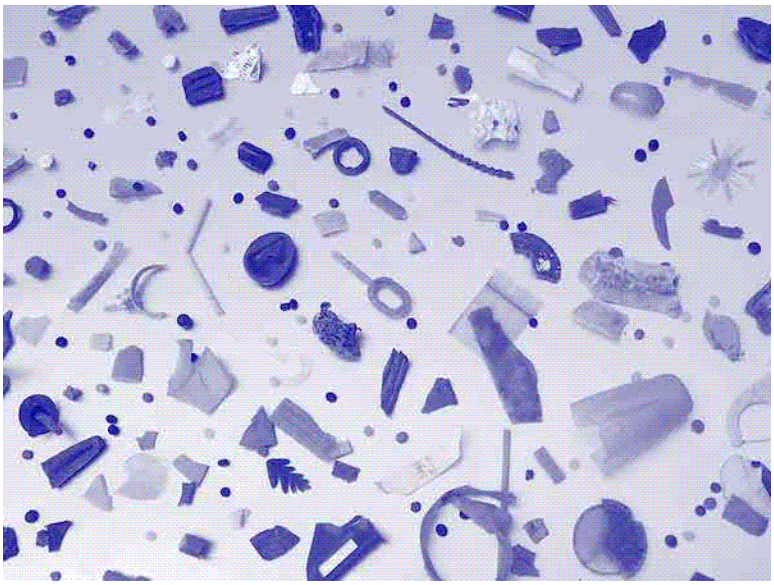
Compiled by the Synthetic Collective www.syntheticcollective.org & plasticheart.solar

PLASTIC HEART:

A DIY Fieldguide for Reducing the Environmental Impact of Art Exhibitions



Plastic fragments and industrial plastic pellets gathered from strandlines of Great Lakes beaches

IMAGE DESCRIPTION:
Photograph of various pieces of micro- and macro- plastic pollution from beach samples are spread out evenly over a smooth semi reflective surface. The image is dithered and a monotone dark blue.

The Synthetic Collective is an interdisciplinary collaboration between visual artists, cultural workers, and scientists. We work together to sample, map, understand, and visualize the complex ways in which plastics and microplastics pollute the Great Lakes region. We locate our inquiries at the intersection of plastics pollution, geologic processes, and artistic production. Our intent is to follow plastics through from manufacture and consumption to disposal and disaggregation. Interdisciplinarity is crucial to our research methodology – we are led by a driving principle that artists and scientists conduct research together from the outset of the inquiry. As such, we hope to better connect scientific knowledge with arts-based research, and enrich artistic production with informed science. The Synthetic Collective is Kirsty Robertson, Heather Davis, Tegan Moore, Kelly Jazvac, Kelly Wood, Patricia Corcoran, Ian Arturo, Sara Belontz, Lorena Rios Mendoza, and Kathleen Hill.

Plastic Heart: A DIY Fieldguide for Reducing the Environmental Impact of Art Exhibitions was assembled to accompany the exhibition Plastic Heart: Surface All the Way Through, The Art Museum at the University of Toronto, Fall 2021

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In order to limit energy use and fossil fuel consumption, the following design choices were made in putting together the *Fieldguide:*

- Image dithering to lessen file size
- Default fonts to minimize conversion time and data use
- Compression of final PDF
- Limiting colour choices
- Symbols reduced to bare-minimum size
- Simple tables rather than a graphics-heavy design aesthetic

Research and writing of this document took place in London, Ontario, on the traditional lands of the Anishinaabeg, Haudenosaunee, Lūnaapéewak, and Neutral (Chonnonton) peoples, on lands connected to several Treaties including Treaty 6 London Township, Treaty 7 Sombra Township, Treaty 21 Longwoods and the Dish with One Spoon Wampum Belt Covenant; in Tiohtià:ke/Montréal, where many First Peoples claim the land and waterways as a homeland, traditional territory, and/or birthplace of their people since time immemorial including but not limited to the Kanien'kehá:ka (Mohawk) of the Haudenosaunee Confederacy, Huron-Wendat, Abenaki, and Anishinaabeg (Algonquin); and in New York City, where Mannahatta is the traditional territory of the Lenape people and Brooklyn the traditional territory of the Canarsie people. NYC has also been a gathering spot/home for Kanien'kehá:ka and other Indigneous peoples from across Turtle Island.

Plastic Heart: Surface All the Way Through *was held at the Art Museum at the University of Toronto in Fall 2021. We would like to acknowledge the sacred land on which the University of Toronto and the Art Museum operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Patron First Nations, the Seneca, and most recently the Mississaugas of the Credit River. The territory was the subject of the Dish with One Spoon Wampum Belt Covenant between the Iroquois Confederacy and the Confederacy of the Ojibwe and allied nations to peaceably share and care for the resources around the Great Lakes. Today the meeting place of Toronto is still home to many Indigenous people from across Turtle Island, and we are grateful to have the opportunity to work and live on this territory.*

We are grateful to the Indigenous peoples who have been protectors of the Great Lakes since time immemorial. By acknowledging the lands on which we have worked and held our exhibition, we attempt to hold ourselves accountable to these communities and to do the work of decolonization which must extend far beyond land acknowledgments.

Synthetic Collective member Kelly Jazvac sifting sand to sample for plastic pellet pollution in the top 5cm of beach sediment.

IMAGE DESCRIPTION:
Photograph of a light haired person wearing a toque and gloves, kneeling on a beach looking down towards a sifting device they are holding. There is a paper bag in the foreground and long grasses in the background. The image is dithered and a monotone dark blue.

THE FIRST MUSEUM AGE, THE LAST MUSEUM AGE

When developing exhibitions, the guiding question of the Synthetic Collective is: is it possible to curate a zero-carbon exhibition? This question is deceptively simple. Behind what the viewer sees are many steps that go into building the exhibition itself. Where does one begin to tally the environmental impact? Is it in the space itself as the art works and artefacts are assembled? Or is it in the very first steps of the process—the mining for heavy metals and pigments, manufacturing chemicals and products, laying the fiber optic cables that underlie the systems of communication that are key components of contemporary exhibition making? It's impossible to curate a carbon neutral exhibition taking into account the millions of small actions resulting in the final product, unless the exhibition exists only in a moment of imagination so brief that it need not draw on caloric intake (phosphates for the soil, oil for transportation, chemicals for the pesticides). But if one reframes the question to ask how small a footprint an exhibition might have while still maintaining a *cultural impact* worthy of its *waste impact* and its legibility as an exhibition, then there is vast potential.

Synthetic Collective's approach to exhibition making was prompted in part by the installation of numerous grand scale exhibitions designed to educate various publics about climate change. As curator Jennifer Newell, historian Libby Robin, and science writer Kirsten Whener (2017, 1) write in the introduction to their volume about museums, communities, and climate change: "climate change demands urgent transformations in the ways we think about ourselves and our world, and … museums are effective places for supporting conversation about and action on this issue." An impressive number of museums are attempting to install large-scale exhibitions with the intent to educate about climate change, pollution, and waste. But often such exhibitions use huge amounts of material resources in order to convey their messages.

Writer Chris Hampton (2018) notes: "Museums are regularly forums for such big ideas. But seldom do we consider: are they also places that practice them?" Rarely are environmental impacts and costs calculated as a crucial element of exhibition design. In part this is because of a move in museums towards relational and engaging forms of education that often take place through sophisticated technological and interactive interfaces. Science, technology, and natural history museums in particular have been

leaders in developing interactive technologies that enable state-of-the-art storytelling and teaching, but that are resource heavy in their construction and functionality. Major exhibitions of eco- and environmental art at authoritative galleries have also worked hard to educate various audiences, often through showcasing impressive eco- and environmentally-themed artworks and exhibitions. But here, too, slick and professional gallery settings often demand the extensive use of toxic materials that become waste in quick cycles of installation and deinstallation.

Is there a way out of this conundrum? Can less environmentally harmful exhibitions still be impactful? And if so, what kinds of questions about exhibition materials and installations should curators and museum prep teams be asking?

We suggest that art museums and exhibitions can provide a model for showcasing how exhibitions can themselves be sites for research into the environmental consequences of materially-based, public-facing forms of education.

We are inspired by artists and curators who have taken up some of these questions in their work. Museums large and small have begun to consider their carbon footprints, to reuse exhibition materials, and to incorporate local work. An important recent precedent can be found in Gropius Bau's 2020 exhibition *Down to Earth*, which asked artists and curators not to travel, eschewed the shipping of art works, and turned off lights and air conditioning; artists with video, film, and digital art recreated their works in natural light in performances in the exhibition space. Another example is curator Suzanne Carte's *Division of Labour* at the Workers Arts & Heritage Centre (Ontario), which we describe in the Display section below. We also acknowledge that many artists have taken up some of these questions in their work, and we are inspired by artists such as Amy Balkin, whose project *Public Smog* actively seeks to protect airspace even as it includes the billboard "Public Smog is no substitute for direct action"; Ruth Cuthand's *Don't Drink Don't Breathe* series that draws attention to boil-water advisories faced by 94 First Nations in Canada; Julian Oliver's *HARVEST*, which uses wind-energy to mine cryptocurrency, with profits directed towards climate-change research; and collectives such as Forensic Architecture and Dear Climate whose work leads directly to action at local and international levels. We remain cognizant that any "solutions" must be part and parcel of, and contribute to, advocacy efforts that extend far beyond the realm of the museum.

Our aim is to provide a methodology or guide for art exhibitions so as to create a series of best practices that can be replicated or researched by museums and galleries large and small. We begin with the premise that an exhibition that addresses pollution, waste, or climate crisis must do more than acknowledge its environmental footprint and must take active steps to mitigate impact that go beyond purchasing carbon offsets.

At the centre of our inquiry is the role played by plastics in the art world, exhibition making,

and conservation. We suggest that a better understanding of the lifespan of plastics will lead to more sustainable choices at all levels of art and exhibition making and museum collecting.
Museums, especially large ones, tend towards a simultaneous embrace of the new amid a culture of indefinite preservation. From the time of what Ruth Phillips (2005, 83) calls the first museum age in the nineteenth century, and through the vast expansion of museum complexes, a fundamentally paradoxical relationship to time has emerged, such that the goal of collecting is to arrest time through the twin processes of collection and preservation. Simultaneously, museums are charged with either portraying or recreating pasts that should have decayed, thus crafting a kind of unnervingly static past-in-the-present. This is true even of the most cutting-edge contemporary art institutions, which nestle a resistance to changing environments and unwavering humidity levels within content that is designed to be perceived as ahead-of-the-times.

As contemporary art production has grown phenomenally over the course of the 20th and 21st centuries, artists have sought to explore new materials, among them plastics. In turn, as museums and galleries have collected these works, it has created a need for preservation of often ephemeral art objects that are sometimes made from the most precarious of substances: acrylic paints, glue, fiberglass, plastics of all sorts. In turn, these substances, with plastics key among them, decay, crack, disintegrate, discolour, and off-gas in ways that fundamentally change the look, smell, and integrity of the original work. There are numerous tangled paradoxes: the materiality or look of the original artwork is impossible to preserve even as the materials last into futures unknown. In short, as waste and particularly plastic waste accumulates in the environment, where it persists for centuries and millennia, galleries and museums are tasked with halting a seemingly intractable problem: the sleek shine of plastics is but momentary, and polymers present expensive and time-consuming conservation problems for many collections.

In truth, it is only since the 1960s, when plastics entered the art world in force, that museums have had to contend with such materials, and even then artists were often both embracing and resisting the peculiarities of these new mediums. Thus, in the 1960s we find artists such as Françoise Sullivan, Fred Eversley, Les Levine, and Eva Hesse pushing the boundaries of plastic, working directly with fabricators in plastics factories, excavating and playing with the flexible properties of the material, re-defining the so-called “plastic arts.” Environmental resistance would come later.

Though at the time, questions about plastic and the arts often circled around whether it was an appropriate material for art making in a high art/kitsch sense, can we look back now to repurpose the questions asked in the 1960s of plastic: What might an exhibition look like that draws out these problematics while remaining acutely aware of its environmental footprint? Must an exhibition with a low carbon footprint also espouse a post-aesthetic sensibility?

The “dematerialized” object closely associated with conceptual art often had the subversion of the art market at its core, but in hindsight can be seen also as working towards a kind of carbon neutrality. Take, for example, Lippard’s 1970 exhibition at the Vancouver Art Gallery *955,000* (one of several “Numbers” exhibitions that Lippard curated). In this iteration, the exhibition and catalogue consisted of 138 unbound index cards accompanied with 20 cards written by Lippard. The index cards represented the proposed works of 138 international artists, while the title of the show reflected the population of Vancouver at the time. The “non-object portability” of the show upended accepted curatorial norms, key among them the idea that exhibitions must include completed artworks, shipped to authoritative galleries. Reminiscing about these exhibitions, Lippard (2015) noted: “conceptual art in its purest form could be sent in the mail. This very much accelerated and expanded the audiences and, perhaps more importantly, did the same for communication between the artists themselves; they began to travel more, meet, become friends and collaborators, and pass on the word to those of us who traveled a lot less.” From Lippard’s numbers exhibitions to Seth Siegelaub’s infamous *January 5–31*, *1969* exhibition, a show which consisted of a mock catalogue and two empty galleries (unless one counts the already existing office furniture and the presence of artist Adrian Piper who served as gallery attendant for the exhibition), conceptual art of the 1960s seems groundbreaking not just in its efforts to jostle the norms of the (New York) art world, but also in retrospect and re-reading in its proto-environmentalism, and its suturing together of material objects that could enter the commodified art world and the energy required to transport and display them.

In the years since, the rising stardom of curators, and the fast cycling of art exhibitions have moved far away from the conceptual art moorings of the 1960s, as travel has become a near-essential marker of success, aligned with the increase in international mega-exhibitions and biennials, new museum building projects, and the almost unfathomable growth of the upper echelon of the contemporary art market. So too, important advances in protecting and preserving artworks and artefacts have led to the imposition of stringent controls on museum settings, and sophisticated lighting, ventilation, heating, and cooling systems that have a heavy energy cost. Simultaneously, sophisticated technological innovations have contributed to the ability of museums to engage and educate audiences, though at a price. As the climate changes outside in increasingly erratic ways, inside the museum it maintains an artificial constancy that belies the very conditions often depicted or analyzed by many displays and works of eco- or environmental art. We conclude that if the world needs art, it needs art that will not consume it. Thus, following in the steps of our radical artist ancestors, we present a manifesto for museums, artists, galleries, curators, and artists.

