

## **Chairs' & Center Directors' Meeting Minutes**

**Date:** February 28, 2011 (1:00 to 2:30 pm)

**Location:** EBU II – Room 443

**Attendees:** Abbaschian, Reza

Bhuyan, Laxmi

Boretz, Mitch

Davidson, Don

Haddon, Robert

Hartney, Pat

Lake, Roger

Matsumoto, Mark

Myung, Nosang

Parker, Linda

Payne, Tom

Ravi

Schultz, Jerry

Stahovich, Tom

**Absent:** Balandin, Alex

Barth, Matt

Bhanu, Bir

Najjar, Walid

Xu, Daniel

The agenda for the meeting is shown in Appendix 1.

### **1. Welcome and call for agenda items - Reza**

Mark opened the meeting since Reza was delayed due to his attendance at an EVCP candidate interview. There were no items added to the agenda.

### **2. Approval of Minutes - Pat**

The revised minutes of the February 14<sup>th</sup> Chairs/Directors meeting were unanimously approved.

### **3. Safety - Maggie**

Maggie made the attached Lab Safety presentation and provided handouts including:

- a Policy on Health, Safety and the Environment,
- Guiding Principles for Implementation and Five Core Functions,
- Roles and Responsibilities for Safety in Labs and Research,
- UCR Lab Safety Checklist and Guidance,
- List of online resources,

- a sample Laboratory Safety Officer job description, and
- two articles concerning the December 2009 lab accident at UCLA.

Recommendations made during the presentation included:

- add Lab Safety Officer (LSO) position to the Lab Safety Roles and Responsibilities document
- standardize safety responsibilities in all BCOE Lab Manager (LSO) job descriptions
- provide a checklist to faculty and chairs on their specific responsibilities, frequencies of reviews, inspections, etc.
- provide safety training to all incoming BCOE faculty and a process to assure that existing faculty have received this training
- add a safety resources page to the BCOE website
- establish a protocol of when to report an incident and to whom

#### **4. Faculty Recruitment - Chairs**

Jerry reported that Bioengineering has interviewed two candidates and that five more are coming.

Laxmi stated that five CSE candidates have been interviewed so far and three more interviews are scheduled. CSE expects to make an offer to a candidate by the end of the week.

Tom S. indicated that ME has reviewed all applicants and will schedule interviews soon.

Roger reported that EE has interviewed three candidates, two in Computer Engineering and one in Controls. More EE candidates will be interviewed.

Nosang stated that CEE recently interviewed the 6<sup>th</sup> of its 14 candidates. Three interviews per week are currently scheduled. Reza welcomed Nosang as the new CEE Chair.

Reza reminded Chairs that, except for CEE, all BCOE recruitments are at the Assistant Professor level. The EVCP needs to approve requests from departments (other than CEE) to interview Associate or Full Professor candidates. Reza noted that it would take time to process an offer at this level since it would have to be approved by CAP and the EVCP. Reza stated that he can't guarantee that such an offer would be approved by campus. If it was not approved, there might not be enough time to make an offer to another candidate and the opportunity to hire might be lost. As such, departments should only consider outstanding Associate or Full Professor candidates. In comparison, offers at the Assistant Professor level can be processed in one day since Deans have this hiring authority.

#### **5. Initial Complements – Pat**

Pat stated that BCOE ended FY 09/10 with a deficit of about \$4M when Initial Complement (IC) commitments are included. Reza noted that the average IC for BCOE faculty hires is about \$700K. If BCOE is able to hire 11 new faculty this year, their IC amounts will add about \$7-8M to BCOE's deficit. In addition, the impact of reduced FY 11/12 UC state funding on BCOE is unknown at this time. As such, the Dean's Office has been retaining Indirect Cost Recovery (ICR) return funding for the past two fiscal years and has not allocated this year's Instructional Equipment funding to departments. After discussion, it was agreed that the Dean's Office will release IDC funds to PIs at the previous 10% (of BCOE's net IDC return) rate but the departmental matching share will be reduced from 10% to 5%. It was also agreed that departments can request Instructional Equipment funding this year up to the amount allocated to them the previous year. Pat will send last year's Instructional Equipment allocation information to Chairs. Instructional Equipment requests should be sent to Reza (with a copy to Pat). Reza emphasized that departments should continue to identify high quality faculty candidates but that chairs should be cost-conscious when negotiating Initial Complements.

Lastly, it was noted that most BCOE departments need more TA funds. Reza responded that the College's TA funding from campus hasn't changed over the last 10+ years. Reza expects that BCOE will be able to generate enough additional undergrad workload to justify additional TA funding in the next couple of years.

## **6. Graduate Education – Mark**

Mark distributed the latest summary (dated 2/28/11) of graduate student applications, admits and accepts. Mark noted that several BCOE departments are not getting offers out. There are 21 domestic and 32 international grad student offers in process. Laxmi stated that CSE's PhD recruitment target for 2011/12 should be increased by 5. It was also noted that CSE is receiving \$5,000 in fellowship funding from the Grad Division for each self-supporting international MS student. This is a Grad Division experiment with the CSE department only and may not be continued.

## **7. Other Matters**

No other matters were discussed.



# **Chairs' & Center Directors' Meeting**

## **February 28, 2011**

### **Agenda**

Engineering Building Unit II – Room 443

- |    |  |        |
|----|--|--------|
| 1. | Welcome - Request for Agenda Items from the Floor  | Reza   |
| 2. | Approval of Minutes from February 14, 2011 Meeting | Pat    |
| 3. | Safety   | Maggie |
| 4. | Faculty Recruitment                                | Chairs |
| 5. | Initial Complements                                | Pat    |
| 6. | Undergraduate Education                            | Ravi   |
| 7. | Graduate Education                                 | Mark   |
| 8. | Other Matters                                      |        |

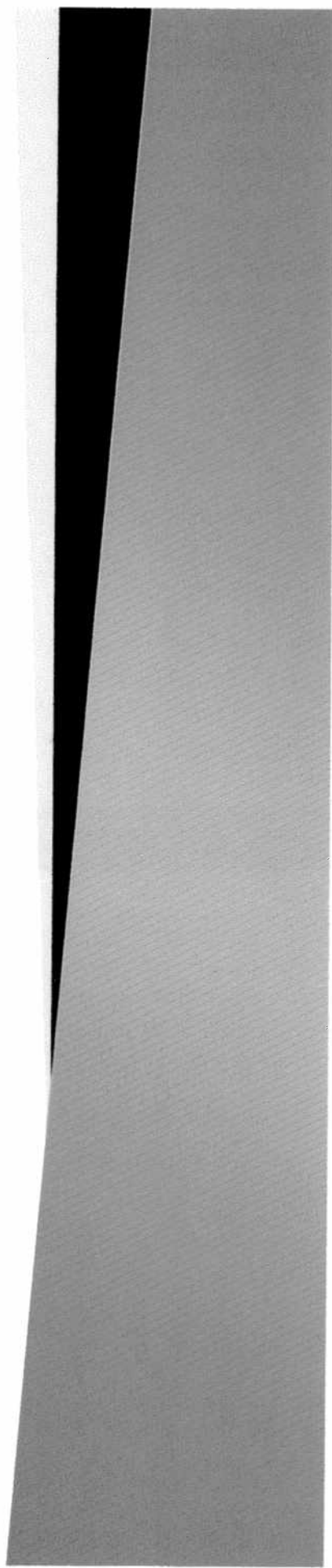
The next scheduled meeting will be

# **Monday – March 14, 2011**

*Please note: Meetings will be held in EBU II – Room 443*

# Safety in Research Labs

Bourns College of Engineering Chairs' Meeting  
February 28, 2011  
Maggie Souder, x2-1241




# Background: UCOP Policy

The University of California is committed to achieving excellence in providing a healthy and safe working environment, and to supporting environmentally sound practices in the conduct of University activities. It is University policy to comply with all applicable health, safety, and environmental protection laws, regulations and requirements.

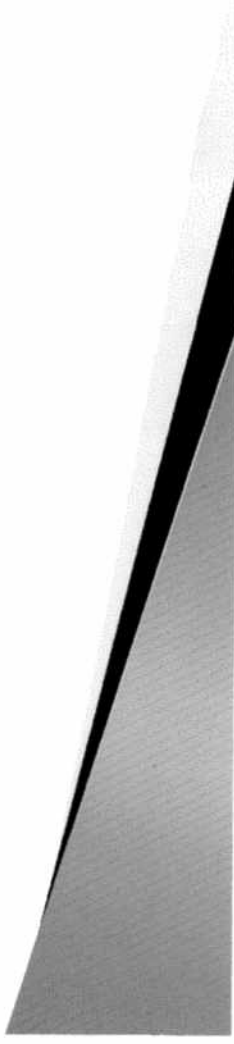
To meet this standard of excellence, the University implements management initiatives and best practices to systematically integrate health, safety, and environmental considerations and sustainable use of natural resources into all activities. All University activities are to be conducted in a manner that ensures the protection of students, faculty, staff, visitors, the public, property, and the environment.

