



(Image: PhotoDisc)

Issues & Perspectives

Taken for Granted: The Burning Question of Laboratory Safety

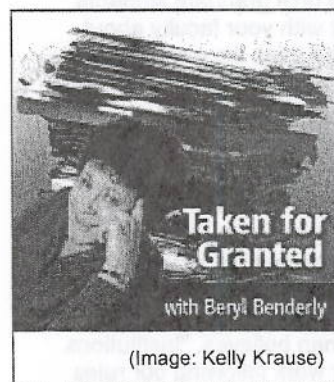
The young scientists laboring in the nation's university laboratories make many

sacrifices. A needless and agonizing death should never be one of them.

But that is the fate that befell Sheharbano Sangji, known to her friends as Sheri, over Christmas break. On 29 December, the 23-year-old research assistant in the laboratory of Patrick Harran, a professor and chair of chemistry and biochemistry at the University of California, Los Angeles (UCLA), attempted to transfer a quantity of a chemical called *t*-butyl lithium from one container to another. This material is pyrophoric and ignites on contact with air. That was what happened when something went wrong with the syringe Sheri was using. The synthetic sweater and flammable gloves she wore—she was not wearing a lab coat—burst into flames. She apparently ran away from, not toward, the lab's shower. She succumbed to her injuries on 16 January at a hospital burn center.

"I have come to the disheartening conclusion that most academic laboratories are unsafe venues for work and study." --Neal Langerman

A report by state occupational safety officials on the incident is pending. In the meantime, laboratory safety experts agree that factors and attitudes that are all too common in many academic labs could lead to similar tragedies. The Sangji case is "a harbinger of things to come" unless scientists devoted to accident prevention are willing to "stand in the gap between worker's safety and (scientific) productivity," writes Harry J. Elston, editor of the American Chemical Society's (ACS's) *Journal of Chemical Health and Safety*, in a lead editorial entitled "Recipe for disaster," posted to the Internet on 31 March. Far too many academic labs, agrees James Kaufman, president of the **Laboratory Safety Institute** in Natick, Massachusetts, emphasize not worker safety but "publishing papers and winning Nobel Prizes."



(Image: Kelly Krause)

In a **statement** issued 19 January 2009, UCLA Chancellor Gene Block said that "the entire Bruin community ... [was] deeply saddened to learn of Sheharbano's passing and the tragic accident." The statement added that "UCLA is cooperating fully with investigations being conducted by the California Division of Occupational Safety and Health ... and the state fire marshal." Harran did not reply to inquiries from *Science Careers*.

Some scientists across the nation have already drawn their own conclusions, however. "At the recent ACS [American Chemical Society] meeting [in March] in Salt Lake City, this was a major topic of discussion," says Neal Langerman, a consultant to the ACS **Committee on Chemical Safety** and an officer of its **Division of Chemical Health and Safety**. The consensus? "It should not have occurred." According to an article in the *Los Angeles Times*, a safety inspection by UCLA in October had identified various deficiencies in Harran's labs, including failure of personnel to wear proper protective clothing.

The centrality of training

After reviewing the UCLA accident report on the Sangji incident, as well as reports on other incidents identified by the federal **Chemical Safety and Hazard Inspection Board** and other documents, "I have come to the disheartening conclusion that most academic laboratories are unsafe venues for work and study," writes Langerman, a regular columnist for the *Journal of Chemical Health and Safety*, in an article posted on 29 March. "I have concluded that only by a major change in the way we practice laboratory safety can we improve the situation." Reviews of accident reports, Kaufman tells *Science Careers*, suggest that accidents are much more common in academic labs than in industry.

What accounts for this difference? "One word: training," says Russell Phifer, chair of ACS's chemical health and safety division. As an example, he cites the publicly available information on Sangji's death, which, he says, makes clear that "everything that went wrong can be blamed on improper training. Any one of five or six different things going differently could have saved her life." Transferring *t*-butyl lithium, he explains, is a potentially tricky maneuver that requires specific skills. "Less

than 5% of [those] who work in a lab have ever worked with *t*-butyl lithium," and it is unlikely, he continues, that a student would "pick this up on the undergraduate level." Sheri received her bachelor's degree in May 2008. According to the *Los Angeles Times* report, the Harran lab could not produce documentation that it had trained her to use *t*-butyl lithium.

