

“Sustainability seeks Equilibrium: What does it mean to printmakers?”

(Title Slide)

John: I would like to thank the organizers of this conference for inviting us to speak today. It is a privilege to share our thoughts with you.

(Robert B. Gibson quote slide)

John: In an effort to examine current theories and issues of sustainability as they relate to printmaking and print media, I took a sabbatical leave at the Centre for Fine Print Research at the University of the West of England in Bristol in fall of 2008 and spent four months working with Stephen and getting input from various staff members, science faculty, and manufacturers. We investigated the literature and current thinking in sustainability, looking for applications of theory that printmakers might incorporate into their practice.

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But first a bit of background and how we each came to this study:

Steve: I have always been a practical person and came to Art and printmaking at a very young age. For a period of ten years I was a commercial, then edition screenprinter and understood some of the health hazards of these high solvent products. When I came to research in the early Nineteen Nineties, health for the user was becoming a major issue and my first research project was to undertake a study of water based screenprinting. During this period, I had the benefit of teaching etching to a Professor of Chemistry. He introduced to me a balanced view and the problems of just looking at the data in isolation by pointing out that in the UK Health and Safety Bible, ‘Sax’s Properties of Dangerous Materials’, whisky scores the highest toxicity levels and under no circumstances should be taken by inhalation.

John: Like most artist printmakers of my generation, I was excited by a combination of process and multiplicity of effect found in printmaking. I studied chemistry for three years before changing my course work to art; I understand something about the materials I use. Yet I was slow to recognize the health hazards, let alone the larger effects on the environment. I worked for several years with lacquer-based screenprinting inks and to this day feel fortunate to have no apparent adverse health effects. I also saw, in the rising, sometimes manic movement toward “safe” printmaking a lack of understanding of materials and misapplication of terms, like “toxic.” “Non-toxic” intaglio, for instance, implies that traditional intaglio is “toxic,” which it is not. It may use substances that can be harmful and corrosive, but toxic they are not. Both Stephen and I agree that the terms of the discussion, need to be re-evaluated and the emotional element removed.

Artists may have several immediate responses as to just what sustainability issues are. They may equate the word with health or environmental concerns.

They may reject out of hand any intrusion into the studio, where *art* is being made: no need to worry about the latest buzz words.

Others may see that the rising concern over total environmental health that increasingly impinges on our daily life must have application to the studio as well and require a balance of responsible practice.

And many, perhaps, do not exactly know what sustainability actually means. So let’s have a brief primer on sustainability.

(Our Common Future)

The influential and seminal 1987 Brundtland Commission report, Our Common Future, defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Building on the initial desires to define human development projects in terms of sustainability — making them “responsible to the earth” — applications of sustainability concepts to include all human activity soon appeared and the expansion of the concept beyond environmental consciousness has developed.

(The “Five Pillar” structure of Sustainability)

A “five pillar” construction of sustainability theory recognizes ecological, social, economic, cultural, and political concerns involved in all material, development, and process considerations, although there are also other perspectives. We are particularly fond of this approach because it includes cultural considerations. More on that later.

(UK’s Sustainable Development Strategy)

Governments, from national to local, soon recognized the necessity of framing sustainability issues. For example, the UK’s Sustainable Development Strategy, published in May 1999, defines sustainable development in terms of four objectives:

- 1) Social progress which recognises the needs of everyone,*
- 2) Effective protection of the environment,*
- 3) Prudent use of natural resources, and*
- 4) Maintenance of high and stable levels of economic growth and employment.*

There are many other definitions, some rather self-serving or intentionally narrow. We encourage you to take up the search for more information on your own.

There are other terms you may have heard:

(Carbon Footprint)

Sustainability assessments are often developed using information like **Carbon Footprint**, a measure of the amount of carbon dioxide and other greenhouse gases emitted by a human activity or accumulated over the full life cycle of a product, process, or service. My friend Stephen here has a rather large carbon footprint because he flies to about 12 conferences and meetings a year, around the world. His air miles total over a third of a million miles. Mine, I must say are nearly as great, totalling around 300,000 air miles in the last ten years. Together, we totalled over 12,400 air miles coming to this conference.