*“The University’s goal is to prevent all workplace injuries and illnesses, environmental incidents, and property losses or damage. **Achieving this goal is the responsibility of every member of the University community. Supervisors have particular responsibility for the activities of those people who report to them.**”*

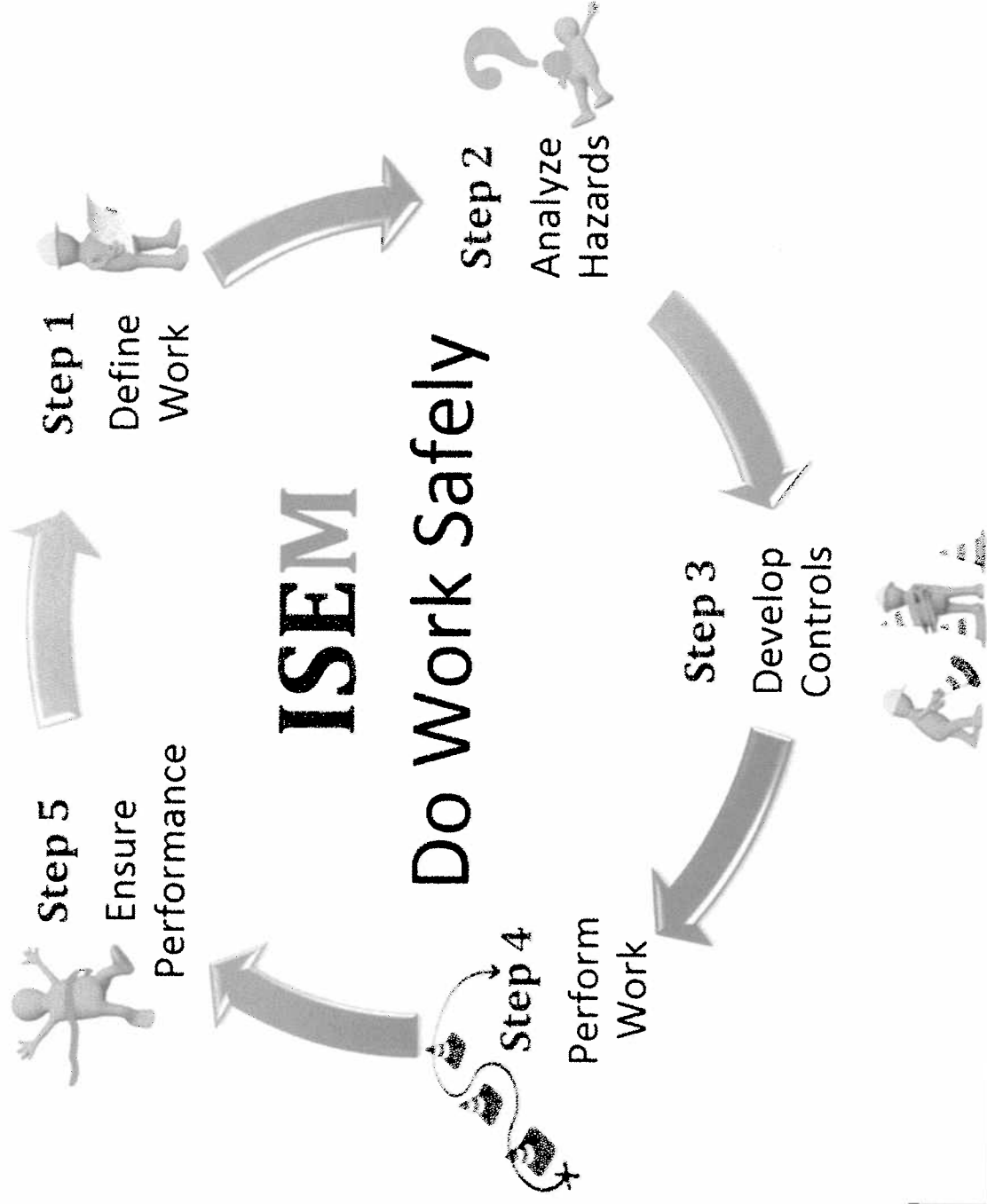


# Background: Policy, 9 Principles

1. Involvement of Faculty, Staff, and Students
2. Management Responsibility
3. Clear Roles and Responsibilities
4. Ensure Competence Commensurate with Responsibilities
5. Balanced Priorities
6. Identify Standards and Requirements
7. Stakeholder Participation
8. Hazard Controls for Specific Activities
9. Obtain Prior Authorization



# Background: Policy, 5 Core Functions





# Background: Implementation

- ▶ Policy clearly communicated
- ▶ Expressed expectations & commitments
- ▶ Use objectives and performance tracking to achieve goals
- ▶ Use system metrics at operational/source level
- ▶ Annual report on progress to President & Regents



# UCR Safety Audit

Requested by UCOP the report recommends:

- ▶ Communicate commitment and clarify roles & responsibility for laboratory safety
- ▶ Completion of lab inspections
- ▶ Chemical Hygiene Plan updates
- ▶ Hazard-specific training for lab personnel



# Individual Accountability

- ▶ Roles & Responsibilities for Safety in Labs & Research stresses accountability at all levels
- ▶ Important because:
  - UCR Laser fire – September 2008
  - UCLA researcher fatality – December 2008
  - UCR Microwave fire – December 2010
  - UCR Autoclave malfunction – January 2011
  - UCR Electrical fatality – February 2011



# Individual Accountability: Makes sense because can...

- ▶ Create safety culture
- ▶ ID potential problems
- ▶ Improve data quality/control
- ▶ Increase safety awareness/behavior
- ▶ Increase support staff knowledge
- ▶ Immediately self-correct
- ▶ Highlight critical issues



# Individual Accountability: Expectations

You are probably doing this already! However, items that may be flying under the radar include:

- ▶ Chemical Hygiene Plans
- ▶ Training & documentation
- ▶ Lab reviews
- ▶ Chemical inventory



# Resources

- ▶ Resources page
- ▶ CHPs: model plan online, EHS consult, LSOs
- ▶ Training: assessment tool, online/in-person EHS courses, campus LMS, EHS consult, LSOs
- ▶ Lab reviews: checklist & guidance, online training, EHS consult, BCOE Dean's office assistance
- ▶ Chemical inventory: online, LSOs, EHS consult
- ▶ BCOE Safety & Facilities Coordinator



# QUESTIONS?



# Examples

- ▶ New professor is ready to begin operations...
- ▶ New lab employee needs training...
- ▶ It's time for a new LSO to perform the annual lab review...





# Safety in Research Labs

Bourns College of Engineering – February 28, 2011 Chairs' Meeting

## CONTENT

- Background
  - UCOP Policy
  - Audit Report – relevant recommendations and campus responses
- Individual safety accountability and expected results
- Key safety issues (see also Roles & Responsibilities for Safety in Labs & Research)
  - Chemical Hygiene Plans
  - Training & documentation
  - Lab review
  - Chemical inventory
- Resources

## HANDOUTS:

- Policy on Health, Safety and the Environment
- Nine Guiding Principles for Implementation and Five Core Functions
- Roles & Responsibilities for Safety in Labs & Research
- UCR Lab Safety Checklist and Guidance document
- List of online resources
- Sample Laboratory Safety Officer job description
- Articles
  - Kemsley, J. N. (2009, August 3) Learning From UCLA. *Science & Technology*, 87, 31, 29-31, 33-34)
  - Christensen, K. (2010, March 13) Serious lab accident at UCLA in 2007 was not reported, *Los Angeles Times*

# Safety in Research Labs

Bourns College of Engineering – February 28, 2011 Chairs' Meeting

## POLICY ON MANAGEMENT OF HEALTH, SAFETY AND THE ENVIRONMENT

The University of California Policy on Management of Health, Safety and the Environment<sup>1</sup> was formally established on October 28, 2005 by President Dynes with a goal of systematically integrating safety and environmental principles into all University activities. The Policy was developed by the campus EHS directors in consultation with the Academic Senate, the Office of Research Policy, Administrative Vice Chancellors, the Office of General Counsel, and other UC functional offices. More recently, President Yudof emphasized his personal commitment in a letter dated August 10, 2009 and asked that individuals support the Policy and associated Guiding Principles.

The University of California is committed to achieving excellence in providing a healthy and safe working environment, and to supporting environmentally sound practices in the conduct of University activities. It is University policy to comply with all applicable health, safety, and environmental protection laws, regulations and requirements.

To meet this standard of excellence, the University implements management initiatives and best practices to systematically integrate health, safety, and environmental considerations and sustainable use of natural resources into all activities. All University activities are to be conducted in a manner that ensures the protection of students, faculty, staff, visitors, the public, property, and the environment.

*"The University's goal is to prevent all workplace injuries and illnesses, environmental incidents, and property losses or damage. Achieving this goal is the responsibility of every member of the University community. Supervisors have particular responsibility for the activities of those people who report to them."*

The Policy is supported by a document entitled, Guiding Principles to Implement the University of California Policy on Health, Safety and the Environment<sup>2</sup>. This document contains nine guiding principles and five core functions that together along with the Policy and implementation requirements comprise an Integrated Safety and Environmental Management (ISEM) system.

---

<sup>1</sup> [http://www.ucop.edu/ucophome/coordrev/policy/PP102805\\_HSE\\_Policy.pdf](http://www.ucop.edu/ucophome/coordrev/policy/PP102805_HSE_Policy.pdf)

<sup>2</sup> [http://www.ucop.edu/ucophome/coordrev/policy/PP102805\\_HSE\\_principles.pdf](http://www.ucop.edu/ucophome/coordrev/policy/PP102805_HSE_principles.pdf)

# Safety in Research Labs

Bourns College of Engineering – February 28, 2011 Chairs' Meeting

## NINE GUIDING PRINCIPLES AND FIVE CORE FUNCTIONS<sup>3</sup>

### NINE GUIDING PRINCIPLES

1. Involvement of Faculty, Staff, and Students – All employees are responsible for their individual safety. Each must integrate safety, health, and environmental standards into their work and for ensure communication up and down the management line with others.
2. Management Responsibility – Those directing activities or others are responsible for safety and environment protection and for adhering to the Policy.
3. Clear Roles and Responsibilities – the University will establish clear lines of authority and responsibility.
4. Ensure Competence Commensurate with Responsibilities – Managers will ensure employees are trained to have the knowledge, skills, experience, and abilities to carry out responsibilities.
5. Balanced Priorities – Resources will be allocated to safety and environment protection and will be made a priority when activities are planned/performed.
6. Identify Standards and Requirements – Activity hazards and protective requirements and their implementation will be evaluated by employees and supervisors before work begins. EH&S will provide assistance and consultation.
7. Stakeholder Participation – The University will obtain input from interested parties (e.g., regulatory agencies, funding organizations, etc.)
8. Hazard Controls for Specific University Activities – Controls to mitigate hazards and environmental impact will be employed.
9. Obtain Prior Authorization – Persons responsible for an activity must obtain authorization when necessary (e.g., high risk operations, permit required, review committee action needed).

### FIVE CORE FUNCTIONS

1. Defining the Scope of Activities – goals and programs are translated into activities, expectations are set, tasks are identified and prioritized, and resources are allocated.
2. Analyzing the Hazards – hazards and environmental aspects associated with the activities are identified, analyzed, and categorized.
3. Developing and Implementing Hazard and Operational Controls – applicable standards and requirements are identified and agreed upon, controls to prevent/mitigate hazards and aspects are identified, the safety and environmental parameters are established and controls are implemented.
4. Performing Activities within Established Controls – readiness is confirmed and activities are performed safely and in compliance with applicable regulations and policies.
5. Providing Feedback and Assuring Continuous Improvement – the appropriate parties obtain feedback on the adequacy of controls, identify opportunities for improving the definition and planning of activities, conduct departmental and independent oversight and, if necessary, participate in regulatory enforcement actions. As a complement to departmental management, the campus EH&S offices may be contacted to provide safety and environmental assistance, consultation, and independent oversight functions.