A Manifesto for Curating and Making Art in a Time of Environmental Crisis

1. If you're going to make it, make it count.

2. Lead by example.

3. Take steps to mitigate environmental damage of art making and exhibitions. Doing so reveals other economies of inequality and acknowledges the art world's culpability in upholding systems of oppression. Projects should enhance initiatives aimed at preventing, reducing, and mitigating harm.

4. Learn about the toxicity and harm of materials involved in the production of artworks/exhibitions. Consider what is involved in their production and what that means for the environment. Weigh this information against point 1.

5. Reuse and recycling can happen at every stage: different aesthetics for exhibition curation that privilege reuse over new materials should become the norm.

6. Invest in alternate shipping systems and packing practices. Borrowing from a smaller geographic region, reusing packing materials and crates, and finding low-carbon methods of transportation should be standard.

7. Avoid transferring responsibility: carbon offsets alone are not enough and should be understood as greenwashing.

8. Negotiate exhibition, acquisition, and preservation policies. Upon the acquisition of artworks, artist contracts should include clear choices with regards to whether or not artworks should be preserved/conserved. Not all art works need to be thought of as permanent or unchanging.

9. Build circularity into in-house materials and energy use: use exhibitions to implement longer term strategies for carbon reduction, which may include contracts with museums or galleries for concrete measures to reduce fossil fuel dependency

such as sourcing energy from green(er) suppliers or establishing exchange systems among local museums for exhibition furniture. Establish in-house standards and measurement protocols to reach targets. LEED programs are not enough if it means that new capital plans and building projects are foregrounded as the only way forward for museums.

10. Embrace enough: an aesthetic goal of achieving maximum impact with the minimum of resources. That goal requires drawing a line of “enough” at every decision point, including energy systems and work schedules.

The Synthetic Collective espouses an approach of enough: ecological footprints must be taken into account when weighing aesthetic decisions. An aesthetic of enough is one that simultaneously acknowledges and values the past, present, and future—enough already!—in its refusal of high carbon, high energy, high waste productions. An approach of enough requires humility, and practicality: sustainability, in terms of resources and human energy, is directly linked to systems that can break if we overspend them. It means we should put in a lot of effort to build more equitable worlds, but that should be accompanied with an ethic of care, mindful that we don’t burn out and the planet doesn’t burn up. Enough is an aesthetic based in achieving maximum impact with the minimum of resources. Enough is a counterpoint to the implied goal of museum-standard perfection and a culture that valorizes work above all else.

Synthetic Collective member Kelly Jazvac sifting through debris for plastic pollution at a Lake Huron beach.

IMAGE DESCRIPTION: Close up photograph of a light skinned person's forearms and hands leaning over a sandy ground. They hold a clump of natural debris in one hand, while the other hand is firmly set in the sand, holding their weight. The image is dithered and a monotone dark blue.

PLASTIC HEART: SURFACE ALL THE WAY THROUGH

Further information about the plastic-pellet study informing the exhibition Plastic Heart: Surface All the Way Through *can be found in the DIY Fieldguide essay "Flipping Into Focus: Visualizing the Invisible." If the sun is shining in Montreal that day, further information about the artists and artworks in the exhibition can be found on the solar-supported exhibition website* www.plasticheart.solar. *This case study serves as a general overview of how and why the Synthetic Collective approached the exhibition as an experimental curatorial intervention into museum and art practice.*

Plastic Heart: Surface All the Way Through opened at the Art Museum at the University of Toronto in Fall 2021. Organized as the COVID-19 pandemic spread across the globe, the exhibition took place during a time in which single-use plastics played a central role in providing safety and personal protective equipment to frontline workers, yet also amidst a vast increase in plastics pollution and a promise of a nation-wide ban on single-use plastics in Canada. *Plastic Heart* was an experimental exhibition that examined plastic as art material, cultural object, geologic process, petrochemical product, and a synthetic substance fully entangled with the human body.

The exhibition drew on the work of the Synthetic Collective (SC), an art and science collaboration that had recently completed a study of microplastics pollution on the shores of the Great Lakes. The exhibition featured data visualizations of this study, as well as artworks created by SC members drawing on the Great Lakes research. It also included new commissions, and works considering plastics created by numerous other contemporary artists, most of them located in the Great Lakes region. These works were balanced by historical art installations and sculptures that had used early plastics. Some of these historical artworks are now degrading, bringing into the exhibition questions of conservation and preservation.

Most importantly for this *Fieldguide, Plastic Heart* mobilized practices of institutional critique and proposed an alternative method of exhibition development and presentation addressing ecology and sustainability in content and form. The exhibition sought to stimulate viewers to be active subjects and worked to challenge the artist's complicity within capitalist-colonialist models of exhibition making and

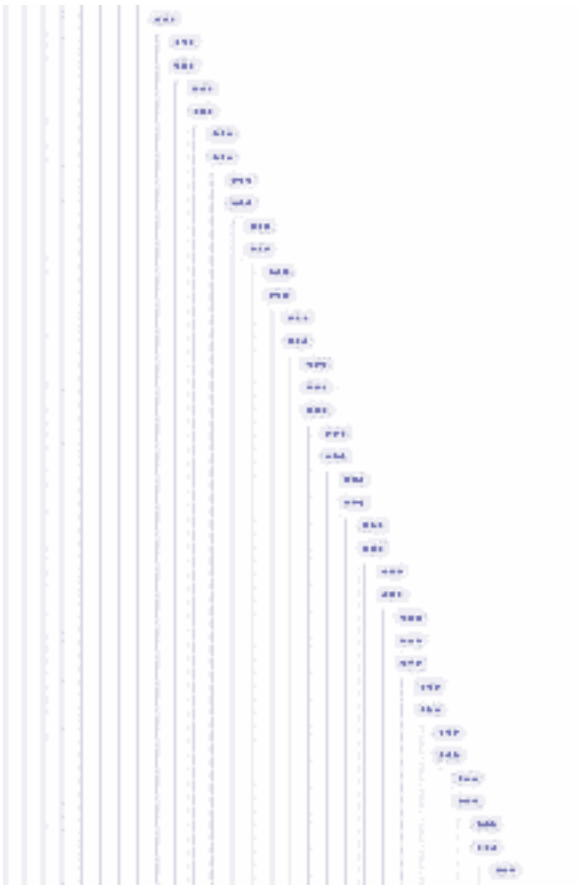
experiencing. By acknowledging plastics as both lubricants of artistic, gallery, and museum practices, and also as "wicked problems" intimately linked to the fossil fuel industry, the exhibition undertook auto-critique as an essential component of its making.

This essay takes readers step by step through the process of organizing *Plastic Heart.* The exhibition is discussed in a mixture of verb tenses, including past tense, to acknowledge the 2021 showing at the Art Museum at the University of Toronto, and present and future tense, signifying that versions of *Plastic Heart* will travel to other locations, and also that exhibitions do not finish the moment the gallery doors close, but have afterlives in the way they are remembered, and also in the way that the exhibition materials (such as display cabinets, didactics, movable walls) are typically hived off from exhibition content and translated from the context, backdrop, or framing into waste. Assessing the full impact of an exhibition requires understanding and weighing both its conceptual and material outcomes. This essay can be used as a guide for other curators, artists, and museum workers hoping to organize less carbon-intensive exhibitions. Where possible, we have drawn in other examples, and have discussed both the successes of the exhibition, and places where further research is required.

We make clear from the start that our solutions are ground-up, DIY, on-the-fly, and often comprise low-level interventions. While a number of museums have undergone significant build projects to include solar energy, green technology, switches to LED lighting, and other capital projects, our goals were/are much more scrappy. We see our actions in line with those of small-budget museums and artist-run centres that do similar work, perhaps not always through the lens of "ecology" or "sustainability" but because there are not sufficient funds for energy-intensive engagement with the public. As a collective, we feel that small-scale interventions can have significant impact but are often overlooked in favour of larger projects.

PLANNING

In reflecting on her projects at Tensta Konsthall (Sweden), curator Maria Lind argues for "digging where you stand," a strategy of reflecting meaningfully and deeply on one's immediate context, engaging with local communities, and partnering with local resources and groups (Rehberg & Lind 2020). It is an approach that draws from socially-engaged curatorial practice, and it reflects a recent global turn to slower, deeper, and more thoughtful approaches to curating in the wake of a hyperactive period of biennial-fueled globetrotting (Petrešin-Bachelez 2017, Johnston 2014, Bishop 2013). In her call for "slow institutions" Nataša Petrešin-Bachelez (2017), for example, builds on the premise of socially-engaged curating, asking: "How can we work within and with institutions today, as cultural workers



Screen capture of an email chain.

IMAGE DESCRIPTION:
Screen capture of a collapsed email chain visible as a long descending string of ellipsis icons. Under each ellipsis is a straight vertical line extending down to the bottom of the image. The image is dithered and a monotone dark blue.

and artists, at a time of violent racialization and profound ecological crisis, when heightened surveillance reinforces the organized and transnational governmental abuse of natural resources and the commons?" What are our responsibilities as curators to "imagine new ecologies of care as a continuous practice of support" (Petrešin-Bachelez 2017)? Slow curating revolves around a commitment to deep research, and a resistance to an accelerationist impulse, coupled with an emphasis on collaboration (with artists, other curators, cultural workers, and community members). SC adds to these conversations by suggesting that an approach of slow curating and working locally can position an ethics of care at each level of the exhibition, from the smallest and most seemingly mundane details to the final production—literally from the nails in the wall to the overarching curatorial thesis.

A Question

How can collaboration take place without also encouraging the kinds of travel that contribute to the "profound ecological crisis" socially-engaged curating should confront?

The Details/Digging Where You Stand

In planning *Plastic Heart*, SC sought to invite artists from the relatively small geographic region of the Great Lakes and tributaries, which stretches from Montreal to New York, and from Sudbury, London, and Kingston (ON), to Detroit, and Chicago.[1] Knowing that we all live and work in similar ecosystems created an instant link, as did understanding that even if we are spread miles apart, there is a watery connection between us, a kind of community built through

1 Three artists came from outside of the region. Christina Battle was located in Edmonton, but has worked extensively with the Synthetic Collective on a number of projects. Meagan Musseau was located in Elmastukwek, Ktaqmkuk territory (Bay of Islands, western Newfoundland) and she contributed a small and easily shipped work. Marianne Vierø was located in Berlin and created a sound and video work not requiring shipping. All other artists lived and worked in the Great Lakes region.

lakes and estuaries. This made sense within the context of the exhibition, although it also meant that other artists whose work might have contributed to the exhibition goals were left out. Further, this choice did not mitigate all issues with shipping (see below), and careful consideration ensued on whether the ecological footprint was worth the cultural offset.

While collaboration remained a central goal, meetings in person seldom happened. Though all members of the SC live in the region of the Great Lakes and tributaries we do not all live in the same city and are in fact spread over many hundreds of kilometers. Meeting online took away the need for driving, flying, or otherwise making our way to meeting locations. At first this seemed an obvious choice, but it was not a decision without consequence.

We made use of technologies such as Zoom, Google Docs, Dropbox, FaceTime and other proprietary softwares that come with their own issues of privacy, profit making, and energy consumption. Exhibition design took place on SketchUp and was altered and shared multiple times. Over time the extent of the carbon footprint created by our use of non-green technologies was increasingly alarming. Tung-Hui Hu (2015, 1-2) describes the silence of the cloud: "the inaudible hum of the electrical grid," almost unnoticeable but ubiquitous—a "mute piece of infrastructure [that] is just there, atmospheric" but covers a massive and polluting infrastructure (See also Hogan 2013, McGovern 2020). Our disquiet grew as the pandemic highlighted the extreme levels of energy use required for video streaming, a cavalier overconsumption building potentially to what scientists were/are beginning to call the "information catastrophe" (Vopson 2020). Perhaps we could have made a different decision; certainly we found working in person to be much more efficient. Online, tasks required frequent check-ins and unspooled over longer time frames—this was a different form of slowness than that suggested by Lind and Petrešin-Bachelez. As it was, the COVID-19 pandemic forced our hand: meetings would take place online, so too would exhibition design, programming and outreach planning, and catalogue writing and design. As with so many green choices, they were frequently "better" as opposed to "ideal."

We open this essay discussing the planning of the exhibition in part because it remains one of the significant carbon failures of *Plastic Heart* and one of the places where we have much to learn. We begin from a place of humility. While we were successful in largely avoiding the creation of plastic waste during the planning stages of the exhibition (a core goal of all SC activities), we were less successful in finding and using less carbon-intensive methods for communication and planning. There was an additional quandary. The SC is a fairly large group with a horizontal structure. Often, large Zoom meetings (of up to 10 people), reply-alls and long email chains were necessary to uphold the very premise of the group: that all members are equal and that we all work together on collaborative tasks. The outcome was that email and conversations were a significant energy use, and one that it seemed

we could not avoid without disrupting other fundamental goals of our co-work, co-learning situation. Arguably, museums working with internal staff and without guest curators could avoid some of the extensive use of online communications. In larger organizations, hierarchical structures and clear roles and responsibilities could effectively mitigate large energy commitments to communication. In short, collaborative structures where contributors live in different regions are energy intensive. There is a need for balance here however. We feel that the co-working and equity-based environment created by the SC was and is vitally important to the premise of the exhibition and to the forms of socially-engaged curating that underlie our approach. Thus, forms of communication that protect collaboration and slow curatorial models remain an area for further research.

Further details

- Phone calls and video-free communications were highly effective in some situations (e.g. when two people needed to meet, or when several/all SC members met but did not need to actually see one another). Pre-pandemic, for those of us living in the same city, meetings took place in person (we were also typically able to walk to our meeting place).

- Thumbnail images, smaller documents, and other low-res/low-energy solutions can be effectively used, regardless of group size.

- Perhaps we could all benefit from shorter and fewer emails, fewer reply alls, and fewer meetings. Clear tasks were set at each meeting to streamline the entire exhibition planning process, and to lessen the energy use (human and resource-wise).

- Artists and loaners should be informed of exhibition parameters from the outset. Some artists/loaners will not want to participate (primarily because of installation, shipping, and insurance limitations, see below) and others will enthusiastically embrace the exhibition goals.

Conclusion: balancing institutional needs with attempts to showcase local, national, and international artworks and artefacts can be addressed in a number of ways (some of which are outlined below). Less carbon-intensive exhibitions will look different. They might include fewer artists overall, more local artists, smaller works, and so on. Meetings might take place online or less frequently if collaborators live significant distances apart, or in person if they do not. The number of email and other communications

should be lessened and reply-alls should be avoided as should long email chains. Low carbon exhibitions require extra planning, innovation, and shifting of some of the aesthetic standards of traditional exhibitions. SC suggests that such approaches should be seen as in line with a global turn in curating towards socially-engaged projects and slow curating. Take the pressure off yourself and take some pressure off the climate.