(Life-cycle Inventory and Life Cycle Assessment)

The terms Life-cycle Inventory and Life Cycle Assessment refer to systematic analyses of the raw material and energy consumption together with all wastes and emissions, the “environmental burdens”, for all processes within a system, often comparing two or more products, practices, or outcomes.

The results of life cycle assessments are sometimes surprising. For example:

(Diapers)

• *A now classic 1994 life-cycle inventory of baby diapers found the use of cloth diapers lowers the generation of solid waste but increases water use relative to disposable diapers, and energy requirements may or may not be significantly different between the two systems, depending on whether the cloth diapers are laundered at home or commercially. A definitive preference for one diaper over the other could not be determined.ⁱ*

(Electric vehicle and Recycling plastic)

• Assessment studies have shown that when electric vehicles reduce air pollution on the road, they increase the air pollution generated by power plants and create a toxic waste problem regarding battery production and disposal.
• Incineration with energy recovery is often a sounder environmental solution for disposing of plastics than recycling them, resulting in lower atmospheric emissions, fewer water effluents, and less solid waste.
The point is that sustainability looks at the whole picture in relation to the environment and the burden placed on it while considering value to society and culture.

(Ink cans)

One problem in the print community is the confusion between products that are healthier in their use for the artist in the studio (or which meet health and safety guidelines) and the true environmental impact of a product in its production, use, and disposal.

What specifically should printmakers be concerned with? Let's start with the obvious: inks, solvents, and papers. Petroleum-based inks and solvents have life-cycles that require large amounts of natural resources and energy in extraction, production, use, and disposal; they place a “burden on the environment” in the terms of sustainability theory, and this includes the need to ship the raw materials and the finished products long distances, requiring energy-gulping, carbon-emitting transportation.

(Gutenberg and Dürer)

When Johann Gutenberg and Albrecht Dürer boiled locally- or regionally-grown linseed oil and ground lampblack into it, eventually cleaning the oily ink with lye made from wood ash, they were unwittingly following sustainable procedures.

(The papermill)

The 14th C. European papermaker made paper with linen rags, river water, waterpower energy (or windpower in Holland), and a great deal of human labour. It was a fairly sustainable enterprise; recycling old clothing for fibre sources, utilising clean river water and adding only biodegradable substances in the process, harvesting freely available energy. The benefit to the culture of this enterprise, with a low impact on the environment plus the establishment of a new economic contributor, especially once Gutenberg had come along with movable type that created an explosion of printing on paper, makes the hand papermill an admirable example of sustainability.

Yet we cannot implore today's artists to make their own inks and make their own paper, or use only ink and paper from local artisans. Our world has grown beyond the local.

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We artists often see ourselves as responsible citizens of the world. We enhance culture and offer critical analysis through art, pursue deep philosophical and aesthetic thinking, add positively to the visual landscape, and we do not precipitate financial system meltdowns.

Yet while some of us actually treat themes of environmental responsibility, waste, inequality, and other such issues in our artwork, we may not be producing that artwork with responsible, sustainable processes.

At least, that was one of the questions we posed at the beginning of our study.

(Red and yellow ink)

A case in point is found in printing ink.

(Photos of ink mills and manufacture.)

The late 1970s and early 1980s saw efforts in industry and art to change the composition of ink to reduce the use of petroleum-based substances for mainly human health risk reasons, although economic, ecological, and geopolitical concerns entered the equation.

(Acrylics)

*While water-based acrylic screen inks are now the norm within the educational printmaking environment and are a gain for the health of the user because they have greatly reduced the use of petroleum solvents for washup and the resultant release of Volatile Organic Compounds into the atmosphere, they are not necessarily “green”. Acrylics are made from petroleum distillates with a similar environmental burden to most other plastic products. Even as far back as 1999 in the introduction to my book *Water Based Screenprinting*, where I advocated using water based acrylics, I wrote, “Environmentally there is little to choose between solvent and water based inks, both are petrochemical products, plus acrylic resins do not break down easily, so causing disposal problems. They can be filtered from the water system but still must be disposed of.”*

In disposal, the long-chain acrylic polymers are cross-linked and become a form of plastic with a lifetime in our water and soil systems lasting hundreds if not thousands of years. More comparative studies remain to be done on these materials to determine the true nature of their sustainability. We are not necessarily advocating a return to commercial oil- screenprint inks, but we are asking you to consider all elements of sustainability theory, not just health and safety. Perhaps other answers remain to be found.