---

<sup>3</sup> Note: the Guiding Principles are paraphrased; the Guiding Principles in their entirety and the Five Core Functions can be found at [http://www.ucop.edu/ucophome/coordrev/policy/PP102805\\_HSE\\_principles.pdf](http://www.ucop.edu/ucophome/coordrev/policy/PP102805_HSE_principles.pdf)

# Safety in Research Labs

Bourns College of Engineering – February 28, 2011 Chairs' Meeting

## ONLINE RESOURCES

- UCOP Policy on Management of Health, Safety and the Environment:  
[http://www.ucop.edu/ucophome/coordrev/policy/PP102805\\_HSE\\_Policy.pdf](http://www.ucop.edu/ucophome/coordrev/policy/PP102805_HSE_Policy.pdf)
- Guiding Principles to Implement the University of California Policy on Health, Safety and the Environment: [http://www.ucop.edu/ucophome/coordrev/policy/PP102805\\_HSE\\_principles.pdf](http://www.ucop.edu/ucophome/coordrev/policy/PP102805_HSE_principles.pdf)
- Integrated Safety and Environmental Management: <http://www.ehs.ucr.edu/safety/ISEM/isem.html>
- Model Chemical Hygiene Plan: [www.ehs.ucr.edu/forms/chp.doc](http://www.ehs.ucr.edu/forms/chp.doc)
- Accounting of departmental Chemical Hygiene Plans:  
<http://www.ehes.ucr.edu/laboratory/CHP/currentchps.html>
- Training Assessment Tool: <http://ehs.ucr.edu/training/assessment.html>
- EHS Courses and Tutorials: <http://www.ehs.ucr.edu/training/online/>
- EHS In-person Course Schedule: <http://www.ehs.ucr.edu/training/courses/indexlms.html>
- Campus Learning Management System (LMS): <http://ucrlearning.ucr.edu/>
- UC Enterprise Risk Management Information System: <http://www.ucop.edu/riskmgt/erm/>
- Chemical inventory Database: <http://ucriverside.ecompliance.net/>

# UCR Lab Safety Checklist and Guidance

---

## 2011 Lab Safety Inspection Checklist:

### Environmental: Hazardous Waste:

1. Is all hazardous waste stored at or near the point of hazardous waste generation and under the control of a responsible person (PI and/or the person generating the waste)?
2. Are the hazardous waste containers compatible with the contents, in good condition?
3. Are all liquid hazardous waste containers provided with secondary containment?
4. Are the hazardous waste containers properly labeled with the UCR Waste Tag?
5. Are the hazardous waste containers CLOSED except when waste is being added?
6. Are all waste stored so incompatible wastes are not adjacent (in same tub)?
7. Is the waste inspected weekly?

### Safety

8. Are aisles and exit doors clear and accessible?
9. Are emergency showers, fire extinguishers, spill kits and other emergency equipment accessible?
10. Are emergency showers & eyewashes checked at least monthly?
11. Are occupants wearing safety glasses, lab coats, or appropriate gloves/PPE while working with potentially hazardous materials?
12. Is there any evidence of eating or drinking in the laboratory?

### Industrial Hygiene

13. Is the bottom slot of the chemical fume hood unobstructed?
14. Is work within the chemical fume hood done at least 6 inches from the front of the hood?

### Biosafety

15. Are bags of solid biological waste (petri dishes, gloves, Falcon tubes, etc.) in appropriate biohazardous waste collection containers?
16. Have full bags of solid biological waste been autoclaved and have autoclave indicator tape been attached to the bags?

### Radiation Protection

17. Are radioactive materials properly secured (locked refrigerator, locked freezer, locked box, etc.)?
18. Are radiation laboratories locked when unoccupied?

### Hazardous Materials Storage

19. Are gas cylinders secured (chained)?
20. Are containers of hazardous materials segregated by hazard class with the locations appropriately labeled?
21. Are containers for holding or dispensing hazardous chemicals or materials adequately labeled?

## Guidance Documentation

### Environmental: Hazardous Waste

1. **Is all hazardous waste stored at or near the point of hazardous waste generation and under the control of a responsible person (PI and/or the person generating the waste)?**

**Guidance:** Laboratory waste accumulation areas must be located near the point of waste generation and under control of the person generating the waste. If you have to go through a hallway or other public access area to get to the hazardous waste accumulation area it cannot be considered at or near the point of hazardous waste generation

**Reference:** 22CCR §66262.34 (e)

2. **Are the hazardous waste containers compatible with the contents, in good condition?**

**Guidance:** Waste containers should be of seamless construction and not cracked or damaged. Incompatible wastes cannot be stored in the same secondary containment so that in the event of commingling (from breakage or other localized spill or release) there will be no reactivity issue. Typically, glass or plastic bottles of various sizes are used, with original labels fully obscured of their labeling and wording. Containers must be compatible with hazardous waste stored in them, e.g. Hydrofluoric acid not stored in glass container, corrosives not in metal containers. Container materials must be compatible with the hazardous waste stored so as to avoid reactions.

**Reference:** 22CCR §66262.3(d); 22CCR §66262.3 (e)(1)(A); 22CCR §66265.176

3. **Are all liquid hazardous waste containers provided with secondary containment?**

**Guidance:** State law provides secondary containment for all liquid hazardous waste storage areas. Incompatible wastes should be stored in different secondary containers.

**Reference:** 22CCR§66265.177

4. **Are the hazardous waste containers properly labeled with the UCR Waste Tag?**

**Guidance:** Containers used for hazardous waste must be properly and clearly labeled. All of the legal requirements can be accommodated with the proper use of the UCR Waste Tag System. The label requirements include: 1) The Start Date of Accumulation, 2) the words "Hazardous Waste", (3) the container's contents written out (e.g. "WASTE OIL, no formulas, no abbreviations"), (4) the hazard classification associated with the waste (e.g. "TOXIC"), 5) name and address of the person producing the waste. Original container labels must be defaced and obscured or removed.

**Reference:** 22CCR §66262.34 (f)

5. **Are the hazardous waste containers CLOSED except when waste is being added?**

**Guidance:** A container holding hazardous waste shall always be closed during accumulation and storage, except when it is necessary to add waste. An expensive but compliant alternative to the 'funnel' in a bottle is the "ECO Funnel" or Nalgene

Safety Waste Systems Funnel. A container holding hazardous waste shall not be opened, handled, transferred or stored in a manner which may rupture the container or cause it to leak.

**Reference:** 22CCR§66265.173a

**6. Are waste containers stored so incompatible wastes are not adjacent (in same tub)?**

**Guidance:** A container holding a hazardous waste that is incompatible with any waste or other materials transferred or stored nearby in other containers, piles, open tanks, or surface impoundments shall be separated from the other materials or protected from them by means of a dike, berm, wall, or other device.

**Reference:** 22CCR§66265.17

**7. Is the waste inspected weekly?**

**Guidance:** The PI/Supervisor or designee of the facility generating the waste shall inspect areas used for container storage, at least weekly, looking for proper labeling, incompatible segregation, leaking containers and for deterioration of containers caused by corrosion or other factors

**Reference:** 22CCR§66265.174

**Safety**

**8. Are aisles and exit doors clear and accessible?**

**Guidance:** The CA Fire Code emphasizes the importance of keeping the evacuation routes clear and useable at all times, i.e., "maintained free of all obstructions or impediments to full instant use" In emergencies, a few seconds delay can make a big difference in whether people are able to safely evacuate. When an emergency occurs, there is no time to clear equipment out of the way. Smoke, fumes, or carbon monoxide can overcome people attempting to evacuate. Corridors should also be kept clear and accessible.

**Reference:** California Fire Code, 8CCR§3225

**9. Are emergency showers, fire extinguishers, spill kits and other emergency equipment accessible?**

**Guidance:** No equipment should be blocking access to showers, fire extinguishers, spill kits, electrical panels, etc. No equipment should be placed on the floor under an emergency shower. Commonly, trash cans or other materials are inappropriately placed underneath showers making it difficult if not impossible to use when there is no time to waste. The showers are tested monthly by campus plumbers: They will be unable to conduct the test if the area underneath is blocked.

**Reference:** 8CCR §5162, 8CCR §6151, 22CCR66265.32(c), 8CCR §5191A

**10. Are emergency showers & eyewashes checked at least monthly?**

**Guidance:** If eyewash is connected to working drain, a person in the lab should be assigned to run water through it once a week for one minute. This will flush out bacteria that may grow in stagnant water. This is based on the ANSI standard. The campus plumbers will test all eyewash units that are combined with showers monthly. They should have a tag on the combined units where the records are maintained.

**Reference:** ANSI Z358.1, 8CCR §5162

**11. Are occupants wearing safety glasses, lab coats, or appropriate gloves/PPE while working with potentially hazardous materials?**

**Guidance:** Prudent practice, UC policy and UCR Lab Safety Rules require wearing eye protection in all labs and shops when and where potential eye hazards exist whether you are working or visiting and observing. Many facilities require eye protection at all times and post eye protection required signs on the doors in the hazardous areas. Cal/OSHA requires employers to provide employees with the appropriate eye protection.

**General requirements.**

- Each affected employee shall use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.
- Each affected employee shall use eye protection that provides side protection when there is a hazard from flying objects. Refer to your departmental Laboratory Safety Officer for more information on selecting the appropriate type of eye protection and ordering prescription safety glasses.

**Lab Coats.** Lab coats are required by UCR's radioactive materials license while an employee is working with unsealed radioactive materials. For work with biological materials, lab coats are required for Biosafety Level 2 (BL2) laboratories and highly recommended for Biosafety Level 1 (BL1) laboratories. They are highly recommended for work with most chemicals. It may also be necessary to wear chemically resistant aprons with sleeves for work with certain types of acids.

**Gloves.** Gloves (e.g. nitrile, vinyl, latex) are required for all work with unsealed radioactive materials and biological work. For chemical work, the glove must be chosen for good resistance to the chemical being used. Thin disposable nitrile, latex and vinyl gloves have only incidental contact resistance to many lab chemicals. Check with the glove manufacturer for details of their chemical resistance.

