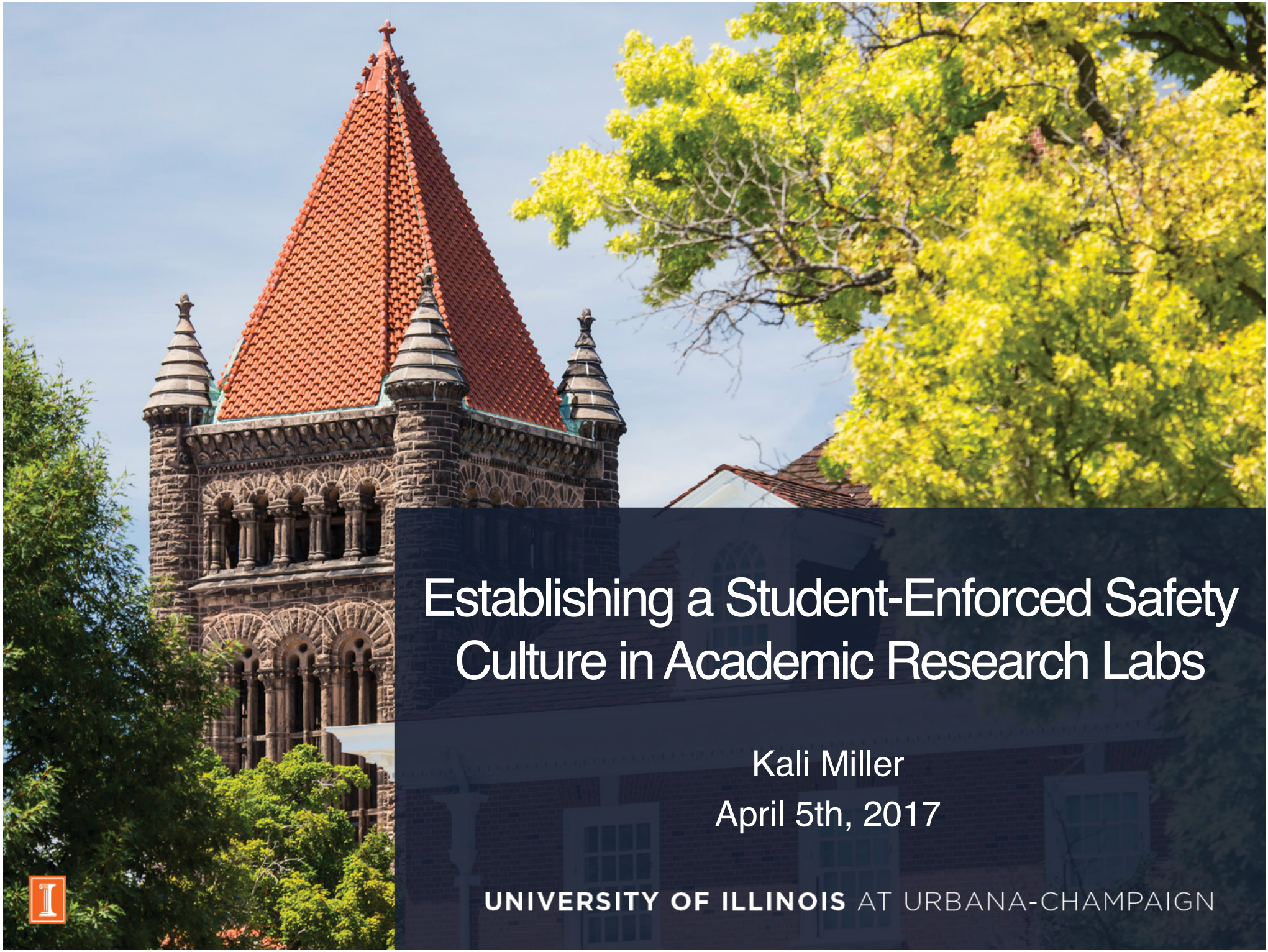


Establishing a Student-Enforced Safety Culture in Academic Research Labs

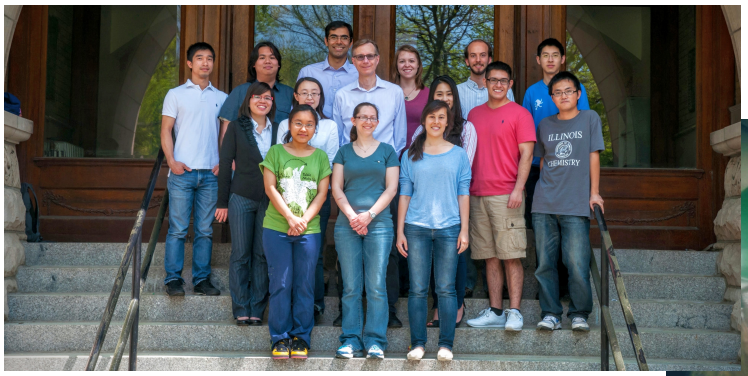
Kali Miller

April 5th, 2017

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Background

- Undergraduate and graduate research at UIUC
- Startup in the Urbana-Champaign Research Park
- Internships at Dow Corning



How has the settlement influenced programs beyond UC?

Outline

1. Motivation for a Student-Enforced Safety Culture
2. Contributing Factors to Unsafe Practices
3. A Supplementary Approach to Top-Down
4. Future Directions

Motivation for a Student-Enforced Safety Culture

- A 2008 tert-butyllithium laboratory fire resulted in the death of the UCLA researcher Sheri Sangji
- Prosecutors charged the university system and Prof. Harran with felony violations of the California labor code




This is the first criminal case resulting from an academic laboratory accident