(Photo of Cranfield in Wales)

A different and quite simple solution to solvent cleanup of inks was researched by The Centre for Fine Print Research a few years ago, in collaboration with Cranfield Inks in Wales.

(Caligo Safe Wash inks)

We helped them develop an oil-based ink with a surfactant added which allows washup with soap and water. These are traditional inks made with linseed oil and a single pigment. The surfactant causes the oils to become emulsified with the addition of soap and water, to wash the material away. The resultant waste is biodegradable; the waste from acrylics, you may remember, is not. The water-wash inks Cranfield markets are for relief and intaglio, but may have other applications.

(Soy plants and fields)

Soy inks have risen to a level of awareness and promotion that may also be undeserved. Michael Craine of Cranfield Inks says, “Anything that can be said about soy can be said about linseed. The insertion of the word “vegetable” before “soy” was brilliant marketing (by the soy industry), but is totally redundant and means nothing, while suggesting that other ink vehicles are *not* sourced from plants, which they are”.

(Soy deforestation)

And, the soy industry has deforested large areas of rainforest in South America in order to grow more soy to meet the demand they have created.

(Graphic Chemical)

Dean Clark of Graphic Chemical & Ink, of Chicago, supplier of hundreds of thousands of pounds of ink annually to the fine art graphic world, like 10,000 pounds of bone black etching ink alone, points out that, “Bodied linseed oil which is what is used in printmaking inks, is a relatively low VOC material”.

(What are VOCs?)

So, what are VOCs? Volatile Organic Compounds are carbon-based compounds that have a high vapour pressure and low water solubility, emitted as gases from certain liquids or solids. VOCs are often components of inks, paints, cleaning supplies, petroleum fuels, hydraulic fluids, paint thinners, solvents, and dry cleaning agents. VOCs are common ground-water contaminants and major contributors to atmospheric pollution, including greenhouse gases. Additionally, VOCs may have short- and long-term adverse health effects. VOC's are also emitted from cigarette smoke.

(Solvents)

Traditional solvents are turpentine- or petrochemically-based and are contributors of VOCs and greenhouse gasses. They are also health hazards, depending on how they are used. Replacements for solvents, such as Simple Green, vegetable oils, or d-limonene citrus-based cleaning agents, may or may not be sustainable. Much more research and life cycle analyses remain to be done.

(Pigments)

Finally, the one other constant in all inks and paint is the pigment colour. All contemporary inks and paint apart from black use a chemically derived colour, most from petrochemical sources. The sustainability and lifecycle of colour pigment and dyestuffs is another research project in itself.

(Diagrams of paper manufacture and paper machines.)

Basically, paper is made one three ways: by hand, by cylinder machine creating so-called “mouldmade” paper, which constitutes most art papers, and machine-made paper. Paper choice for most printmakers is usually based on 1) archival qualities, 2) suitability for the printing, 3) preferences for colour, surface, size, weight, etc., and 4) cost.

(Fourdriniers)

Does the life-cycle or carbon footprint of a particular paper matter when aesthetic choices are being made? Does it matter for you to know that a certain paper is made in a sustainable energy situation with cleaner water exiting the papermill than entering?

(Cylinder machine close-up)

Should the British artist for example consider using Somerset paper made in England, over Arches or Rives made in France because they yield similar results in print but Somerset is not shipped as far and so incurs a smaller transportation carbon footprint? But what about the North American cotton linter used to make those papers, shipped to Somerset, England for one and to Vosges, France for the others? There are no cylinder machines in North America for producing mouldmade art papers. So we send our cotton linter over to England or France, or Italy or Germany, and then buy the paper that is shipped back — a sustainability nightmare. Should one consider using handmade papers as being more environmentally efficient? Should one, in fact, make one's own paper?