MAKING

PLASTIC HEART POLYMERIC AND RELATED MEDIA

ARTIST	TITLE	MEDIA	POLYMERIC MEDIA
Christina Battle	*THE COMMUNITY IS NOT A HAPHAZARD COLLECTION OF INDIVIDUALS,* 2021	Digital print on organic cotton, animated GIF, participatory project with seed packs (grass and wildflower seed, mycorrhizal fungi), postcards, website	No polymeric media
IAIN BAXTER&	*Still Life,* 1965	Vacuum-formed plastic	Butyrate
Leticia Bernaus	*NOT EXACTLY LOVE,* 2018	Digital video	Featuring polyethylene (bag), Display: polycarbonate (iPad)
J Blackwell	*Plastic Basket (B204),* 2013	Plastic bag, yarn	Low-density polyethylene (LDPE)
Amy Brener	*Flexi-Shield (Eostra),* 2019	Platinum silicone, pigment, larkspur and chrysanthemum, flowers, fern leaves, miscellaneous objects	Polysiloxane, polyethylene and/or polypropylene
Hannah Claus	*chant pour l'eau,* 2014	Digital print on acetate, thread, PVA glue, plexiglass	Cellulose acetate, Poly(methyl methacrylate) (PMMA), polyvinyl alcohol
Sully Corth	*Untitled,* 1971	Lucite	Poly(methyl methacrylate) (PMMA)
Heather Davis & Kirsty Robertson	*Chemicals of Mutual Concern,* 2020	Water-based non-toxic ink on cotton rag paper and hand-mixed ink derived from subway pollution and beach detritus	Unknown pollutants
Aaronel deRoy Gruber	*Mini Cyclops-lexis,*1969 *Multiplex 4*, 1971	Plexiglas, Lucite	Poly(methyl methacrylate) (PMMA)
Fred Eversley	*Untitled,* 1968	3 colour 3 layer cast polyester	Polyester resin

Naum Gabo	*Monument to the Astronauts,* 1966	Brass, plastic, and stainless-steel gauze	Poly(methyl methacrylate) (PMMA)
General Idea	*Liquid Assets,* 1980	Plexiglas, die-cut foam inserts	Poly(methyl methacrylate) (PMMA), polyurethane
Kelly Jazvac	*Semon's Seaman,* 2020-21	Billboard tarp, cotton thread, sand, plastic pellets	Polyvinyl chloride (PVC), polyethylene
Woomin Kim	*Steady Stream,* 2012/2020	Silicone	Polysiloxane
Kiki Kogelnik	*New York Street Performance,* 1967	Silver Gelatin Print	Featuring polyurethane foam (PU)
Les Levine	*Disposables,* 1964	Polystyrene	Polystyrene (PS)
Mary Mattingly	*Core,* 2020	Polyacrylonitrile composite fabric (from the coal-based chemical product Acrylonitrile), iron and carbon (hanging supplies), dispersed dyes (water; and chemicals including formaldehyde condensates of naphthalene sulphonic acid dispersants, polyacrylate thickeners, and sodium hydrosulphite alkali reducing agents)	Polyacrylonitrile composite/ Acrylonitrile, polyacrylate
Tegan Moore	*Permeations of a Dataset,* 2020 - 2021	Factory reject "mystery foam" sheet with anti-static agent, hail-damaged roofing, photodegraded corrugated plastic, plastic pellets, salvaged phone, starch packing peanuts, mulberry paper	Polyurethane (foam sheet), polycarbonate (roofing), polypropylene (corrugated plastic and pellets), polyethylene (pellets)
Skye Morét	*Thank You to our Industrual Partners,* 2020- 2021	bags, 6-pack tops, caps lids, to-go containers, glavanized steel utility wire, cotton rope, steel trim screws	Polyethylene, polypropylene
Meagan Musseau	*E'e for that Aunty magic, from the Intergalactic L'nu Basket series*, 2019	Black ash wood, sweetgrass, and plastic	Polyvinyl chloride (PVC), cellulose acetate
Meghan Price	*Igneous,* 2018 *New Balance*, 2017/2020	Woven wool, cotton & waste plastic Used athletic shoes	Ethylene vinyl acetate copolymer
Françoise Sullivan	*Various works, 1966 - 1969*	Plexiglas	Poly(methyl methacrylate) (PMMA)
Catherine Telford-Keogh	*The democratic model of upward mobility saturated his fantasies of the good life, where Hal could languish in bed for years at the Holiday Inn watching National Geographic on piles of damp laundry and money,* 2017	Mr. Clean® Multi-Surface Antibacterial Cleaner with Summer Citrus, Honey-Can-Do® Vacuum Space Bag, inkjet print on paper, inkjet print on transparencies, vinyl, styrene, poster mounts	Nylon, polyethylene, polypropylene (space bag), styrene, acetate (transparencies), polyvinyl chloride

Lan Tuazon	*No Nouns Left Whole,* 2018	Found nested containers	High density polyethylene (HDPE)
Marianne Vierø	*A matter of form,* 2020-21	5 channel audio composition with 2 channel video, partly nonsynchronous	Display: Polycarbonate (iPad)
Joyce Wieland	*Home Art Totem,* 1966	Mixed media	Polyvinyl chloride or acetate
Nico Williams	*naabibii'ige,* 2021	Glass beads, thread	No polymeric media

The Polymeric and Related Media chart records the known polymers found in all artworks included in Plastic Heart: Surface All the Way Through. *This information was used by the SC and artists in the exhibition to learn more about their works and to understand the many ways that plastics are used in the art world, ranging from experimental material to diverted waste.*

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In 1927, artist Naum Gabo created the sculpture *Construction in Space: Two Cones*. Like many of Gabo's works, the sculpture is constructed in celluloid, and is a combination of three-dimensional shapes held together in tension. Among the first artists to use plastics in his work, Gabo had an abiding interest in new materials, particularly in the toughness, light, colour, and flexibility of plastic—what he saw as its material strength totally independent from mass (Rankin 1988, 286). Many of his early works use cellulose nitrate and cellulose acetate: semi-synthetics that combine cellulose from cotton fibers and camphor as a plasticizing agent. His later works primarily use Perspex (also known as Lucite or Plexiglas). As Elizabeth Rankin (1988, 289) notes, the use of industrial materials in Gabo's work was an avant-garde rejection of post-WWI historical values, a turn towards the future and innovative materials and technologies. In part, she writes, Gabo chose plastics because he believed they would not decay and would not become weathered and patinated in the manner of bronze. He was unfortunately incorrect. Many of Gabo's early works started to degrade almost as soon as they were complete. They have discoloured, buckled, cracked, and, in some cases, including *Construction in Space: Two Cones,* disintegrated entirely.

Plastic is a surface, all the way through. It has no interiority; its form and substance are designed to emerge together. It is often thought of as immortal, but it also readily breaks and degrades into smaller, yet lasting, pieces. Plastics, also called polymers, are made through a process of conversion. Raw

materials such as oil, natural gas, and coal are refined into ethane and propane. In turn ethane and propane are heated through a process called “cracking”, which converts them into ethylene and propylene (monomers). Monomers are combined to create the long-chain molecules of synthetic polymer/plastics. Perspex, for example, is Poly(methyl methacrylate) (PMMA), a transparent thermoplastic (meaning it can be melted and reformed). Chemically it is the synthetic polymer of methyl methacrylate. There are thousands of different kinds of polymers, each with its own set of characteristics, thus plastics are not one thing, but many. Chemicals are often added to plastics to make them stronger, safer, or more or less flexible. Some of these chemicals (such as plasticizers, which are colourless and odourless esters often added to plastics such as PVC or vinyl) are potentially toxic and can off-gas. Additionally, the monomers making up the polymers are extremely durable. Plastics typically do not biodegrade, but they do photodegrade, breaking into smaller and smaller pieces when the monomers are exposed to UV light and the long chain molecules break. Once those smaller pieces are less than 5mm, they are known as microplastics. Thus, the Perspex Gabo was using in his later work, for example, became brittle with age and likely to shatter. Plastics’ chemistry is constantly changing and evolving, and the polymers used by artists in the 1920s–1960s are very different from those used today.

Gabo’s work provides an extreme case in point, but the issues are the same for all artists working with plastics. Plastics are considered to be ephemeral for a reason, though it should be noted that ephemerality is only partial: though they crack, shed, and discolour, their component parts are here for the long haul, with added chemicals lingering indefinitely, for decades and centuries if not millennia. As the decades moved on and plastics began to play a growing role in consumer markets, artists turned to the material for its ubiquity, its cheapness, its commodity status—but also, like Gabo, for its seductive material qualities, its flexibility, opacity, and glossiness. Plastics are the always-new, so that the 1960s experiments of artists like N.E Thing Co., Françoise Sullivan, Fred Eversley, and Eva Hesse with fiber glass, polyester, PVC, and latex, represent explorations in then-current art movements and engagement with the industrial and factory-made. They also put these artists on the cutting edge of their day, due to their work with new and little understood materials (Barger 2007). Often the very things that attracted artists to plastics were the things that would break down. Hesse died at the age of 34, and her remaining works, for example, have evolved far beyond their original intentions, warping, cracking, and transforming from transparent to yellow, ochre, and brown opacity.

It is impossible, Rankin argues, to understand Gabo’s early works as he intended them to be understood. Certainly by 1988, when Rankin was writing, *Construction in Space: Two Cones* had significantly disintegrated. It had been stored undisturbed in an airtight case at the Philadelphia Museum of Art since its acquisition but was unpacked in 1960. A strong odor was apparent when the case was opened and cracks began to develop the following day as rapid evaporation of the volatile plasticizer took

place (Rankin 1988, 290). The work is now dark brown and cracked like a crystal, its forms almost indecipherable and crumbled. Gabo blamed the museum, feeling strongly that it was their negligence rather than the materials of the sculpture that had destroyed the work (Barley n.d.). Years later, then-curator at the Philadelphia Museum of Art Ann Temkin (2002, 291) asked: "Is the condition of the piece so far from the artist's intention that it is better to leave it unseen and make do with photographs of it in good condition? Does one attempt to remake the objects or portions of them, sacrificing literalness to present something true to the spirit of the original? Or does one accept the aging of the sculpture as part of its meaning and present it as it now exists...?" In 1968 Gabo thought to repair *Construction in Space: Two Cones* before deciding it was impossible. The sculpture was returned to the Philadelphia Museum of Art where it remains in its crumbling state. Gabo created a replica, which he donated to the Tate Museum in London. In 2014, Danish artist Marianne Vierø was invited to Philadelphia to create a replica of the damaged sculpture in its broken state, using 3D printing and new materials. Though appearing crumbled, Vierø's work will remain (somewhat) stable in a way that Gabo's will not, the two decaying at different rates, fast and slow at once.

From the 1920s through to the 1960s artists gave little to no obvious acknowledgment of the toxic effects and afterlives of plastics and plasticizers—information was simply not widely known at the time of production. Plastics were not seen as pollutants but rather as flexible material that allowed the exploration of shape and form: easy to manipulate into three-dimensional objects. The words "plastic" and "plasticity" come from the Greek *plassein* meaning "to mould" and, as one might expect, these words have a longer history in the arts than the invention of plastic materials themselves. Plasticity as a *material* characteristic names a certain malleability. Roland Barthes (1957, 97) suggested that "more than a substance, plastic is the very idea of its infinite transformation." However as we have now realized, plasticity is not elasticity, fluidity or adaptability. It is not endless polymorphism. And therein lies our predicament: plastic can become anything but is inherently nothing (natural or genuine) in itself—a quandary recyclers often point out.

It is interesting to note that many of the early artist-adopters of plastic materials and molding processes worked in a formalist sensibility exploring shape, surface, and colour in modernist modes and/or pseudo-abstractions. These works are still dazzling and fascinate on many levels. By the 1960s a new strain of aesthetic approaches to plastics had emerged in the assemblages of the Nouveaux réalistes, and Pop Art's deployment of commodity objects. Many of the contemporary artists in *Plastic Heart* take up this later tendency and for the most part have abandoned the "magical" molding and forming of their forebearers in favour of more recombinant material strategies—"consent[ing] to be prosaic" as Barthes (1957, 98) had it. Through the 1970s and 80s, plastics became less a new material and increasingly the norm, particularly as the growth in synthetic paints such as lacquers and enamels,

as well as acrylic paints, fundamentally changed the art world. Nonetheless the lure of plastic as a fluid and easily manipulated material remains seductive for artists. But since the 1990s, consideration of the long-term effects of plastics, on bodies and on landfills, has strongly entered the art world (Boetzkes 2019).

[Photo has been removed from Version II. Please see image description below and physical reproduction in the exhibition *Plastic Heart: Surface all the Way*

The above strategies can be found in the work of many artists in *Plastic Heart.* For some, such as Hannah Claus and Woomin Kim, plastic offers a crucial material flexibility that allows them to convey a message that might not otherwise be possible. Claus's installation uses a digital reading of a Mi'kmaq water song, sung to celebrate and thank the water, while Kim's work mimics the formation of stalactites in slow accumulation of dripping liquid silicon. For others, such as Leticia Bernaus, J Blackwell, Amy Brener, Meagan Musseau, Meghan Price, Lan Tuazon, and Catherine Telford Keogh, working with/on plastic and waste allows for the exploration of complicated relationships between the synthetic and the natural, showing how these two terms depend upon each other but are ultimately enfolded into one another. Commissions from Christina Battle, Nico Williams, Mary Mattingly, and Marianne Vierø, delved deeply into, respectively, plant phytoremediation and community building; intergenerational and collaborative knowledge and settler/Indigenous relations; coal, adhesives, and extractivism; and the deterioration of Gabo's early plastic sculptures. A data visualization by Skye Moret, and works by Synthetic Collective members Heather Davis and Kirsty Robertson, Kelly Jazvac, Tegan Moore, and Kelly Wood helped to convey research undertaken by the SC in their plastic pellet sampling from the shores of the Great Lakes.

Eva Hesse in her Bowery Studio, 1967. © The Estate of Eva Hesse. Courtesy of Hauser & Wirth. Photo: Herman Landshoff

IMAGE DESCRIPTION: Photograph of artist Eva Hesse in her studio. She is facing the camera and holding up a large crumpled transparent plastic sheet above her head which fills most of the frame.

