

## Environmental Health &amp; Safety

## Safety Matters

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## Getting Serious about Training by Paul Rubock

EH&S is charged with ensuring adherence to the training requirements of many safety and environmental regulations applicable to research activities. The purpose of this oversight is two-fold: people trained about workplace hazards are less likely to suffer the consequences of over-exposure to them and, the regulatory bodies frequently conduct unannounced site visits to determine compliance. The first thing they look for are training records. So even if personnel are operating totally within the letter and spirit of a specific regulation, a violation exists if training has not been documented.

EH&S can assess training compliance for Columbia personnel listed on IACUC protocols requiring Hazardous Materials Appendices. When an appendix is attached to a protocol, RASCAL populates it with the Laboratory Safety and Biosafety/Bloodborne Pathogen training dates of protocol personnel. Those with solely administrative or review functions on the protocol must be actively 'unincluded' from the Appendix or they will receive a training notice that does not apply to them.

Starting February 2011, any Appendix submitted with an IACUC protocol with personnel who are not current on their training will be 'held' possibly delaying protocol approval until training requirements have been fulfilled. To determine your training requirements, go to:

<http://www.ehs.columbia.edu/RascalRules.html>

## Controlled Substances: What's New? by Lauren Kelly

Over the past year EH&S has been assisting researchers in meeting federal and state regulatory obligations as summarized in the University's [Controlled Substances Policy](#), as well as on EH&S's [Use and Management of Controlled Substances](#) webpage. The Policy and the associated resources and reference documents are continually updated to reflect our most current knowledge of the regulations based on interaction with the regulators. Please check the [website](#) (<http://www.ehs.columbia.edu/ControlledSubstances.html>) frequently for updates to the Policy, Resources and Reference documents. The most significant update for the research community is the **requirement**, starting February 2011, that Purchase Orders for controlled substances be accompanied by copies of the purchasers' DEA Registration, New York State License, **and** their RASCAL training certificate. The latter document can be obtained by completing RASCAL module TC0502. Purchase orders will not be processed without all accompanying documentation.

The following is a brief summary of some recent additions:

- ◆ Updated *Policy*, including clarification on the difference between Schedule I and II-V materials as well as direction on *reverse distribution*, which is more environmentally friendly than other disposal methods for unwanted or expired controlled substances.
- ◆ An *inspection checklist* for license applicants who are preparing for a NYS DOH inspection.
- ◆ The name of an additional vendor for purchasing *approved narcotics cabinets*.
- ◆ Updated *recordkeeping templates*, which should be used in place of the prior templates.

As always, please contact [EH&S](#) with any questions or concerns regarding Controlled Substances use in research.

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[HTTP://EHS.COLUMBIA.EDU/](http://ehs.columbia.edu/)

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## Do You Know Your Spills? by Keith Bottum

In September, EH&S responded to a formalin spill where approximately 500 ml. was spilled when a 5-gallon carboy was mishandled. Effective response and communication among all parties allowed for efficient clean up without personal exposure or environmental harm. The magnitude and impact of this particular spill were relatively unexceptional, but it provides an opportunity to review steps for ensuring that should a spill occur, it too will be nothing more than unexceptional.

### CRITICAL EQUIPMENT

CHECK YOUR CRITICAL EQUIPMENT IN SHARED SPACES TO ENSURE THAT AN EMERGENCY CONTACT STICKER IS POSTED. IF YOU NEED A STICKERS, YOU MAY OBTAIN THEM FROM THE MORNINGSIDE OR MEDICAL CENTER EH&S OFFICE, ANY OF THE PUBLIC SAFETY DESKS AT EACH OF THE CUMC RESEARCH BUILDING ENTRANCES. OR, SEE EH&S' WEBSITE TO PRINT A STICKER FOR YOUR LAB. [HTTP://WWW.EHS.COLUMBIA.EDU/LABSIGN.HTML](http://www.ehs.columbia.edu/LABSIGN.HTML)

Personnel quickly made the determination, based on the supplies, personnel and expertise on hand, that the spill was unmanageable and knew to contact EH&S for assistance. A+ on that. However, if the lab had the required formalin-specific spill neutralizer, normal operations could have resumed much sooner.