(Handmade paper at Twinrocker)

Hand papermaking, while producing exquisite material for print and book work, is extremely time and labour-intensive.

(Photos of St Cuthberts)

Steve Carroll, at St Cuthberts papermill that produces Somerset and other mould-made art papers reminds us that there are no cylinder paper machines outside of Europe.

(St Cuthberts cylinder machine)

He says, "Mould-made papers for use by artists are only manufactured in Europe, there are possibly only 4 or 5 such manufacturers. Most artists have a preference for one particular grade of paper and will purchase it wherever it is manufactured." He also notes that St Cuthberts is heavily regulated regarding water use, quality, and effluent. In addition, market pressures constantly require them to reduce costs and energy use

What changes are necessary? When will they come, and how? John Purcell, of John Purcell Paper, London, who has been selling paper to the art world for over thirty years and observing our world for longer, says, "There has to be a trigger for change." He points out that humans are cultural animals.

(Gutenberg)

"In our millennia of development," he says, "progress has been inexorable; Gutenberg had to happen . . ."

(Industrial Revolution)

"as did the Industrial Revolution . . ."

(Smokestacks, cities)

Progress . . .

(Digital Revolution)

and, probably, the Digital Revolution. "But now we know the damage," he points out. We are faced with serious problems demanding action. What will the trigger be? Environmental crisis or the slow realisation that we are all part of the problem and part of the solution?

And speaking of digital,

If we question the true production costs of each gallon of solvent or ink, or each copper plate or sheet of paper, we must also question the true costs of the digital revolution. We are encouraged from multiple directions to incorporate digital media into traditional artmaking processes, but we must also face the debt of trichloroethylene ground pollution at semiconductor plants worldwide, pollution from lead and heavy metals as monitors and outdated computers are dumped in landfills or into the sea, difficult economic and political burdens of the rare earth elements mostly mined in China that are necessary for chips and devices, and the energy costs of manufacturing all of that hardware that now has less than an average 3-year lifetime. The cost of a digital-heavy society may in fact be unsupportable or at least is questionable. If digital-heavy culture is questionable, digital-heavy art is, too.

(E-waste)

The quantity of electronic products discarded globally has skyrocketed recently, with 20-50 million tonnes generated every year. E-waste now makes up five percent of all municipal solid waste worldwide, nearly the same amount as all plastic packaging, but it is much more hazardous. Computers contain cadmium, hexavalent chromium, mercury, bromine, PVC, and lead among other materials. The average lifespan of computers in developed countries has dropped from six years in 1997 to under two years. Scary. And way beyond the scope of our study, but very worthwhile studying.

But let's get back to artmaking, and sustainability.

(Les Demoiselles, Guernica, and Picasso)

Is it right and fair to consider art within concepts of sustainability? Thought of another way, how many VOCs do you suppose were released when Picasso painted his "Les Demoiselles d'Avignon", or "Guernica", from his paints . . . and his smoking?

Les Demoiselles has been described as the "most influential work of art of the last 100 years". An anonymous Wikipedia author says Guernica "has eclipsed the bounds of a single time and place, becoming a perpetual reminder of the tragedies of war, an anti-war symbol, and an embodiment of peace." Does the value of those works to our history and culture override Picasso's VOC emissions? Would the works have been possible without those emissions (paint *and* smoke)? Is it absurd to even question sustainability of works like this? If so, when do we know that we are in fact talking about art works of this magnitude and that the sustainability assessment is irrelevant?

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On the other hand, who wants to be discovered fiddling while Rome burns? Can we at least put out our own fires, put our own house in order? Individual responsibility for safe practice that is as sustainable as possible would seem to be a reasonable watchword.

So far, the results of our study so far are two-fold. One is a list of questions about print practices and materials that we think need to be researched in order for the print community to have the information for informed decisions.

Second is a small survey of sustainability attitudes and practices that we undertook within the print community; academic print studios, independent print production studios, commercial printing companies, and manufacturers. Some of our friends and colleagues in this audience participated. We will come back to the results of that survey in a few minutes.