http://cen.acs.org/articles/90/i33/California-Deal-Tightens-Lab-Safety.html

Motivation for a Student-Enforced Safety Culture

- 2012 Settlement dropped charges in exchange for implementation of a new safety program at all 10 UC campuses
- The settlement required an academic institution to adopt the industry safety management style:
  - Safety is well-recognized
  - Enforced in organizations from the top

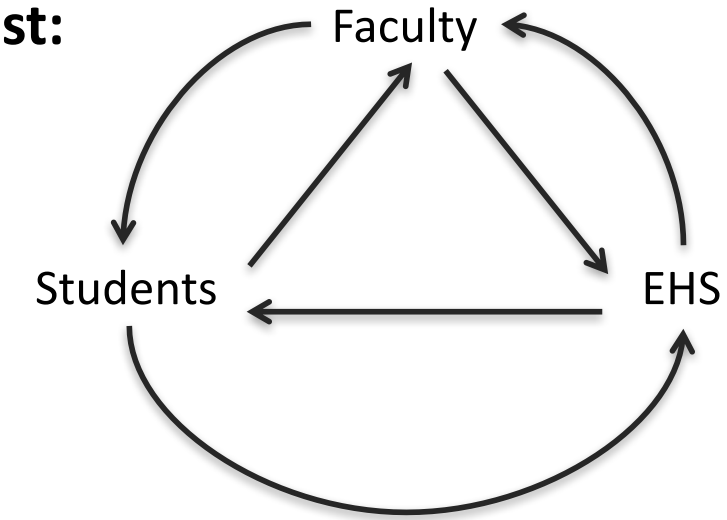
Legally imposed responsibility of top-down leadership for the first time in an academic institution

http://cen.acs.org/articles/90/i33/California-Deal-Tightens-Lab-Safety.html

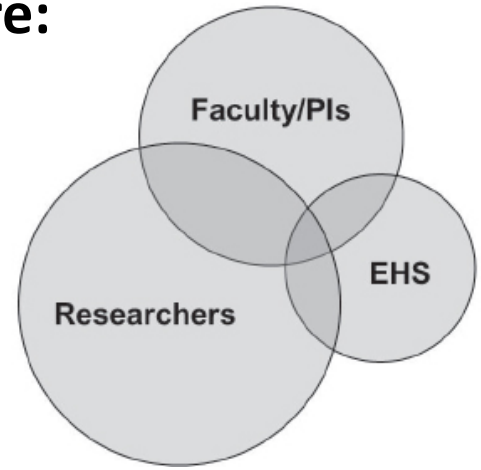
Motivation for a Student-Enforced Safety Culture

- There are many different approaches to fixing the culture
- Methods will change depending on each university

Past:



Future:



How do you break this cycle and establish a safety culture, especially where legally enforced programs are not yet present?

