THE STATE OF THE ARTS: CHEMICAL SAFETY - 1937 TO 2017

Monona Rossol, M.S., M.F.A., Industrial Hygienist

ABSTRACT. This paper, written for chemists, summarizes personal observations in the theatrical industry and in art and theater schools over a working life time. These observations are used as the basis for developing the opinion that there has been little or no significant progress in safer handling and use of chemical products and art materials in schools over the years. Suggestions for improving chemical safety are covered which include providing 1) better training, 2) safer facilities and 3) better enforcement of chemical safety rules in schools.

HISTORY

My work began in 1937, at age one, as the understudy for the rabbit in my father's Vaudeville magic act (APPENDIX 1). My job was to be the prop in an illusion specially created by my father. And by age three, I was a professional entertainment worker and, like my father and mother, a member of the Chicago Local of the American Guild of Variety Artists (AGVA). My little sister and I were "Jean and Joan" doing acrobatic routines and soon I was also record syncing, singing, and assisting in the magic act.

Magic also provided me with an introduction to chemicals such as red and white phosphorus, gun powder, Lycopodium and pyrotechnics.

For those who don't know much about Vaudeville, it was the primary form of entertainment in the United States until moving pictures progressively displaced it. But as Vaudeville slowly died, the Vaudevillians continued to live. And we continued to perform. We stopped playing the Orpheum Circuit theaters and began working in venues such as State and County Fairs, Circuses and Carnivals, Elks and Moose Clubs, Resorts and, in the 1940s, USO (United Service Organizations) shows at military bases.

But the world of back stages, circus lots, and carnival midways in the 1940s and 1950s was also dangerous. I saw both career-ending and fatal accidents and experienced an accident that ended the acrobatic portion of my own career. I learned that carnies are usually fugitives from the law, but that the most dangerous men were likely to be the politicians and rich townies who felt entitled to treat young women entertainers anyway they saw fit.

THE COLLEGE YEARS. I left home at age 17 and forged my parents' signatures on the forms to enroll at the university of Wisconsin. No one in the admissions office was smart enough to notice that the person filling out the form didn't know the ages of the student's parents. (Your ***true*** age is ***never*** even mentioned in a Vaudeville family.)

And in the University, I saw exactly the same power structure I had seen on the road. Many of the professors fit neatly into the role of the powerful townies. Male students were the grips and carny barkers.

What was completely new to me was the attitudes toward women. In show business, I was encouraged (even pushed) to work in any capacity I might be able to master. And since men can't sing soprano, there always was the understanding that everyone had a role in making the show a success. I was about to experience a different attitude in my work for the University.

In 1956, while still an undergrad, I began working as a Project Assistant in the Zoology Department. I worked in zoo labs from 1956 to 1959. Then I took a year off from school to work at Bjorksten Research, an industrial laboratory, for a year. Then, and from 1961 to 1967, I worked in various positions various chemistry departments and in Civil Engineering labs.

While Dr. Aron J. Ihde, who employed me as a teaching assistant, encouraged me to continue my education in chemistry, most of the other professors made it clear that I should restrict my career to being helpful to the males who were doing the ***real*** research.

LAB SAFETY. I was also observing safety practices in these university labs. Safety was mentioned in general terms with admonitions to wear splash goggles and be careful. In addition, I now know that the ventilation we had in organic chemistry labs was far from efficient.

The year I worked in an industrial lab, however, opened my eyes. For example, my director showed up at my bench one morning and removed one of the chemicals I was working with. He showed me published data which indicated the chemical was probably a carcinogen. This chemical was now restricted in our lab to use in a fume hood with special gloves.

And on another occasion, I noticed an odd change in color in one area of the skin on my hand. My director already had lists of all of the chemicals each employee was exposed to and we began going through the list to figure out which one was likely to be the cause. The choice soon became obvious and I was sent to a doctor with information on the chemical's known and suspected effects and recommendations for a particular treatment.

Contrast this with the work I was doing for one professor which involved hydrofluoric acid. I was told to be careful that this acid was particularly nasty, but there was no discussion of the delay between exposure and reaction. One day when I got home from work, I began to feel incredible pain in three of my fingers. I called the Professor and was told to keep my hand in a bucket of ice water over night. It took more than one night, and I had to wear false nails on stage for quite a while.

ART SCHOOL. Looking for another avenue for my energies, I tried to enroll in Studio Art. I was told that women could enroll in Art Education to teach art, but they could not be artists. (Later my Art History professor explained the reason to us in one of his lectures. He said there were no significant women painters because women's brains are defective and they do not process color and form as artists need to do.)

After repeated attempts, I was admitted into Studio Arts. I'm still haunted by what I saw there. Some of the art professors would be in jail today for their interactions the students and models. The male students were even more dangerous since they followed their mentor's behavior blindly without any of the reservations that come with age.

The women students dearly wanted to be accepted. What the males sold to them as "acceptance" and "sexual freedom" was so obviously exploitation. And what upset me most was the women's rejection of my arguments for not accepting this behavior. Instead, they defended their abusers. The rebuttal to this argument came at graduation when the males all had jobs and the women only had a degree.

COMBINING FIELDS. One day as I traveled back and forth between my classes in the Art Department and my job in the Chemistry Department, I realized that the same chemicals were being used in both places--acids for etching, solvents for oil painting, minerals in ceramics, and the like. The Chemistry Department provided students some rudimentary safety training, eye wash stations, and ventilation hoods. But there were often no precautions in the art department for the same chemicals.

Worse, the art professors were convinced that artists must not be neat or clean and they should have intimate physical contact with their art materials. As a result, everyone was covered head to foot in their paints, clays, and inks. Well, not everyone. I was minoring in music and had a heavy performance schedule as a singer. I came to the studios with hair done up and long fingernails, even in pottery and glassblowing. Moreover, I got a very large body of work done and picked up two National awards (the 1962 Young Americans show and a purchase prize award in the 23rd Ceramic National competition), so I know it can be done.