Personnel must know what to do before a spill happens, and labs must have proper supplies on hand. Personnel must be able to quickly determine if the spill is manageable or if help from EH&S is needed, and must know what spill kits are available and when and how to use them. For example, labs using acids and bases must have appropriate neutralizers; labs using formalin must have a formalin-specific kit. This information is covered in EH&S training and is required for all laboratory personnel. Be prepared - See the EH&S website <http://www.ehs.columbia.edu/> to determine your training requirements.

## Who are you going to call? by Rebecca Lonergan

Most people are aware of the inherent chemical hazards in laboratories and are prepared in the event of a spill; however, chemical spills can happen anywhere, at any time! One recent incident illustrates the need to be aware of chemical hazards even outside of the lab, and the importance of contacting EH&S, or Public Safety if after hours, whenever you suspect a spill may have occurred.

Two students moving furniture from a storage space in a non-laboratory building discovered a silvery substance on the floor. Not expecting to encounter chemicals in the area, they swept the floor and collected the dust and silvery material in a trash bag and bottle which they then set aside and left unlabeled. Several days later while EH&S was visiting the area on an unrelated matter, the student mentioned the collected material. Upon investigation EH&S discovered elemental mercury contamination throughout the room stemming from old, improperly stored mercury containing equipment.

Because the material was not reported immediately to EH&S or Public Safety, the loose mercury made its way from the equipment and spread throughout the room resulting in a greater area of contamination. The reporting delay may have caused the lag time in response, which may have contributed to a small spill cleanup becoming an expensive, multi-day spill response.

- ◆ If you see something in a laboratory or non-laboratory space that you suspect may be associated with a hazardous incident, contact EH&S or Public Safety immediately.
- ◆ Generally if spills are reported immediately, they can be cleaned up quickly and thoroughly to minimize exposure and disruption to operations.
- ◆ If you are unsure of a situation or whether a spill is beyond your capabilities, contact EH&S.
- ◆ Remember to collect and label all debris and equipment used during spill responses for

For Lab Fire Safety  
Prevention tips,  
check out:

FDN(wh)Y Me @

[http://](http://www.ehs.columbia.edu/FDNYMe.html)

[www.ehs.columbia.edu/](http://www.ehs.columbia.edu/FDNYMe.html)

[FDNYMe.html](http://www.ehs.columbia.edu/FDNYMe.html)

disposal as hazardous chemical waste.

- ◆ Need a refresher on handling chemical spills or working with chemicals? See our website at <http://www.ehs.columbia.edu/ChemicalSpillsFires.html>

## Let's Make Mercury Spills Extinct by Courtney Drayer

**M**ercury is a neurotoxin that bioaccumulates in the environment, and mercury spills are difficult, timely and expensive to clean up. In an effort to reduce the quantity of elemental mercury at the Columbia campuses and prevent accidental release of mercury into the environment, EH&S has provided a free mercury thermometer substitution program for the past ten years. EH&S will provide your laboratory with a certified ( $\pm 1^\circ\text{C}$  accuracy), National Institute of Standards (NIST) traceable, 12" partial immersion organic liquid in glass (LiG) thermometer for measurements from  $-20^\circ\text{C}$  to  $+110^\circ\text{C}$  (VWR Catalog #33600-036) in exchange for an intact mercury thermometer. Similar partial immersion, LiG thermometers with the same length and same  $\pm 1^\circ\text{C}$  accuracy are offered at the at more than triple the price (e.g.: VWR Catalog #61017-823).