National Research Council, 2014, Safe Science: Promoting a Culture of Safety in Academic Chemical Research

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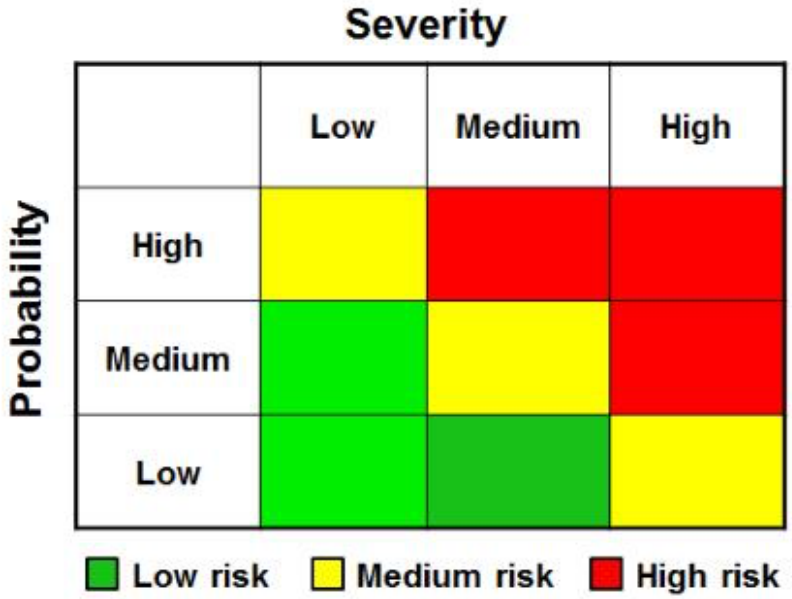
Developing an Intuition for Risk Management

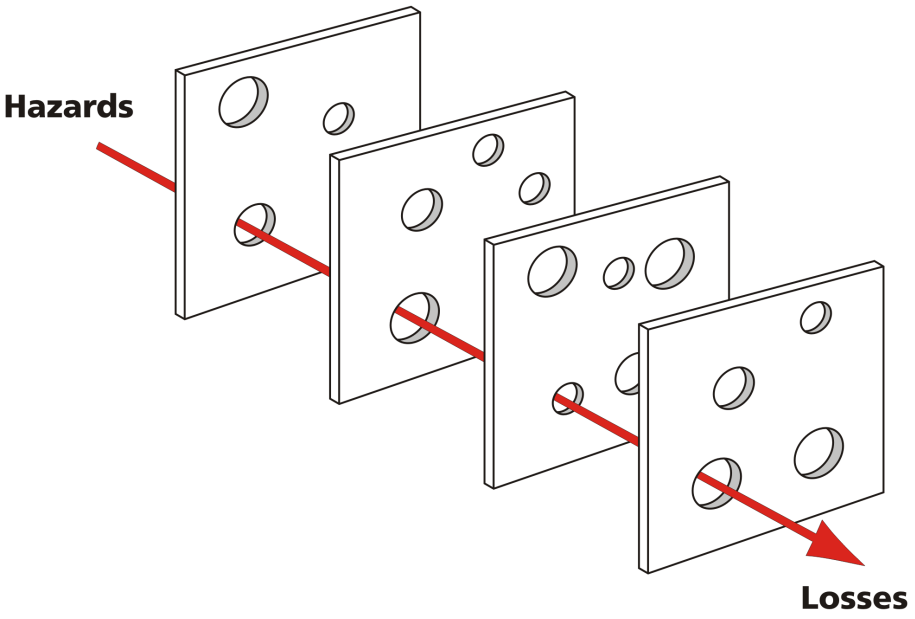
- Most violations are caused by inadvertent carelessness
- Non-hazardous materials may pose a large risk if handled improperly
- Similarly, hazardous materials may be relatively safe if handled carefully



What happens when students underestimate the importance of low and medium risk hazards?

