety culture changed.
- A new approach to laboratory safety culture, as described in ***Prudent Practices in the Laboratory*** and ***Safe Science*** from the National Academy of Science, arose

H.K. Livingston
First CCS chair in 1963, newly moved to Wayne State University after 13 years at DuPont

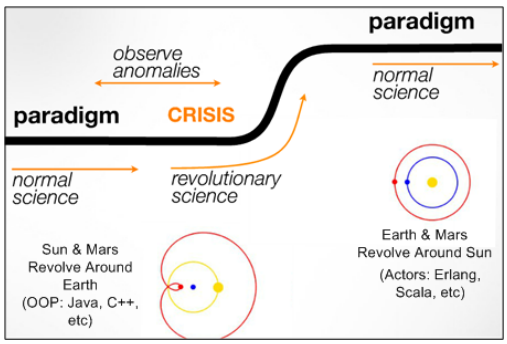
"Working Safely at the Frontiers of Science"

- "When the first … plutonium came into the laboratory from the power plant at Oak Ridge in 1944, it suddenly occurred to me that the … ***health physicists hadn't given any attention to the danger from alpha-particle emitters like plutonium.*** All of the precautions… were for gamma radiation.
- "In view of the problems that had occurred in the late 1910's… with the ***radium dial painters***, I realized that the ingestion of just a little bit of plutonium would be a greater danger than radiation from gamma emitters.
- ***"So I got in touch with the medical authorities and called the danger to their attention.*** This led to a recognition of the problem and a renovation of the entire laboratory to include additional hood space and air monitoring."



Glenn Seaborg
ACS President, 1976; patent holder on americium and curium

The Paradigm Shift



Kuhn's description of the process of a scientific paradigm shift

- The 21st Century Lab Safety Culture considers ***Community Safety*** as well as ***Personal Safety*** as science and technologies change.
- Including ***Community Safety*** applies the scientific values of
  - **Transparency**,
  - **Transferability**, and
  - **Scalability**

  to the hazard management process.
- This change in the ***chemical safety paradigm*** requires a move from ***an emphasis on rules*** for individual behavior to ***assessing risk*** based on the way the chemical is being used.

Audience Challenge Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Have you noticed a change in the safety culture of the labs you work in over time?

- Yes, in my experience, there has been a distinct improvement in laboratory safety culture
- There's been some improvement
- I haven't seen much change in safety awareness in my lab experience
- In my experience, safety culture has degraded over time

The Good News: Safety Tools for the 21st Century

- The **Globally Harmonized System** addresses the *"Right to Understand"*
- The **RAMP** Paradigm: ("*Preparing*" is where the community enters the picture)

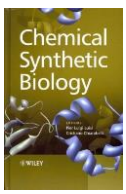
R Recognize the hazards
A Assess the risks of the hazards
M Minimize the risks of the hazards
P Prepare for emergencies from uncontrolled hazards

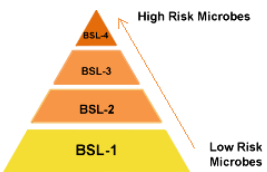
Texas Tech University
Laboratory Explosion

- **System Safety Management** approaches such as exemplified by the Chemical Safety Board's reports
- Market-Driven "**Green Screen**" Tools reflect the public's interest in chemical hazards

The Other News: 21st Century Safety Hurdles

- Work on scientific frontiers: nano- and bio- tech
- Interdisciplinary and international sciences lead to conflicting laboratory safety paradigms
- Public perception of "chemical safety"
- Shifting legal expectations