NIST is a government organization that, among other responsibilities, offers thermometry calibration services. NIST is currently working with the American Society for Testing and Materials (ASTM) to rewrite temperature and measurement consensus standards in order to discontinue the use of mercury thermometers, where possible. NIST is also working with the Environmental Protection Agency (EPA) to develop non-mercury solutions for elevated temperature applications (e.g; autoclave operations) where traditional organic liquids will fail. Additionally, organic LiG thermometers can both be NIST traceable and ASTM certified for accuracy. One remaining concern is that organic LiG thermometers are not as sensitive as mercury thermometers. However, thoughtful engineering and selection of the appropriate alcohol for the temperature range needed can give results comparable, if not better than, mercury. To illustrate, the sensitivity of a thermometer can be measured by the following equation;

$$\frac{\Delta H}{\Delta T} = \frac{4 V \beta'}{\pi d^2}$$

Where T is temperature, H is height, V is volume,  $\beta'$  is the cubical coefficient of thermal expansion corrected for the rate of expansion of glass, and d is the diameter of the capillary bore. In the case of a small mercury thermometer, with a volume of  $300 \text{ mm}^3$  and capillary diameter of 0.2 mm, the sensitivity of the thermometer will be  $0.97 \text{ mm}/^\circ\text{C}$  - there will be almost a millimeter between each one degree marking.. In order to achieve this same sensitivity ( $0.97 \text{ mm}/^\circ\text{C}$ ) using ethanol as the filling liquid in a thermometer of the same volume, the capillary bore should be 0.65 mm. As an added bonus, a thermometer that has a larger diameter should also be easier to read. For those who are concerned about the low boiling point of ethanol, other filling liquids cover various ranges of temperature (for example, i-amyl benzoate is reliable through  $+220^\circ\text{C}$  and pentanol is reliable down to  $-115^\circ\text{C}$ ). Non-metal thermometers are appropriate for use in temperature ranges for many standard laboratory scale experimentation. For additional information in selecting a mercury alternative, NIST provides a guidance document that addresses the technical issues regarding substitute devices in an article by [Ripple and Straus, 2005](#).

### Mercury thermometer

IN AN EFFORT TO REDUCE THE QUANTITY OF ELEMENTAL MERCURY AT THE COLUMBIA CAMPUSES AND PREVENT ACCIDENTAL RELEASE OF MERCURY INTO THE ENVIRONMENT, EH&S HAS PROVIDED A FREE MERCURY THERMOMETER SUBSTITUTION PROGRAM FOR THE PAST TEN YEARS.

EH&S  
Website:  
<http://www.ehs.columbia.edu>



## Protecting Yourself from Cold Stress by Terrence Jaimungal

**A**s winter approaches, the cold weather brings with it risks that are invisible to the naked eye. With dropping temperatures, workers are under the threat of suffering from cold stress. Exposed to cold or freezing temperature for long periods of time, a person runs the risk of losing enough body heat to lead to brain damage and even death.

**Train Employees for the Cold & Changing Weather** Workers should be trained not only about cold-induced illness and injuries, but also to identify situations (wind, duration of outdoor activity) that may cause cold stress.

Workers should be especially trained in recognizing the signs and symptoms of cold stress or cold-induced injuries like hypothermia and frostbite.

**Use the Buddy System** Cold weather is not the time to enjoy solitude while accomplishing your tasks outdoors. You don't want to be working one minute and thawing your fingers the next. So get a partner and work on monitoring each other for signs of cold stress. Don't be stubborn because most of the time, it's very difficult to determine danger signs when you only have yourself to rely on.

**Adjust Work Schedule to the Cold or Changing Weather** Schedule work during the warmest part of the day. Break a task into shifts so you can take frequent, short breaks in warm dry shelters.

**Layer Clothing** At this time of the year, the saying "less is more" surely does not hold true. Remember that it's better to go for several thin layers of clothing instead of wearing a few thick layers. For clothes next to the skin, choose those with synthetic fabrics to avoid absorption of sweat; an ideal choice is polypropylene. For outer layer, choose waterproof and wind-resistant fabrics.