Thus, artists in the exhibition make work that draws attention to the proliferation of plastics, and also to land

rights, water pollution, waste, commodity chains, traditional knowledges, remediation, embodiment, and consumerism. For these artists, plastic is a key signifier of colloquial life and continuous environmental degradation. Even for the artists who were not specifically considering the chemical or waste impact of materials, the work nonetheless speaks to the ways that plastic permeates almost all aspects of contemporary existence, with a slow, dull, toxic resolve. In each work there is a weighing of materials versus impact, an acknowledgement of the first point in SC's manifesto: "if you are going to make it, make it count." In the exhibition, the contemporary works form a bridge to the experimental artworks of the past, at once celebrating these early explorations and reconsidering what it means to make now, given the wider acknowledgment of the environmental impact and toxicity of plastics.

We felt it essential to include historic works made from plastic in *Plastic Heart*: to explore how and why artists were using these materials, and also to understand how the works have evolved and degraded over time. Museums and galleries in the region were prolific collectors of early plastic works; it was relatively simple to request work by IAIN BAXTER&, Naum Gabo, Les Levine, and Aaronel deRoy Gruber. Nevertheless, Gabo's work would present other quandaries in terms of shipping and display. Artists working in Canada were creative users of plastics in the 1960s, and local private collectors held works by Joyce Wieland and Les Levine, as well as by Claes Oldenburg. The Art Museum at the University of Toronto held works by General Idea and Sully Corth. Françoise Sullivan loaned sculptures from her own collection, supplemented with 1968 photos of her working at Hickey Plastics, manipulating plexiglass into a three-dimensional form. We were not able to obtain a work from Eva Hesse, but instead decided to include documentation: a 1967 photo of Hesse in her Bowery Street studio, holding up a crinkled piece of plastic film, which we hung alongside a documentary photograph of a performance by Kiki Kogelnik.

We wanted to put historical objects and artworks on display, showing the public the cracks and tears that bear the traces of time, of plastic's decay. Some artists and collectors outright refused our requests, or gently pushed us towards still-intact pieces. Others remade broken work to restore the original vision. But the decaying modernist sculptures, or the ones that might decay, offer a different vision of plastic as a material. Instead of seeing it as immortal, as the utopian striving for a clean, perfected future, decaying plastic teaches us the earthly lesson of decomposition. What might it mean to embrace this principle of decomposition within the gallery? And what does it mean when what is decaying is plastic, known to become more hazardous as it becomes smaller? How could we capture both the interest artists had in working with new materials, and the ways that those materials might have turned on them over time?

The sheer excitement that access to plastics gave to many artists working in the 1920s–1970s was

important to capture, and was matched by the many examples in the show of material culture artefacts: Lucite shoes, manufactured fiber and plastics samples, medical and beauty devices, a Styrofoam cup compressed by water pressure, a very early plastic medallion made of bois durci (a plastic-like-substance derived from blood and sawdust), and three recent plastinated hearts from a moose, a racoon, and a mouse. As noted in a 1953 ad for Firestone, plastic was a "magic new material that serves you a thousand ways," a promise that was kept, even as it was undone by the instability of plastics long-term, and the growing problems presented by their waste.

Conclusion: Historical works were included both as examples of artists exploring new materials alongside their development and production, but also to demonstrate the difficulties of conserving plastics.

The contemporary artists selected for Plastic Heart *were all invested in the exhibition premise and most enthusiastically found ways to lower their carbon footprints. Some of the approaches of artists in the exhibition included:*

- *Thinking through the long-term impacts of industrial processes used in making materials, creating artworks that signaled the extensive life cycles of supposedly disposable materials.*
- *Salvaging materials, re-using materials in artworks, and aiming towards no-waste studios.*
- *Working against trends of bigger is better in art practices and embracing smaller scales and low-resolution images within a philosophy of "enough."*
- *Collaborating with the gallery to re-work exhibition contracts with regards to shipping and insurance (see below).*
- *Researching and choosing low-impact materials when new materials were required. This included paints made from natural substances with no added plastics, unbleached paper, and printing on recycled paper with non-toxic inks.*
- *Allowing the work to fade and accepting or even celebrating change over time.*
- *Strategically planning for lightweight and compact shipping: by the artist's design, many artworks in this show roll or fold down into crates/boxes with a remarkably*

- *smaller volume than the installed work.*
  Creating low-resolution video for smaller screens, and planning sound/audio for lower energy requirements (e.g. low frequency sound requires more energy than high frequency sound).

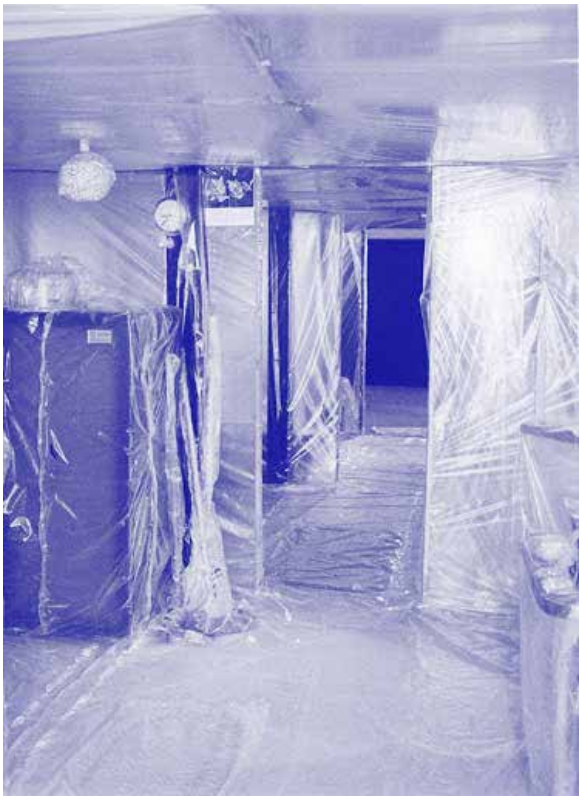
Artists are often willing and excited to work within exhibition parameters. In this case, working with limitations produced professional-calibre work. What emerged was a level of comfort in the patina of use in the installation of the exhibition that actually worked to highlight the level of thinking and planning that had gone into the exhibition and the work it contained.

Throughout we were inspired by a 2012 quote from Lucy Lippard: "Do something that is: visually striking, socially radical, conceptually and contextually sensitive, sustainable, in the public domain (outside of art venues), and hurts no living thing—something that will change the world. Good luck!"

SHIPPING

Traditionally, most artworks are shipped by professional shipping companies that use foam, bubble wrap, packing tape, Styrofoam, and other plastic materials. Working with different kinds of shipping can present issues for insurance and can work against the standards of the institution. It is often the case that if artworks are not packed professionally, they are not insured during transportation. Because of this, artist, curator, and institutional support and collaboration are required in order to lessen the impact of shipping.

For the case of *Plastic Heart* there were certain works, primarily historical works from authoritative institutions, that had to be shipped in standard packed crates. In each case, we made a decision as to whether the show really required the work. For example, with Naum Gabo, we felt the historical significance of his early plastics experimentation was an essential contribution to the exhibition. A work was secured from nearby (Hamilton, Ontario). But in the case of Joyce Wieland, we started with one plastic sculpture from the National Gallery of Canada in Ottawa, and eventually replaced it in the show when we were able to find a different but similar work in closer proximity to the Art Museum in the hands of a private collector, thus mitigating some of the shipping materials, transportation, and resources required for the loan. In a third case, we decided against requesting Marianne Vierø's replica of Gabo's damaged *Construction in Space: Two Cones* from the Philadelphia Art Museum, and instead worked directly with Vierø—she took the exhibition parameters to heart and created a new artwork for us that drew from her work on the



Iain Baxter&, Bagged Place, February 1966, mixed media, variable dimensions. Installation view, UBC Fine Arts Gallery. *Plastic Heart* reproduced images of this iconic work. Courtesy of the artist.

IMAGE DESCRIPTION: Photo documentation of an installation in an apartment dwelling. Everything in the room is draped and sealed with clear plastic sheets, including the floor, walls, refrigerator, broom, clock, and light fixture. The image is dithered and a monotone dark blue.

3D printed replica but could be “shipped” digitally.
In other cases, we included documentation, photographs, and other paper and/or digital materials in lieu of the works themselves. Such curatorial strategies are in line with Conceptual projects of the 1960s and 70s that interpreted documentation as a way to “record, elaborate, or even generate works or ideas, [while] the portability and cheapness of its materials helped artists communicate those ideas to larger international audiences and expressed a political desire for the ‘de-commodification of art’” (Berger & Santone 2016, 204). Conceptual approaches and strategies to art making, which coincided with a growing interest in using plastics as material, worked in our favour, allowing us to expand on the initial impetus of using artists’ documentation to avoid shipping for certain artworks (except for digital files), to choose printing methods that aligned with our approach to exhibition making, and to highlight artists who made significant contributions to early plastic studies and who we might not otherwise have been able to include. There are potential insights that might be gleaned from photographs, notes, reviews, letters and so on that might reveal the role played by plastics in the work of these artists.

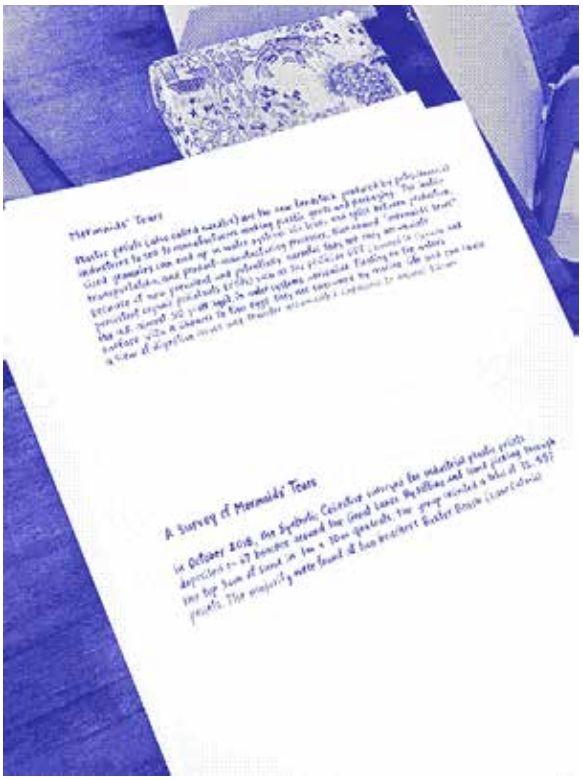
With living artists there was room to work together. Often, we were able to create contracts with clauses stating the work would be shipped by electric car, in the hands of one of the curators, or in one case, would be walked from one museum to another by the curators. We worked with artists to devise solutions to packing materials. And we included the packing materials themselves in the exhibition as a kind of auto-critique, designed to make audiences aware of the implications of packing and shipping art works.

Conclusion: It is often taken as given that artworks need to be professionally packed and shipped. This is particularly the case with historical works. Because of this, it may be that some works cannot be borrowed because of the energy, shipping, or humidity demands. However, living artists are often willing to consider alternatives, even if it means that works cannot be insured during shipment. We suggest artists be given greater latitude in determining how to ship works. Further, we advocate for the clear labeling and reuse of materials in shipping, even at the most authoritative of institutions. Curators can and should make shipping decisions based on proximity to the display location, working with permanent collections if they exist, borrowing from local artists and private collections, and borrowing from nearby institutions, also as a way of fulfilling obligations to a region and/or "digging where you stand."

DISPLAY

Exhibition display is a significant area of innovation in reusing and repurposing materials. In her 2014 text "Subtraction," Keller Easterling argues for a reexamination of demolition practices to shift the concept of subtraction into "active form." With this thinking, "construction debris is treated not as waste but as a material stream" and "assembly and disassembly are designed as two sides of the same process." The arts industry and its economy of temporary exhibitions leads to a cycle of construction and demolition of temporary support structures, often multiple times per year. Stick construction, which uses wood studs, drywall, joint compound, nails, and drywall screws is labour-intensive, and teardown is wasteful. An alternative could consider these materials as part of a material stream, rather than a waste stream. A recent example of this ethic working in the arts is the exhibition *Division of Labour* at Workers Arts and Heritage Centre, Hamilton, and the Art Gallery of Burlington, curated by Suzanne Carte (Carte 2020). With a zero-waste outcome in mind, the exhibition not only used reclaimed and salvaged materials, but in the last week of its run was reconfigured into an Artist Material Fund, giving arts community members an opportunity to again reclaim all materials used.

In recent years, vinyl lettering and backdrops and vinyl labels have become the standard even in small museums and galleries. Vinyl lettering and exhibition making are virtually synonymous. Vinyl is easy to use, cheap, and professional-looking, whereas most alternatives are not (or at least are not all three of these things). Arguably, vinyl lettering has played a role in democratizing museums, allowing for extensive and cheap labelling, contributing to the educational turn in museums, and thus challenging the elitist status of authoritative institutions. But there is a cost. One of the most toxic of plastics produced, PVC, is made through pyrolysis (thermal cracking) of petroleum, followed by the addition of plasticizers and stabilizers, added to create flexibility, durability, sheen, and adhesive capabilities. It is the



Plastic Heart exhibition panels were hand painted by graphic artist Devon Kerslake. She diluted Beam Paint's watercolour stones into an ink and wrote out the didactic labels by hand on salvaged paper mat boards.

IMAGE DESCRIPTION:
A photograph of a white board lying diagonally on a table with a small patterned box underneath it. Handwritten text on the board is mostly too small to read except for the titles "Mermaids' Tears" and "A Survey of Mermaids' Tears". The image is dithered and a monotone dark blue.

plasticizers and stabilizers, key among them phthalic acid esters and brominated flame retardants, that can be toxic, releasing and off-gassing volatile organic compounds such as formaldehyde, benzene, and perchloroethylene (these produce the recognizable "smell" of vinyl lettering). Many plasticizers are known carcinogens and endocrine disruptors. As museums and galleries try to lessen their environmental footprints, solutions like digital labels, professional sign painting, custom stencils, writing directly on the wall, fabric and paper didactics, recyclable materials made from Polyester or Polypropylene rather than PVC alternatives, and biodegradable vinyl substrate are all being used.

Greener alternatives take three factors into account: the materials used (plastic, paint, paper, etc.), the quantity of materials needed for the same text (decal vs. stencil), and the overall need for a text to be printed and put on the wall. Deciding how to share information can be difficult: exhibitions espousing an environmental ethics often want to convey a great deal of information, but the conveyance itself can contribute to the problems the exhibition hoped to mitigate.

