Sustainable Creativity
A Study of Art Materials and Waste at Williams College

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ENVI/GEOS 206: Renewable Energy and the Sustainable Campus
17 May 2011

Introduction:

Art materials and processes have long been associated with environmental degradation and negative effects on human health. We have the power to negate this association by making a conscious effort to replace our current practices with sustainable alternatives. Non-toxic materials and environmentally responsible methods of disposal are available: it is up to individual artistic institutions to change their outlook and make use of these advances in technology. Lately, institutions have been doing just that. Spencer Art Studio Assistant Doug Paisley explains that about ten years ago, the Environmental Protection Agency made the responsible use of art materials and art waste a top priority. They cracked down on colleges and studios around the country, issuing massive fines where significant environmental problems existed. This sudden increase in enforcement was exactly what the art community needed to make the switch over to greener materials and practices. Wary of receiving a fine, institutions began searching for non-toxic materials and responsible methods of disposing of waste. Art media producers responded to this change in demand by creating safer, cleaner materials: taking measures such as the removal of toxic chemicals from paints and experimentation with new types of solvents. Thus a more sustainable artistic market arose, a market in which Williams College participates today.

The environmental regulations placed on the college are so stringent that the majority of the problems regarding hazardous waste arise when students bring in materials from outside the college. Students at Williams, like artists everywhere, will use pretty much anything they can get their hands on to create their masterpieces. Occasionally a student will bring in a harmful material to work with either without realizing or caring that their choice in medium violates EPA

standards. "You'll be walking down the hallway and smell these horrifically toxic fumes and walk in to see some student fiberglassing something or other. You're like-- what are you doing?! You can't do that!" laughs Paisley. Luckily, the materials provided to Williams students are as environmentally friendly as possible, and when students follow procedures as instructed, things usually go smoothly.

The Spencer Art Studio at Williams College has done an excellent job at implementing sustainable practices, especially in areas that require specialized waste removal such as printmaking, oil painting, and photography. While there is always room for improvement in any system, the sustainability flaws in Spencer Art are relatively few, and those that do exist are hard to fix. Visual art at Williams is not yet an entirely green field of interest, however, the energy of students and administrators would be better spent on more straightforward tasks that yield a higher environmental benefit.

Painting:

Oil Paints

Williams students use Winton oil paints, a student grade paint manufactured by Winsor & Newton. These paints are considerably safer and better for the environment than older generations of oil paints. The Winsor & Newton website provides a table of the chemical components found within each of their colors, as well as an evaluation of the hazards they pose to human health and the environment. The following figure (Figure 1) is an excerpt from the data on the Winsor & Newton website evaluating the health hazards and toxicity of their Cadmium Colors (Cadmium Lemon, Cadmium Orange, Cadmium Red Medium, Cadmium Red

Light, Cadmium Yellow Light & Cadmium Yellow Medium). Like older oil paints, these colors are composed of Cadmium Zinc Sulphide and Cadmium Sulphoselenide, but the amount of Cadmium in the new paints is at a low enough level to be considered safe. Cadmium is generally considered to be one of the most dangerous of the chemicals found in paint: the improvements made to this material are particularly encouraging when we keep in mind that the other colors of paint are even safer.

Fig 1:

3. HAZARD IDENTIFICATION
CLASSIFICATION
Acute health hazards None
Chronic health hazards None
11. TOXICOLOGICAL INFORMATION
GENERAL INFORMATION
The soluble cadmium content in the pigment is less than 5 ppm. Only large volumes may have adverse impact on human health.
INHALATION May cause irritation to the respiratory system.
INGESTION May cause discomfort if swallowed
SKIN CONTACT Slightly irritating. Prolonged contact may cause dermatitis.
EYE CONTACT Irritating to eyes
HEALTH WARNINGS No specific health warnings noted.
ROUTE OF ENTRY Inhalation. Skin and eye contact.
MEDICAL SYMPTOMS Irritation of eyes and mucous membranes.
ECOTOXICITY Not regarded as dangerous to the environment
DISPOSAL METHODS Dispose of waste and residues in accordance with local authority requirements.
(http://www.winsornewton.com/assets/HealthandSafetyDataSheets/US%20Data%20Sheets/Winton%20Oil%20Colour/winton_oil_colour__cadmiums.pdf)

As the toxicological information in Figure 1 reveals, the trace amounts of cadmium found in this paint can still result in minor discomforts such as skin irritation. Students at Williams have the option to wear latex gloves to protect their hands if they so choose. Unfortunately, the wearing of these gloves generates waste, as they can only be worn so many times before they

wear out. Art product companies have introduced a variety of products with names like "Liquid Gloves" or "Gloves in a Bottle" which are essentially just lotions you can rub on your hands to form a barrier between your skin and toxic substances. These products reduce waste and market themselves as being eco-friendly. It is unknown whether or not Williams has invested in these alternatives, but regardless they are cheap enough so that students can buy them themselves if necessary.