**Wear Complete Personal Protective Equipment (PPE)** Wear warm gloves, hats and hoods. In extreme conditions, don a warm woolen hood that covers your neck, head and ears. If you get hot while working, just open your jacket. Don't remove your hat and gloves. The key is to wear clothing that can be adjusted to changing conditions. Avoid wearing tight-fitting footwear as this restricts blood flow. Shoes or boots should allow you to wear either one thick or two thin pairs of socks.

**Know Your Limitations** If you're sick or under medication, you are at greater risk of cold stress. This is especially true if you have hypertension, diabetes, or a cardiovascular disease.

**Wear Eye Protection** Ice or snow plus excessive ultraviolet rays can equal *eye injury*. Before working outside, check first if you may be exposed to glare or, worse, blowing ice crystals. If conditions point to the affirmative, the wear right kind of eye protection.

## Alcohol + Flame = Trouble by Paul Rubock

**T**wo constants in biological safety cabinets (tissue culture hoods) are an alcohol squeeze bottle and a Bunsen burner. The burner can be eliminated if sterile, single-use, disposable inoculating and transfer devices are used. (Remember, the air inside the cabinet's work space is microbiologically sterile and the perceived need to flame 'everything' is a by-product of the era when most work was conducted on the open bench. The use of flammable ethanol for disinfection inside of the BSC can create a hazardous environment.

This past month an investigator was using a glass rod to spread cells on a petri dish. The rod was being dipped in alcohol and flamed with a Bunsen burner to sterilize it between procedures. (You can probably tell where this is going.) The evening's work came to an abrupt halt when some flaming alcohol dripped off the rod and ignited the contents of the beaker. Then the flaming contents of the beaker were tossed into a red bag, causing it to ignite. Personnel in the laboratory put out the fire with an extinguisher. (Do you know where your laboratory's extinguisher is and how to use it?)

Accidents such as these can be eliminated by using disposable plastic spreaders. They are available in pre-sterilized packages and can be autoclaved for re-use. See *VWR product #60828*.

## Portable Space Heaters by John LaPerche

Use of any portable space heater - at home or work - can present a high risk for fire if the heater is not a properly operated, approved appliance. Areas where portable space heaters are used must contain sufficient electrical power to support them. Please consider the following before using a portable heater:

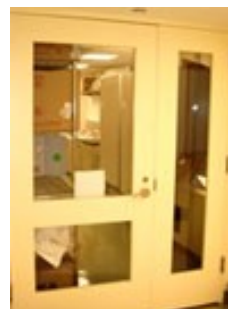
- ◆ Before purchasing a portable space heater, Facilities Management must be notified to assess heating and ventilation in the area/s where space heater/s are being considered.
- ◆ Facilities Management will determine if appropriate heating can be provided by standard building systems and determine if safe and sufficient electrical power is available and communicate back to the department accordingly.
- ◆ Only heaters meeting the following criteria will be considered for use:
  - ◆ The unit must be of the oil-filled type, completely enclosed, with no exposed heating elements.
  - ◆ The unit must be UL rated (inspection tag intact) and have a grounded plug.
- ◆ Fan forced heaters, quartz or ceramic type heaters and units with exposed heating elements are **prohibited**.
- ◆ When in use, heater must be kept at least 3 feet from combustible materials.
- ◆ Heater must be operated as per Owner's Manual and all safety instructions.
- ◆ Heater must be plugged directly into wall outlets; extension cords **may not** be used.
- ◆ Do not place heater under desk or in other enclosed area.
- ◆ Turn off heater when room is unoccupied; heater must never be left unattended.

Contact EH&S if you have any questions about the use, placement, or operation of space heaters.

## Fire Rated Double Doors - Proper Use and Operation by Harry J. Oster

"A chain is only as strong as its weakest link" is a familiar phrase. If we replace the word "chain" with "door," this can be applied to fire rated double doors found at the entrance to common equipment rooms and newer labs. The components of this type of fire rated door assembly are referred to as "active" and "inactive" door leaves. The larger, "active" door leaf (~36") is designed to be used as the operating side incorporating a door handle and self closer at the top of the door, while the smaller sized "inactive" door leaf (~12") is designed to remain CLOSED and LATCHED by way of the top and bottom recessed flush bolt locks embedded into the edge of the door. The "inactive" door leaf does not have a door handle or self closer at the top of the door.