**Reference:** Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, UC Policy on the Management of Health, Safety and the Environment, UCR Laboratory Safety Rules, 8CCR §3382; Cal/OSHA Lab Standard 8CCR §5191

**12. Is there any evidence of eating or drinking in the laboratory?**

**Guidance:** Eating, drinking, and cosmetic application is not allowed in laboratories by the UCR radioactive materials license condition, the California Occupational Safety and Health Administration, and UCR Lab Rules to prevent ingestion of hazardous materials. Surface contamination may also be present on desks, computer keyboards, and phones. Gloves must be removed before leaving the lab. Hands need to be washed after leaving the lab or shop.

**Reference:** UCR Radiation Safety Required Procedures for Radiation Protection, UCR Lab Safety Rules, 8CCR §3368

**Industrial Hygiene**

**13. Is the bottom slot of the chemical fume hood unobstructed?**

**Guidance:** If the bottom slot of the fume hood is blocked more than 30% (by bottles or equipment within 6 inches of the back bottom slot), it is obstructed. There are 2 or 3



slots in the back of the fume hood which distribute the air flow evenly to the back of the hood and prevent turbulence which leads to poor containment. All large pieces of equipment can be mounted on small blocks, which allow the air to flow under it into the bottom slot. If the bottom slot is blocked more than 30%, there will not be good airflow and containment of chemicals at the front of the hood along the hood surface where the chemical work is usually performed. Video Guidance

**Reference:** 8CCR §5154.1

- 14. Is work within the chemical fume hood done at least 6 inches from the front of the hood?**

**Guidance:** All work with chemicals should be conducted 6 inches back from the front of the fume hood.

**Reference:** 8CCR §5154.1

#### Biosafety

- 15. Are bags of solid biological waste (petri dishes, gloves, Falcon tubes, etc.) in appropriate biohazardous waste collection containers?**

**Guidance:** Solid medical or biohazardous waste must be contained at the point of generation in red biohazard bags (orange biohazard bags are illegal in California), separate from other types of waste. Prior to placing waste in a red bag, write on the bag the building and room number where the waste was created with a marker. Biohazard bags must be tied closed and placed in rigid containers with a tightly fitting lid, which must be labeled with "Biohazardous Waste" or "Biohazard" and the International Biohazard Symbol on the lid and sides, visible from any direction. It is recommended that medical waste be placed in double red bags to prevent spills if the primary bag fails. Note: Waste containers must be covered by a tight-fitting lid that is removed only while the container is being filled or emptied. The waste container should only be filled to the point where the lid fits tightly at all times. The waste containers are never to be overfilled. Biohazardous & Medical Waste Disposal Requirements

**Reference:** California Medical Waste Management Act

- 16. Have full bags of solid biological waste been autoclaved and have autoclave tags been attached to the bags?**

**Guidance:** Bags of biohazardous waste must be autoclaved prior to being placed into the regular building dumpster. Waste that has been treated must be labeled with autoclave indicator tape. should be placed in the autoclave with their associated bag. There is a bar at the top of the tag that changes color to indicate that it has been exposed to steam. Tag numbers, date, time and temperature of the autoclave run, and the processors name must be recorded in an autoclave log book maintained by the lab. Bags should not be left in the open lab, hallways, or kitchen areas unless they have been autoclaved and tagged.

**Reference:** California Medical Waste Management Act

#### Radiation Protection

- 17. Are radioactive materials properly secured (locked refrigerator, locked freezer, locked box, etc.)?**

**Guidance:** All stock radioactive material must be stored in a locked container, which cannot be easily removed from the lab (i.e. a refrigerator). The stocks must be

locked away at all times, except when in use, and at those times there must be a constant surveillance over the material. When a radiation worker's surveillance over the radioactive material is the means for security, they must challenge all unknown persons entering the lab.

Unsecured stock radioactive material can be placed back into the locked container.

**Reference:** UCR Radiation Safety Required Procedures for Radiation Protection

**18. Are radiation laboratories locked when unoccupied?**

**Guidance:** All radiation laboratories will be locked when unattended for extended periods. Also, at the stock radioactive material storage location there must be an up to date inventory of the stock radioactive material. As for unattended radioactive materials, an "experiment in progress" sign should be placed near the experiment along with tape with the radiation symbol on it as a posting for the experiment.

**Reference:** UCR Radiation Safety Required Procedures for Radiation Protection

**Hazardous Materials Storage**

**19. Are gas cylinders secured (chained)?**

**Guidance:** All gas cylinders must be secured at about 1/3 and 2/3 the height of the cylinder. If a cylinder falls, it may shear off its valve and the escaping high pressure gas has been known to propel the cylinder like a rocket that can smash through masonry walls. Use two chains or straps to secure cylinder to a bench or wall. Whenever the cylinder does not have a regulator on it, the cap must be kept on to protect the valve. Do not drop or strike cylinders against each other. Segregate flammable gas cylinders from oxygen cylinders when stored together. Usually highly corrosive, toxic and pyrophoric gases are in gas cabinets. Segregate empty and full cylinders and label empty cylinders.

**Reference:** California Fire Code, UC Best Practices

**20. Are containers of hazardous materials segregated by hazard class with the locations appropriately labeled?**

**Guidance:** Chemicals must be kept to minimize the likelihood of a reaction while in storage and to warn users of their hazards. Guidance on chemical storage and segregation is found through both the fire code and department of transportation safety information.

**Reference:** California Fire Code

**21. Are containers of hazardous materials labeled with full chemical names and hazards, or use a standardize, lab wide abbreviation system with abbreviations, full chemical names and hazards posted?**

**Guidance:** Chemicals in their original bottles, must have their labels maintained.

Chemicals transferred to a second container must be labeled with full chemical names and hazards (e.g. ethanol, flammable, toxic) or use an abbreviation whci is posted in a list of abbreviations with full chemical names and hazards (e.g. EtOH; ethanol, flammable, toxic). Complete labels are available for common chemicals from commercial sources. An example of labels using abbreviation lists is on the page at: <http://www.ehs.ucr.edu/laboratory/>.

**Reference:** 8CCR §5191; 8CCR §5191A for labs & 8CCR §5194 for non-labs

# Safety in Research Labs

Bourns College of Engineering – Chairs' Meeting

February 28, 2011

---

## DEVELOPMENT ENGINEER / LABORATORY MANAGER JOB DESCRIPTION

- 25% Administrative, and Supervision

... Maintain computerized inventory of all reagents in teaching and research laboratories and MSDS. Maintain records of faculty, staff, and student' participation in Environmental Health and Safety training seminars.

- 25% Environmental Health & Safety and Staff training

Serve as chair of the Bioengineering Safety Committee, and as the Chemical Hygiene Officer and Hazard Communication Officer for the Department of Bioengineering. Direct and advise faculty, staff, and students on the proper handling and disposal of hazardous chemicals, and laboratory safety. Establish and implement safety procedures for faculty, staff, and students working in instructional and research laboratories. Conduct periodic safety inspections of instructional and research laboratories. Oversee the safe operation of the teaching and research laboratories, follow university guidelines in the safe use and disposal of chemicals used in the shop. Provide safety trainings for department staff.

# Roles & Responsibilities for Safety in Labs & Research

---

**Individual Responsible**  
**Person working in the lab or field**

*Oversight provided by*  
**Faculty and other Supervisors**

## **Actions & Guidance**

1. Know & follow the UCR Laboratory Safety Rules and department Chemical Hygiene Plan
2. Create, improve and follow written procedures (SOPs)
3. Identify & report hazards to your supervisor and/or EH&S
4. Use Engineering Controls
5. Wear Appropriate Personal Protective Equipment
6. Ask questions of more experienced personnel
7. Provide guidance to less experienced personnel
8. Report injuries to supervisor
9. Cleanup spills promptly
10. Store chemical by hazard class
11. Store chemical in secondary containers
12. Label containers
13. Label storage locations
14. Update campus chemical inventory when new chemical arrive
15. Update campus chemical inventory when containers are emptied
16. Provide supervisor with suggestions for improving lab safety
17. Follow the Five Steps in ISEM
18. Review Material Safety Data Sheets and other safety data prior to working with unfamiliar substances
19. Report safety concerns to your supervisor promptly
20. Use creativity to enhance safety
21. Do not damage the environment
22. Manage hazardous waste properly
23. Prevent fume hood emissions of hazardous materials including strong acids
24. etc...

**Individual Responsible**  
**Faculty and other Supervisors**

*Oversight provided by*  
**Department head (Chair, Director)**

## **Actions & Guidance**

1. Obtain approvals from the relevant committees for using biohazards, radiation, animal subjects, human subjects, class 3b or 4 lasers, select agents, controlled substances, chemical warfare agents, etc, prior to beginning work, adding personnel or making changes from the approved activity.
2. Provide resources for your people to work safely, measure and reward safety performance
3. Control access to your areas with high hazard materials, conditions or activities.
4. Understand, review, modify and approve
5. activities and safety measures in your space

6. Prior to ordering or working with regulated carcinogens, discuss your plans with EH&S and provide information needed to comply with the regulatory reporting requirements (8CCR §5203) and to obtain the necessary training.
7. Train everyone in your assigned spaces to work safely prior to beginning work and when the process changes
8. Develop written procedures capable of protecting your staff of the health hazards of the chemicals with which they work
9. Maintain chemical exposures below regulatory limits (8CCR §5155 & 8CCR§5155A, Table AC-1)
10. Provide engineering controls and personal protective equipment to control the hazards to your staff (fume hoods, glove boxes, lab coat, lab aprons, goggles, safety glasses, gloves, etc.)
11. Provide storage cabinets appropriate to the hazard category of the chemicals stored with appropriate labels and connection to the exhaust system when feasible.
12. Request resources in contracts and grant proposals to cover the costs of equipment, supplies and disposal of hazardous materials
13. Participate in department and campus safety committees
14. Audit the hazardous materials labeling, storage and disposal practices in your lab frequently
15. Involve the department administration in the filling of injury reports.
16. Assist over exposed and injured parties in obtaining medical care when injured or overexposed to hazards
17. Conduct accident and near-miss investigations, develop and follow through with strategies to prevent reoccurrences, EH&S can provide guidance and assistance.
18. Ensure your chemical inventory in the campus database is updated at least every 60 days
19. Review your departmental chemical hygiene plan, lab specific written procedures, material safety data sheets and other safety data information with your people to ensure they understand the hazards and methods of preventing exposure
20. Review and update your location information in the campus econtacts system to maintain an accurate placard outside your lab doors at the start of every quarter
21. Meet all UCR requirements for the use of biohazardous materials, radiation and lasers
22. Request EH&S technical assistance when
  - a. remodeling your lab
  - b. installing a new fume hood
  - c. designing a new workstation
  - d. working with hazardous materials or processes unfamiliar to you
23. etc. ...