A Sample of Strategic Opportunities in Chemical Safety for ACS

1. Develop Safety Information Solutions

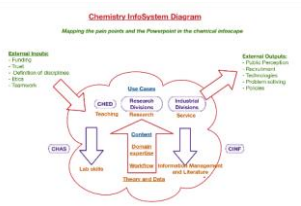
http://www.acs.org/hazardassessment

2. Empower Members with Safety Skills

Stakeholder Workshops

3. Support Safety Education

Outreach around RAMP



4. Communicate Chemical Safety as a Core Value

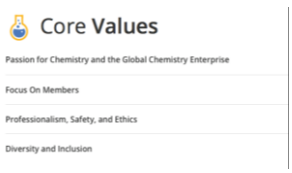
Support an ecosystem of professional safety resources

Summary: ACS Advantages in Safety Leadership

- **Safety supports chemists' scientific goals as well as ACS's strategic objectives**

ACS Chemistry for Life®

- **Diverse efforts are being piloted within the ACS**
  - Many are ready for development
  - Some will Win Big, others will Fail Early



- **ACS has a strategic advantage in the chemical safety field due to its well-established (55 years) expertise, resource library and outreach channels.**

Audience Challenge Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Is the connection between "professionalism", "safety" and "ethics" as an ACS Strategic Value clear to you as an ACS member or potential member?

- Crystal clear
- Fairly clear
- It's somewhat murky
- Those don't connect for me

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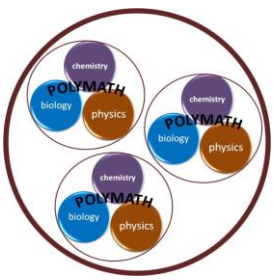
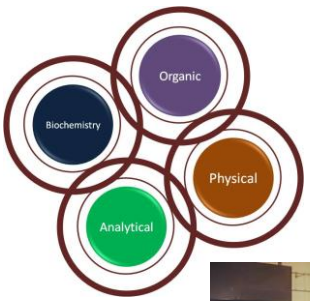
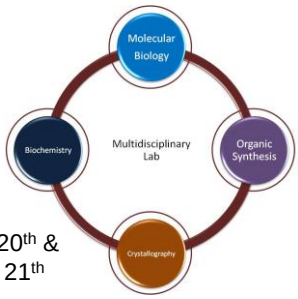
The Changing Research Environment

Late 19th & Early 20th



Mid 20th





Late 20th & Early 21th

ACS Technical Division Chemical Health & Safety (CHAS)

ACS Committee on Chemical Safety

Some Problems with Rule Based Safety

To impress a professional man such as a chemist with the fundamental ideas of safety necessary to his profession is somewhat of a harder task than that of instructing a laborer or worker in simpler lines of work.

It is human nature to treat with contempt and disregard, however, materials which are in themselves exceedingly dangerous, but which under ordinary conditions are handled safely without accident. ***It is exactly at the moment when such a state of mind is in possession of the chemist that the greatest number of accidents occur.***

The laborer can be warned that he will be discharged if he violates any safety rule, ***but the chemist who knows more about his chemical compounds than anyone else and treats them carelessly must be reminded.***

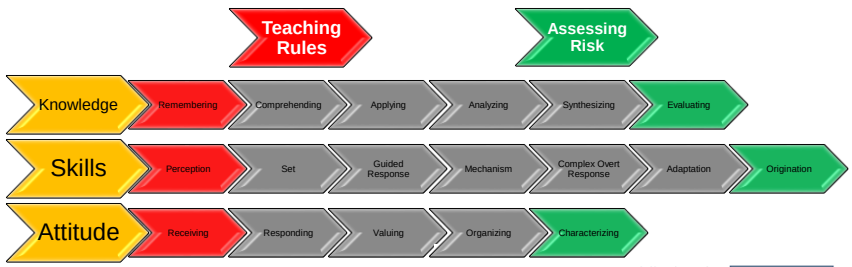
EDWIN C. BUXBAUM, Safety in the Chemistry Laboratory, *JChemEd*, 1934

https://pubs.acs.org/doi/abs/10.1021/ed011p73

An Emergency Shower Should Always Be Handy in Any Laboratory Where Small-scale Operations Are Tried Out

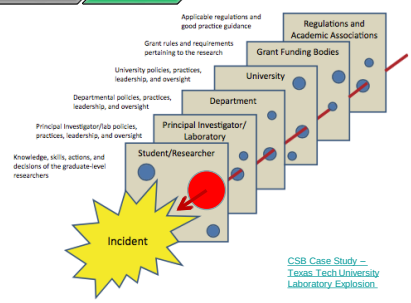
Above the shower to the left, note the lamp, which is never allowed to be out, and the form of the volume of water which is concentrated on the head of any person below it and covers the body thoroughly with a heavy volume of water.