Cumulative Act Effect (Swiss Cheese Model)

- Likens human systems to multiple slices of Swiss Cheese
- Risk of a threat becoming a reality is mitigated by the differing layers and types of defenses



We need to find a way for students to be vigilant and self-motivated to prevent potential laboratory accidents

Opening the Conversation

- Academic environment doesn't currently encourage open reflection of accidents and near misses
- Many students don't have the habit to stop to think about safety

When top-down enforcement of safe practices isn't established or feasible, an supplementary approach is peer-enforced safety

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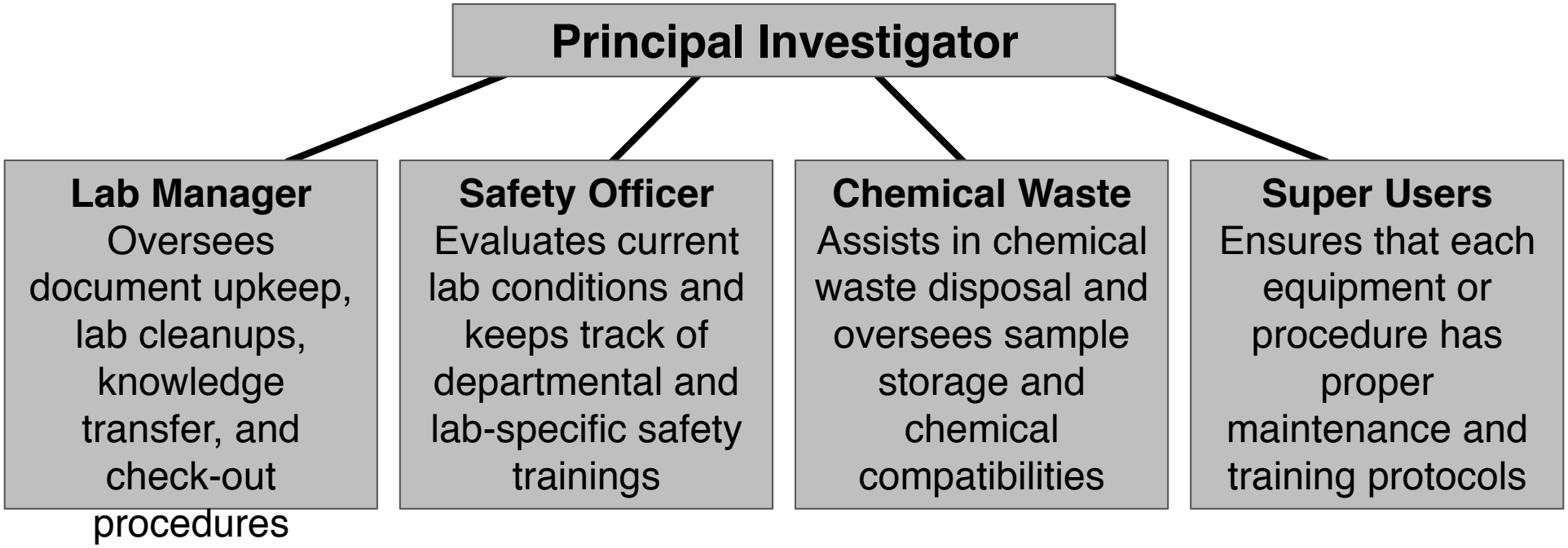
Peer-Enforced Safety

- Many universities are now adopting single or multi-lab safety groups that are organized by students
- These programs are encouraged by administration
- Need widespread participation to be effective
- Usually have a hierarchical nature but students need freedom to design their own leadership structure to create ownership