Solvents:

During the push for EPA's push for greener materials, Williams switched to a solvent called Gamsol for mixing oil paints and cleaning brushes. The Gamsol corporation prides itself on adhering to a higher standard than other industrial paint thinners such as turpentine or turpenoid. On their website they assert "Gamsol is special: it is made for products and processes that come into more intimate contact with the body such as cosmetics, hand cleaners, and cleaning food service equipment" (http://www.gamblincolors.com/solvents/index.html). Like turpenoid, Gamsol is a petroleum distillate, but Gamsol is different in that the company removes the aromatic solvents in its product until only .005% remain. These aromatic solvents are the most harmful part of petroleum solvents, and their removal both reduces flammability and increases the safe exposure time for artists by significant amounts. Gamsol's product is so clean that it can be labeled as non-hazardous material for shipment, which is quite an accomplishment given the stringency of hazardous material transportation. (http://www.gamblincolors.com/solvents/index.html) While no petroleum distillate is going to be as good for the environment as, say, water, Gamsol does seem to be the best choice on the market today. It is certainly preferable to turpentine, which, though only "mildly toxic when used according to the manufacturer's

recommendations", is highly flammable, can pass through skin, is dangerous to inhale, and causes " eye irritation, headache, dizziness and vomiting" (http://dhss.delaware.gov/dph/files/turpentfaq.pdf).

Clean-up and Disposal:

Students must keep jars of solvent open while painting, but before they leave they are expected to close these jars to prevent fumes from escaping into the air (despite the mildness of Gamsol, every precaution is still taken). Used rags are placed in a bucket with a lid, so as to avoid air contamination. This process seems to have been amended since 2009, when former Geoscience/ Environmental Studies 206 student Owen Martel wrote in his examination of the Spencer Art Studio that the process of drying the rags was "problematic" because it allowed "rags [to] dry through the evaporation of the solvent into the room" (Martel 2009). While the lid on the can holding the rags and the advanced ventilation system in Spencer Art Building should drastically reduce this concern, staff could consider keeping the rags in an area less populated by students. Rags that cannot be reused any more are sent to a landfill. While we want to try to reduce waste as much as possible, it is difficult to think of a way to prolong the life of these rags, since they come from old cloth products and are reused multiple times until they have to be thrown away. Since the rags are dry, the paints and solvents from them will not be absorbed into the groundwater once they are sent to a landfill.

As for the solvents and excess paint, there are two systems in use currently, each of which has its own benefits. Students and faculty have devised a filtering system that minimizes waste without requiring complicated machinery or outside companies. After being allowed to sit for a few hours, the excess paint in solvent jars (paint that comes off of the brushes as students dip

into the solvent) settles to the bottom of the jar. Students are able to filter out this paint and pour the solvent into a new jar for reuse. It should be noted that the amount of excess paint in the solvent jars is usually extremely small, and it takes a long time for students to even have to filter it out, they usually can just avoid the half-inch or so of paint at the bottom. Once enough paint is acquired, students pour the dregs into a small aluminum drum which facilities takes to Morley Science Laboratory.

Solvent also takes a long time to become unusable, but when it can no longer do the job students pour their excess solvent into a bucket. Previously, the department used a large aluminum drum about the size of an outdoor trashcan to hold their excess solvent until it could be taken away. This was a more efficient system in that the drum was attached to a funnel and a valve that made sure no vapors escaped while students were pouring in solvent. Now when students lift open the lid of the bucket to pour in their solvent, vapors are released into the rest of the room. However, the drum was too large, according to Paisley it would have taken them about ten years to fill. The bucket being used is a fraction of the size of the drum and is only 1/4th of the way full after an entire year of painting. Additionally, the funnel attached to the drum often became clogged with paint and had to be removed, thus negating its purpose. While it would be nice to try to find a way to reduce the solvent vapors released when the bucket lid is removed, the mildness of Gamsol and the sophisticated ventilation system in Spencer make this inefficiency relatively minor.