Individual Responsible

**Department head (Chair, Director)***Oversight provided by***Dean****Actions & Guidance**

1. Meet with all new employees and provide safety guidance to your faculty and staff regularly
2. Meet with your safety staff regularly
  - a. Departmental Laboratory Safety Officer
  - b. Department Safety Coordinators
  - c. Building Supervisors for Emergency Conditions in the buildings where your department is housed

**d. Department Emergency Staff**

3. Update your departmental Chemical Hygiene Plan at least annually
4. Prepare to continue business after a disaster
5. Facilitate the reporting of injuries to Worker's compensation and EH&S
6. Conduct or assist with accident and serious near miss investigations in your department
7. Report safety issues to your dean
8. Anticipate and prepare for abandonment and reassignment of lab rooms
9. Ensure labs are cleaned-up when occupants leave
10. Measure and reward safety performance

**Individual Responsible**

*Oversight provided by*  
**Provost**

**Dean**

1. Obtain regular reports on safety about each of your departments
2. Measure and reward safety performance
3. Bring safety issues to the attention of the Provost
4. Allocate resources to fund safety, accident prevention and environmental protection
5. Encourage your faculty to engage in safety issues, participate on safety committees and demand an outstanding safety program

**Individual Responsible**

*Oversight provided by*  
**Chancellor**

**Provost**

1. Strive for an award winning campus safety program
2. Encourage creative thinking toward improving safety
3. Engage faculty, staff and students in discussions about safety
4. Obtain reports for all levels of the organization on safety
5. Follow and encourage others to follow the UC Presidential Policy on Management of Health Safety & The Environment
6. Report to the Chancellor on progress with compliance with this policy

**Individual Responsible**

*Oversight provided by*  
**President**

**Chancellor**

1. Report to the President on compliance progress with the Presidential Policy on Management of Health Safety & The Environment

**Individual Responsible**

*Oversight provided by*  
**Associate Vice Chancellor, Facilities**

**EH&S Director**

1. Provide technical consultation to the labs to assure they are able to operate safely
2. Assist in the development and review of research protocols, biological use, animal use, radioactive use authorizations and laser use
3. Train lab faculty, staff, students and visitors to complete risk based safety self assessments/audits
4. Complete selected periodic inspections to reinforce individual lab performance
5. Review design and construction projects in labs
6. Develop and present lab safety training
7. Facilitate emergency planning, preparedness & response

8. Assist the departmental Laboratory Safety officers to develop, implement and maintain chemical hygiene plans
9. Provide interpretation of complex technical rules and regulations pertaining to environmental health and safety to University administration, staff and students
10. Devise strategies for compliance that minimize negative impacts to research and education activities
11. Develop University policies and/or procedures for the safe and compliant operation of laboratory activities
12. Participate in technical and policy development needs to state and local regulatory agency officials and the legislature in relevant areas related to regulatory impacts to University of California facilities and operations
13. Review the design safety of process equipment
14. Conduct accident investigations with root cause analysis
15. Provide review and technical advice on pressure vessels, electrical hazards, centrifuges, and other lab equipment
16. Assess hazards, and preparing plans for experimental set-ups
17. Develop and implement field research and travel safety processes and plans for faculty, staff, students and affiliates

[Back to Original Article](#)

## Serious lab accident at UCLA in 2007 was not reported

*A student was injured in an incident similar to one in 2008 that killed a research assistant.*

March 13, 2010 | By Kim Christensen

A year before a UCLA staff research assistant was fatally burned in a lab fire, a graduate student was seriously injured in a similar accident that university officials failed to report to state regulators, records released Friday show.

The California Division of Occupational Safety and Health this week fined UCLA \$23,900 for the earlier incident, which occurred in November 2007 -- 13 months before Sheharbano "Sheri" Sangji suffered burns that took her life and prompted a campuswide review of lab safety. Cal/OSHA last year fined the university \$31,000 in Sangji's death.

In addition, despite sweeping safety measures announced in July, Cal/OSHA last month issued \$67,700 in fines for alleged violations that have occurred since Sangji died, records show. UCLA officials said Friday that they had not yet received Cal/OSHA's citations for the November 2007 incident.

They disputed the agency's February findings on the more recent violations, the most serious of which was a "repeat serious" citation for inadequate safety training. Others were related to safety gear, the storage of chemicals and inspections, the records show.

"We intend to vigorously defend against this new round of citations because Cal/OSHA, we believe, got it wrong," Vice Chancellor Kevin Reed said.

He said the university has made across-the-board safety improvements since Sangji's death, including doubling the number of lab inspections last year, enhancing training and issuing protective equipment such as lab coats.

The lack of protective coats was a factor both in the fatal fire in 2008 and the one that occurred in 2007, Cal/OSHA found.

In the earlier incident, a grad student working as a paid researcher suffered first- and second-degree burns on his hands and chest when ethanol he was handling splashed onto his clothing and hands and was ignited by a Bunsen burner.

"On this day, the injured employee was wearing a polyester shirt over a cotton shirt," the report noted. "The polyester material melted, resulting in serious burn injuries on the employee's chest."

The injured student made it to UCLA Medical Center's emergency room under his own power and was admitted to a burn unit the next day, records show. He spent a week in the hospital. The incident came to Cal/OSHA's attention in September, when an investigator for the agency learned of it while examining UCLA records, the report noted.

Neal Langerman, a San Diego consultant and former head of the American Chemical Society's Division of Chemical Health and Safety, said no one will ever know whether Sangji's death could have been prevented.

"One could speculate that training and supervision would have improved, and a possible outcome would be that history would have run a different path and the Sangji death would not have occurred," he said.

In any case, he said, it is "very disturbing" that UCLA failed to report the injury. "One wonders what else they haven't reported."

Reed said UCLA officials are reviewing why the injury wasn't reported to Cal/OSHA, but said that nobody "could think for a minute that we haven't taken safety issues seriously" since Sangji's death.

On Dec. 29, 2008, Sangji, 23, was severely burned over nearly half her body when air-sensitive chemicals burst into flames during an experiment and set ablaze her clothing, which also was made of synthetic material and melted to her skin. She died 18 days later.

In May, Cal/OSHA found that Sangji was not trained properly and was not wearing protective clothing.

UCLA paid the fines but appealed the violations. Later it withdrew its appeal amid an outcry by Sangji's family and the union that represented her.

Reed said Friday that he suspects that Cal/OSHA's continued scrutiny of UCLA was driven by complaints by the union rather than the merits of the case. Representatives of the union, the University Professional and Technical Employees, could not be reached late Friday.

A Cal/OSHA spokesman disputed Reed's contention, however, saying the agency was focused only on the facts of the case. In addition to its civil findings, Cal/OSHA also has conducted an investigation into potential criminal charges. It has presented its findings to the Los Angeles County district attorney's office, which said Friday through a spokeswoman that the case remains under review.

[kim.christensen@latimes.com](mailto:kim.christensen@latimes.com)



Chemical & Engineering News

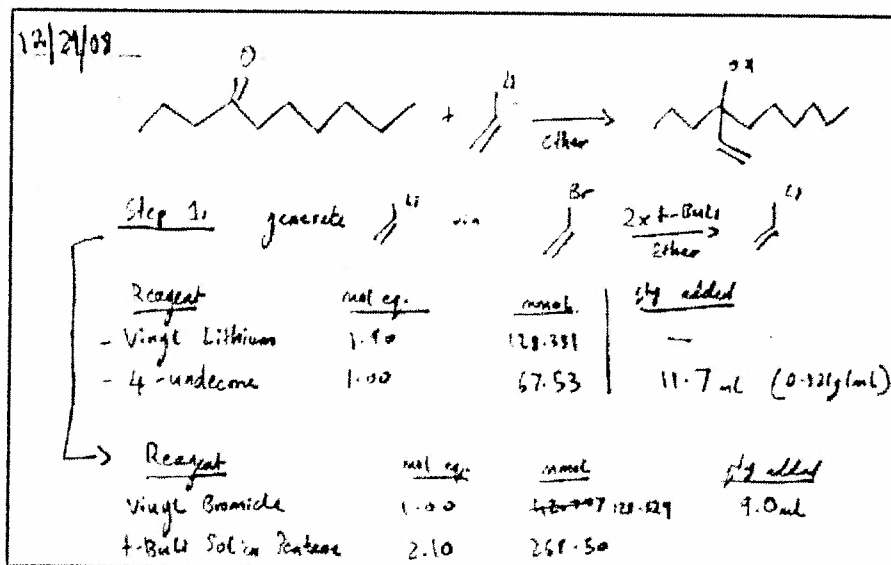
Serving the chemical, life sciences and laboratory worlds

**Science & Technology**Home » August 3, 2009 Issue » Science & Technology » Learning From UCLA

August 3, 2009

Volume 87, Number 31

pp. 29-31, 33-34

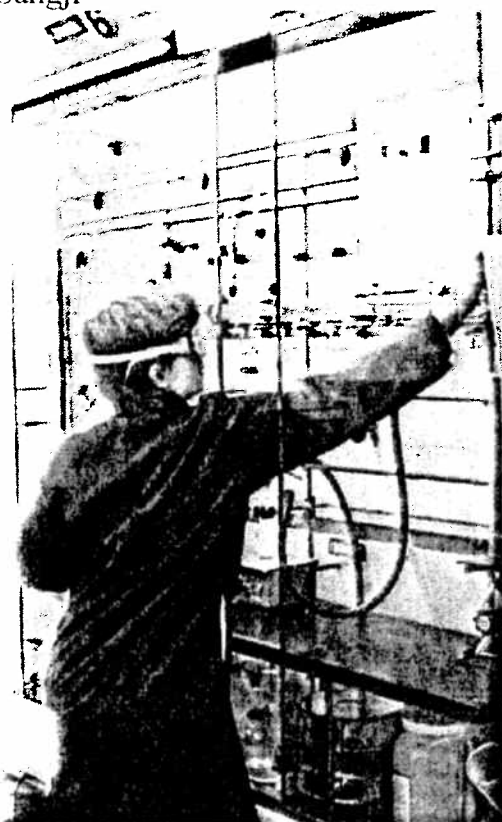
**Learning From UCLA****Details of the experiment that led to a researcher's death prompt evaluations of academic safety practices**Jyllian N. Kemsley[UCLA View Enlarged Image](#)

REACTION Sangji's lab notebook reveals that she planned to react vinyl bromide with tert-butyllithium as the first step of a larger synthesis.