But my messy cohorts seemed to assume that even intimate contact with highly toxic lead and cadmium compounds was safe if these chemicals were used in paints or ceramic glazes. The fruits of this kind of unscientific thinking in the Art Department were made manifest by many accidents and illnesses. Three of these were particularly memorable.

1. The hot plate where we melted wax in the glaze room (which would have been done in a hood in the Chemistry Department), developed an ominous fog a few feet above the pot which suddenly exploded. The blast created a tangled mess of burned glaze recipe binders and countertop equipment. This paraffin fume phenomena was well-known to chemists–but not to anyone in the art department.

2. A number of sculpture students, including myself, got acute lead poisoning when we were taught to make "dripped lead sculpture." We melted junk yard lead indoors without ventilation, cast it into bars, and used an acetylene torch to remelt the bars and drip the lead into our molds. We thought we had some kind of flu that caused the vomiting and diarrhea. No one in the art department, including me at that time, knew that an invisible fume of tiny lead oxide particles is emitted into the air when lead melts. And since the first effects of lead exposure are to lower the IQ, it may explain why I still remained in art school.

3. One of my classmates, Clayton Bailey, decided to build a salt kiln. These are kilns into which salt is thrown when the kiln is at high temperatures. The salt dissociates and the sodium rips a hydrogen molecule off the clay, changing it from a hydro aluminum silicate to a glassy sodium aluminum silicate which functions as a glaze. Chemists will all be aware that this leaves a hydrogen ion and a chlorine ion at liberty to chew on any human tissue in the vicinity of the kiln. But Clayton decided it would be cool to build this kiln indoors. The choking fumes resulted in the emergency evacuation of the entire building.

These incidents made me aware that there was a need for someone in the arts with some basic knowledge of chemistry and perhaps a little common sense. I found my passion.

MY GRADUATE SEMINARS. Since we were required to present graduate seminar papers on art-related subjects, I did several in 1962 and 1964 on the safety aspects of ceramics. It was in these seminars that I first experienced the incredible hostility generated by the suggestion that artists might want to rethink their work habits. During the critique of my seminars, some of my classmates informed me that this subject had no place in the arts and knowledge about the toxicity of their materials would interfere with their creativity. I didn't think that death and disease would do much for their creativity either, so I persisted.

WORKING IN MADISON. My interest in safety became known and soon I was consulting on art safety in addition to teaching for the Madison Art Center and the Madison Area Technical College. By now, I had both MS and MFA degrees in art, but I certainly had no business consulting as a safety expert. I was successful only because I had absolutely no competition. Nobody else was even slightly interested in doing this work.

After I had worked several years at the Madison Area Technical College as one of only two ceramics teachers, the Director decided to increase the department to three people and appoint a "ceramic department head." I applied for the job. Instead, they hired a "boy" fresh out of school who only had a BS degree. I had to teach him to fire the kiln and mix the glazes and they paid him twice what I was getting. I knew then, if I stayed in Madison, I'd probably kill someone.

NEW YORK CITY. I came to NYC in 1968 and from that day on, I had no major discrimination problems. I must admit, however, I fell back on my entertainment background and my first paid jobs were singing and acting. In a kind of reverse logic, whenever I was broke, I went back into show business.

Soon I made connections in the art world and was getting into good NYC art shows and teaching pottery at various schools and colleges such as Henry Street Settlement, Greenwich House Pottery, Lehman College, and many others. The safety in all of these schools was egregious. Most shocking to me was the Henry Street Settlement that provided activities and education for poor children on the Lower East Side. On the pottery walls were big posters reminding mothers to prevent children from eating lead paint chips. On the pottery floor were white and red footprints from the 50-pound bags of lead carbonate and red lead glaze ingredients that were spilled and being tracked around.

All through the 1970s and early 1980s, I worked in ceramics all day and sang and acted at night. And I went back every summer to my Wisconsin studio to make pottery to sell at the art fairs, sing in summer stock, in churches and with local touring orchestras.

SAFETY AS A PROFESSION. In New York in the 1970s, the schools at which I taught were again calling on me to solve safety problems such as controlling odors from kilns. But unlike Madison, I found there were other people in New York who were interested in art safety. Two of these people were Michael McCann, a Ph.D. Biochemist, and Cate Jenkins, a Ph.D Chemist and National Science Foundation Resident. In 1977, the three of us founded the Center for

Occupational Hazards later known later as the Center for Safety in the Arts. Our aim was to provide the arts with health information and industrial hygiene services.

Applying industrial hygiene to art and theater professions was a new idea in 1977. While there are regulations and limits on exposure to toxic chemicals if you are a worker in a factory or laboratory, these regulations were not being applied to the artists using the same chemicals.

The collaborative work at the Center provided me with ways to begin addressing some of these safety and health issues. I learned by working with other industrial hygienists. Also crucial was working and studying with Thomas Cutter, an Industrial Ventilation Engineer. In return for my education, I shared with these industrial hygienists and Tom Cutter, information about how artists use their toxic materials and do hazardous tasks so we could develop ventilation systems and other precautions that do not interfere with their creative objectives.

As part of this work I toured, inspected and/or wrote reports on the safety conditions in an average of 15 different art or theater venues per year. These sites ranged from grade schools to universities and from amateur community theaters to Broadway houses. These jobs were all over the United States and Canada, in two venues in London, England, and every state and territory in Australia during the two consulting and lecture tours I did there. I was back on the road.

In 1984, two industrial hygienists reviewed my consulting reports and recommended me for full membership in the American Industrial Hygiene Association. Also by 1984, my work and writings had attracted the attention of some of my peers. I was given a Special Service Award at the 13th Annual Air Pollution/Contamination Control Conference by sponsored Rossnagle & Associates. Also given an award at this event was Irving J. Selikoff, a giant in occupational medicine and an expert in asbestos hazards (APPENDIX 2). Dr. Selikoff also called on me yearly to provide a seminar on the hazards in the art and theater professions for doctors graduating in occupational medicine.