Some Problems with Rule Based Safety



Teaching safety with rules

- operates in the lower orders of learning (Bloom's)
- Creates a big hole in the cheese if
  - A rule is missed or
  - The person simply lacks the competency



CSB Case Study – Texas Tech University Laboratory Explosion

Consequences of Focusing on Rule Based Safety

- **Learning By Rules**
  - Focuses on memorization & repeated training
  - Requires enforcement authority & reinforcement
- **Single idea concepts are applied to specific situations.**

For Example:

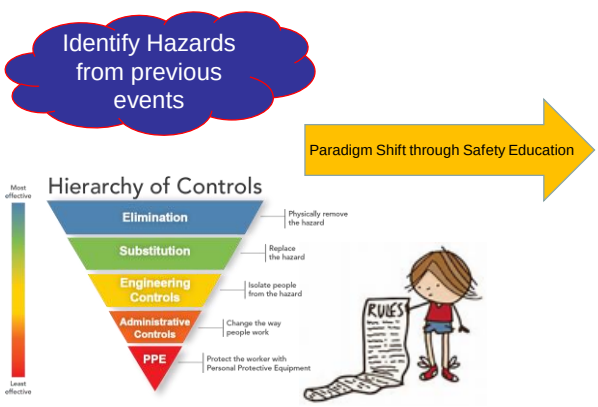
- **Concept:** Working in a chemical fume hood eliminates inhalation hazard - hoods cannot control fires to protect the user
- **Concept:** Wearing nitrile gloves prevents exposure, but cannot prevent burns
- **Missed Rule:** Proper PPE/lab clothing rules were not communicated or enforced

Sheri Sangji

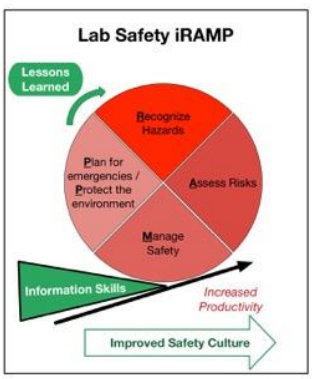
1985-2009

Moving Academic Laboratory Safety into the 21st Century

20th Century: Selecting controls based on rules, guided by chemical intuition & compliance



21st Century: A ***safety system*** built on education, positive culture, and documented risk assessment

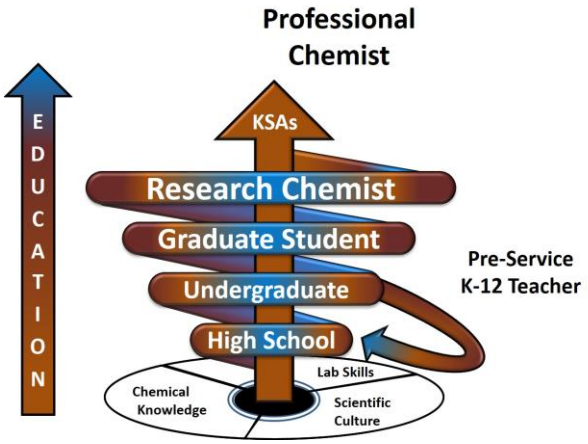


The Spiral Approach

This approach to safety education requires a shift in thinking – Safety is more than a "skill"

Incorporates ***technical knowledge (K), lab skills (S) & cultural change (A)*** to create competency categories

By weaving the KSAs throughout the chemistry curriculum chemical safety is broadened and deepened



ACS Technical Division Chemical Health & Safety (CHAS)

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Audience Challenge Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

As reported in the press, how many people have been hurt in fires associated with solvent fueled chemistry demonstrations since 1998?