The other system in use is made possible through Heritage Crystal Clean Washers. These washers recycle solvents through a faucet not unlike how a fountain reuses water. Students can wash out their brushes underneath these washers as they would wash them out under a sink for

water-based paints. Once the solvent in the washer can no longer be reused, the company takes back the waste and it is eventually sent to a toxic waste landfill in South Carolina.

Acrylics & Watercolor:

Both acrylics and watercolors are water based paints, so their use requires no chemical solvents. Unfortunately, this also means that these materials are often washed down the sink. Non-toxic paints are not worse our oceanic ecosystems than the other forms of non-toxic waste that is being dumped, but usually it is best to try to avoid the introduction of non-natural substances into an ecosystem at all. Jars of paints that have gone bad or cannot be used are set out for several months until they dry. Once hardened, they can be thrown away like ordinary waste and are sent to the landfill. Not much waste is generated this way, as the art department uses most of their paint before it goes bad and what is thrown away is usually just the residue stuck to the sides of the container. Water colors in particular create very little waste as the pigment tubes are so small and artists preserve them as long as possible. The art department makes a concentrated effort only to buy as much paint as they think they will use, which makes the disposal of excess paint relatively rare.

Printmaking:

Printmakers use the brands Charbonnel, Graphic Chemical, and Daniel Smith for inks, and while none of these companies provide the chemical contents of their products like Winsor & Newton, all of the inks are advertised as 'low-acidity' and the staff in the art department do not seem to be overly concerned with their toxicity. Like the oil painting studio, printmakers mostly use gamsol as a solvent, but they also use small amounts of lithotine in the lithography class

taught every other semester. Lithotine is both a skin and eye irritant and its inhalation can cause intoxication and respiratory irritation. When lithotine is being used, trunk hoses siphon off the contaminated air and vents in the studio replace it with fresh air. This ventilation system is only activated when students are practicing lithography, so as not to consume excess energy. The printmaking studio also has a hood similar to those used in the science labs which absorbs the vapors that are produced when students are working with corrosive materials. The amount of corrosive material, mainly Nitric Acid, used is very small, only "a few drops" are needed and no waste is produced, but the smell from the bottle is strong enough to require the use of a hood (Paisley 2011). Ferric Chloride is used for etching copper plates ever other semester, but is milder than nitric acid and is "kept in plastic tanks, where it can be used and reused for a year or longer" (Paisley 2011). Once exhausted, the acid is taken to Morely Science Center by facilities for removal.

General Chemical and Paint Disposal:

Once or twice each year, the facilities office announces that they are collecting extra paint, chemicals, art supplies, etc. Departments that have extra paint report their surplus to facilities and facilities picks it up and brings it to Morley Science Lab for evaluation. Williams college safety officials such as Safety Officer Anne Skinner decide whether or not the material in question should be labeled as hazardous waste. The waste that is determined to be hazardous is eventually picked up by a company employed by the science department and disposed of in a hazardous waste landfill in Michigan. Most often, all parties involved are already aware that the materials they are transporting will eventually be considered hazardous waste, but they are

unable to refer to it as such until it reaches the science lab due to transportation regulations. Hazardous waste cannot be transported across or along a public street, and our campus, while contingent, has several public streets running through it. Manager of Environmental Health and Safety, Joe Moran, says this system is being re-evaluated for colleges and stresses that the process Williams is using now is "perfectly legal", if a hassle (Moran 2011).

In recent years, facilities has made a huge push to only buy as much paint as they think they need, instead of buying in bulk to assure that they have enough in an effort to increase sustainability. This effort includes the annual clean-outs facilities has launched, encouraging professors in the lab sciences and other departments that require the use of chemicals to get rid of the materials they are not using. Moran acknowledges that many professors are reluctant to part with materials they think they might need in the future but argues that "if things are sitting long enough to gather dust, that means it's time for them to go" . The facilities office also requires independent contractors to take their own excess paint with them when they leave, so as to insure the college does not have to process extra waste. The accumulation of hazardous materials is against EPA regulations and this shift in the way we think about using materials has made a huge impact on waste reduction which should continue into the future.