In 1986, I left the Center and started up another nonprofit, called Arts, Crafts and Theater Safety (ACTS), to do the same kind of work. Under ACTS, the number of consultations in schools and theaters roughly doubled.

Then in 1995, I found the perfect fit for my interest in protecting theater workers. I took a second job: Safety Officer for the United Scenic Artists, Local USA829 of the International Alliance of Theatrical Stage Employees (IATSE).

And, of course, I was still singing, now mostly in Cabaret. However, I never mentioned these jobs to the doctors, industrial hygienists and engineers I worked with during the day. I knew they were not ready to catch my act in some after hours gay club in a costume cut down to there.

SUMMARY. This long story documents that, if we start counting with my job as a prop in 1937, I have had 80 years of continuous experience in the entertainment industries. And depending on whether we count my amateur safety consulting beginning in 1964 or the professional work beginning in 1977, I have had either 53 or 40 years of continuous employment in safety consulting in the arts. These safety jobs have taken me to every state in the U.S. with the exception of North Dakota and Alabama.

STATE OF THE ARTS TODAY

There are no statistics to support my views. I only am informed by my observations. But these observations lead me to believe that the overall level of chemical safety in our art schools and theaters has hardly changed. While I would like to crow about individual battles won at individual schools or theaters or elimination of a few particularly hazardous materials, the big picture is not one of significant progress. My reasons for this opinion are the following.

SCHOOLS AND THEATERS. I still see theaters and schools with practices as wrong and as primitive as I saw as a child and as a college student. While they are fewer in number, each year I walk into at least one or two of these time-warp facilities. They are full of both chemical and physical safety hazards. But if we look only at their chemical safety issues, I see ancient stocks of chemicals stored improperly. Some of these usually are unstable when I find them such as old organic peroxides from resin casting, potassium chlorate (from printmaking), or expired pyrotechnic chemicals (in theater).

In addition, I will see workers or students whose tasks are clearly exposing them to significant amounts of toxic substances including lead and asbestos. It is common to see them doing lead soldering, lead type setting, or working in studios and shops in old buildings with lead paint flaking from walls and ceilings, and with friable asbestos sources in equipment and building materials. And I will see other toxic and flammable chemicals being addressed with useless and even dangerous ventilation systems including many illegally installed spray booths.

And while some of the facilities have removed some of their old chemical hazards, they are willy-nilly replacing them with new hazards such as unvented 3D printers, laser cutters, and Robot routers. Many schools and theater shops ceased using styrene-emitting polyester resins, but replaced them with two-component urethane resins that emit isocyanates. Carbon nanotube black pigments in powder and spray forms now are a fad. People in the arts embrace new chemical products and technology without reservations or competent safety assessments.

TRAINING. Only a handful of the schools and theaters I see have done their Globally Harmonized System training. In fact, I see schools and theaters every year that have never done any kind of OSHA chemical training, ever.

Moreover, the low (or no) science requirements needed to qualify for entry into art and theater programs combined with a lack of mechanical skills in young people caused by limiting their exercise to moving their thumbs, has created students and young faculty members who don't have the background to assess chemical risks or become proficient at routine safety practices. In addition, their idea of chemical research is to google the advertising claims of the sellers of their supplies. And medical surveillance is likely to involve herbs and aroma therapy.

STEP ONE: COMMIT TO PROPER TRAINING

The fix for the chemical safety problems must begin with a commitment by schools, employers, and teachers to provide OSHA hazard communication training (1910.1200). (This fix, will not work for those state schools in the 25 states that exempted themselves from the federal OSHA rules unless they adopt an equivalent system.)

Chemists are used to training and working under the OSHA Laboratory Standard (19101450), but this rule will not work for art and theater departments. The Lab Standard assumes a level of chemical sophistication that is not present in art and theater schools. There is no one in these departments who could legitimately take the position of the Chemical Hygiene Officer and administer a Chemical Hygiene Plan. Until and unless the science requirements for art and theater programs are changed, this will continue to be a hard and fast reality.

And this means that schools and employers in arts will need to budget for a hazard communication trainer and manager for the arts. Some schools have tried to solve the problem by delegating art and theater department safety to one of the Chemical Hygiene Officers in the sciences. But these CHOs have no understanding of the processes used in the arts. And, they will soon find, safety in the arts is a full-time job.

TRAINING. The federal OSHA hazard communication regulations have all the elements necessary to set up proper chemical safety training in the arts. But the training, as OSHA requires, must be relevant to the work and the products and processes actually used on the job. None of the currently available standard OSHA training formats I have seen will work for either art or theater people.

LABELING. The best example of the problem with standard OSHA training programs can be seen by considering the training of art and theater workers to correctly interpret label information. The OSHA programs usually only cover the Globally Harmonized System labels (GHS). Yet people in the art or theater departments probably will never see GHS labels because their products will be labeled under various consumer labeling regulations instead.

Consumer products require training under the OSHA rules if they are used in amounts or in ways unlike ordinary consumers would be expected to use them. And in art and theater, training on all these consumer materials is needed due to long studio and shop hours, experimentation with materials, the many off-label uses of the products, and the unusual and intimate conditions under which these products are commonly used.

Trainers must teach art and theater people to interpret the labels whose terminology is mandated by three different agencies: The Consumer Product Safety Commission (CPSC), EPA and FDA. The CPSC has different labeling criteria for:

* ordinary consumer products (e.g., household paints and home improvement products),
* art materials (any products marketed for art or craft use),
* flammable fabrics (needed by theatrical costumers), and
* children's articles and toys (needed by teachers of art education).

The FDA labels are found on products used for:

* makeup or hair dressing (e.g., theatrical hair and makeup workers, actors, etc.) or
* disinfectants and other medical uses (e.g., wardrobe maintenance people, stage and location medics, etc.).

The EPA label terms are used on:

* pesticide and other biocide products, and
* CPSC labels (e.g., the terms "VOC" and "biodegradable" are on consumer labels and often are mistakenly thought to indicate a product's safety).