(Questions)

So here are a few of the many questions that we have collected during this study. Some may be researched at the Centre for Fine Print Research. Some need investigation by others in the field. Some will need research grant funding support and we challenge those of you who are interested and committed to take on one of these subjects and pursue it to a conclusion to be shared with the rest of our broad print community. I'd like to suggest that a number of these topics would be relatively easy to research, would be excellent candidates for internal academic grant support, and would produce welcome information in our community, not to mention would be excellent additions to annual academic activity evaluations and produce research in an art department on a par with science laboratories.

We have already voiced some questions, but others include:

(Ink smear)

- What is the volume of ink consumed annually, worldwide? What is the volume of fine art ink consumed annually, worldwide? What are the similar figures for solvents? Do those figures tell us anything about our impact?

(Pigments)

- *What are the annual consumption levels of pigments used in all inks and paints? Of those levels, what percentage use pigments known or thought to be harmful to the environment and/or human health? While known carcinogens cadmium and lead are now almost non-existent in current pigment manufacture due to their health problems for the user, this does not mean their replacements are necessarily any healthier for the environment. The vast majority of dyes and pigments are synthetic and are manufactured as part of the Petro-Chemical industry. Are there more sustainable alternatives?*

(Darkroom)

- Is the printing out of digital films — digital pigment inks onto polyester or acetate film — any better or worse in sustainability terms than graphic arts process films with silver emulsions, in all production, processing, and disposal considerations? And, as previously mentioned, what is the true environmental burden of the digital culture? Can it be sustained, and how?

(Paper)

- *What is the carbon footprint of one tonne, or one hundred tonnes, of the various papers we use?*
- *Is it possible to establish cylinder paper machines in North America so that quality art papers may be made on this continent?*

(Mining photos)

- What volumes of aluminium, zinc, and copper are consumed annually for graphic art purposes (litho plates, intaglio plates, relief plates) worldwide? What portion of total aluminium, zinc, and copper usage does this represent? Does the life cycle of these metals raise any questions about sustainability of use?

(Acrylic screen inks)

- *Are acrylic polymer screenprinting inks, which are based on cellulose ethers, in particular, ethyl-hydroxyethyl cellulose, or hydropropylcellulose, in fact sustainable when energy and material inputs of manufacturing and waste and disposal outputs are considered? This may be extended of course, to cover acrylic paints of all kinds.*

(Screenprinting)

- Taken solely on an environmental evaluation, does the lifetime production of a prolific fine art screenprinter — working in a studio in which editions of fine art prints are produced — amount to an acceptable or unacceptable burden on the planet? Using oil-based inks and solvents or water-based inks? What might be a life cycle evaluation with a carbon footprint for each edition of 100 prints?

(Lithographer, Intaglio, Relief and Letterpress)

• Taken solely on an environmental evaluation, what are similar life cycle evaluations for editions of prints in lithography, intaglio, relief and letterpress?

(Simple Green, d-Limonene, Vegetable Oil) with (Solvents and tanker trucks)

• What are the life cycles of butyl cellosolve (Simple Green) or d-Limonene (citrus-based cleaner) or vegetable oil? How do the energy inputs and waste outputs compare with other cleaners and solvents? Are they sustainable substitutes?
• What is the sustainability of using rags for cleanup as opposed to paper towelling? Does shop rag cleaning through services create more energy usage and emissions (air and water stream) than landfill volume for rags or paper waste can justify?

And let's get some real facts and data including life cycle evaluations on solvents, petrochemical and otherwise.

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Well, obviously, the questions go on and on.

At this point, we have many questions and few answers. Some of what is currently promoted as “green” may not be green at all. From what we have learned so far, there are no prescriptions for best-use materials or processes, although we know that there are things we should avoid, things we can cut back on. We certainly have no proscriptions against particular activities. What we wish to pass on to you is a heightened awareness and concern for the big picture, not just health factors and environmental factors but additionally,

(The “Five Pillar” structure of Sustainability)

let us remember the five pillars of sustainability and consider economic, social, cultural, environmental and political issues.

Printmakers are an extraordinarily creative and tenacious group. They collaborate, share information, and continually examine what we do and how we do it. We are confident that the more we learn, the more sensible solutions we can create that should work for both individuals and the art community.