Sculpture:

The sculpture department also makes a concentrated effort to be as environmentally friendly as possible. The wood used in most student pieces comes from a local lumberyard, as students occasionally accompany the studio assistant in order to pick out their own supplies (sophomore art student: Lu, 2011). Student sculptors collect scrap pieces of wood and metal,

sorting them into bins to be used later. Sculptors also use a large amount of found materials in their work, oftentimes empty cans or paint tubes from other parts of the art department that would otherwise be thrown away. Paper mache, a material created from newspaper and glue, is a good example of the type of recycling students do in the sculpture department. In many ways sculptors can be considered the most sustainable artists in the visual art department, as they are always looking for new ways to integrate old materials. They use mainly wood, metal, plaster and clay in their pieces and because they do not have to worry about hazardous materials, their waste is simply thrown in the demolition dumpster. Even if wooden sculptures are painted, they can still be disposed of this way because the paint is dry. Not much information was available on the glazes used in pottery, but one would hope they are relatively non-toxic and that, when dry, they can be disposed of as one would dispose of other types of paint.

Theatre Sets:

Sculpture materials are also sometimes used in the construction of theatre sets. The theatre department always announces when they are going to tear down a set, and allows students to take and reuse whatever they would like (Moran 2011). Additionally, not too many of the shows at Williams require the large-scale construction. During the summer theatre festival much more elaborate sets are constructed and de-constructed, but this festival is not under the jurisdiction of the college, so it would be difficult to monitor or try to minimize the waste it produces. The festival usually rents its own dumpster and takes care of its own construction and disposal.

Photography:

The chemicals used in photography are recycled through a system not unlike the Heritage Crystal Clean Washers. There is a bucket at the bottom of the sink that is collected by facilities for silver recovery at the end of a given time period. All of the chemicals can be used several times, but when they finally need to be replaced they are taken to the Morley Science Lab facility to be disposed of as hazardous waste.

Ventilation:

The ventilation system in Spencer is particularly impressive, consisting of several different vents and hoods that can be used for various classes in different departments. For example, in the sculpture studio students have have a booth for spray painting or using other aerosols, such as fixatives, in which the fumes are absorbed into filters. The booth is engineered to be safe enough for students to use it without wearing a mask, but students continue to do so for increased safety. Although the booth is extremely safe, it does not have to meet the same stringent requirements as a similar booth in the facilities department, because it is for educational rather than industrial use. The theatre department uses a similar booth when constructing their sets. Sculpture students also have vents in the welding area to prevent the inhalation of impurities. These vents are built into the wall along the area where the welders work, but there is an additional hose that can be used if students need a ventilation system for a more exact job. The printmaking studio has a similar hose which they use for solvent vapors (more details on ventilation in the printmaking studio is available in the printmaking section). The ventilation system that runs throughout the entire building in Spencer is designed to recycle the air as much as possible, as vapors from various departments do not necessarily stay in a designated area.

Unfortunately, though the ventilation system is effective in that it removes dangerous solvents from the air where students are working, these vapors are still eventually released into the atmosphere.

Recommendations and Conclusions:

Through extensive research of the processes currently at work in Spencer and the processes being used at other liberal art schools, I think it is safe to conclude that Williams is doing a commendable job when it comes to sustainability and the arts. No other collegiate institution I researched seemed to have better technology for reducing art waste than Williams. The EPA crackdown about a decade ago appears to have scared everyone into using the same sorts of methods. It seems as though we've reduced our waste as much as possible, the next step should be to try to better manage the vapors given off by different materials, as they are currently being released into the atmosphere. This would be a difficult task to accomplish: either manufacturers would need to somehow invent materials that do not release any vapors or Williams would need to implement some sort of cleaning system in its ventilation. Neither option seems likely to occur in the immediate future. Despite this somewhat disappointing lack of opportunity for drastic change, there are plenty of other inefficiencies on Williams campus that could and should be addressed. If minor improvements are going to be made within the art studio, they will likely be invented by those who work there everyday and are aware of the inefficiencies that exist. The Zilkha Center and other environmental groups on campus should look elsewhere in their quest to paint Williams green until an art student or staff member approaches them with ideas on how to make a great system even better.