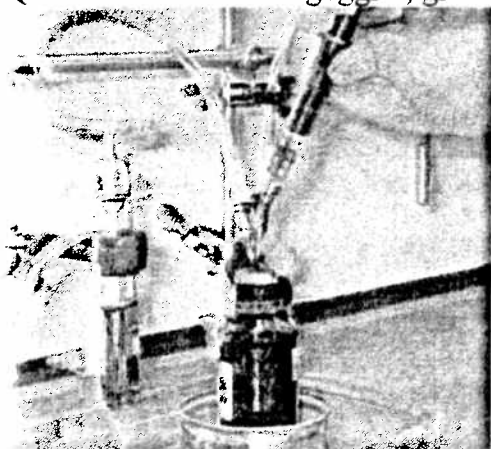
Courtesy of Naveen Sangji

Sangji



Dow Chemical

EQUIPPED Davis dons goggles, gloves, and a flame-resistant lab coat to do experiments at Dow.



John Palmer/UC San Diego

PYROPHORIC A recommended set-up for syringing tert-butyllithium includes inert gas supply and venting to a bubbler, as well as a glass syringe.

**On Jan. 16**, Sheharbano (Sheri) Sangji, a 23-year-old chemistry research assistant, died from injuries sustained in a chemical fire on Dec. 29, 2008, in a laboratory at the University of California, Los Angeles (C&EN Online Latest News, Jan. 22).

The incident has trained a spotlight on safety practices in academic labs, with researchers highlighting the need for awareness of risks and regular hazard assessments, while cautioning against developing an adversarial relationship with campus environmental health and safety officials.

Before researchers can learn from what went wrong, however, they must first understand what happened.

Sangji had started work in the lab of Patrick Harran, a chemistry professor at UCLA, on Oct. 13. According to copies of Sangji's lab notebook obtained from UCLA through a California Public Records Act request, Sangji

planned in December to scale up a reaction she'd run once before, on Oct. 17, to produce 4-hydroxy-4-vinyldecane from either 4-undecanone or 4-decanone—the structure and molecular weight written in her lab notebook are inconsistent with the named reagent.

The first step of that reaction was to generate vinylolithium by reacting vinylbromide with two equivalents of *tert*-butyllithium (tBuLi), a pyrophoric chemical that ignites spontaneously in air.

That's an acceptable way to approach the synthesis Sangji was doing, says [E. J. Corey](#), a Nobel Laureate and chemistry professor at [Harvard University](#). A Grignard reagent could be used instead of vinylolithium to do the addition to the ketone, Corey says, but side reactions would reduce the yield. And the best way to generate a clean lithium reagent, Corey says, is to use two equivalents of tBuLi (*J. Am. Chem. Soc.* **1972**, *94*, 7210).

When Sangji had done the reaction in October, she added 28 mL of anhydrous ether to a flame-dried 200-mL flask. Next, she added 3.0 mL of vinyl bromide and stirred the mixture for 15 minutes at  $-78^{\circ}\text{C}$ . She then charged the flask with 53.79 mL of 1.67 M tBuLi in pentane. She further stirred the mixture for two hours, then moved it to a  $0^{\circ}\text{C}$  bath for 30 minutes, and finally took it back to  $-78^{\circ}\text{C}$ .

Separately, she added 6 mL of ether and 3.90 mL of 4-undecanone to another flame-dried flask and cooled the mixture. She then used a double-tipped needle to transfer the material to the tBuLi flask. She stirred the reaction at  $-78^{\circ}\text{C}$  for two hours, then warmed it to  $-10^{\circ}\text{C}$  before quenching the reaction with 80 mL of  $\text{NaHCO}_3$ . Her crude yield was 3.60 g of 4-hydroxy-4-vinyldecane, or 86.75%.

At the end of December, Sangji's goal was to generate three times that amount of material—a “moderate” scale reaction, Harran said, according to a transcript of his interview with Joel E. Aplin and Maurice S. Jurado, deputy fire marshals at UCLA, that was obtained by C&EN through a public records act request.

Using information from the notes and reports from the UCLA fire marshal, UCLA Fire Department, [UCLA Police Department](#), [UCLA Environmental Health & Safety Office \(EH&S\)](#), [Los Angeles City Fire Department](#), and [California Division of Occupational Safety & Health \(Cal/OSHA\)](#), also obtained through public records requests, C&EN has tried to put together as detailed an account as possible of what happened to Sangji that day.

Sangji was working on a nitrogen manifold in a fume hood in a lab on the fourth floor of UCLA's Molecular Sciences Building. She had titrated the tBuLi twice to determine its concentration—1.69 M—and needed 159.5 mL of the reagent to react with 9.0 mL of vinyl bromide. She was drawing up the tBuLi in roughly 50-mL aliquots in a 60-mL plastic syringe equipped with a 1.5-inch, 20-gauge needle.

For unknown reasons, the syringe plunger came out of the barrel and the tBuLi was exposed to the atmosphere. Although it wasn't part of her experiment, an open flask of hexane was also in the hood and Sangji knocked it over. The tBuLi ignited and the solvent caught fire, as did Sangji's clothes. She was wearing nitrile gloves, no lab coat, and no one remembers if she was wearing eye protection.

Although there was a safety shower in the lab, Sangji did not use it. Instead, Weifeng Chen, a postdoctoral researcher in Harran's group who was cleaning up one of the lab's benches, wrapped a lab coat around Sangji to try to put out the fire. “She was screaming and was moving around and I was attempting to wrap her tightly,” Chen told Cal/OSHA Investigator Ramon Porras. Chen abandoned the lab coat when it started burning. He then started pouring water on Sangji from a nearby sink, while she sat on the floor.

## INCIDENT INFORMATION (PDFs)

[Sheri Sangji's lab notebook pages](#)

[UCLA EH&S Harran lab inspection report](#)

[UCLA EH&S accident report](#)

[Los Angeles Fire Dept report with Sangji interview](#)

[UCLA Fire Marshal Harran interview](#)

[Cal/OSHA Harran statement](#)

[Cal/OSHA Chen statement](#)

[Cal/OSHA Ding statement](#)

[Cal/OSHA UCLA citation](#)

[California State Fire Marshal report](#)

[California Fatality Assessment and Control Evaluation report](#)

Hui Ding, a postdoctoral researcher in an adjacent lab, heard Sangji screaming. He went into the lab and saw Chen trying to put out the fire. Ding also saw that “the tip of the reagent bottle was positioned sideways and was also on fire,” he told Porras. Ding returned to his lab and called 911, then checked on Chen and Sangji again before going to get Harran from his office on the floor above.

When Ding returned to the lab with Harran, Harran saw that Sangji’s hands, torso, and neck were burned. “Her clothing from the waist up was largely burned off and large blisters were forming on her abdomen and hands—the skin seemed to be separating from her hands,” he told Porras in an e-mail. Sangji was conscious, asking for more water, where emergency responders were, and for someone to call her roommates. When Harran heard sirens, he went down to the road to tell the emergency personnel where they needed to go.

**UCLA police dispatch** recorded the 911 call at 2:54 PM as an “unknown type chemical fire.” Emergency crews were dispatched at 2:57 PM, and Christopher Lutton, a UCLA deputy fire marshal; a fire engine; and emergency medical personnel arrived at the building at 3:01 PM. Lutton donned full protective gear and went up to the lab to assess the situation, with dispatch recording at 3:06 PM that the fire was out upon arrival. Lutton cleared the other emergency responders to go up to the lab. Once medical personnel arrived, Sangji was put on a rolling chair and moved under the safety shower for decontamination. She was then transported to [UCLA Ronald Reagan Medical Center](#). From there she was transferred to [Grossman Burn Center](#), in Sherman Oaks, Calif., where she died on Jan. 16.

Harran told Cal/OSHA and fire marshal investigators that the lab generally follows [Aldrich Technical Bulletin AL-134](#) for handling air-sensitive reagents. The bulletin first recommends heating glassware in an oven to eliminate any adsorbed moisture, then cooling it in an inert atmosphere. Sangji refers in her notebook to using flame-dried flasks and the syringe found at the scene was plastic.

Additionally, if a researcher is using a syringe to transfer the reagent, the bulletin says to use a 1- to 2-foot-long needle. The Cal/OSHA report says that Sangji’s was 1.5 inches.

## MORE COVERAGE

Visit [C&ENtral Science](#) to read Jyllian's blog entries related to this story

- » [Evaluating Safety](#)
- » [Personal Protection from Fire](#)
- » [Tampering with Evidence?](#)
- » [Promoting Safe Research Practices](#)
- » [Some Thoughts on Lab Incidents](#)

The Aldrich bulletin also recommends pressurizing the reagent bottle with high-purity dry nitrogen such that the pressure in the bottle pushes out the syringe plunger. “The plunger should not be pulled back since this tends to cause leaks and create gas bubbles,” the bulletin says.

But Harran told fire marshal investigators that he prefers not to pressurize the bottle to push out the material. “I find that a little dangerous because then it can jump on you,” he told Aplin and Jurado. Harran said that he

favors using a nitrogen line with a bubbler, under enough N<sub>2</sub> pressure so that as he withdraws the syringe plunger to pull in reagent, the bubbler keeps going.

“Aldrich recommends regulating the inert gas to about 3 to 5 psi to pressurize the bottle,” says Mark Potyen, a R&D scientist at [Sigma-Aldrich](#). “Through a 16-gauge needle, the largest Aldrich recommends, the movement of the plunger is manageable and is a safer technique than pulling the plunger of the syringe to use the reduced pressure in the syringe to draw up the material.” This is partially why Aldrich recommends glass rather than plastic syringes, Potyen says, because pressure at 3 to 5 psi cannot push up a plastic syringe plunger.