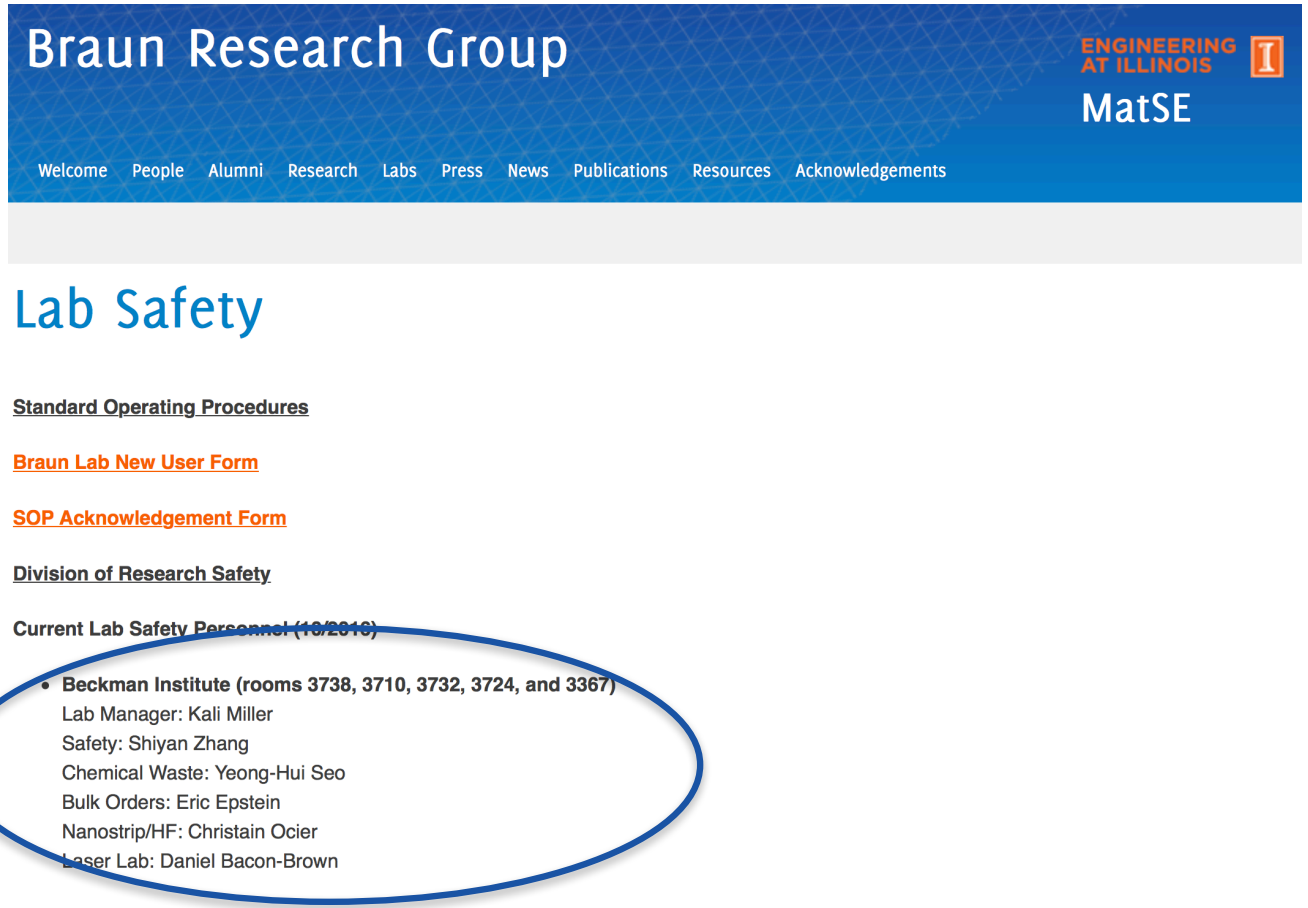
In hands-off academic research labs, chemical safety groups must still be organized and supported by faculty

Lab-Specific Safety Organization



Structure emphasizes individual accountability and important tasks are delegated throughout the lab

Lab-Specific Safety Organization



Braun Research Group

ENGINEERING AT ILLINOIS
MatSE

Welcome People Alumni Research Labs Press News Publications Resources Acknowledgements