Image 1: Heritage Crystal Clean Washer

Image 2: Cans of Gamsol

Image 3: Aluminum Drum Containing Excess Paint

Image 4: Tubes of Winton Oil Paints

Photos to Aid Understanding

Image 5: Drum and Funnel for Solvents

Image 6: Bucket for Solvents (replaced large drum and funnel, the yellow drum in the background can be used as an indication of scale

Image 7: One of the Trunk Vents in the Printmaking Studio

Image 8: The Hood in the Printmaking Studio (corrosive acids are kept inside the hood)

Painting and Print Making

Painting and Printmaking continued

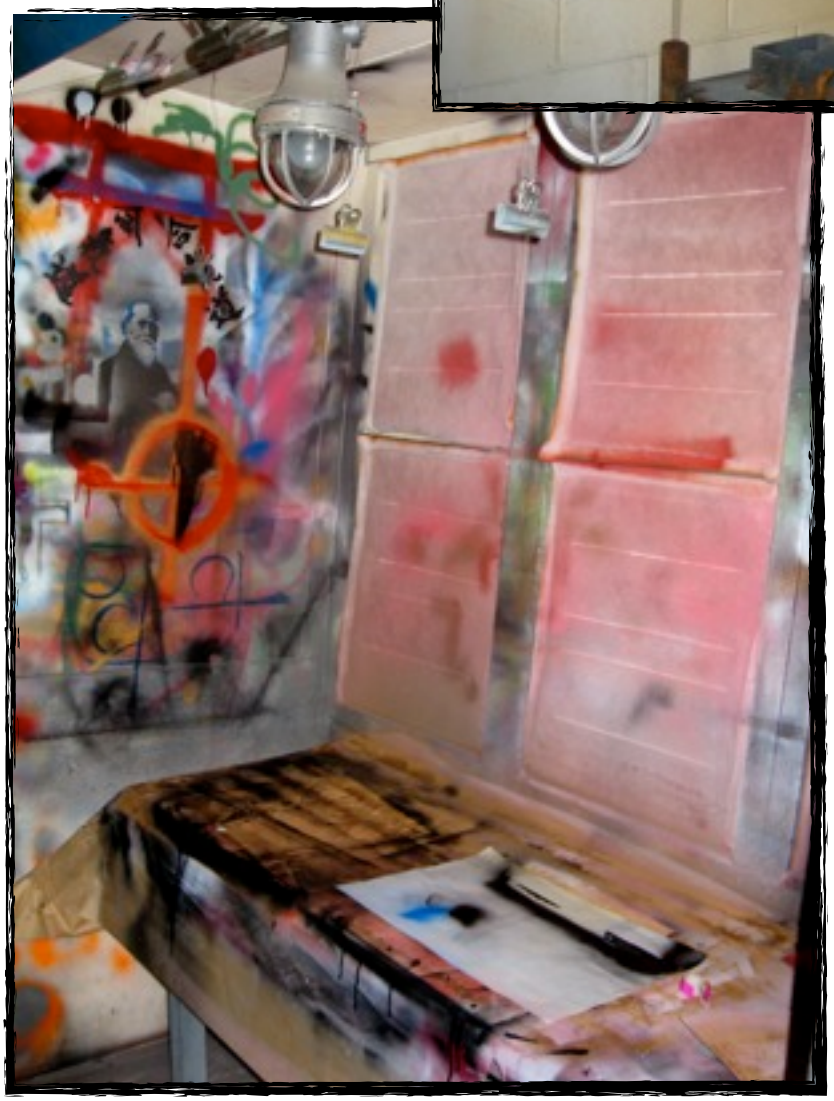
Image 9: (right) Garbage Can of Wood Scraps Waiting to be Reused

Images 10 and 11: (below) Cans of Metal Scraps Waiting to be Reused

Sculpture

Image 12 and 13: (right and lower right) Ventilation systems in the Sculpture Studio. System on top right used for welding, system on bottom right used for general air recycling.

Image 14: (lower left): Inside of the spray booth in the Sculpture Studio (similar to the booth in the theater)



Ventilation

Works Cited

Delaware Health and Social Services: A Division of Public Health. "Frequently Asked Questions: Turpentine." http://dhss.delaware.gov/dph/files/turpentfaq.pdf.

Gamblin Artists Colors Co. "Solvents." *GAMSOL: Odorless Mineral Spirits*. http://www.gamblincolors.com/solvents/index.html

Lu, Muzhou. 2011. Interview by author. Williamstown, MA, May 15th.

Martel, Owen. 2009. *Paint It, Green: Studio Art and Sustainability*. Williamstown, MA

Moran, Joe. 2011. Interview by author. Williamstown, MA, May 12th and 16th.

Paisley, Doug. 2011. Interview by author. Williamstown, MA, May 12th.

Skinner, Anne. 2011. Interview by author. Williamstown, MA, May 10th.

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