- None
- Less than 25
- Between 25 and 50
- Between 50 and 75
- Over 100

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An Example: The Flammable Solvents Learning Spiral

Knowing why solvents are flammable can help students develop skills to work with them safely in lab.

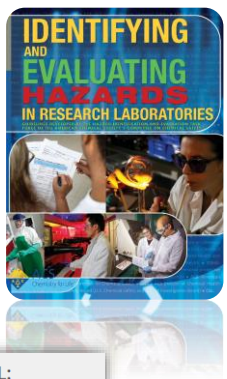
- In Intro classes we could teach conceptual knowledge about how vapor pressure, flash point, and boiling point determine the flammability of a solvent.
- In organic class, concepts such as how the number of carbons and molecular complexity can affect solvents entering the vapor phase could be introduced.
- In physical chemistry, one could discuss flammability as a kinetic property — will the oxidation produce an explosion or will a substance turn brown with age. Numerous other concepts (thermodynamic concepts such as Raoult's Law for mixture vapor pressures, adiabatic expansion, and Le Châtelier's mixing rule for flammable limits) that could be used.

Selected ACS Safety Resources

***Identifying and Evaluating Hazards in Research Laboratories* 2015**

Develop good practice guidance that identifies and describes methodologies to assess and control hazards that can be used successfully in a research laboratory.

[1]http://www.csb.gov/assets/1/7/Status_Change_Summary_ACS_(TTU_R2)_C-AA_pending.pdf



"The scope of the ACS document indicates that it is intended for use for laboratory researchers 'without deference to where they are in their careers' all with 'varied approaches to learning and experimental design and who may require different kinds of assessment tools." [1]

HAZARD ASSESSMENT In Research Laboratories

Web Site version, 2017

THE FOLLOWING INFORMATION WILL:

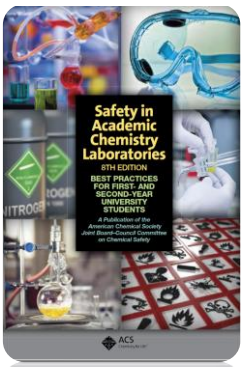
- Familiarize you with the fundamentals of hazard assessment;
- Guide you through preparation practices such as scoping and assembling your team;
- Offer a number of ways to conduct hazard assessments;
- Provide tools (e.g., templates, examples, etc.) that can be shared with your team and used immediately.

Selected ACS Safety Resources

***Safety in Academic Chemistry Labs*, 8th Edition, 2017**

- **"SACL"**
- **Considered the "flagship" publication of the CCS**
- **Millions of copies sold**

The first edition of this book was written in 1972 by members of the ACS Committee on Chemical Safety under the direction and urging of its chair, Howard H. Fawcett (now deceased). It was published as an 11-page, double-spaced, typed and mimeographed document. ~ Jay Young, Editor of the 7th Edition.



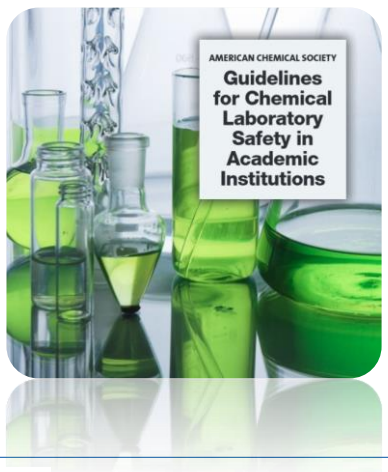
The 8th Edition

- **Targets 1st and 2nd year undergraduates**
- **Includes GHS, process hazards, risk assessment, & emergency preparedness (RAMP)**
- **Includes sidebars and "In your Future" sections**
- **Very few "lists"**
- **Download at CCS or purchase at ACS Web Store**