Because the theme of *Plastic Heart* was echoed in the form, there was room to play with labels. PVC vinyl was, from the outset, anathema to exhibition goals and consciously avoided. At first we decided to go with natural (blueberry and black walnut) inks on scrap framing mat board. However, natural inks can limit visual accessibility as the colour fades, making them difficult to read over time. Replacing labels mid-way through the exhibition is a possibility, but one we decided against due to the amount of information in the labels and the labour involved in re-writing them. Instead we worked with Beam Paints' watercolours made from "local Manitoulin honey,

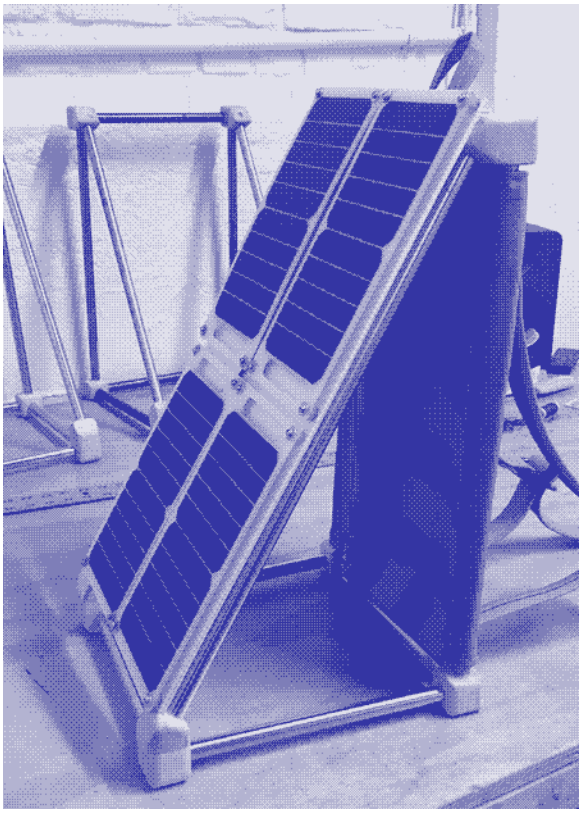
wildcrafted tree sap, hand-gathered washed-and-sifted local stone and the finest of lightfast pigments." The paints fulfilled a number of the exhibition goals, including working with a local business that had sustainability and Indigenous teachings at its core.

Plastic Heart did not involve painting or building new walls. We made use of the previous exhibition's constructions, altering our design to work with what was already in place. We also used display cases constructed by the Art Museum for the exhibition *Traffic: Conceptual Art in Canada c. 1965 to 1980* (2010). We left holes in the wall (occasionally covering them with other works and occasionally just leaving them). We did not paint the walls of the exhibition, working instead with the previous curator's palette. While such tactics are clearly experimental and may not be possible for all exhibitions, they are possible for some, particularly if exhibition culture drops the emphasis on white-cube and clean-slate starting points, instead using what is already there as a material stream and a point of departure for imagining new, site-responsive installations.

Conclusion: A number of museums and galleries have been working to reuse and repurpose materials. However, exhibitions are still excessively demanding of aesthetic "newness" in a way that requires over-painting, new didactic walls, the most up to date technologies, and so on. Thinking through subtraction as an active form is an important step. In short, the aesthetics of exhibition making need to change if curating is to be a sustainable discipline.

TECHNOLOGY

The question of how to consider, commission, and display multimedia artworks and other digital visuals was particularly challenging as our material and energy conservation goals "went against" the flow of both museum and digital industry advances. Digital media are not dematerialized, despite their mutable and sometimes phantom appearance. Although it may be that Moore's Law (which predicts that processing power will double every two years) is still holding, processing efficiency doesn't always equate with energy efficiency, as new technologies always strive to offer higher resolutions. Image and sound production and display partake of all accelerationist technologies that exploit the pit mine and the electrical plug to greater and lesser extents. Everything from cameras to tablets, digital TVs to projectors, all draw on Internet infrastructures and the vast, electron-thirsty computer-server farms we now call "the cloud" and "the fog." Competition to provide more spectacular, interactive displays and immersive filmic and photographic experiences mean documentary forms follow an ever-expanding, data-heavy horizon that "improves" the sensation of the real, but that means increased computational bandwidth at every turn.



Synthetic Collective's solar panel backpacks in the process of production. Materials include solar panels and battery, used USB cable, hardware, wood, salvaged copper, salvaged plastic signage, and salvaged canvas.

IMAGE DESCRIPTION:
A photograph of a triangular prism, open on three sides made from copper tubing joined by wooden blocks. One closed panel is made from fabric and has backpack straps attached. The other closed panel contains a grid of 4 solar panels. The open frames of more backpacks, not yet finished, are in the background. The image is dithered and a monotone dark blue.

Audience expectations are also expanding as Augmented Reality, special effects, and majestic drone views become the norm. For most media artists, there is no viable alternative—only a kind of withdrawal from dazzling visual spectacles in favour of a modest "reproduction." Antiquated, retro technologies may have a niche appeal and be a deliberate conceptual counterpoint to these art-industry and "big picture" trends; but there remain more paths in this domain to explore. We should always ask: what are we getting out of newer more energy intensive technologies and at what cost? When is enough, enough? What do artists and galleries need to view? Are artists ready to digress? And what does that mean for the quality and impact of artworks on display? The SC sought to incorporate a reduction and balance of *technological enoughness*: taking on new technologies here; reducing digital usage there; trying on new equations of energy calculation. Artists in the exhibition agreed to our parameters, most showing work on tablets already owned by the gallery. The lack of big projections fundamentally changed the scale of the exhibition. Though the pandemic ensured social distancing in the galleries, *Plastic Heart* was nonetheless an intimate experience, as small-scale video works built close relationships between viewers and technology.

Plastic Heart used portable solar panels to power the videos in the exhibition. To do this we assessed the needs of video works and designed their presentation to work within our DIY power capabilities, in communication with the artists and for the requirements of their work. Ultimately, we limited the scale of video works to 12.9-inch iPad Pro displays (the tablets already in the Art Museum's inventory), which also use a much lower wattage than projectors or televisions. The solar panels,

charge controllers, and lithium polymer batteries had to be sourced from online retailers (Amazon and BuyAPi) because of COVID-19. We were able to source USB cords from online community classified ads. The panels were installed on DIY roving devices made from salvaged sign-material waste and reclaimed copper. Due to COVID-19 restrictions of interactive exhibits, exhibition visitors could not participate in powering the exhibition media as planned. We had hoped visitors would take the portable solar antennas and backpacks outside in sunny weather conditions, charging batteries to power videos. Instead, a dedicated solar-panel minder optimized the sunlight hours by placing stand-alone solar-paneled sandwich boards outside the museum during opening hours to charge tablet batteries.

This was a first-time experimental endeavor and there are definitely areas for future research and improvement, including the supply-chain challenges of finding/utilizing used solar panels with sustainable methods. The embodied energy of a new solar panel complicates its clean incentives, due to the process of production, including mining for precious metals. One way we hope to reconcile this challenge is through design for longevity. Designed as a mobile infrastructure, the panels will be re-used in future Synthetic Collective exhibitions, and will be integrated into a future renewable energy lending library as infrastructure for temporary exhibitions, events, or off-the-grid research projects.

We also had to learn from our mistakes. Originally, we wanted to centre pedal power in the exhibition, and designed an entry space that used a bike-powered electricity generator to power a light that would shine through a pellet-filled plastic bag, creating a resonant lightscape on the title wall of the show. We felt the alternative power source combined with a low-tech upcycled projection captured the intent and feel of the exhibition. We also planned to DIY-construct the generator ourselves, and to use a bicycle borrowed from a local bicycle shop, n+1. In fact, we planned to use artist Greg Curnoe's old bicycle. Curnoe's environmental awareness and extensive research into the deep history and Indigenous relationship to his lot in London, Ontario, made him an apt choice. But the issues piled up. First and foremost the bicycle was not accessible. Not only did it present a mobility barrier but it also created a physical obstacle in the space. Furthermore, Curnoe was extremely tall—even many able-bodied visitors would not be able to comfortably pedal, and a smaller bicycle was also problematic in the wake of COVID-19: how would we keep it sanitized? These issues alone likely would have led to the elimination of the pedal powered bicycle, but research quickly showed us that our belief in the power of the pedal was misguided, at least when it came to electricity generation. Bicycles are excellent for green transportation but for the most part, pedal power is extremely inefficient for generating electricity or charging batteries, to the point that the environmental cost of the construction of generator and battery cannot be replaced by the human power of pedaling ("Bike powered" 2011). In the case of *Plastic Heart,* using an incandescent lightbulb, powered through the gallery's grid, was significantly less environmentally costly than assembling the generator for pedal power. It was a lesson we took to heart.

In terms of archiving the exhibition, the SC was able to make use of a solar-powered server to host a low-data website (www.plasticheart.solar). Solar power means the website simply isn't available all the time, as it literally depends on the weather. However the SC found that interesting, and a way of physically embodying "slow curating" (you just have to wait until the sun comes out). We drew our inspiration from lowtechmagazine.com and their open-source DIY resources for setting up low-data websites and solar-powered servers. We relied heavily on the technical prowess of three exceptional artists and Concordia MFA students with knowledge and skills to get things done: Nicolas Lapointe, Anna Eyler, and Jean-François Robin. Although the SC opted to make their own solar-powered server (which SC member Kelly Jazvac has to shovel off everytime it snows heavily in Montreal), we also learned of other renewable energy webhosting services at greengeeks.com (wind powered) and webneutralproject.com and will continue to explore their potential. The SC is also experimenting with DIY wind-power as a backup to the solar-powered site. The website itself, designed by Anna Eyler, meticulously analyses data size to make all design and layout decisions (e.g. one, single, static scrolling page results in lower data than many pages and navigation bars). Despite the stripped-down aesthetic, a fruitful byproduct of this low data, clean design is global accessibility: it takes much less bandwidth to view our exhibition site, making it more accessible in locations without broadband.

Conclusion: Building sustainability into exhibitions involves a constant process of learning, unlearning, and self-criticality. Decisions must be made that can alter the presentation of the exhibition. Choosing low-res projections, small screens, and solar power can lead to different kinds of display. Accessibility considerations must lead rather than follow discussions on technology. The SC advocates for an approach of "technological enoughness" to find balance among curatorial decisions, artists, and energy efficiency.

PLASTICS IN COLLECTIONS AND MUSEUMS

In 2010, a report was released by the International Institute for Conservation of Historic and Artistic Works, titled *The Plus/Minus Dilemma,* arguing that the environmental guidelines for museums and art galleries were developed within "the narrowest range of conditions and the greatest insistence on them" at a time when energy was cheap and climate breakdown was not an overwhelming concern. Over time, what had been a guideline became a standard, and control came to overshadow efficiency and sustainability.

70°F (20° C) +/- and 50% RH +/-

In the introduction to *The Plus/Minus Dilemma* it is asked what responsibilities museums and archives have, not just for the preservation of cultural heritage, but also for the preservation of natural resources (Podany 2010, 2). But a current throughout is that, quite simply, museums and archives are tasked with adding longevity to the items and objects in their care. Often goals of preservation are at odds with environmental protections. As Sarah Sutton (2015, xiv) of the Consultancy Firm Sustainable Museums notes, "green choices are usually complex choices." The debates are myriad, thorny, and vast, ranging from calls to completely abandon HVAC and temperature controls to observations that major galleries are essentially run as heavily insured businesses. Without strict environmental protections, loan programs from one museum to another would shut down, thus vastly undermining the ability of museums to mount temporary exhibitions (a situation that may have been brought into being regardless by the pandemic) (Colby Stothart 2010, 10).

Plastics enter this conversation at an oblique angle. Their very cheapness in terms of manufacture makes some environmental protections appear ridiculous. Is a plastic gadget worthy of the same protections as an irreplaceable manuscript? But by the same token, many "precious" items made from plastics, such as artworks or spacesuits, have become the centre of conservation discussions precisely because they are so difficult to preserve. Steady and controlled climates are not enough. As seen in the case of Hesse's and Gabo's works, plastics break down anyway. Plastics, despite the common perception that they "last forever," are not archival quality. They may be embedded into the archives of the earth, by becoming compressed into geologies all over the globe, but they readily break down and so are incredibly troublesome objects for art galleries, museums, and conservators.

As XiaoZhi Lim notes, writing in an article in the *New York Times* describing the extensive and hugely expensive process of preserving Neil Armstrong's spacesuit (which includes 21 layers of nylon, neoprene, Mylar, Dacron, Kapton, Teflon, and other plastics), conservators must grapple with the fact that plastics are not one thing but thousands, cannot be identified at a glance, and all break down differently. An entire glossary of terms and neologisms defines the many ways that plastics dissolve, crack, melt, ooze, and turn to dust. Plastics suffer from creep rupture and micro-crazing, from embrittlement and fragmentation. Lim (2018) quotes conservator Odile Madden who notes "historic objects—they take you back to a time. But holding that moment in time in a material sense is tough."

There is an underlying relationship here wherein the act by which plastics are made into art presuppose a certain relationship to time. Art is, for the most part, supposed to survive or to be sustained into perpetuity. Art galleries and museums are specifically places wherein climates are controlled to actively deny the world outside, with its constant processes of erosion, degradation, growth, and renewal. Art might reflect on that world but it is maintained within a false environment, one wherein

humidity and temperature are tightly controlled. Such relationships are not inevitable. As art historian Mark Jones (2008) pointed out in an article on museums and climate control written for National Museums Directors' Council UK, many paintings survived for centuries in vastly fluctuating ambient environments, something that is equally true even of paper and manuscripts held in unconditioned environments.

It was only in the 1930s, around the same time that plastics were widely introduced as consumable objects, that museums and galleries began to successfully control interior climates. Prior to this time, museums (especially large museums) were concerned with cleaning collections that had been badly damaged by past pollutants including (according to a mid-19th century report from the National Gallery, London) coal and "sulphurous smoke" in urban environments, "curious black stains" (that may have been mould from ventilation systems), dirt from muddy shoes, and dirt from "the human exhalations from the enormous crowds" and "little accidents that happen with children" (Brommelle 1956, 176–77). Essentially, opening up museums to the public brought dirt, which meant decay, and together these contributed to a growing feeling that museum objects and artworks were in need of protection—from people and environments. Early efforts were largely unsuccessful. Nonetheless as glass was installed in the open windows of the National Gallery in the 1850s to protect from pollutants from a nearby municipal wash house, a project began to keep the world out and visitors' fingers away from objects in a quest to create a climate ideal for permanent stasis (Brummelle 1956, 177). It was an effort that, inadvertently or not, extended the colonial project of extraction and acceleration that collected the objects, built the wealth, and contributed to the industrial pollutants against which closed and controlled environments were being created in European museums (Sharpe 2016; Yusoff 2018).