But training people to read these labels is a complex business. These various consumer laws often used warning words and similar pictograms whose meaning is very different from the GHS definitions.

ART MATERIAL LABELS. If we further narrow the discussion to art material labels only, the magnitude of the problem becomes even clearer. The regulations for these products come under the Federal Hazardous Substance Act administered by the Consumer Product Safety Commission under the special provisions in 16 CFR 1500.14. The rules are in Section 3(b) of the Act called "Products requiring special labeling." Part (8) "Art Materials" lists rules for artist's materials.

Materials labeled under this law are exempt from other labeling laws such as the laws restricting lead in consumer paints. Artists paints are allowed to contain lead, cadmium, and almost any other toxic substance and at any concentration.

The ordinary artists paint and ink tubes and containers will have a number of phrases, abbreviations and symbols that trainers will need to be able to explain including the following:

* "Conforms to ASTM D4236"
* Colour Index abbreviations such as: PW 6, PY 13, etc.
* Hazard warning statements (with meanings quite different from those on GHS labels)
* A certification seal (there are several seals with different meanings)
* The word "nontoxic" is often on the labels which doesn't mean at all what artists assume it means.

A trainer must inform students that it is illegal to sell any art material in the United States that does not have a toxicologists certification and statement on the label that it conforms to ASTM D4236. And that conformance statement does not mean the products is safe. In fact, this labeling rule has all of the flaws and ambiguities that GHS was designed to eliminate.

For example, a paint containing a pigment in an amount that can be fatal to a child on ingestion can be labeled "nontoxic" if that paint is marketed to adults. This is because ingestion is not anticipated by an adult if the product is "used as directed!"

The GHS rule prohibits the use of phrases such as "safe if used as directed" on labels. But all of the labeling of art materials either use this phrase on the label or use it as the criteria for assessing the product's toxicity for the purposes of labeling.

The trainer need to inform artists that these exposure estimates based on "used as directed" have seriously harmed consumers. The best example is the deaths of two patients in senior care facility art programs in the early 1990s who accidentally ingested some ceramic glaze. These were lead-containing glazes labeled both "nontoxic" and "lead-free" based on a toxicologist's

exposure estimate. And later, lawsuits were filed and settled in favor of plaintiffs claiming their children were brain damaged *in utero* because their mothers were misled by this same labeling.

And trainers should be able to point to similar abuses are occurring today. For example, benzidine pigments can be labeled "nontoxic" because the particular benzidine compounds used in art have never actually been tested for chronic toxicity. (Similar benzidine chemicals are listed carcinogens.) Untested chemicals, under the art material labeling law, can all be labeled "nontoxic" despite any reservations chemists might have based on their structures.

There is so much more to say about art material labeling. But the point of this discussion is only to show that trainers must be familiar with the actual label terminology used on products their trainees use.

THE REST OF THE HAZCOM TRAINING. Each and every hazard communication subject needs to be similarly adapted to the products and processes actually used in the art studios.

Theater training is even more complex due to the strange combination of products they use labeled under all of the different agencies. And since theater is the only industry that deliberately contaminates its workplace air with chemicals, trainers of theatrical workers should cover exposure to special effects fog, smoke and haze.

Obviously, this kind of training is not happening. And to be blunt, well-meaning OSHA trainers are misinforming and boring artists and theater people by training them in irrelevant subject matter and demonstrating with every word they utter that they are unfamiliar with the materials their trainees use or how they use them. That is counter to the intent of the OSHA Hazard Communication Standard which demands site-specific and product-specific training.

To address this issue, I have designed and taught a 40 hour course for potential trainers with backgrounds either the sciences or the arts. It should enable them to cover most of these issues (APPENDIX 3). And I have worked with both Local USA829 and the National Training Fund of IATSE to help develop training modules for professional theatrical and film workers. The next step is for my students to go forth and provide this specialized training for schools.

STEP TWO - PROVIDE A SAFE BUILDING

Safe practices can only be done in a facility that is designed for safety and most art and theater school studios and shops are poorly designed. And the blame falls most heavily on architects. In one of my books I explain the problem this way:

> In 1977, Architect Walter Netsch was attending a dedication of the school he built for the Art Institute of Chicago. This brand new building already had ventilation problems, cracking floors, and other issues. The students confronted him on a stairway during a walk through of the facility. They asked him about some of these things and most specifically they asked what on earth he was thinking when he put a skylight in the photographic darkroom.
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> Netsch replied: "I didn't build a school of art. I built a sculpture in Grant Park." And then he walked away.

I think of architects as very special set designers. They create amazing, unique and innovative designs and environments that literally can astound us all. But in my world, direction of the whole show is never given to the set designer. Instead, everyone involved in a production can make their needs known to the show's director. And safety trumps all design considerations.

Instead, the artistic statement is still the primary consideration for many architects and the donors who pay for the buildings. And safety must try to squeeze somewhere into their grand concept.

VENTILATION DESIGN STANDARDS. Chemical safety is dependant on proper ventilation. Every new project I accept starts with a presentation on ventilation. I try to acquaint faculty and administrators with the two sets of ventilation standards that must be integrated in the new building:

* The standards of the American Society of Heating Refrigerating and Air-conditioning Engineers (ASHRAE) specify "*minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health effects*. (Page 3 of ASHRAE 62.1)

* The standards of the American Conference of Governmental Industrial Hygienists (ACGIH) as detailed in their *Industrial Ventilation: A Manual of Recommended Practice.* This manual provides design specifications for ventilation systems used to control airborne toxic substances created by various processes.

The ASHRAE 62.1 standard is accepted worldwide by engineers and designers, but it's application is limited in art and theater buildings to the audience seating areas, lecture rooms, offices, cafeterias, and other areas in which significant toxic chemical use is not occurring.