Aldrich also recommends using a syringe that is twice the volume that you intend to deliver and advises against reusing syringes for multiple transfers, Potyen says, since a dirty syringe could result in a locked-up barrel.

## SAFETY INFORMATION

[Sigma-Aldrich technical bulletin on handling air-sensitive materials \(PDF\)](#)

[Imperial College London hazard assessment form \(PDF\)](#)

[C&EN Safety Letters](#)

For amounts larger than 50 mL, Aldrich advocates that researchers transfer the reagent by cannulating, or using a double-tipped needle to transfer the reagent under pressure from the bottle into a sealed graduate cylinder, then again from the cylinder into the reaction flask.

“I would have preferred that [Sangji] had done the cannula technique,” Harran told Aplin and Jurado. “We use both methods in the laboratory. .... I don’t know if she had done the cannulation technique previously, so she may have been repeating the procedure that she had done simply on a larger scale.”

Although Harran told Cal/OSHA Investigator Porras that he talked with Sangji on the morning of Dec. 29 about what she planned to do that day, he did not indicate whether they discussed specific experimental procedures.

Looking at what actually went wrong with Sangji’s experiment, there is not enough information available to say for certain. In the materials obtained by C&EN, no one documented the state of the hood immediately after the accident. And although Fire Marshal Lutton took photographs of the scene, he did so after fire officials asked Harran to shut down the experiment to ensure that the hood was safe.

Postdoc Ding noted that, when he first entered the lab, a reagent bottle was sideways and on fire—but he did not say whether that was the tBuLi bottle or the hexane flask. If it was the tBuLi bottle, and it was not clamped as specified by the Aldrich bulletin, it could have been a clue that perhaps Sangji, using a needle too short for the reagent bottle, had upended the bottle in one hand while trying to handle a 60-mL syringe with the other, and things went awry from there.

Alternatively, although Harran told C&EN in an interview in May that he remembered that the bubbler on the nitrogen manifold was active when he later returned to the lab and shut down the experiment, he couldn’t recall if the port to the tBuLi bottle was open. Perhaps Sangji had simply forgotten to turn on the gas to the bottle, then pulled too hard on the syringe plunger, not realizing that she was fighting a lack of pressure in the bottle.

Other possibilities include that the tBuLi reacted with moisture in the undried syringe, or with air that got into the syringe while Sangji was pulling up the reagent. Or Sangji was on her second or third transfer with a used syringe, it locked up, and she tried to release it.

Last but not least, since she was using a 60-mL syringe for 50 mL or more of tBuLi, perhaps she simply overshot while pulling out the plunger.

Los Angeles Fire Department investigators were able to speak briefly with Sangji at the emergency room, where she told them that “she pulled the plunger out too far, the plunger came out of the housing of the syringe, and the chemical spilled out and flashed.” She also told them about the spilled hexane.

But UCLA fire marshal investigators never spoke with Sangji, despite being told on Jan. 6 that she could be interviewed.

Sangji's family also did not discuss the incident with her while she was in the hospital, says her sister, Naveen Sangji, because they were trying to stay focused on the positive and "we thought we had all the time in the world to get to the unpleasant stuff."

Whether Sangji should have been doing the experiment under closer supervision is an open question. Both Harran and Kevin S. Reed, UCLA's vice chancellor for legal affairs, have said in written statements that Sangji was an experienced chemist. Sangji graduated from Pomona College in May 2008 with a bachelor's degree in chemistry. While at Pomona, she spent three years working for chemistry professor Daniel O'Leary doing peptide chemistry. Neither of her published papers involves alkyllithium or similarly hazardous reagents (*Org. Lett.* **2005**, *7*, 5721; *J. Am. Chem. Soc.* **2006**, *128*, 7754).

**After graduating** from Pomona, Sangji went to work at Norac Pharma, in Azusa, Calif. Daniel Levin, president of Norac Pharma, says that, although he can't disclose the specific chemistry Sangji did for the company, she did not work with pyrophoric materials. He adds that, although he thought Sangji had more research experience than average for a chemist with a bachelor's degree, she was still closely supervised in both the planning and execution of her experiments at the company.

### Lab workers "have to have the mind-set that something can always go wrong."

At UCLA, Harran told Aplin and Jurado that Sangji had trained with an unnamed postdoctoral fellow who had done the tBuLi procedure multiple times. Sangji "had executed it successfully, I think three times, previously," Harran said.

But UCLA has no evidence that Sangji used tBuLi more than once before the day of the incident, says university spokesperson Carol Stogsdill. "However, her résumé and work history show that she was familiar with pyrophorics—and, importantly, the techniques we use to handle t-butyllithium are common to those employed when handling a wide range of air- and/or moisture-sensitive chemicals," Stogsdill says. Sangji "had prior experience with those techniques and was further trained in them in Dr. Harran's lab."

Because Sangji was an employee rather than a graduate student, Cal/OSHA investigated the incident; as a result of the investigation Cal/OSHA fined the university \$31,875 (*C&EN*, May 11, page 7). The agency cited the UCLA chemistry and biochemistry department for lack of training; failure to document training; failing to correct unsafe laboratory conditions and work practices identified in an Oct. 30, 2008, inspection of Harran's lab; and failing to ensure that employees wore appropriate personal protective equipment (PPE), such as lab coats.

On the training front, prior to the incident, the UCLA EH&S office conducted general laboratory safety training at the beginning of every quarter, while principal investigators provided laboratory-specific training.

Having started in mid-October, Sangji missed the EH&S training and would have been expected to attend in January, says James Gibson, director of EH&S. Neither Chen nor Ding had received general safety training from EH&S, either—Chen started at UCLA on Oct. 10, 2008, and Ding told Cal/OSHA investigator Porras in January that he had been at UCLA for four months. Harran and UCLA maintain that all researchers had the laboratory-specific training needed to perform their work safely. EH&S now provides general safety training monthly, and researchers cannot receive keys to their labs until the training is complete, Gibson says.

UCLA has also now purchased flame-resistant lab coats for researchers using flammable reagents.

The October laboratory inspection was the first for the Harran lab since the group had moved to UCLA from the University of Texas Southwestern Medical Center on July 1, 2008. Several of the violations described in the inspection report involve things that could be due to differences in Texas versus California law. The report notes that gas cylinders were not properly restrained, for example, and California requires that gas cylinders have two straps whereas Texas requires only one.

Other violations flagged in the inspection include keeping more than 10 gal of flammable solvents outside of the flammable storage cabinets, and that lab researchers were not wearing PPE. UCLA's standard practice is to correct such deficiencies at the time of the inspection and in a Nov. 5, 2008, e-mail to Harran, UCLA Chemical Safety Officer Michael Wheatley says that the lab "was able to correct some deficiencies on the spot," although he doesn't specify what those were. But in the aftermath of the incident Cal/OSHA investigators again flagged

flammable solvent storage and PPE issues, noting that photos of the lab taken after the incident showed approximately 14 gal of flammable liquids inside a hood, and Sangji was not wearing a lab coat.

Generally, UCLA rules at the time gave Harran 30 days to correct the deficiencies. In that Nov. 5 e-mail, Wheatley asked Harran to set up a time to go over the report.



Courtesy of Patrick Harran

Harran

Harran replied on Nov. 12, asking if the meeting could wait until his group moved out of their temporary labs and into their permanent location, which was still under construction. "Our labs on four are overcrowded and disorganized," Harran wrote. "I wasn't planning to be in temporary space for this long. We should be moving soon."

"That should be no problem," Wheatley responded. The labs did not relocate until early January.

Gibson says that UCLA historically has inspected labs once a year, and new labs were simply added to the cycle without necessarily getting additional support from EH&S officers during the setup period. UCLA is considering how to remedy that gap, Gibson says.

Gibson also says that, although the incident occurred over the winter holiday for the university and administrative offices were closed, UCLA expects that research labs will generally be open 365 days per year.

The California State Fire Marshal Arson Bomb Investigation Division reviewed the information collected by UCLA fire marshal investigators and concluded that the incident was an accident and closed the case. Although UCLA requested that the California Office of the State Fire Marshal review the Aldrich-recommended syringe procedure to see whether it meets the fire-code requirements for a closed system for a solid or liquid hazardous material, the state fire marshal declined to consider the matter, says Ernie Paez, chief of the South Fire & Life Safety Division of the Office of the State Fire Marshal.

Cal/OSHA is reviewing the incident, as is standard for a case involving a fatality, to determine whether to forward its findings to the Los Angeles district attorney's office to evaluate whether criminal prosecution is warranted. UCLA has withdrawn its appeal of Cal/OSHA's citations (C&EN, June 29, page 30).

**Sangji's family** has been very unhappy with how the various investigations have gone, Naveen Sangji says. She notes that, except for Cal/OSHA Investigator Porras, everyone else directly involved in investigating the incident was a UCLA employee. She also questions Cal/OSHA's thoroughness, given that the Cal/OSHA report says Sangji was syringing 20 mL of tBuLi, not three 50-mL aliquots.

"We feel like we've gotten nowhere with the state agencies and the university," Naveen says. "We think it's time for the district attorney to step in and figure out what's going on. We want to know who was responsible and who failed in their duties to make sure Sheri was safe at work, and those people should answer for their failures."

The family wrote to the American Chemical Society on July 6, asking the society to issue a public statement reprimanding Harran for disregarding the safety of his researchers, and to demand full disclosure of the events of the day.

In her July 17 response to the letter, Madeleine Jacobs, executive director and chief executive officer of ACS, which publishes C&EN, writes that "issuing a rebuke to a specific individual or individuals is not an option consistent with our role. There are entities, such as Cal/OSHA, which investigate and apportion blame in these circumstances, and we are obliged to respect their oversight role." Jacobs adds that "there may be an

opportunity for ACS to develop a statement that highlights the tragedy of deaths such as Sheri's as compelling examples of the need for stronger safety practices in academic laboratories."

Anna Davis, who is approaching her first anniversary as a research scientist working on catalyst discovery for water-soluble polymers at Dow Chemical, agrees that academic lab safety could be improved. She says that safety at Dow is generally much more a part of the laboratory culture than in the academic institutions at which she's worked. Davis received her Ph.D. from UC Berkeley and did postdoctoral research at Northwestern University.