Lab Safety

Standard Operating Procedures

Braun Lab New User Form

SOP Acknowledgement Form

Division of Research Safety

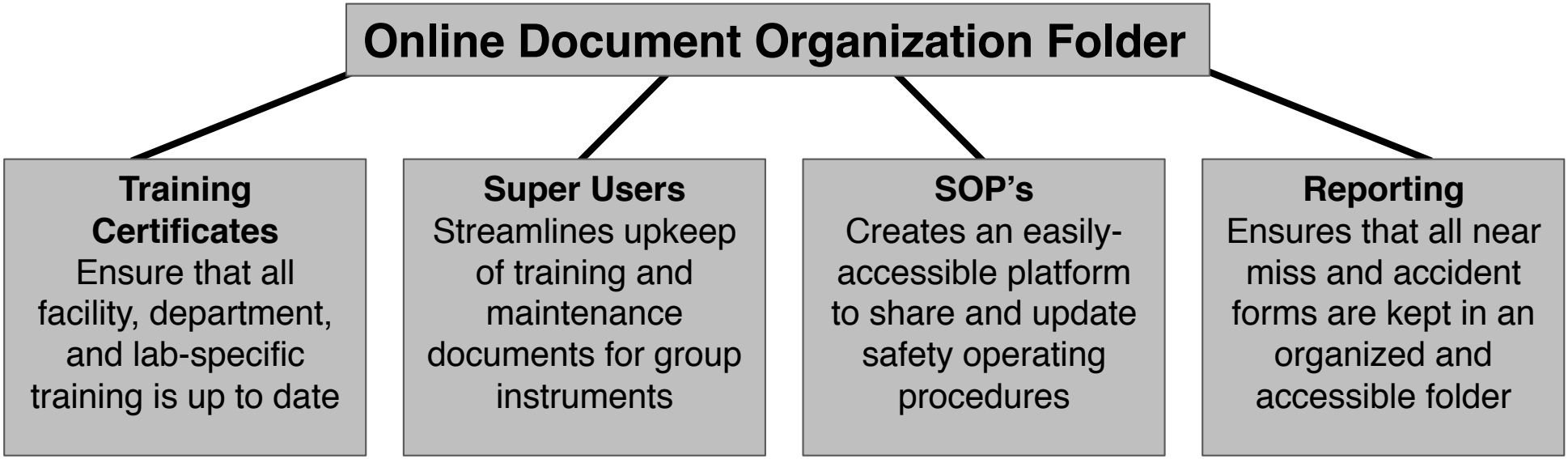
Current Lab Safety Personnel (10/2018)

- **Beckman Institute (rooms 3738, 3710, 3732, 3724, and 3367)**
  Lab Manager: Kali Miller
  Safety: Shiyan Zhang
  Chemical Waste: Yeong-Hui Seo
  Bulk Orders: Eric Epstein
  Nanostrip/HF: Christain Ocier
  Laser Lab: Daniel Bacon-Brown

Structure emphasizes individual accountability and important tasks are delegated throughout the lab