Selected ACS Safety Resources

***Guidelines for Chemical Laboratory Safety in Academic Institutions*, 2016**

- Gives **104 learning objectives** that all chemistry undergraduate students should understand upon graduation
- The objectives are organized into the **RAMP** paradigm
- Creates a mechanism to broaden and deepen **(spiral)** concepts throughout the undergraduate curriculum



Selected ACS Safety Resources

JOURNAL OF CHEMICAL EDUCATION
Cite This: J. Chem. Educ. XXXX, XXX, XXX−XXX
Commentary
pubs.acs.org/jchemeduc

Revising the Division of Chemical Education Safety Guidelines for Chemical Demonstrations

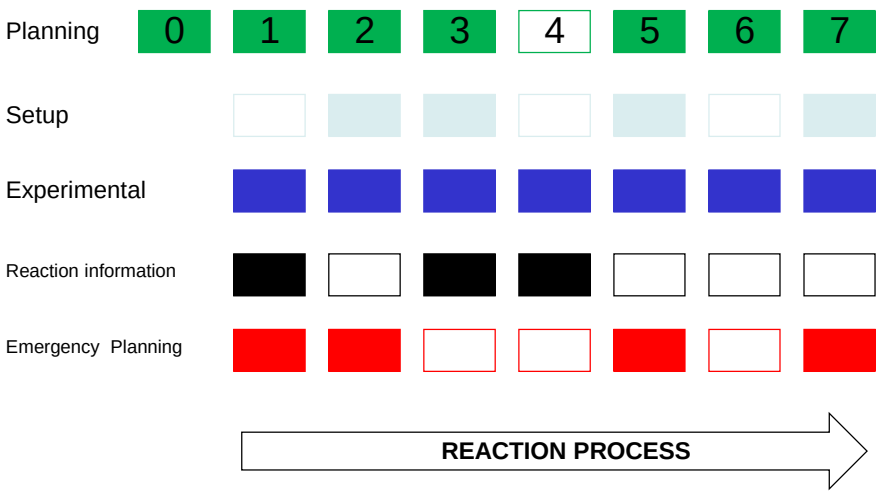
Irene G. Cesa,[†] David C. Finster,[*,‡] Samuella B. Sigmann,[§] and Monique R. Wilhelm[∥]

The goal of the current revision project was to produce a relatively succinct but adequately useful set of guidelines that could be printed on two sides of a page and distributed widely to educators across the country…. a statement of "what to do" rather than "how to do it"…

[CHED Safety Committee Demonstration Guidelines, 2016]

Storyboarding – Idea From Faculty

Biodiesel Synthesis Steps



PAPER ID: 2873006

PAPER TITLE: From procedure to practice: An organic chemistry storyboard for developing empowered undergraduate research assistants (final paper number: CHED 2023)

DAY & TIME OF PRESENTATION: Tuesday, March, 20, 2018 from 1:30 PM - 1:50 PM

ROOM & LOCATION: Magnolia - New Orleans Marriott Convention Center

Good Safety Ideas are Local! (Leadership & Empowerment)

1

Prevent Exposure

Recognize Hazards
- Chemical (health)
- Chemical (physical)
- Sharps (syringe)
- Chemical spills

Barriers
- Set up in certified fume hood
- Synthetic scale only
- PPE
- Equipment training (#??)
- Spill tray

Chemical Waste
- Label completed prior to work start with names of chemicals

NOTES: Syringe transfer

Reagents
Hydrogen chloride solution (4 N HCl in 1,4-dioxane)

Recommended glove material: Chloroprene

DANGER

Recommended glove material: Nitrile

Reagents
Canola Oil

Not classified Hazardous by GHS

Flash point 17 °C (63 °F)
Conditions to avoid
Heat, flames and sparks.