First and foremost, we need a sensible debate that tackles the issues in an informed manner. We need to ask wise questions. The answers may well lead us to adopt new materials, or change our methods, or perhaps continue making art as we have been, but it is important that the decisions be made with best available information applied to the most reasonable and comprehensive theory. Actions and decisions, let alone theories, based on sound bites and catchwords are intrinsically flawed. We can say without argument that whatever you use, whatever you do, is a problem. The charge is not for artists to eliminate the problems, but to minimize them. In a recent online discussion of “green” practices, one printer said, “Greenest thing you could do is close down your shop, start farming, and check out of the . . . economy”. Assuming that that course of action does not itself lead to sustainably problematic issues, we can guess that few of us want to go to that extreme. We can only examine our individual practice in our particular circumstances and determine what supplies and processes we can use that will have the lowest impact on the environment — present and future — while still creating the art and contributing to the culture in a positive manner.

It may actually be that good housekeeping and careful use of materials is perhaps better for the environment than trying to find that healthier cleaner that is in a plastic container and has travelled thousands of miles by road and air.

(Robert Gibson quote)

If anything, this study may be a recognition of “how little we know” but it also a commitment of our best intentions to learn, to assess, to change when necessary, and to leave our art to a better world.

(Thank you)

Part 2: John Heaney Presentation

Part 3: A Report from our Survey

We recently extended our study on sustainability to undertake a small online survey of sustainability attitudes and practices within the print community; academic print studios, independent print production studios, commercial printing companies, and manufacturers. Some of you participated. It is admittedly unscientific and is not an extensive polling of the field, or fields. But although our sample is not large, we have been able to make some observations.

(Questions 1 & 2 – Chart and Graph)

Approximately 42% of respondents were schools, colleges, or teaching organizations. 34% were group printmaking studios, either member-only or open access. 21 % were commercial entities, and 21 % were private studios.

(Question 3 – Chart and Graph)

Of those, over 71 % did intaglio, 71% relief, 52% screenprint, 50% digital printing, 40% lithography, 13% offset lithography, 13% letterpress, 9.5% monoprint, 5% collograph, and 3% photography.

(Questions 6 & 5 – Chart and Graph)

When asked about their understanding of sustainability principles, 60% said they had a medium to good to very good understanding; 35 percent a medium to middling understanding, and only 6 percent admitted to a not very good to poor understanding.

The largest number of respondents defined sustainability as “To recycle as much of your materials as possible and reduce or offset the carbon footprint of the products used in the production of your work.”

60% said they had changed their practices for sustainability reasons. Some claimed to have begun changing in the early 1990s, (one in 1979), with most in the last six years.

When asked to describe their current environmental and sustainability practices, the largest number pointed to recycling, of paper and other materials, as a primary sustainability practice. Coupled with that was minimizing waste. Slightly less frequently mentioned was reducing the use of solvents, meaning petrochemical solvents. This was often accompanied by mention of the use of vegetable oils instead of solvents in cleanup. Nearly as many mentioned concern for their rags — recycling them, washing them and/or using recycled cloth.

[We have to point out here the previously mentioned study about burning plastic waste for energy being less resource-heavy than washing and recycling.]

A fair number of people mentioned their use of acrylics as a sustainable practice.

[Remember our previous caution about the question of acrylic sustainability.]

Only a very few respondents mentioned energy efficient utility systems, use of alternative energy sources, use of hybrid or super-efficient vehicles, water conservation, and even composting.

When asked why the above practices had been initiated, the overwhelming reasons given by 90% of respondents were environmental benefits and human health. Lesser reasons mentioned were setting a good example, training future artists and teachers responsibly, and moral/ethical reasons.

(Question 11 – Change of Practice Graph)

Nearly 60% of respondents say that they have changed their practices for sustainability reasons. It is notable that 40% have not.

(Question 15 – Reasons to adopt change)

We asked if there were any reasons you might need to adopt different, more sustainable practices in the near future and the responses included these:

Some people think they will change when they are forced to, by government or school policy. That's one way to do it.

Some people are resisting and waiting for others to figure it out first.