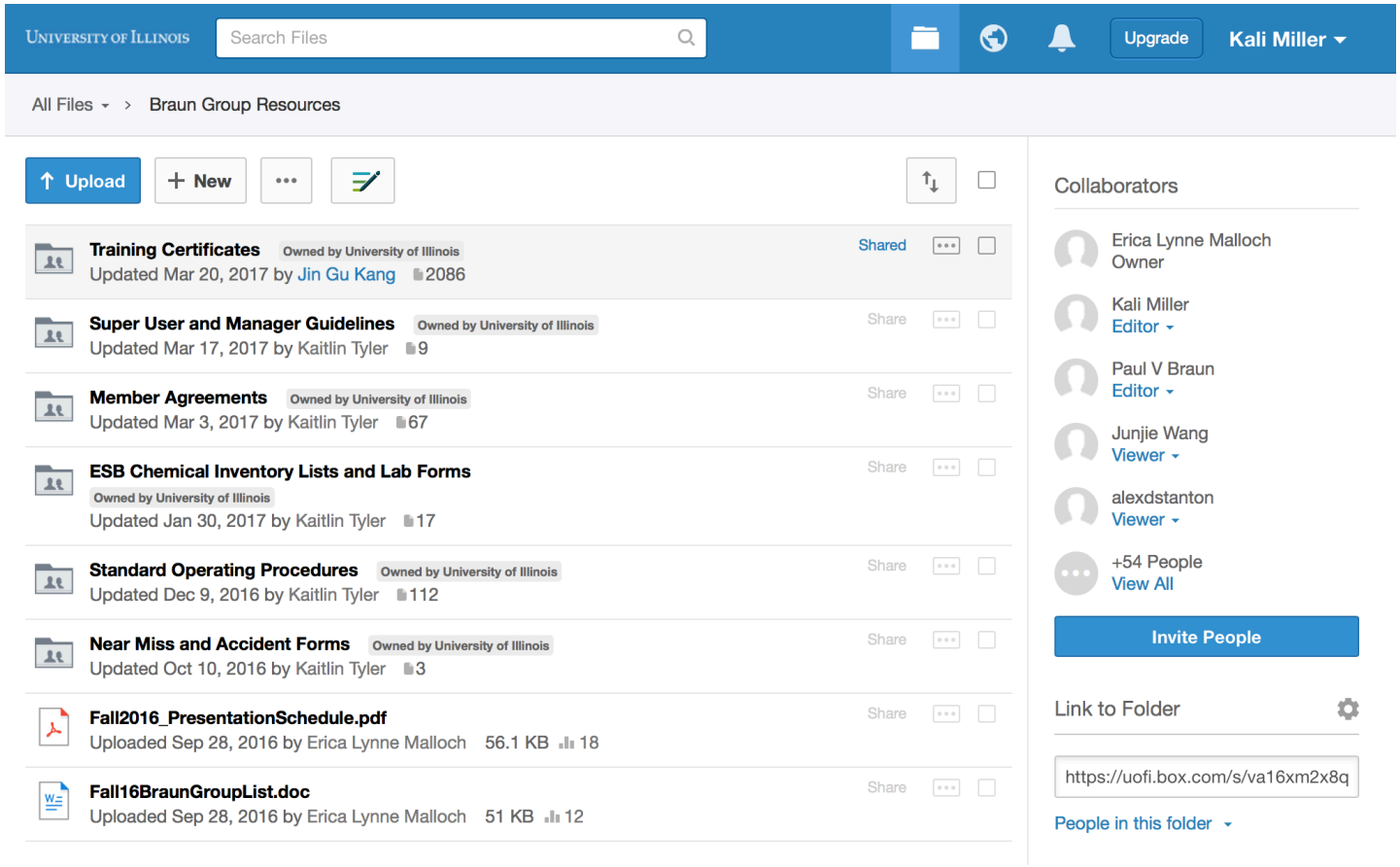
Lab-Specific Safety Organization

Online document organization platforms promote easy access and are an efficient way to keep materials updated



Transfer of knowledge is critical to the sustainability of safe lab practices via student-run programs

Lab-Specific Safety Organization



Transfer of knowledge is critical to the sustainability of safe lab practices via student-run programs

Department-Wide Safety Programs

Need monthly or quarterly meetings for announcements and reflections about:

- Near miss forms and accident reporting
- Anonymous lab feedback that includes both good and bad safety behaviors
- Evaluation of university-required trainings
- Frequent internal lab inspections and cleanups

Opening a recurring and relatable conversation about safety is key to accident prevention in hands-off research labs

Department-Wide Safety Programs

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Chemistry

107 Noyes Laboratory
505 South Mathews Avenue
Urbana, IL 61801

Gregory S. Girolami
Alumni Research Scholar and Head
girolami@scs.uiuc.edu
tel: 217-333-5071

DATE: 17 January 2017

TO: Joint Safety Team: S. Dubowsky (Chair), M. Burke, G. Girolami, M.-J. Han, M. Philip, J. Turner, M. Drummond (DCGSAC contact), S. Desmond (ex officio), B. McCall (*ex officio*), C. Stevens (*ex officio*), group safety officers