From the 1920s efforts picked up, culminating post–First World War when the combined effects of the invention of evaporative air-cooling systems and the growth of indoor central heating (which dried out environments leading to flaking on panel paintings and other cultural artefacts) resulted in increased attention to controlling temperature and humidity conditions (Atkinson 2014, 205). The creation of temperate climates that were best for human visitors were often not so ideal for museum collections. By the 1930s temperatures and humidity levels could be fairly accurately controlled. At this time, plastics manufacturing was picking up steam, and plastics became a part of daily life, associated with cleanliness and convenience. This belied their manufacture: a dirty business, today producing close to a billion tons of carbon emissions each year, among other toxic chemicals in the atmosphere. Not surprisingly, plastics contributed extensively to the expansion of capitalist economies, in turn proliferating the emissions and greenhouse gases currently leading to climate breakdown.

It was in 1978, with the publication of *The Museum Environment* by Garry Thomson, where the now

nearly ubiquitous equation of a temperature of 70F or 20C +/- 2 degrees and a relative humidity of 50-55% was introduced. Thomson's book unexpectedly set museum standards and in doing so created an energy-intensive and narrow window for controlling interior environments, now reflected in International Council of Museums (ICOM) conditions specified for loans (Atkinson 2014, 205). In short, unless temperatures and humidity levels fall within the established criteria, loans are impossible.

Since 2010 and the publication of *The Plus/Minus Dilemma* debates have picked up, questioning the impact and efficacy of the accepted museum environment norms. Discussions tend to foreground concerns over the environmental footprints of large museums. But efforts to unsettle, decolonize, and repatriate museum collections should also be seen as having impact here. Standard museum temperature and humidity controls do not fit with all cultural protocols for belongings held by museums.[2] For example, Indigenous belongings that are meant to return to the earth, or that require special care (such as smudging, ritual feeding, or being danced or woken) challenge any one-size-fits-all approach to caring for collections (Clavir and Moses 2019).

As museums contemplate how to move forward, plastic maintains a wild presence within museum collections. Even in the perfect conditions of the controlled environment of the art gallery, plastics break down. Thus, in *Plastic Heart,* a problem emerged. The Art Museum is divided into two parts, the first with museum standards for temperature and humidity controls, the second with ambient temperatures and humidity. At first, we were very inspired by Tue Greenfort's work *Exceeding 2ºC* at the 2007 Sharjah Biennial, where he reduced the temperatures in the Sharjah Art Museum by two degrees for the course of the exhibition, leading to a significant energy savings that was translated into a purchase of a piece of the Ecuadorian rainforest to be protected in perpetuity. Could we do something similar by reducing the Art Museum's environmental footprint for the time of the exhibition? It quickly became apparent that if we interfered with the temperature and humidity, we would not be allowed to borrow works from other institutions. The fragile and already degrading works by Gabo and others held in museum collections required stringent environmental controls so as not to decay further. We backed off from our original intentions, but a paradox nonetheless remained: the most degraded works and samples included in *Plastic Heart* had to be shown in the climate-controlled section of the museum. As an exhibition dedicated to understanding waste and climate impact, the strangeness of museum norms was extremely apparent. Though long removed from initial attempts to keep pollution out of museums by closing them

2 Here we follow curator Jordan Wilson (Musqueam First Nation) in referring to Indigenous artefacts and objects held by museums as "belongings" (Wilson 2016).

to the outside, it appeared that the more unstable the outside environment grew in a summer and winter of pandemic and climate crisis, the more stable it had to remain indoors. Ultimately, the Synthetic Collective was not able to make infrastructural changes, meaning the exhibition demonstrated a low-carbon approach but could not expand its curatorial vision into the infrastructure of the museum.

Conclusion: The SC remains committed to a holistic approach to lowering the energy footprints of museums, and supports museum efforts to negotiate new and less stringent norms for temperature and humidity control that balance the protection of collections with the protection of environments. We also advocate for approaches to plastics conservation that acknowledge the mutability of plastics. As Eva Hesse said in relation to the synthetic rubber that she often used in her practice, "the rubber only lasts a short while… it's not going to last. I am not sure what my stand on lasting really is…Life doesn't last; art doesn't last" (Cruz 2014).

EXHIBITION MAKING IN A PRO-PLASTIC PANDEMIC

"The first one I saw was on the path outside my house: a single white plastic glove, the fingers curled inward like a sleeping animal." So begins an essay on plastic in the pandemic by David Farrier (2020). The COVID-19 coronavirus pandemic had a significant impact on the curating of *Plastic Heart,* and simultaneously made more apparent many of the inherent contradictions of plastic. The emergence and recognition of COVID-19 in North America in early 2020 led to a lockdown and postponement of the exhibition. Vastly different ways of interacting with and understanding exhibitions resulted with the shy reopening of museums to small groups of individuals. Museum attempts to break down barriers, encourage interactivity and participation, were overturned. Exhibition visits would be solitary undertakings, contemplative, quiet, devoid of touch and wandering. Certain sections of *Plastic Heart* would need to be rethought.

While it is certainly true that single-use plastics for medical purposes contributed to the health and safety of so many during the pandemic, it is also true that this time was used by the plastics industry to lobby for the roll back of many of the environmental gains of the past five to ten years (Wheeler 2020). For example, plastic bag bans were delayed or repealed (and occasionally reinstated) in New York, Maine, New Hampshire, Oregon, San Francisco, and Massachusetts, despite the fact that little testing was done on cloth bags and evidence showed that the virus remained active on plastic for anywhere from three to nine days (van Doremalen et. al 2020). The reliance upon plastic during this time was not always based on health and safety advice, but rather adhered to many of the marketing strategies of the twentieth century when plastic was introduced as a sanitary and safe material. As Farrier (2020) notes

Brass door handles at The Art Museum at the University of Toronto, 2020. These doors mark the threshold between the climate controlled galleries and the non climate controlled galleries.

IMAGE DESCRIPTION: Photograph of a set of wood framed glass double doors with long columnar handles. The doors lead to a large white room with wood floors, and spot lighting. There is a circle shaped decal on one of the doors in a with a large arrow reading “One Way”. The image is dithered and a monotone dark blue.

of the increased use of disposable plastic gloves in the early days of the pandemic “What justifies this misplaced trust in disposability, as if discarding them was to shed contact like a second skin?”

Approaches to single use plastics in the pandemic failed to engage in the long standing concerns around the safety of plastics themselves, particularly with regards to plasticizers with known harmful effects, the ability of nanoplastics to move between and into cell walls, and the fact that plastics regularly adsorb (accumulate on their surface) other petrochemicals. Of particular concern in relation to a virus that attacks people’s lungs is the potential incineration of plastics as it became unprofitable for plastics to be recycled due to the sharp decline in oil prices. Similarly, it is now known that those with increased exposure to airborne pollutants tend to have more negative outcomes when infected with COVID-19: deaths throughout the pandemic correspond with the kinds of environmental racism that lead to “sacrifice zones” in which heavy manufacturing (including of plastics) causes intense pollution and consequent detriments to health (Lerner 2020).

Plastics are strange actors, heavily relied upon in the medical sector, and yet also contributing to air and water pollution, soil degradation, loss of habitat and waste mismanagement that not only lead to poor health outcomes, but that can become breeding grounds for vectors of zoonotic diseases (Krystosik et. al. 2019). The proliferation of single-use disposable masks, gloves, and other PPE during the pandemic created a trade off, adhering to what Michelle Murphy (2008) calls a “chemical regime of living,” one in which there is no turning back and chemicals are so much a part of us and our environments as to be kin. But the stealth impact of plastics pollution on

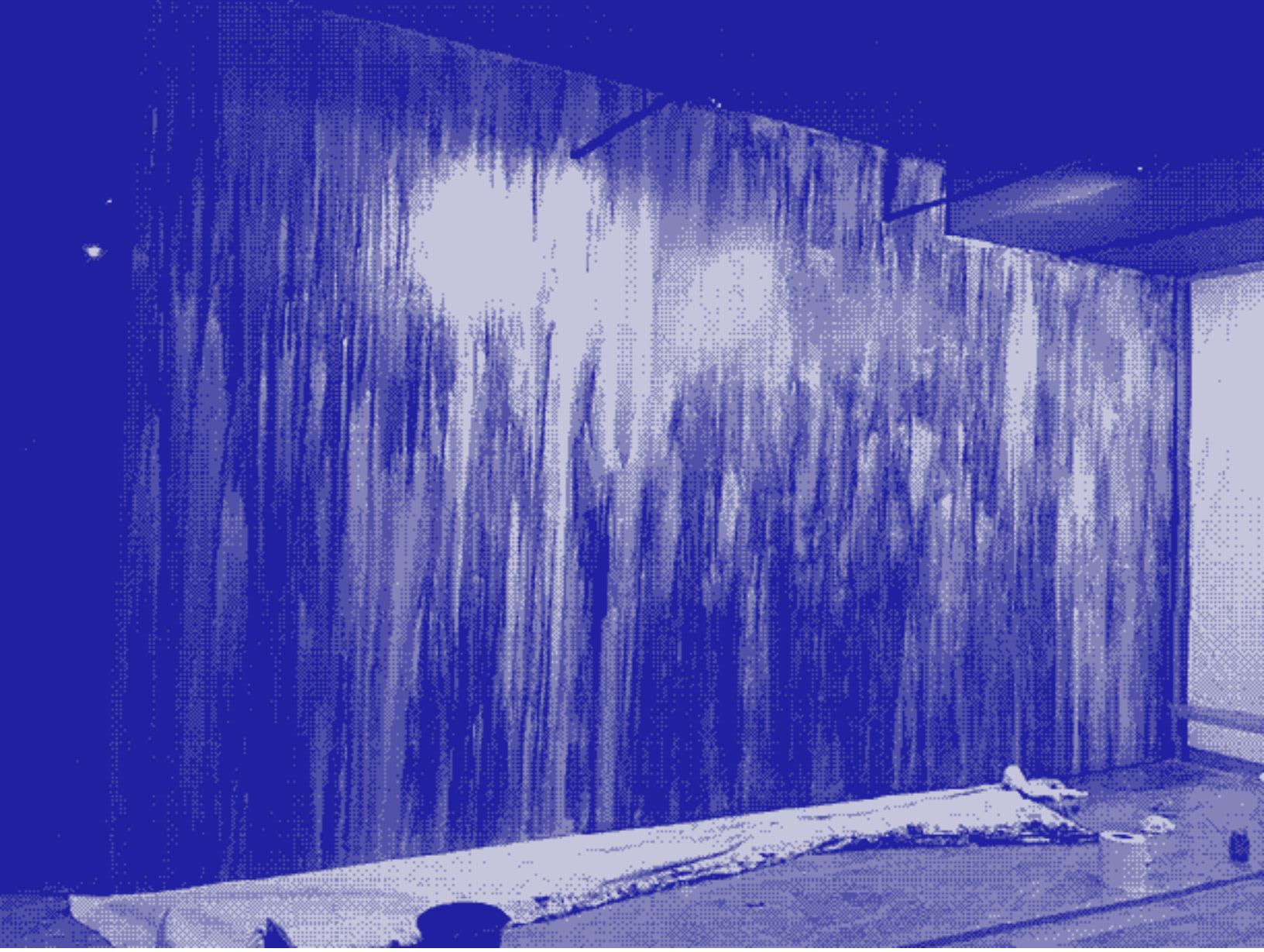
health remains largely unknown, and thus the impetus to understand plastics as hygienic remains largely unchecked. While making the exhibition, we needed to be mindful of both the real and grounded fears of contagion that audiences might have, while also remaining critical of the petrochemical industry in its blatantly opportunistic use of the pandemic for monetary gain; of the uneven impacts of the pandemic; and of the long presence of waste in the form of disposable protective equipment in future centuries. Farrier concludes: “Millennia from now, neoprene gloves could linger deep beneath the surface like handprints declaring to the dark, *We were here*.”

While the most obvious effects of curating in a pandemic were the postponement and recalibration of the exhibition, there were other lessons to be learned. The first of these was the way the use of plastic in the pandemic, including in PVC face shields and plexiglass separators, had an impact on the way we read some of the works. One key example was N.E. Thing Co.’s 1966 work *Bagged Place,* which was included in *Plastic Heart* as documentation. *Bagged Place* was a site-specific work in which an entire apartment, including every object in it, was individually bagged in clear plastic, down to the toast in the toaster and the water in the sink. While the work was meant to be a parody of real-estate ads, in 2021 it gained a new resonance corresponding with increased standards for sterilization of goods and hygienic barriers in interior spaces as a consequence of the pandemic. It was, at least for us, impossible to read the documentary images outside of the doubled history of 1966 and the present moment. Because the original work was site specific, existing in *Plastic Heart* as documentation, and because we understood that the experience of the 2021 exhibition would need to be in real space and also online for those uncomfortable with public spaces, the questions cascaded. In the time of COVID-19, when art viewing shifted to predominantly online images: is it better to have the “real thing” in the museum space? Or is the desire for the real thing actually the real problem?

Our work making the exhibition pandemic-safe also involved a deep dive into alternatives to plastics, including copper, which is naturally anti-microbial. The same research that showed COVID-19 surviving on plastic for days showed that it died on copper in a matter of hours (Morrison 2020). The antimicrobial impact of copper also has staying power: copper railings at New York City’s Grand Central Terminal have the same anti-microbial impact that they had upon installation more than a century ago. Archeological evidence also shows that humans have been using copper for its antimicrobial properties for at least eight millennia. Papyrus records from Ancient Egypt demonstrate copper’s medical usage (Morrison 2020). Through the work of artists such as Tsēmā Igharas (Tahltan First Nation), Sonny Assu (Ligwilda’xw Kwakwaka’wakw) and Beau Dick (Kwakwaka’wakw) we were introduced to the central role of copper in Indigenous cultures, teaching, and lifeways. Copper, in short, is extremely important. This is not to suggest that copper is a perfect alternative to plastics or other metals. Indigenous mining for copper in Northwest Coast cultures was primarily local, coming from current day Alaska and the Nass River.

The same is not true of today's global mining for copper, which is tied to poor environmental outcomes, abusive labour practices, and the extensive use of sulphuric acid in the extraction and treatment of copper. In this sense, new copper is part of the extractive economies SC tries to actively resist. But copper is everywhere, and it was already present in the infrastructure of the Art Museum, including on panels and the brass handles of heavily-used doorways of the main gallery spaces. We were thus able to make use of what already existed and to draw attention to the ways the built environment of the gallery had, at some point in the past, made use of past knowledges to build safer infrastructure that now went largely unnoticed.