Some people won't, apparently.

Some know they should change but haven't overcome the inertia and basic resistance to change.

Where are you?

(Question 19 – Paper Graph)

Reported paper use shows high volumes of mouldmade artist paper, not surprisingly, all of which is made in Europe.

(Question 23 – Ink Graph)

Traditional oil-based inks are still the most used.

(Question 31 – Digital Graph)

62.5% said that digital processes had not saved them money.

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Some observations

Overwhelmingly, many people think that health and safety are the same as sustainability issues. It's not really true. The two are generally connected but they are not the same. You may make choices in protecting your health in the studio that are totally unsustainable. Sort of like defending the purchase of a HumVee because it protects your children extremely well in their daily ride to school, when in fact it's a completely, indefensibly unsustainable, wasteful vehicle.

(Our Common Future)

The first definition of sustainability we offered in the survey is still the most comprehensive one and reflects everything we have discovered in our study of sustainability. Restated, it says that sustainability is: "The preservation of ecosystem integrity, including the capability of natural systems to maintain their structure and functions and to support biological diversity whilst respecting the right of future generations to enjoy the sustainable use of renewable sources."

(The "Five Pillar" structure of Sustainability)

What is not articulated here in any of the definitions offered are the several considerations found in the five pillar approach to sustainability: the ecological, social, economic, cultural, and political concerns. As mentioned previously in the Picasso analogy, it may be possible to justify or balance certain apparent imbalances of material and energy use, waste production, and cost with considerations of value to culture, economy, and political benefit. When I first approached a sustainability scientist at my university upon starting this research, to find out more about the field and how they might feel about applying theory to something like art, he actually laughed at me. He suggested that because we are making art, we pretty much remove the burdens, or at least balance them, with the positive contribution to culture and society that we make. I find that an interesting assertion and assumption.

(Leonard Baskin "Hydrogen Man" — Antonio Frasconi book)

When does the act of printmaking / printing create overriding benefits to the culture? What consumption of paper and ink — and time and money and human effort — is worth it?

(Thomas Kincaid print — Eric Avery book)

We promised not to be proscriptive but we can push people toward thoughtful action. A friend has told me about an art teacher who tells his students that he does not want them to produce any more art for the landfill. And yet discarded art is necessary to the learning process and I would never intimidate and restrict students with the proscription that everything they make must be suitable for the archive. I am not ready to tell my students not to make waste — that's an important part of learning. It may be an important part of art production, period. You will have to decide what is worth doing.

(Comments that raise good questions)

Here are some survey responses that we thought raised interesting questions or showed thoughtful action.

(Comments that cause concern)

Here are some survey responses that we thought were troubling and raised questions about understanding.

(We would like you to remember . . .)

We would like to you to remember that most of us in this audience are supposed to be academics. Therefore we owe it to our students to give them properly researched and correct information, not supposition or just what we have been told by others!

(Blank)

But perhaps you can also contribute more than that. Our investigation has raised questions that need more investigation. We're only beginning to understand what we don't know. Everyone can help find out what some of these answers are. Do some testing, write a small research grant, ask questions of manufacturers, find people at your institutions in the sciences who may be willing to collaborate on a study. Whatever you do, think about these issues and perhaps in a year or two, *you* can be the ones presenting your findings to this group.

Thank you.

Notes For Discussion:

If someone asks, “What are ‘things we should avoid, things we can cut back on?’” we can answer: We all know to avoid using materials like lithotone, lacquer thinner, KPR (Kodak Photo Resist), XXXXX, and XXXXXX. We know we can cut back on waste, cut back on materials going to the landfill, increase the materials being recycled, cut back on energy use in our studios (heating, lighting, cooling), etc. Now, we know that we should pay attention to where our supplies come from, how far away, try to avoid transportation that uses petroleum fuel and energy.

Terms and definitions:

Toxic / non-toxic / toxicity

Toxic, adj., 1. Of, relating to, or caused by a toxin or other poison: a toxic condition; toxic hepatitis.
2. Capable of causing injury or death, especially by chemical means; poisonous.