During recent fire safety rounds the smaller "inactive" door leaf has been found open and unlatched in many rooms with this type of door. This condition severely compromises the rooms' fire safety rating and is also a clear violation of the New York City Fire Code. A FDNY Inspector may then issue a violation and/or fine. Please help EH&S help you remain safe and avoid violations by simply keeping the smaller "inactive" door leaf closed and latched at all times and only use the larger "active" door leaf for your normal daily activities into and out of these rooms. If you have difficulty with operation of the door, please contact Facilities.



Note: VIOLATION    Note: NO VIOLATION

Small door open    Small Door closed and secured



## Hazardous Materials Shipping Update by Christopher Pitoscia

In the time since the release of the last issue of *Safety Matters*, EH&S has been actively updating existing training modules and developing new tools and resources to assist the Columbia community in meeting the requirements of regulations governing the transportation of dangerous goods such as laboratory chemicals, biological samples and radiological materials. The importance of compliance with these regulations, as well as the scrutiny of hazmat shipments, has never been greater. Recent criminal activity involving the exploitation of the global cargo transit system to ship explosives-laden printer cartridges has placed shippers of all cargo - dangerous cargo shippers especially - under the regulatory microscope.

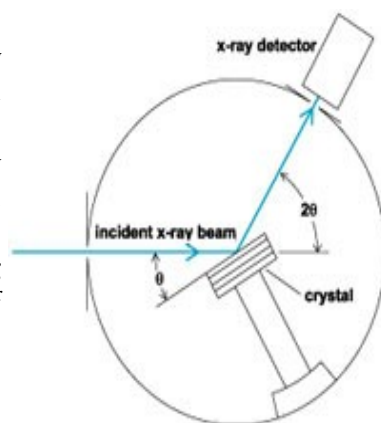
RASCAL training for the shipment of exempt biological materials and dry ice has now been updated to meet the requirements of the dangerous goods regulations and enhancements to the module for Category B Biological Substances will be completed soon. In addition, by the end of the year, a page of the EH&S website dedicated to hazmat shipping will be available, providing access to flowcharts to assist personnel in determining the appropriate handling of their dangerous goods shipments.

Finally, Columbia personnel are reminded that any person involved in the preparation of hazmat packages must undergo proper training, and trained personnel are urged to be extremely vigilant in properly preparing shipments of dangerous goods. Please visit [www.ehs.columbia.edu](http://www.ehs.columbia.edu) frequently for updates and announcements, and please do not hesitate to contact EH&S for assistance with hazardous materials shipments.

## X-ray Diffraction Machines: Uses and Hazards by George Hamawy

X-ray diffraction machines are used throughout Columbia University. The scattering of x-rays in different directions due to interference effects by matter with accompanying variations in intensity makes these machines a powerful tool in determining the atomic arrangement of matter. Photos of the X-ray diffraction patterns of crystallized DNA by Rosalind Franklin enabled Watson and Crick to make the critical leap that led to their elucidation of the double helix!

The x-rays used most commonly in these machines are of short wave length, known as “soft” x-rays that are readily absorbed in matter. Soft x-rays are easily shielded, however they are very dangerous when absorbed in soft tissues and severe burns can result from exposure of the hands, arms, skin or eyes to the direct or diffracted beams. Because of the potential for harm, all x-ray diffraction machines at Columbia University must have interlock switches and warning lights. Effective shielding must be used, film badges must be worn, and radiation safety training must be completed. These machines are among the items that EH&S is currently inventorying for security and compliance. If you received an email information request (make, model serial number) please respond. For more information please contact EH&S at (212) 305-0303 (CUMC) and (212) 854-4442 (MS).



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Do you have a suggestion for a future *Safety Matters* article? Do you have a comment on something you just read? Please share it with us at [newsfeedback@columbia.edu](mailto:newsfeedback@columbia.edu)