Curating in a pandemic brought to the forefront some things that might otherwise have remained invisible. How would we communicate online in a manner that did not cause harm? How would we maintain our co-working, co-curating, co-learning environment in a time when it was safest to stay apart? How would we encourage audiences to experience the exhibition if they could not come to it? And how would we manage the complexities and discrepancies between the positive views of plastics in the pandemic versus the future impact of the waste created by keeping safe in the moment? Such questions are the bread and butter of the SC, and scrappy solutions are our mandate. The fieldwork for this exhibition took place on the shorelines of the Great Lakes, in various meeting rooms, in the gallery, online wandering through the cloud, but always in various formations of togetherness. Our approach of *enough* grew from a process of "digging where we stand" or trying to understand the various ways our lives and research interconnected across the rivers and lakes, and through the deep-time history of plastics, and to resist falling into a pattern of fieldwork and research as what Shannon Mattern (2016) calls "romanticized, heroicized, represented … as a performance of strength, endurance, and machismo." Instead this DIY *Fieldguide* is a document of process and learning. It is unfinished even as we conclude.



An in-process installation image of Christopher Mendoza's, *yet you dream in the green of your time,* 2019-2020. This wall, painted with ink made of buckthorn berries from the lower Don River Valley, alum, and Gum Arabic, was part of the University of Toronto's MVS studio program graduating exhibition in Fall 2020. It remained intact for Plastic Heart, as we opted not to build or paint any walls.

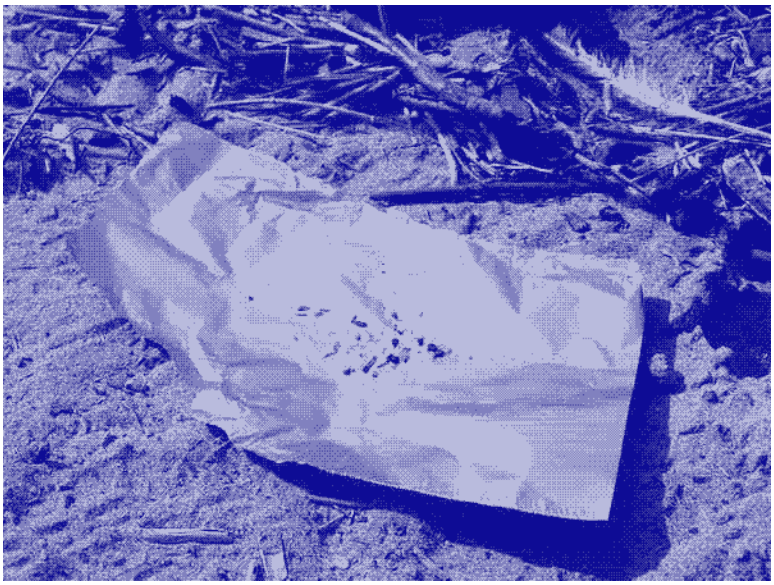
IMAGE DESCRIPTION: A large wall fills most of the frame, taken from a slight angle. The wall is coated with a dark glossy pigment that has dripped down the wall in vertical layers. Spotlights reflect off the surface of the wall. A drop sheet is placed on the floor in front of the wall, along with some other supplies. The image is dithered and a monotone dark blue.

FLIPPING INTO FOCUS: VISUALIZING THE INVISIBLE

HEATHER DAVIS AND KIRSTY ROBERTSON

The plastic pollution story is one that has been repeated often in the past five years. It's hard not to pick up a newspaper without seeing a new study on how plastic is everywhere: water, air, land, our bodies, the tiniest creatures to the largest. The slow suffocation, the temperate starvations, the seeping of chemicals, all these conditions form a central part of the banality of environmental horror, the ways in which ecocide comes to feel rather mundane. The damaged planet has become part of our everyday lives, and in this sense an extreme state of exception by one standard appears quite ordinary by another. The challenge, for our collective and the exhibition, was to think through what new stories we need to tell about plastic and plastic pollution. What does following plastic in its journeys through the Great Lakes offer us as a methodology that crosses so many disciplinary divides? And how can we make an impact with the stories, and means of storytelling, we could employ?

We started where we were, in and around the Great Lakes, the largest freshwater system on earth, and a body of water that is often referenced as a freshwater index for the oceans. Recent studies have shown that plastic-debris accumulation in surface waters, benthic sediment, fish, and seabirds in the Great Lakes is as high as levels in oceanic garbage patches (Ballent et al. 2016; Brookson et al. 2019). Although vast, in comparison to the depths and mysteries of the oceans, the lakes offer a way to think through plastic pollution problems that give a sense that we can do something. Thus, while the amount of plastics polluting the Lakes suggests systemic failure, there is evidence of mitigation and repair, including but not limited to: plastic microbead bans passed into law in the US and Canada; annual healing Mother Earth Water Walks led by Anishinawbe Grandmothers[3]; an attempt to grant Lake Erie legal personhood under state law in Ohio; and ongoing struggles to ensure treaty obligations and return waters through land-claims restitution. When we asked ourselves what could we do to contribute to such efforts, a pellet analysis seemed like the most sensible first step. Pellets or "mermaid's tears" are the small "nurdles" that petrochemical factories produce and ship to manufacturers; pre-production plastic that becomes consumer-plastic objects, goods, containers, and packaging. These pellets can



Plastic pellets collected on a beach for chemical analysis of POPs (persistent organic pollutants).

IMAGE DESCRIPTION: Photograph of a few dozen industrial plastic pellets, mixed with a bit of sand and natural material, collected in a sheet of aluminum foil laying on beach sand and debris.The image is dithered and a monotone dark blue.

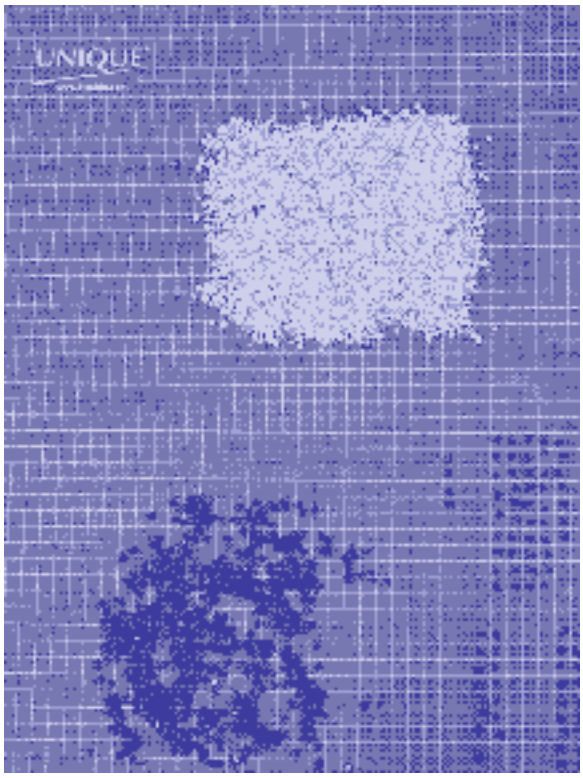
be found all over the shores of the Great Lakes. We wanted to see what we could find out about how they are distributed, if there was a correlation between particular plastics industries, many of them located near Sarnia, ON, and the density of pellets on beaches. Counting, mapping, and characterizing the number of pellets on beach strandlines of all Great Lakes would contribute a research baseline that could be used to track pollution over time, and open the door to potentially working with industry.

The study required scientific linearity and precision: all beaches had to be sampled in the same way within a two-week window to catch a clear picture of a changing landscape. The pellets move on waves and winds and storms. The currents of movement in the environment both churn them around the lakes and encourage them to accumulate in bays and fissures; there are plastic, water, shoreline relationships that are both within and outside of our power to track. Being systematic allowed us to be as precise as possible even as we acknowledged that available methods are not perfectly accurate. Marking the strand line where debris accumulates in 1m x 10m blocks or quadrats, we sampled to a depth of 5cm, mostly using our fingers to run through the sand, sifting it when it was fine, pulling out macroplastics that included bottles, tampon applicators, condoms, tape, balloons, confetti, straws, sorting through the micro-plastic fragments of post-consumer goods, and pulling out the industrial plastic pellets.

On some beaches we didn’t find any pellets, while on others there were too many to sort on site. We sampled 67 beaches on five Great Lakes and collected a total of 12,597 pellets (Corcoran et. al. 2020). 86% of the pellets were found at three beaches: Baxter Beach in Sarnia (Lake Huron), Bronte Beach in Oakville (Lake Ontario), and Rossport Beach (Lake Superior, site of a known spill). At Bronte Beach and Baxter Beach (together 78% of the pellets) the sand is almost indistinguishable from plastic pellets. The beaches look like beaches until the pellets flip into focus and the sands retreat from view. These

are newly created land/scapes, abundant in polymer, that have become attraction sites for other chemical embraces, where the pellets “adsorb and release persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs), dichloro-diphenyltrichloroethane (DDT), hexachlorocyclohexanes (HCHs), and polycyclic aromatic hydrocarbons (PAHs)” (Mato et al. 2001; Rios et al. 2007). These chemical embraces are one of the reasons why we are concerned about the unregulated release of pellets. The fact that the pellets are difficult to pick up, and difficult to trace, makes the problem more persistent.

Following the sampling, the labour intensive process of counting and characterizing the pellets began. Over the course of six months, the pellets were separated from other plastic items and each pellet was characterized according to size, shape, diagnostic trait, weathering, and colour. Sorting pellets is mesmerizing. It’s an extended performative action, characterized by a very particular sonic encounter as the plastic pellets are moved across a variety of surfaces—like static on a vinyl record repeated over, and over, and over. It’s difficult. What is oblong and what is round? Is a shape a dimple or a hole? Is everyone who is counting determining size and shape in the same way? At times we paused to make sure everyone was using the same characterizations; often we were not. An oblong means different things to the artists and scientists. We reworked categories, finding shared definitions, resorting. The pellets off-gassed, chemical smells wafting through the lab. Gasoline, polymer, new-car, particulate, coal, rot. Faint, then overwhelming. Not comforting. What is the point in wearing masks and gloves when our environments are literally suffused with the same thing? When the masks and gloves themselves may have been made from pellets similar to the ones we are sorting?



Industrial plastic pellets from a sample, being sorted by colour, shape, size, and distinguishing markings.

IMAGE DESCRIPTION:
Photograph of light and dark pellets are separated into groups on a gridded pad. The word “UNIQUE” is printed on the pad. The image is dithered and a monotone dark blue.

The future-oriented work of collecting the pellets presupposes that there must be a way to prevent their entering the lakes in the first place. “Pellets are lost at source, in transit, and at destination. In turn, rivers are the currents bringing pellets into the lakes and then depositing them onto beaches” (Corcoran et. al. 2020). Our original goal was to forensically map the pellets, to match their varied presentations with the hundreds of plastics manufacturers in the region. But the difficulty of characterizing the pellets themselves demonstrated the immense effort that this task will take. The study found some of what we already suspected: the greatest abundance of pellets is related to Great Lakes watershed population and plastics industry. Part of our motivation for doing this study was to address a legislative gap: there are currently no regulations that specifically prohibit spillage from the plastics industry ending up in the Great Lakes. But, along with growing public awareness of plastic pollution and its harms, this is also a movement to try to curb some of this unnecessary and direct pollution. Would it be possible to reach out to industry to ask, “Do you recognize your pellets?” And if so, can we help contain them? Perhaps the industries making the pellets would prefer not to have them end up scattered on the shorelines of the Great Lakes. If not, there are growing movements to address the unregulated release of pellets. One of the largest environmental lawsuits in history was against Formosa Plastics Corp. for dumping pellets into Lavaca Bay off the Texas coast in the Gulf of Mexico. In a 2019 settlement, the company was ordered to pay 50 million USD towards environmental mitigation projects including clean-up of past discharges and abating future discharges (Waterkeeper v. Formosa, November 2019).

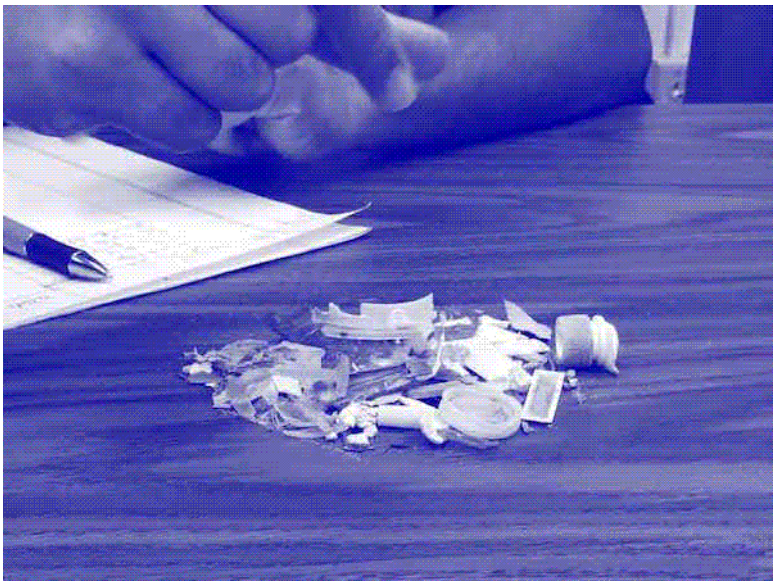
In the meantime, we try to make an invisible issue visible. In other words, how do we enact the same sand-nurdle focus-flip that we needed on the beaches, to see the ways that plastic has saturated our daily realities? Because plastics are everywhere, it is often so difficult to see them. They blend into the background. But once you see them, it is impossible not to. We hold onto the belief that these techniques of visualization are necessary for being able to understand the problems we are confronting and to do something about them.

Yet there was something telling in the way that the maps we produced revealed much of what we already knew: that the concentration of plastic manufacturers and larger populations also indicated concentrated pellets. “[T]he data show that in the basin as a whole, high pellet abundance can be related to high watershed population and greater numbers of plastic industries, as the two factors are positively correlated” (Corcoran et. al. 2020, 10). This type of data mirrors some of the problems with tackling issues of environmental justice. In many ways, we know the answers to our questions already. The point is to provide ways of storytelling that will be more compelling, to get legislators on our side. Despite satisfaction in proving our point, what do these data visualizations reveal? How can we harness the potential power of visualization more generally as evidence to initiate conversations about increased legislation of plastic and its release into the Great Lakes? Clearly, we believe in the power of artistic

spaces as modes of civic engagement. And yet we are also deeply aware of the ways that the space of the gallery implicitly disinvites many people.