Most importantly, ASHRAE 62.1 references the ACGIH *Industrial Ventilation: A Manual of Recommended Practice* and recommends its use when dealing with contaminated air. Yet many ventilation engineers try to use ASHRAE systems to control chemical air contaminants in violation of their own standards. Moreover, heating and air-conditioning engineers are not capable of designing good industrial systems. Instead, an industrial ventilation engineer is needed.

The industrial ventilation engineer, in turn, depends on the industrial hygienist. It is my job to get lists of chemicals and equipment used in each department, interview the faculty to find out exactly what they will be doing, and select the right types of ventilation systems from the ACGIH Manual and choose the safety equipment they need. This is all written up into a massive report.

Sadly, I usually see my building planning reports and recommendations ignored, misinterpreted, and change-ordered out of existence. Each cut or change made can result in a potential health or safety problem for the occupants and users. To illustrate how this happens, I will use the design of some exhaust stacks as an example.

EXHAUST STACKS. The air contaminants captured by local exhaust hoods must go through ducts powered by a centrifugal fan and into an exhaust stack. This stack must be designed to

release air contaminants into moving air space above buildings and in areas that cannot reenter the building. All of my 80-plus reports have included drawings from the *Manual of Recommended Practice* showing that these exhausts must not be rain-capped or covered in any way that restricts the free release of the air contaminants.

But architects and their clients often have an artistic vision that does not include stacks being visible above the roof line. So they either ignore these requirements or the try to disguise the stacks.

In one case, the architect designed the stacks to look like historic fire place chimneys. Three stacks were in each chimney-like structure and the tops of each stack poked slightly above the chimney top as old-fashioned fireplace flues would. I bragged about this artistic and efficient solution until I saw the finished building.

Someone didn't like the little chimneys poking up out of the top, lowered them, covered them over with a metal panel forcing the air to make a 180 turn and exit from a louver in the side of the enclosure. This creates incredibly high back pressure and greatly reduces the air flow in every single hood connected to those stacks. And the louvers, in order to prevent rain from entering, directed the air contaminants down along the slanted roof toward windows and a court yard.

ONE GOOD BUILDING. In contrast, a building for which I did the ventilation specifications at the University of Wyoming–Laramie for Hacker Malone Belton Abel PC, won the American Institute of Architects (AIA) Committee on the Environment (COTE award as one of the top 10 buildings in the world for environmental design (APPENDIX 4). This building used stacks as a design element and featured them instead of hiding them. The Jury's comments were:

> A contextually appropriate design that fits the landscape very well. The jury was impressed by the attention paid to the health and well-being of the building occupants, the way the design addressed air quality in the studios, and the way this was expressed by the ventilation stacks on the exterior. Art materials contain many toxic chemicals; this project is a model for how to do this type of facility.

But before you think this means things are better, keep firmly in mind, that I was at least partially involved in the planning of over 80 facilities. There was only one winner. Most art buildings, both in the past and today, even those I've worked on, are not properly designed.

OTHER SAFETY EQUIPMENT. There also must be provisions for safe chemical storage, emergency eyewashes and showers, and many other items. Art and theater are industries in which woodworking, welding, foundry, kiln firing, acid etching and many other industrial processes are done. They need an industrially ventilated building with multiple safety features in every chemical use area.

Safety must trump the exterior or interior look of the building. In fact, architectural design works best if safety is the driver for the artistic concept.

STEP THREE - ENFORCE THE RULES

The safest building in the world becomes dangerous when regular safety training of the users ceases and building maintenance schedules are let slip. Ventilation and safety equipment must be maintained and properly used. OSHA has made it clear in countless ways that if there is no enforcement of a safety program, there is no program. And penalties for infractions must be swift, fair, and cause sufficient pain to prompt people to comply.

Just as some misguided parents want to be their children's best friends, so faculty members are commonly loathe to enforce the rules on their students. To be frank, I don't know a solution for this problem. I will leave this battle to those who are more familiar with the politically complex in-fighting I see in universities and colleges. But I have a seen a system in the film industry that works which may have some lessons for us.

FILM INDUSTRY SAFETY. In 1995, I wrote the first of many reports that resulted in unions walking off a working film location. The details are not important other than to say this was the typical abandoned building shooting location in NYC with lead paint, asbestos and carbon monoxide from an indoor kerosene heater.

These kinds of work stoppages usually cost employers millions of dollars in terms of payroll and schedule delays. So walkouts are the enforcement penalties that bring labor and management to the table. And now there is a system in place in which I check out a reported problem, write a short report in a couple of hours which is transmitted to management and the business reps of every union on board. Now it is to everyone's advantage to fix things. I know of no other industry in which this can be accomplished as fast.

In addition, a data base of these reports, currently numbering 86 and filed by address, is available to management and Locations Scouts who are considering a shoot at any of these locations. This means that they can see if there are problems at a location in advance.

While this system not very relevant to schools, I see the following elements in this program that might be included in a college or university safety program.

1. **The penalty for breaking the rules must hurt.** While is it unlikely you would want to shut down the school, you can take away the studio time or privileges. Or you can confiscate materials that they shouldn't use. Find a way to make it hurt and then make it inevitable that the penalty will be invoked if the rules are violated.

2. **Hire an expert.** There must be at least one person readily available who has major safety and industrial hygiene experience and who can assess potential problems quickly and with authority.

3. **Let that person do their job.** An industrial safety professional I know took a job with a university art department. Shortly thereafter a student amputated part of a finger in a piece of equipment. He went to the files, identified two other related accidents with that equipment, talked to the manufacturer, devised a fix for the problem, and wrote a report.

The administration, fearing a lawsuit, threatened to fire him and told him never again to write up an accident. This was a short-sighted response. The young lady with the missing finger is entitled to, and will get, damages. It's better to go to court showing the problem was properly investigated and fixed than to have an IH testify he was told not do his job.

4. Be transparent. Let everyone know about the problem. Hold safety meetings regularly and encourage discussion. Provide copies of any studies or data freely. Have the expert there to answer technical questions. Get everything out in the open and fix it.