Definition of TOXIC

1. containing or being poisonous material especially when capable of causing death or serious debilitation “toxic waste” “a toxic radioactive gas” “an insecticide highly toxic to birds”
2. exhibiting symptoms of infection or toxicosis “the patient became toxic two days later”
3. extremely harsh, malicious, or harmful.

But let’s be clear: *water* can be toxic to the human body in huge amounts; whiskey is toxic, literally toxic, to the human body in much smaller amounts.

☞ *Here, Steve’s analogy about whiskey and facts.*

(Toxicity of whiskey)

(Ethanol)

(What is it?)

(Water)

(Any chemical has inherent hazards / “natural”)

And yet, you, or we, drink them both. We don’t go around talking about non-toxic beverages. It makes sense to talk about *safer* materials for use in graphic print processes. But neither “Non-Toxic” nor “Safe” printmaking should be in our vocabularies. I recently saw a workshop listed that was teaching, quote, “Less-Toxic Lithography.” I’ll say it again: phrases like that and Non-Toxic Intaglio imply that traditional lithography and intaglio are toxic. They are not. They use substances that are corrosive and even poisonous. They require care and limited exposure. But your automobile exhausts poisonous fumes that can overcome and kill you; wood stain will kill you if you drink it; oleander leaves can poison your cat. Still, we don’t talk about non-toxic cars, non-toxic woodworking, or non-toxic landscaping. The term toxic should be reserved for the substances and situations that rightly deserve it. Like politicians and campaign issues.

Other Terms . . .??

Plastics.

Besides being “Capable of being shaped or formed: plastic material such as clay that is, malleable. *Or*, Relating to or dealing with shaping or modelling. *Or*, Easily influenced; impressionable,” plastic is defined as “Any of various organic compounds produced by polymerization, capable of being molded, extruded, cast into various shapes and films, or drawn into filaments used as fibers.” Polymerized organic compounds include acrylics whether in the form of transparent sheets or liquid emulsions and resins used as inks.

Acrylic manufacturing involves highly toxic substances which require careful storage, handling, and disposal. The polymerization process can result in an explosion if not monitored properly. It also produces toxic fumes. Recent legislation requires that the polymerization process be carried out in a closed environment and that the fumes be cleaned, captured, or otherwise neutralized before discharge to the atmosphere.

Acrylic plastic is not easily recycled. It is considered a group 7 plastic among recycled plastics and is not collected for recycling in most communities. Large pieces can be reformed into other useful objects if they have not suffered too much stress, crazing, or cracking, but this accounts for only a very small portion of the acrylic plastic waste. In a landfill, acrylic plastics, like many other plastics, are not readily biodegradable. Cross-linked acrylic resin polymers left over from dried inks are simply another form of this plastic.

[from a Rohm & Haas slanted website: “Acrylic emulsions offer another important advantage: they’re environmentally friendly. As Rhoplex AC-33 and other acrylic emulsions supplanted solvent-based paint components, their water-based, non-toxic, non-flammable nature reduced harmful emissions and enhanced worker safety.”]

Solvent Most people in this room undertake solvent abuse on a daily basis. WATER is a solvent. Drinking coffee with sugar in it means that water is the solvent (solute) for sugar. Water is known as the universal solvent as more things will dissolve into water than any other solvent. Dictionary definition of solvent: A substance that dissolves another. Most printmakers when they refer to solvent, actually mean hydrocarbons, even that term is probably too loose a definition.

(Turpentine and Petroleum Distillates)

(Petroleum Distillate Solvents)

Vegetable ink: Invariably means an ink with soy, a good traditional printmaking ink such as made by Graphic Chemical, Cranfield (Caligo) or Dan Smith will contain and has always contained linseed oil (A vegetable oil) but without the problems of soy.

Cadmium, lead, heavy metals: Unless the source is very old or they have come from unknown sources such as China or Russian watercolours made up until the 1990’s, inks are not allowed to contain heavy metals. Only paints for restoration and usually sold only to those qualified to use them still contain lead or cobalt and cadmium. These will be phased out in the next few years as the suppliers of raw materials cannot afford to pay for getting these products through legislation for the tiny amount of users.

(Cadmium, lead, heavy metals in inks and paints)