Speaking generally—not about the UCLA case—Phifer says that the principles for safely handling hazardous materials such as pyrophorics include supervision by experienced scientists, the nearby presence of someone ready to assist in case of trouble, and proper protective clothing. At a minimum, a cotton or, preferably, fire-retardant lab coat should be worn over garments made of cotton or wool, "including underwear," Langerman adds. Correct use of safety equipment, such as a fume hood and, possibly, a blast shield, would protect from the possibility of flares, Phifer continues. If, despite all these precautions, the coat still caught fire, it could be removed and the natural fibers underneath would burn much more slowly than plastic-based synthetics, he adds. Ideally, Langerman continues, the worker would have been trained to "drop and roll" to quench flames, or to move directly toward a shower. Presumably, he adds, a nearby colleague would immediately help in guiding these actions and in putting out the fire.

From the top

Regardless of whether a lab belongs to a university or an industrial company, the experts agree, the duty to make absolutely certain that all workers—from the lowliest sweeper to the most exalted investigator—understand and follow safety rules rests with the lab chief and his or her superiors. "Safety is a top-down management function," writes Elston, in boldface print. "The corporate safety ethic starts at the CEO level and flows down to front-line supervision. When front-line management is allowed to pass the safety buck to the nebulous 'committee' or 'EH&S department,' or worse, ignore the findings of an inspection, that is when the whole program goes soft and eventually ends up 'in the can,' politely speaking. At a research university, the responsibility starts with the Provost and moves down the academic structure to the Deans, Department Heads and individual PIs [principal investigators]."

In industrial research organizations, safety is a line item on supervisors' annual performance review, Langerman notes. Many research executives share the view of one who, Kaufman says, regularly reminds his staff that "working safely ... is a condition of employment." But in many universities, Kaufman continues, lab safety is seen as the responsibility not of individual lab chiefs and academic departments, but of the university's office of environmental health and safety. In many places, he says, "there is a certain notion about academic freedom, and ... 'If you wanted a career that was filled with following other people's rules, you would enlist in the army.' ... That spirit is ingrained in the academic community."

Instead of the detailed and well-documented safety training that is standard practice in industry, therefore, "unfortunately, all too often, at the college level, safety is not taken seriously enough," Phifer says. "Practically no colleges require, for instance, a safety orientation," he notes, adding that training for grad students is generally no better. "Emphatically, the biggest industry complaint about people that are going to work in labs is that more than likely they have not had proper safety training." In the labs of many competitive academic researchers, furthermore, time and publication pressure favor productivity over performing and documenting safety training.

Academic lab workers alone, the experts emphasize, lack the power to protect themselves. "I used to take graduate students aside," Kaufman explains. "I'd say, 'If you had a concern about your health and safety, would you talk with your faculty about it?'" Ninety-five percent of the graduate students, he estimates, said " 'No way. They don't care. They'll think I'm a wimp and not dedicated, and I'll put my degree in jeopardy, so I'm just going to keep my mouth shut and hope I don't kill myself or anybody else.' "

The safety criterion

The impetus to make safety a priority in academic labs must come from those able to enforce consequences. At too many institutions, Kaufman says, "you end up with a 25- or a 30-year-old environmental health and safety person who's responsible for lab safety or biosafety looking into the laboratory of someone who is institutionally revered as a god and telling him, 'You know, professor, I really don't think it's a good idea for you to be doing this that way.'" Instead, Kaufman believes, "Institutions have to be willing to say, 'Notwithstanding your Nobel Prize and your ... NIH grant, either you do your work following our rules and policy in our safety manual, or we wish you the best of luck wherever you'd like to work next.' "

But that rarely happens, he recognizes, because sought-after researchers can easily move, taking their grants, students, prestige, and overhead payments with them. Instead, the organizations that truly call the shots—the major funding agencies—"must stop paying lip service to safety," Langerman writes in his column, "and include safety performance as part of their funding criteria. ... An investigator with a poor safety history should not receive funding, regardless of the merit of their scientific productivity." And all prizes for scientific merit, including the most august, "need to consider safety performance." A serious safety incident must, as it does in industry, have "a serious and long-lasting impact on the career" of the lab chief, he adds.

Sheri Sangji's death "sent a shock wave" through academic science, Kaufman notes. "I know for a fact that many universities immediately reviewed their protocols for dealing with pyrophorics and many of them looked at their documentation of safety training," Phifer adds. But shock waves are brief and bureaucratic steps will not suffice, experts agree.

The responsibility to teach and enforce proper practices must be real, and a safe lab with well-trained workers must be a requirement for academic career advancement. "If anything positive is to come out of this young lady's death," Langerman says, it "must be that PIs in academic institutions are held accountable, with a regular systematic method, for safety."

Beryl Lieff Benderly writes from Washington, D.C.

10.1126/science.caredit.a0900054

[Cancel](#)