5. Organize. My experience tells me that all workers should be represented by a union. No one should walk into a negotiation with a superior without the backing of his/her union. Otherwise, in my opinion, that negotiation cannot, by definition, be fair. Power must be distributed to both sides of the table.

CONCLUSION

Chemistry, Art and Theater are three different industries. Each is also an intellectual discipline requiring years of study and experience. It is as absurd to believe that a chemist can properly train art and theater people about the hazards on their jobs as it would be to believe a painting professor would make a great biological laboratory Chemical Hygiene Officer.

Interdisciplinary training is needed to address chemical safety in the arts. It is my dream and hope that the program I'm starting at the University of Massachusetts-Amherst to train chemists, industrial hygienists, artists and theatrical personnel will address this need. The IATSE union training programs are another way in which chemical safety can be made practical, relevant, and understandable to theatrical workers.

In addition, chemical safety, industrial ventilation, and safety should be the primary drivers of the design for any new art or theater facility.

And along with good training and a safe building, a safety program with enforcement as a cornerstone is needed.

As for the current state of chemical safety in the arts, in my opinion, it hasn't significantly improved in 80 years. But I have hope for the future

APPENDIX 1

REPRINT FROM THE WISCONSIN STAT HISTORICAL SOCIETY'S WEBSITE:
Magician Ben Bergor of Madison, Wisconsin, 1940s. (Museum objects #1982.159.17,19,21,23,25), Text below:

Ben Bergor was a Madison-born and Madison-based performer and booking agent, who from the 1910s through the 1950s worked in tent shows, vaudeville, burlesque, fairgrounds, school lyceums, dance halls, trade shows, sports shows, community festivals, and movie houses, adapting his theatrical and musical talents to ever-changing popular entertainment venues. He was especially skilled at magic, escape, sleight-of-hand, and emceeing, though he tried his hand as well at ventriloquism and piano playing. He wrote gags and scripts for other performers, and booked all manner of shows, especially for labor organizations.

He is most remembered, however, as an escape artist. He and his wife, Alvina, who performed as Madame Alva, made history in the world of escape tricks with their "original combination trunk and straitjacket escape and substitution." The trick won the Wisconsin Houdini Club trophy for three consecutive years, and received plaudits from Harry Houdini's widow. The trunk is featured here. Had Ben and Alva not been very similar in size, the trick would not have been possible. Bergor himself made the trunk, then persuaded the Wehrmann trunk manufacturing company of Madison to give him a label, but only after the company examined it to make sure it was worthy of their label.

Ben Goldenberger was born in 1893 and lived in a brick house in the first block of North Hamilton Street in Madison, only a block from the State Capitol. He and his older sister, Olivia, were both interested in entertaining, and were encouraged by their mother and maternal grandmother. Olivia sang as a contralto with the Mary Garden Opera Company of Chicago and the Metropolitan Opera Company of New York. Ben's talents ran in a different direction. He never graduated from high school, but received at least a few weeks of special music training at the University of Wisconsin before abandoning education for a very brief career as a boxer, then as an actor, musician, and dancer in tent and medicine shows. Harry Bostock, a Madison optometrist and magician, took Ben under his wing and cultivated his childhood interest in magic tricks.

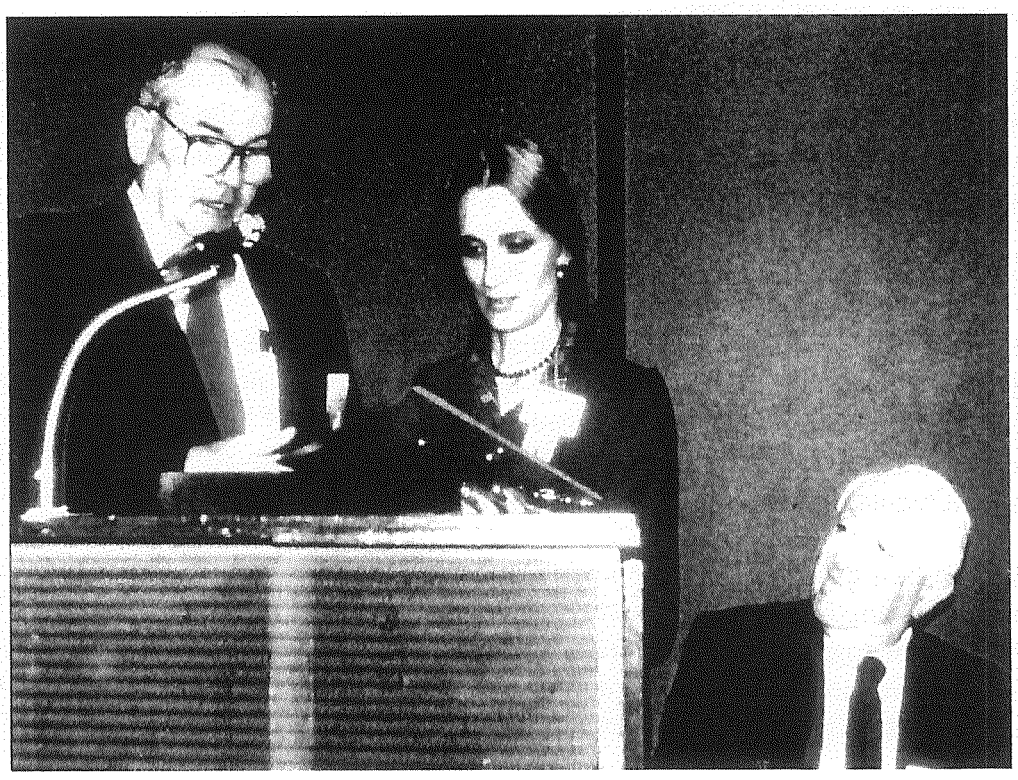
After service in World War I, where he suffered shell-shock, Ben turned to vaudeville, music, burlesque, and magic in Wisconsin, Chicago, and occasionally New York, performing under a variety of surnames that from various emanations of the name "Goldenberger," legally changing his name to Bergor sometime in the 1940s. While in Chicago he performed sleight-of-hand on the city's experimental television station in the 1930s, perhaps the first such performance on television in the U.S.