Reagents
Methanol

Recommended glove material (splash): Nitrile

DANGER

> 93.3 °C (200.0 °F)Closed Cup
Conditions to avoid
Heat, flames and sparks.

Initial boiling point and boiling range 64.7 °C (148.5 °F) - lit.
Flash point 9.7 °C (49.5 °F) - closed cup

Conditions to avoid
Heat, flames and sparks.

Product Number : 179957
Brand : Sigma-Aldrich
CAS-No. : 67-56-1

Experimental

1. Combine in 50 mL round bottom flask (RBF)

Controls for Failed Barriers

-Eyewash/Shower – Ensure function and clear path
-Emergency phone numbers and procedure known
-Fire extinguishers and exits clear

Chemical Safety Education

20th Century

- ***Technical aspects*** of safety are **directly transferred** as procedural skills learned during laboratory work
- ***The culture of safety*** is based on enforcement & compliance – The "Safety Police"
- ***Information transfer*** is based primarily on training compartmentalized topics built on compliance with regulations
- ***Safety management*** relies on training and rules

21st Century

- ***Technical aspects*** of safety are also **indirectly transferred** by teaching students to control risk through ***hazard identification and risk assessment which is applied to laboratory work***
- ***The culture of safety*** *is* ***based on leadership and empowerment***
- ***Information transfer*** involves development of chemical safety competencies (knowledge, skill, and attitude) learned as an ***educational subject integrated into the curriculum***
- ***Safety management*** **is** based on the development of a ***resilient, transferrable, and sustainable safety system***

Read more about it –

Journal of Chemical Health and Safety

Available online 27 November 2017

In Press, Corrected Proof

Feature

Chemical safety education for the 21st century — Fostering safety information competency in chemists

Samuella Sigmann https://www.sciencedirect.com/science/article/pii/S1871553217300865

ACS Technical Division Chemical Health & Safety (CHAS)

Links to all resources available at: www.acs.org/safety

ACS Committee on Chemical Safety

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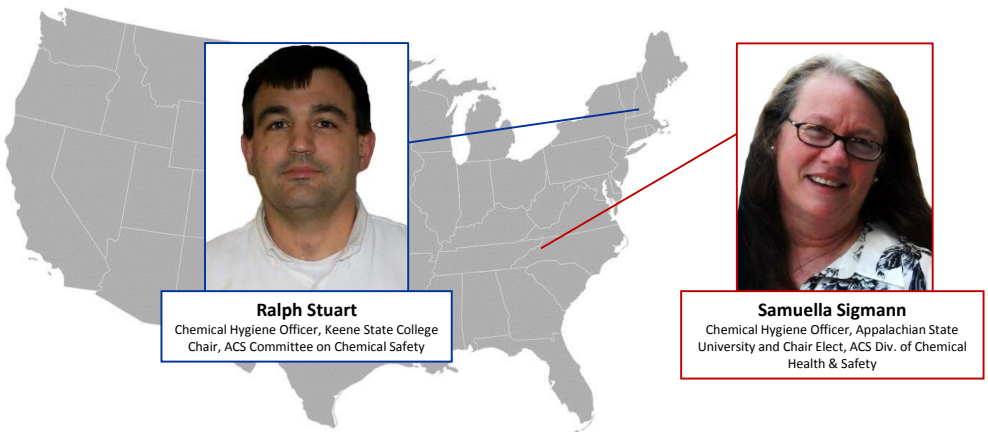
*"**Reshaping Chemical Lab Safety:** Creating a Dynamic and Adaptive Safety Environment"*



Ralph Stuart
Chemical Hygiene Officer, Keene State College
Chair, ACS Committee on Chemical Safety

Samuella Sigmann
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Slides available now and an invitation to view the recording will be sent when available.
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Upcoming CHAS National Meeting Workshops

ACS Technical Division Chemical Health & Safety (CHAS)

SPRING 2018 ACS WORKSHOP:

Developing Graduate Student Leadership Skills in Laboratory Safety

SUNDAY, MARCH 18 • 3:00–6:00 PM

Recently, several research-intensive chemistry departments have instituted Lab Joint Safety Teams (JSTs) and similar programs to support graduate student empowerment around laboratory safety issues. This year, we will offer a pilot workshop on Sunday March 18th from 3:00–6:00 PM at the Spring National American Chemical Society Meeting in New Orleans, LA.