"I was fortunate to work for professors that took safety seriously," Davis says, "But I think that the culture varies too much from one research group to another" in academia, and consequences are minimal when something bad happens. In contrast, at Dow it's emphasized from day one that, no matter what your job is or where you work, safety is a job expectation and is a critical part of your job performance, Davis says.

When asked whether the emphasis on safety is a deterrent to being open and honest when things go wrong in the lab, Davis responds: "You're certainly going to get in trouble if you're lax about safety here. But I think that if you do an earnest job of trying to follow safety practices, then no, I wouldn't say that you're afraid to discuss a near miss or an accident."

Sangji's death has inspired at least some members of the academic chemistry community to take stock of the safety procedures in their labs. Robert M. Waymouth, a chemistry professor at Stanford University, works in the area of organometallic chemistry and catalysis. Although Waymouth typically spends part of every group meeting discussing safety issues that come up in his group, news of the UCLA fire inspired a meeting devoted entirely to talking about what was known about the incident and whether any lab procedures should be changed, Waymouth says.

In keeping with federal OSHA lab standards, certain things in his lab have always had trigger points—for example, using more than 500 mL of an extremely flammable solvent like diethyl ether—that require an explicit risk assessment. In those cases, the researcher doing the experiment must fill out a form and go over it with someone else, to explain what they're doing and why and to review the appropriate safety procedures if something goes wrong. And everyone in the lab is informed of the experiment so the group knows what's going on.

That protocol now applies to any reaction involving tBuLi. The group's lab-safety manual has also been revised to contain more explicit directions regarding use of PPE, Waymouth says.

Waymouth emphasizes that evaluating safety risks needs to be a constant and ongoing thing. Safety shouldn't be something done at a training seminar and then forgotten, he says. Faculty "need to make sure that there's an awareness in the real day-to-day environment about what's the best way to do things safely," he says. "You need to establish a safety environment where people can encourage others to have safe practices and not be embarrassed about it."

And just as essential, lab workers "have to have the mind-set that something can always go wrong," Waymouth says. "If you have thought about it beforehand, you will be more prepared to deal with it. If you're surprised, then it is more difficult to respond rationally. A prepared mind is the most important safety attitude that you can have."

Tom Welton, head of the department of chemistry at Imperial College London, would agree. Risk assessments in the U.K. started to become part of the research culture there about 20 years ago—when Welton was a postdoctoral researcher—after an incident at the University of Sussex.

A third-year graduate student at Sussex was distilling a triacetylene under nonstandard conditions, says Anthony McCaffery, a Sussex chemistry professor who was head of his department at the time. The apparatus exploded, blowing out a window and embedding a large piece of metal in the student's abdomen. The researcher lost a foot or two of his intestine, if McCaffery recalls correctly, and returned to the school to finish his Ph.D. after recovering from his injury.

The U.K. government had recently created the country's Health & Safety Executive to prevent death, injury, and ill health in workplaces. The Sussex incident was the first case the agency decided to prosecute. "I was required to appear in the local Magistrate's Court and the County Court to defend the indefensible, since they charged us



with failure to carry out a proper risk assessment, which was not a widely accepted procedure in university research at the time,” McCaffery says. The university pled guilty and was fined.

**The end result** for academic chemistry research in the U.K. was that risk assessments have become an integral part of experiments. The assessments don't apply just to chemical reactions but also to equipment such as lasers. The initial assessments were “much like some kind of legal record where if we got sued we could say we'd done this,” Welton says, but the paperwork has evolved over the years into a simple table that is printed on one side of every page spread in his department's lab notebooks—risk assessment on the left, experimental notes on the right. “Twenty years ago, it was very much about a legal defense should it be necessary,” Welton says. “Now it is about making the person engage in the risk management of what they're doing.”

Chemistry students in the U.K. start doing risk assessments in their very first undergraduate lab, so the process is second nature by the time they get their bachelor's degree, Welton says. He adds that the training is critical not just from a safety perspective, but also for future employment. “If we don't train students in risk management and safety procedures, then we're not training them for employment in modern industry,” Welton says. “If we want someone to turn up in a job and be productive, they can't do that if they're not safety aware.”

UCLA has made significant changes to its health and safety program in the aftermath of Sangji's death, beyond fixing the specific issues identified by Cal/OSHA.

UCLA laboratory safety inspections have been standardized and expanded. Items identified as critical—for example, missing or inoperable fire extinguishers or eyewash stations, or lack of PPE—must be corrected within 48 hours; other deficiencies, within 30 days. Gibson's office is working to develop a computer system that will streamline much of the inspection process.

University research labs are also now required to quantify chemical, biological, and other hazards; to assess risks based on laboratory activities; specify appropriate PPE; and train all lab personnel in the appropriate use of PPE for their experiments.

And if a lab balks at any point? Chancellor Gene Block “has made it very clear in his communications that EH&S has the authority to shut down labs, and we take that responsibility very seriously,” Gibson says. If a lab is shut down, it can't reopen until the professor appears before the university's newly formed safety committee and provides an action plan to improve safety in the lab.

The safety committee recently issued its first report to the chancellor. It said that UCLA still has more to do to develop a top-down culture of safety consciousness and suggests that reward systems should be developed to encourage compliance with safety procedures in labs. It also says that the university needs to increase accountability and oversight, improve and expand outreach and training, improve laboratory design, and improve inventory and record keeping.

As UCLA works to develop a new safety culture on campus, it needs to watch that an adversarial relationship doesn't build up between researchers and EH&S officers, says Rick L. Danheiser, a chemistry professor and chair of his department's safety committee at Massachusetts Institute of Technology. MIT has twice won the ACS Division of Chemical Health & Safety's College & University Health & Safety Award, in 1991 and again in 2005.

In Danheiser's opinion, the key to his department's success in developing a safe laboratory environment is that the department recruited graduate students and postdocs to help develop the policies and procedures that they would be expected to follow. “Everything is done in groups that involve the faculty and graduate student or postdoctoral researchers so that all regard it as an enterprise that we are all involved in,” Danheiser says. “In my experience that's really important in ensuring that there's full compliance.”

This approach includes having faculty and student members of the safety committee participate in unannounced laboratory inspections twice a year. Having that self-inspection component also helps prevent adversarial relationships from developing between researchers and safety officials, Danheiser says.

When Danheiser talks to new students and postdocs joining his lab, he emphasizes to them that it is their responsibility to evaluate whether or not they are comfortable performing an experiment. “I expect them to be able to make the determination whether they are certain they have enough knowledge and experience to do an experiment safely,” Danheiser says. If not, then they need to seek assistance from others in the group, him, the department safety coordinator, or even from MIT EH&S.

Danheiser adds that one issue of concern at MIT has involved postdocs who were trained in other countries and thus are used to a different laboratory culture. "It's sometimes more difficult to retrain them to follow the rules we have, as compared to a beginning graduate student," Danheiser says.

**In those cases**, it's not only important to have the faculty adviser make the rules clear, but also to have a culture that reinforces them through peer pressure in the lab, Danheiser says. "If the great majority of people enthusiastically comply with the safety program and support it and understand why all of the rules are in place to protect people, then they can police themselves."

One of the challenges in lab safety is that the lab setting becomes very familiar to people who work in it day in and day out. "When you do something over and over, your perception of the risk may change even though the risk itself doesn't change," says Lawrence M. Gibbs, associate vice provost for EH&S at Stanford. His department tries to use information about incidents to remind researchers not to get too comfortable. In that way, hopefully something positive can come out of Sangji's death. "It was a tragic, tragic incident," Gibbs says. "We all have to learn from it and use it as reinforcement to help people understand the potential risks of working with high-hazard materials in this environment."

Chemical & Engineering News

ISSN 0009-2347

Copyright © 2011 American Chemical Society

**2011-12 BCOE GRADUATE RECRUITMENT TARGETS**

Dept	M.S.	Ph.D.	Total	Accepts	% of Target
BIEN	20	15	35	2	5.7%
CEE	5	16	21	2	9.5%
CSE	15	20	35	0	0.0%
EE	13	32	45	0	0.0%
MSE	4	8	12	1	8.3%
ME	15	10	25	0	0.0%
Subtotal	72	101	173	5	2.9%

**Applicants - as of February 28, 2011**

Program	International Students			Domestic Students			Total Students		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
BIEN	27	25	37	24	62	57	51	87	94
CEE	112	129	123	22	61	72	134	190	195
CS	425	332	397	55	62	75	480	394	472
EE	420	333	428	33	58	41	453	391	469
MSE	NA	51	60	NA	7	30	0	58	90
ME	65	70	89	18	21	30	83	91	119
Total	1049	940	1134	152	271	305	1201	1211	1439

Apps		
Unit	2010	2011
BCOE	1211	1439
CHASS	1075	1072
CNAS	1150	1282
DBS	51	52
AGSM	125	187
GSOE	99	125
Total	3711	4157

**Admits - as of February 28, 2011**

Program	International Students			Domestic Students			Total Students		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
BIEN	0	0	0	9	26	8	9	26	8
CEE	20	0	2	11	26	17	31	26	19
CS	0	0	19	0	0	15	0	0	34
EE	10	0	0	0	3	0	10	3	0
MSE	NA	0	1	NA	0	3	0	0	4
ME	0	0	0	6	1	6	6	1	6
Total	30	0	22	26	56	49	56	56	71

In Process Queue	
Dom	Int'l
0	0
6	12
2	12
1	0
7	7
5	1
21	32

Admits		
Unit	2010	2011
BCOE	56	71
CHASS	163	35
CNAS	151	197
DBS	8	6
AGSM	36	17
GSOE	4	2
Total	418	328

**Accepts - as of February 28, 2011**

Program	International Students			Domestic Students			Total Students		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
BIEN	0	0	0	0	9	8	0	9	2
CEE	0	0	2	0	7	17	0	7	2
CS	0	0	19	0	0	15	0	0	0
EE	2	0	0	0	0	0	2	0	0
MSE	NA	0	1	0	0	3	0	0	1
ME	0	0	0	0	0	6	0	0	0
Total	2	0	22	0	16	49	2	16	5

Accepts		
Unit	2010	2011
BCOE	16	5
CHASS	13	2
CNAS	4	20
DBS	0	0
AGSM	4	0
GSOE	3	2
Total	40	29