After a long courtship, he married Alvina and settled permanently in Madison in the early 1930s. He soon incorporated Alva into his magic acts, and he added his two daughters (known as Jean and Joan to the public, but as Monona and Elvora privately) to the act, beginning when they were look-alike toddlers. The family appeared in many types of shows, particularly on fairgrounds in the summers. He also organized lyceum programs that traveled to high schools around the upper Midwest.

In 1940, Bergor and his wife performed the trunk act at the third annual Wisconsin Houdini Club convention. In the act, Bergor tied Alvina in a straitjacket, placed her in a large bag, and locked her in the trunk. He then stepped on top of the trunk, pulling up a large curtain. Moments later, the curtain was dropped, revealing Alvina on top of the trunk and Ben locked inside the trunk in the straitjacket and bag. The Bergors won the first annual Harry Houdini Trophy (donated by Houdini's widow) for best escape act for this performance. The Bergors were also awarded the Houdini Trophy in 1941 and 1942 for the same feat, thereby earning the honor of keeping the trophy permanently.

Bergor retired from active performing in the mid 1950s and devoted himself fulltime to his booking agency. His company, Madison Entertainment Service, arranged acts for fairs, outdoor events, sports and home shows, conventions, and school groups, calling on a diverse array of performers including singers and musicians, ventriloquists, hypnotists, jugglers, puppeteers, acrobats, magicians and comedians. Bergor was a member of numerous community organizations such as the Houdini Club, International Brotherhood of Magicians, International Jugglers Association, and the Elks, Masons and Moose lodges, and received multiple honors for his contributions to his profession and his community in his later years. A Ben Bergor Magic Club still exists in Madison, and the local wing of the International Brotherhood of Magicians is known as Ben Bergor Ring 31. Bergor died in 1981.

APPENDIX 2



Left to right: W.B. Rossnagel, Monona Rossol, Dr. Irving J. Selikoff
award dated 1984, photo early 1985

APPENDIX 3

ACTS FACTS newsletter
August 2017
Vol. 31, No. 08

ART SAFETY COURSE REPORT

Your editor just returned from teaching the first art safety course in a new program at the University of Massachusetts-Amherst. The 5-day, 40-hour course, held July 31 to August 4 will hopefully continue to be offered every summer. To help make this possible, my will provides a $600,000 endowment for this course. If you couldn't make it this year, plan attending on next year!

GUEST LECTURER. World-renowned scientist and asbestos expert, Barry Castleman just happened to have a free day during this week. He arrived at the perfect time to provide additional perspective to our discussion of workplace air quality standards. Barry discussed his research on the effects of corporate influence on air quality standards. He also spent an hour answering questions on this presentation and many other workplace health and safety issues.

OBJECTIVES. The course is designed to provide two objectives simultaneously. The first is to give art and theater studio technicians, artists, and teachers, who do not have a science background, enough information to be able to improve the safety features and practices in their studios, schools, and classrooms. The course attempts to provide students with enough information about their materials, processes, equipment, and about the OSHA regulations that apply to them, to enable these students to inform or teach others.

The second objective is to acquaint the science-savvy participants, such as industrial hygienists and safety professionals, with artists' unique safety needs. For example, the PowerPoints are designed to show professionals ways of explaining regulatory and safety concepts to artists using language and examples relevant to the arts. The course also covers information that usually is not covered in regular science training such as the Colour Index pigment identification system and the special labeling law that applies to only art materials sold in the United States.

MEETING A NEED. In general, the course is needed because the standard OSHA training currently provided by schools and industrial hygiene services is not appropriate for artists. For example, the OSHA 10 courses are designed to teach 10 hours of basic information on either the rules for General Industry or Construction. But artists need a combination of General Industry and Construction regulations since they do various tasks that will come under both of these rules.

However, the best example of inappropriate training for artists is the standard OSHA Globally Harmonized System (GHS) hazard communication training. Most OSHA trainers teach participants to interpret the pictograms and terminology on the new GHS labels – a label most art and theater workers will never see in their working lifetimes. Instead, artists will see three other labels that OSHA accepts as valid from three other agencies: the Consumer Product Safety Commission, the

EPA, and the FDA. The symbols and terms used on these labels don't mean the same things that those same words and similar symbols mean on GHS labels. This is a major reason that artists have misconceptions about the toxicity of their art materials.

And the worst source of artist's misconceptions about their materials is due to a regulation that applies only to art materials in the United States. This label is, in my opinion, seriously misleading. The history of the development of this labeling law and its inherent flaws must be covered in any course provided to users of either children's or adult's art materials.

In addition, artists (and most consumers) do not understand EPA terminology on the labels and advertising for consumer and industrial products such as VOCs and biodegradable. Artists need to know why these and other terms are completely unrelated to the safety or health of the user of the product and apply only to EPA's long-term environmental objectives. Many of these low VOC and biodegradable products are more toxic to users than products they are meant to replace.

FIELD TRIP. The class was treated to a walk-through of the Studio Arts building in which the course was held. Here we could see examples of well-designed ventilation systems, proper waste management, and some new equipment. And since no art department is perfect, they also saw some typical art department problems in labeling, chemical storage, older equipment, and the like. Class discussions were held to explore ways to address these problems.

GROUP DISCUSSIONS. The verbal interaction between the students was incredibly productive. Everyone learned, including the teacher. For example, the morning after we discussed the material handling issues associated with heavy items, such as 50-pound bags of clay and lithography stones, a student brought in a prototype design solution he worked on after class. It was for a vertical chain-driven industrial shelving system that could save space by storing all the way to ceiling and which would operate with a key pad to bring the desired heavy object to any height required for off-loading.