KALI A. SERRANO

MICHAIL VLYSIDIS

Fall, 2018 Boston Meeting

Reactive Chemical Management for Laboratories & Pilot Plants

A research group proposes scaling up a reaction from 0.1 mole to 2 moles.

- What questions should you ask?
- How should you evaluate the hazards and risks?
- What options to you have for heat management?

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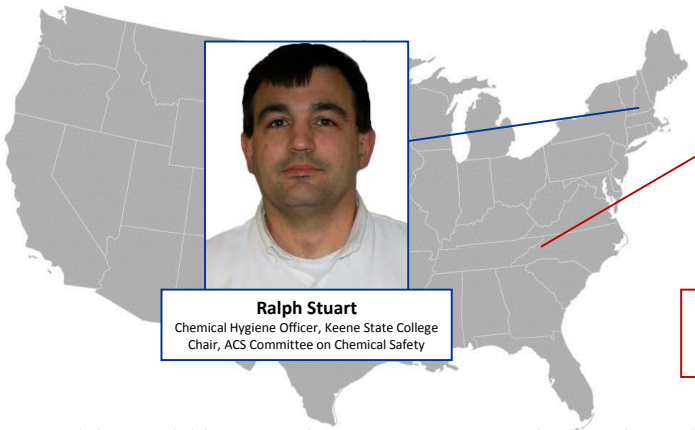

Ralph Stuart
Chemical Hygiene Officer, Keene State College
Chair, ACS Committee on Chemical Safety

Samuella Sigmann
Chemical Hygiene Officer, Appalachian State University and Chair Elect, ACS Div. of Chemical Health & Safety

Slides available now and an invitation to view the recording will be sent when available.

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Previous Chemical Safety Webinars

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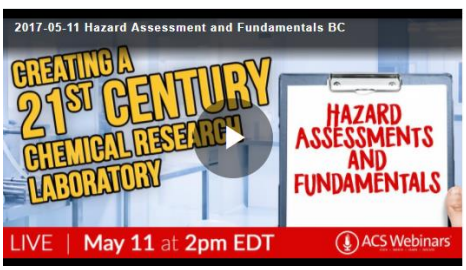
Creating a 21st Century Chemical Research Laboratory: Hazard Assessments and Fundamentals



Ralph Stuart
Keene State College

Kendra Leahy Denlinger
University of Cincinnati

Safety in the laboratory requires a full team effort to be successful. When everyone in the laboratory understands how to identify hazards, assess risk, and select the appropriate control measures to eliminate a hazard or minimize risk, accidents, injuries and near misses can be reduced.

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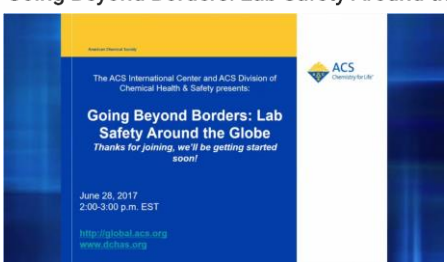
Going Beyond Borders: Lab Safety Around the Globe



Ralph Stuart
Keene State College

Samuella Sigmann
Appalachian State University

Every day, thousands of scientists travel around the globe to engage in scientific exchange, training and collaboration. No matter where you go, learning about the lab safety issues and practices used in the host country should always be a top priority. This webinar will address safety issues while hosting a visiting scholar or issues you may come across as visiting scientist.

https://global.acs.org/acs-international-center-event-webinar-on-global-lab-safety/

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