FROM: Martin Gruebele and Gregory S. Girolami

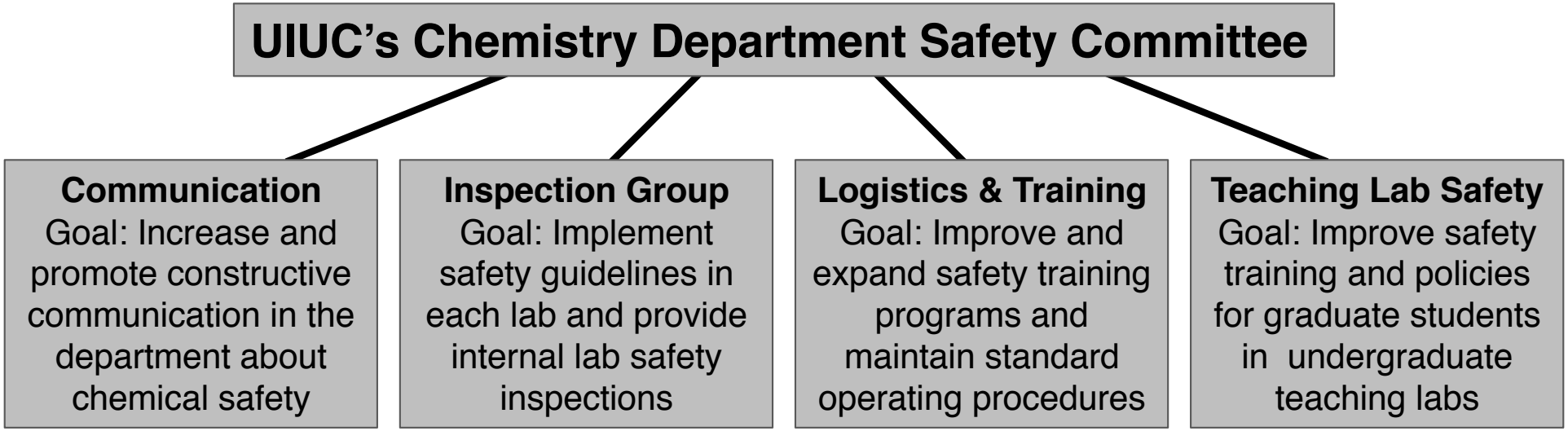
ABOUT: Charge for this year

First, both the past Head and current Head wish to express our appreciation for your willingness to serve on the new Joint Safety Team! Your team will play a key role in increasing our efforts to make Chemistry at Illinois a national leader in laboratory safety. Our vision is that the JST will improve the safety culture and practices of our Department. One guiding principle must be that safety is a shared responsibility: any person who sees another doing something that is unsafe has a responsibility to question the practice. Note that there is no such thing as "potentially unsafe": if there is the potential for an accident to occur, it is unsafe by definition.

Opening a recurring and relatable conversation about safety is key to accident prevention in hands-off research labs

Department-Wide Safety Programs

This type of program can encompass multiple departments, facilities, or research topics depending on the university needs



The organization of leadership will depend on the level of support from the university, college, department, and staff

Outline

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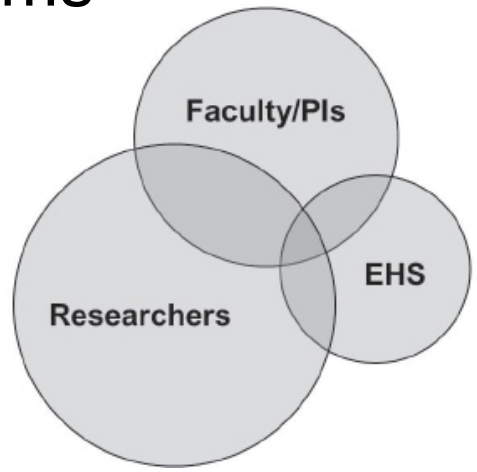
What have we learned and where are we going?

- Open conversation is key in each lab and across similar disciplines
- Many people would be surprised by how motivated students can be to create these programs
- Universities with established safety programs should make their materials available online to facilitate collaboration!



The tipping point in academic research labs: when enough people think it's important then everyone does

Questions?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