Another student then did an iPhone search and found the product was already invented. One unit made by this manufacturer would already meet our clay and litho stone needs. But even more importantly, this company designs units to the space, ceiling heights, and weight requirements of their clients. This means that this equipment can be designed for specific uses in shops and studios. (As soon as I was back in New York, I told two of my building planning clients that I would be recommending this storage solution. And I talked to an art material and equipment supplier who may want to include this equipment in his product line.)

Strategies for addressing many other safety and administrative issues were also developed in these open discussions. I hope we will continue problem solving by keeping in touch after the class.

COURSE MATERIALS. The text for the course was an unedited version of the up-coming 4th Edition of the *Artist's Complete Health & Safety Guide* which is scheduled for publication in early 2018. The book covers traditional and historic processes from alternate photography processes to 3D printing. And the OSHA and EPA requirements for studios and classrooms for all ages are covered from children to the elderly.

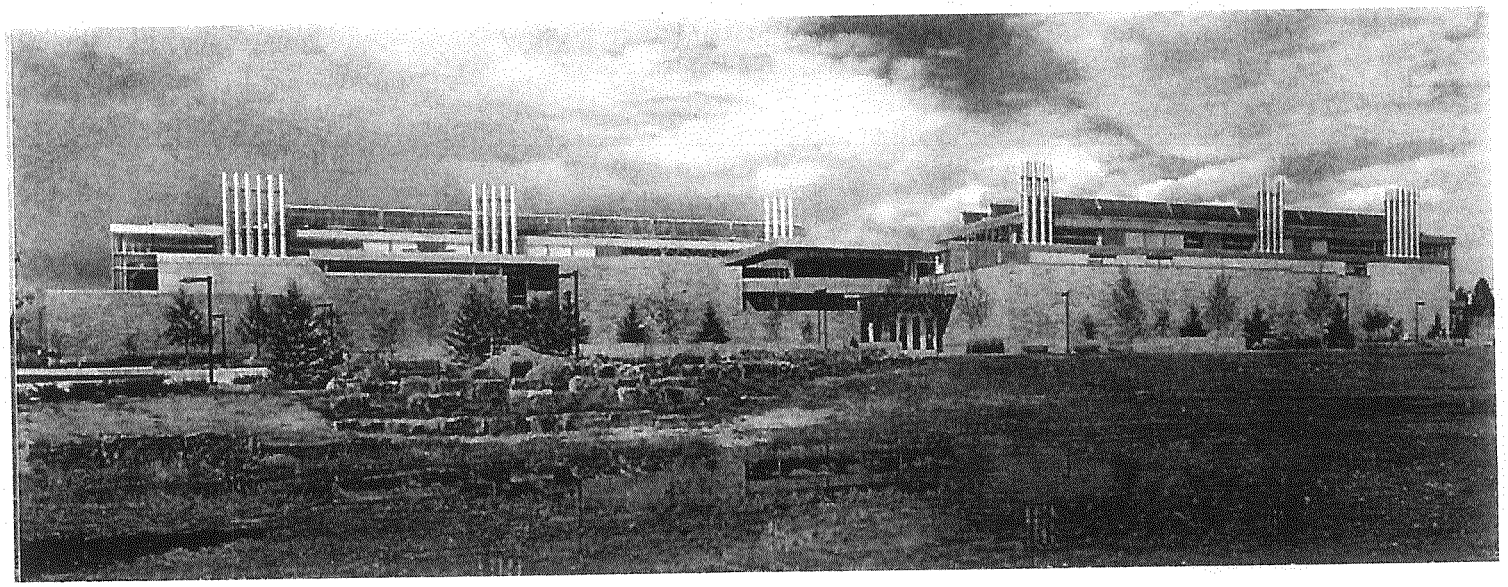
As we worked through this text, the students' comments and observations were noted and I have made changes based on them. In fact, the development of all the course materials can be considered a joint venture. Comments during PowerPoint presentations resulted in improvements in wording and diagrams. Even the final exam has now been changed in response to student comments.

THE STUDENTS. The students demonstrated proficiency on our 50-question, 162-possible error, test. In my opinion, everyone in the class should be able use the SDS data sheet provided to them

to interpret most of the information on Globally Harmonized System safety data sheets (SDSs) and to correctly interpret the terms found on all four types of labels we covered. The PowerPoint on ventilation and our walk-through of the building should help them recognize local ventilation system hoods that are properly designed for a particular process. And they should have a general knowledge of applicable OSHA safety rules for studios and shops. I think the safety professionals in the class are also capable of writing or consulting in this field. I'm so proud of them all that here they are:

Joe Allgeier, Technician, Rochester Institute of Technology, NY
Lisa Bennett, Environmental Health & Safety Assistant, Rhode Island School of Design, RI
Dan Bethune, 3D Studio Technician, Sam Houston State University, Huntsville, TX
Barbara Boyle, Director, Environmental Health & Safety, State University of New York System, NY
Marc Guilbault, Technician II/Safety, Old Dominion University, Fine Art Department, Norfolk, VA
Benjamin Hunt, Instructional Support Technician III, California State University, Sacramento, CA
Diane Inman, Studio Art Manager, Framingham State University, Framingham, MA
Daniel Kelm, Artist and Independent Scholar, Easthampton, MA
Felicia Malachite, Costume Technician, Theater Department, University of Massachusetts, MA
Yung Morgan, Environmental Hygienist, Environmental Health & Safety, UM-A, MA
Karen Piegorsch, Artist and Environmental Advocate, Tucson, AZ
Glenda L. Pons, Hazardous Materials Tracking Manager, Environmental Health & Safety, UM-A, MA
Kevin Ptak, Instructional Support Technician III, California State University, Sacramento, CA
Eileen Reynolds, Senior Safety Specialist, Golden Artist Colors, New Berlin, NY
Evelyn Snyder, Potter and Technical Assistant, Florence, MA
Jean Testa, Lab. Safety Specialist, Office of Env. Safety, Indiana State University, Terre Haute, IN

APPENDIX 4



Studio Arts building - University of Wyoming–Laramie, Hacker Malone Belton Abel PC, winner: AIA COTE award, 2016