This pellet study was created through the combined actions of the industries that made the pellets, weather and water that circulated the pellets, and members of the Synthetic Collective who gathered, counted, and characterized them. This move from the lab to the exhibition space creates a different relationship between the pellets and the environment. In the rarified space of the gallery, the environment is carefully controlled: temperature and humidity remain steady and the pellets—waste in another location—are reimagined as objects that, having been counted and classified, are deserving of some form of protection. Here they push back against Mary Douglas's famous (and much debated) idea of dirt as "matter out of place," instead performing their "dirtiness" or lack of purity as the very thing that makes them, in this context, art. Their very placeness in the gallery undermines the clear understanding of the pellets in the lakes and on shorelines as invisible but destructive. There is also a danger that exhibiting them forecloses the narrative: visualizations confirm the degraded state of the waters but do not spur any further action. Also, having been exhibited, the pellets are difficult to throw out—where can they be discarded? Wherever they enter back into the chain of production, whether resuming their role in industry, or as the detritus of its production, or as art, they are in a state of constant problematic revelation. Once here, where do they, and where should they, go? What stories are they telling? And what are they asking us to do? The same conundrum presents itself from casually picking up pellets on a beach. Now, what is to be done with them?

The intermingling of plastic with art through our pellet study, and the blurring of the lines between artistic practice and chemical engineering, has a long history. As Esther Leslie argues in her book *Synthetic*



Plastic fragments being sorted, measured, and characterised by Synthetic Collective member Ian Arturo.

IMAGE DESCRIPTION: Close up photograph of a medium-dark skinned person gesturing to pick up a peice of plastic out of collection of plastic fragments from a pollution sample grouped on a tabletop. The image is dithered and a monotone dark blue.

Worlds: Nature, Art, and the Chemical Industry, artistic practice artificially re-made the world through human imagination. Art was, in other words, a way to refashion the world. In the nineteenth century, chemical engineering supplanted this practice. Instead of representational and imaginative works of art that helped to visualize and re-order the world to their maker's liking, chemical engineering sought and succeeded at rearranging the basic building blocks of matter, by manipulating molecules. The first examples could be found in the creation of synthetic dyes, used to replace the precious indigo that was a signifier of class and colonial expansion. A chemically engineered and refashioned world then spread to a whole array of objects through the inventions of plastic. This set of practices has had wide-ranging and unintended effects, often with as yet unknown consequences. But the rearrangement of the world based on chemical engineering rests on a set of presumptions that the world is there for rearrangement, that consent is not required. Instead of having to form an object around the constraints of its particular materiality, as is the case with wood, metal, or clay, polymer chemistry created materials with high degrees of specific characteristics, which could then be moulded into virtually any shape imaginable. In other words, the invention of plastics simultaneously united form and substance, eventually producing "new polymers with particular desired properties ('tailor-made molecules')" (McMillan 1979, 6). It was not just a shape that was being created, but the material and shape simultaneously. Materials no longer functioned as a creative restraint in the design of a particular object. This was and is particularly appealing to many of the artists who work with plastic, which allows for a range of expression often beyond other media. Plastic has formed new landscapes, beaches composed of pellets, a world re-made in the interest and designs of chemical engineering. What does it mean for us to re-harness this power in the service of art?

Plastic Heart merges these two realities: how chemical engineering has re-made the world in profound and subtle ways, and how artists have picked up the material to again refashion the world. The pellets we found and transported back to the gallery to be framed as art, are an attempt to wrest back some of the power of chemical engineering, to, perhaps, yet again, refashion the world, making it contain the pellets, or consider plastics use with more deliberation and care.

There is no easy path here—nor a straightforward one, as art and fossil-fuel extraction are deeply entangled. Plastic is sometimes used to make oil extraction all the more palatable; art is also used as a way to justify the fossil fuel industry. Plastic increasingly serves as a justification of so-called "ethical oil," that is, oil extracted from democratic nations, like Canada. The plastic industry very concertedly tried to portray plastic as a sanitized oil, especially as it has been mobilized through the pandemic. When oil prices collapse, fossil fuel companies increasingly rely on plastics to maintain profit. Mark Simpson's concept of lubricity describes the slipperiness of oil as a fundamental aspect of "the texture and mood requisite to the operations of neoliberal petroculture. Lubricity offers smoothness as cultural

common sense, promoting the fantasy of a frictionless world contingent on the continued, intensifying use of petro-carbons from underexploited reserves" (2017, 289). On a smooth globe, distances are no longer an impediment, the seas no longer treacherous. Plastic is central to the production of this lubricity, facilitating the widespread shipping of goods, which it often encases. Art can become a lure to this smoothness, embodying plastic's seduction.

Many artists and activists have critiqued the ways in which art and oil are imbricated. Theatrical and effective protest actions of groups such as BP or Not BP, Natural History Museum, or Liberate Tate, infamously used various interventions and performances such as pouring "oil" over the prone body of a naked young man in the middle of galleries to get Tate to disinvest from British Petroleum (Robertson 2019). In another example, Eliza Evans's work *All the Way to Hell* (2020–ongoing) aims to make mineral rights as inconvenient and expensive as possible by encouraging people to buy very small parcels of land. Here the aggressive fragmentation of land ownership inhibits fossil-fuel interest, much like Amy Balkin's practice, which works to both literally stop the development of 500 acres and also as a proof of principle for activist or artistic strategies.

Despite these projects, the relationship between art and fossil fuels, including art and plastic, continues. It is not from a position of purity or from an assumed distance that *Plastic Heart* proceeds, but from the full knowledge of the contamination by fossil fuels of not only the materials, transportation, and communication systems, but also our expectations of what an exhibition or an artwork should look like. In challenging ourselves to think differently about exhibition making, we also implicitly challenge some of the professional norms of artistic and academic livelihoods. And so we build not from a pristine location, but from the muddied, slightly toxic mix of relations and entanglements that also recognize that art itself can no longer afford to be autonomous.

These pellets are here and will be with us for a very long time, however degraded their future state(s). Perhaps their presence in the gallery offered some degree of remediation, alongside other artists' playful, serious, and sometimes absurd refashionings of plastic and its worlds. Plastic is not going away but neither is our imagining of a world otherwise, one more responsive to the Great Lakes waters upon which we depend and are entangled with. One that offers different kinds of material relations.

The Synthetic Collective in a workshop taking place at the The City of London's Material Recovery Facility.

IMAGE DESCRIPTION:
Photograph of twelve people wearing safety gear standing in a loose circle on a large concrete lot. There is a city garbage truck in the background. The image is dithered and a monotone dark blue.

INTERVIEW BETWEEN CHRISTINA BATTLE AND SYNTHETIC COLLECTIVE

Christina Battle was commissioned to create a work specially for *Plastic Heart: Surface All the Way Through.* In this interview, which took place remotely between Edmonton and London, ON, we discuss how thinking about the material consequences of art making presents unique challenges, lessons, and takeaways.

Christina Battle: For almost 20 years I have worked as a media artist, curator, arts administrator, and educator, and have been an active member of a number of communities. My practice is founded in a DIY ethos and I see culture as being entirely dependent on it if it hopes to remain current and progressive. As such, I consider organizing and collaborating to be active and critical parts of my practice, often with the goal of bridging conversation across disciplines. My work manifests as video, installation, participatory, and curated projects, which I consider to be critical and effective ways to illuminate the complex negotiations we find ourselves facing in society I find media art to be uniquely situated to engage with contemporary culture as an urgent subject. I recently received a PhD in Art & Visual Culture from the University of Western Ontario where I situated my research and practice under a dissertation titled: *Disaster as a Framework for Social Change: Searching for New Patterns Across Plant Ecology and Online Networks.*

Synthetic Collective: We commissioned a work from you for the *Plastic Heart* exhibition because we were inspired by how your art practice engaged with issues of planetary concern and disaster. A lot of your work, such as the billboards you created for *Work of Wind* (*Today in the news more black and brown bodies traumatized the soil is toxic the air is poison,* for Blackwood Gallery in Mississauga, 2018) or your exhibition *BAD STARS* at Trinity Square Video (Toronto, 2018) fit neatly with the parameters of an exhibition geared towards thinking about environmental practice. And you've also worked with the SC when we sampled for microplastics on the shorelines of the Great Lakes, and did research on plastics in the current pandemic. So there's a natural fit there and we're all fans of your work, but participation in *Plastic Heart* came with a series of limitations that we put on all artists creating work specifically for the

show, which is that the environmental footprint of the work had to be in line with the show's premise of creating as low a carbon footprint as we could while still maintaining the integrity and impact of the exhibition. We thought it could be useful for other artists and curators to read about the process of creating a work under these conditions, and I wonder if you could talk a little about your approach to conceptualizing a work for *Plastic Heart?*

CB: Your email couldn't have come at a better time as this very thing has been kind of debilitating for me in approaching this plastic project tbh (debilitating ultimately in a good and challenging way). I have scrapped so many ideas and felt a lot of discomfort over what materials to use. I've struggled with this since the project's start but suspect it has been exacerbated by the plastics/ Twitter research I've been doing for the Synthetic Collective—I just find it all so intense! Making artwork about something so massive with such real consequences at stake feels so heightened with this particular project. I know it's always true given the subjects I work with, but with this work it feels magnified—I suspect because it literally is a materials-focused issue.

At first, I was going to work with videos I shot while collecting plastics for the SC on the beaches of Lake Erie—I made a bunch of loops, incorporating rocks that I collected from each beach we sampled. But it felt like they didn't really "get at" the larger issues related to plastic waste. Maybe they were too fun somehow? I mean, the act of collecting plastic on the beaches was affirming and thought-provoking but I wouldn't classify it as "fun"—it was pretty gross most of the time. Also, video felt like the wrong material for communicating what I wanted to sit with and share through the work.

Then I was going to work with plastic remnants left over from the fabric interfacing I had been using for another project. I have piles of it and it felt like such a useless and massive waste, so I started collecting it specifically for this *Plastic Heart* project but... using it felt flat and still not really doing the thing I wanted so... I was stuck.

I then started building projectors out of leftover cardboard and Fresnel lenses I use for teaching about video projection. (They are plastic sheets and I weirdly have so many!). I was going to maybe combine this with the first videos I had made as a way to try and get at this massive feeling of... I don't even know what... that I have about plastic pollution. I started building microprocessors to create LED lighting to run from within the projectors and had a lot of these materials already (they're mostly made up of plastics) so it felt useful in a way. But I still felt so blah about it and like I was still not getting at the thing I wanted. It still relied on so much plastic! It still contributed to so much waste. It still didn't speak to the complexity that I wanted to address about the issue.

SC: There really is a conundrum to working with or on plastics, in part because it's impossible to disentangle ourselves from plastics. Whether it's at the level of finding microplastics and microfibers

and plasticizers in our air, water, and food, or at the level of trying to make art and exhibitions, we have such an intimate relationship with plastics that extricating ourselves is unworkable. Our futures are all bound up with the plastics that were made decades ago; making art can seem to exacerbate the problem, or it can even seem somehow narcissistic or self-righteous. The SC has been talking a lot about how "solutions" for making art about plastics pollution tend towards gathering detritus, giant animals made from plastic bottles for example, which illustrate that there is a lot of waste in the environment but don't really get beyond that. How do we move beyond upcycling to make something (an exhibition, an art work, a piece of writing) that has impact, that is simultaneously about an issue (plastics), does not intensify the issue (plastics pollution), and engages on some level beyond mere viewing or looking?

CB: It really is a hard thing to wrap your head around. At a certain point upcycling and recycling materials just creates a false solution to the overall problem—in our worldwide production and consumption of plastic, recycling is definitely not a solution that deals with the problem (it never really was meant to but alas, here we are). For me, I think I also just struggle with using materials at all in my work—I come from film/video so my relationship to materials already leans toward the side of leaving little trace. The history of experimental film is one of rejecting object-based practice and inserts a sort of politic around it (that is primarily tied to an anti-commercial, anti-commodity based practice). I come out of that tradition, so I don't come to making objects and working with materials easily—with it always comes a questioning and challenging of materials. I don't want to ignore the obvious material politics involved in media based work; you can't ignore all of the extraction involved in generating the metals and lenses and materials that go into building a projector, but I think, before even getting to the plastics issue, my relationship with objects already hovers around discomfort.

My work tends to deal with environmental issues in one of two ways: either as subject where I try to speak about the complexity of issues of production along with other pressing issues (social justice, racism, surveillance, etc.); or as framework, where I try to work more directly and in participatory ways. Trying to find comfort with materials within these two categories felt like I was missing the plot a bit.

SC: And what was your solution?

CB: In the end I've decided to turn to plants. I have no idea why I didn't just start there, since I work with plants a lot already; it seems so obvious now. I suspect it's because at first I really wanted to have a conversation about the materials themselves from the perspective of mass/quantity/volume. (Maybe because of the experience of picking up so much plastic from beaches during our sampling?)

I've been reading about the hydrocarbons and petroleum byproducts left in the soil because

of plastics production—how they are taken up by plants and ultimately how they end up in us and it feels so gross and mind-numbing. I'm going to continue to work with ideas around phytoremediation that I started last fall with my *Reclaiming the Invisible* project at the Mitchell Art Gallery in Edmonton (2019) and another I'm working on now for the Art Gallery of Southwestern Manitoba that focuses on grasses. I'm still working through the details, but the work will be a participatory project extending from my seed-saving project *seeds are meant to disperse* (2015–ongoing). I will offer three different seed packs loosely based on the geography, planting zones, and natural species for three regions across Canada. Each pack will contain species that are specifically able to recover toxins related to plastics production and will grow well in those regions. Some packs will be in the gallery to give away but I'm thinking about this as a Canada-wide project where I will mail seeds to others across the three regions.

The seed packs will be limited and I'm building a website where people can sign up to receive the packs and participate in the overall project (which will also include a number of participatory prompts). The project attempts to raise awareness about the issue of plastics-production toxicity and land-reclamation strategies (specifically phytoremediation which utilizes plant species to remove toxins from the earth). A goal, of course, is to see some of these plants increase in prominence across the country, perhaps even take up a few of the toxins themselves, but I'm wary of setting up a scenario where it seems like this responsibility should fall on individual citizens to do the work (also, the amount of toxins the seeds I share are capable of taking up is minimal in comparison to what is needed). We need solutions and policy coming from scientists and implemented by governments on a massive scale. But, I think it is important that individuals feel a sense of responsibility to the land itself and to the health of us all living across it. For me, these actions help to connect people across distance and begin to build up a sort of shift in awareness that I think will be necessary in order to push for real action.

SC: Your project also seems like a way of encouraging forms of participatory art and community building in the midst of a pandemic. Writing right now (August 2020), it does seem that 20 or even 30 years of museums and galleries trying to break down no-touch barriers through participatory engagement has been undone in an instant. It's hard to imagine what participatory or socially-based art works might look like in a new present. And as you note, interventions and solutions have to come at all levels; it can't just be individuals working ineffectually to tackle absolutely massive problems. An important part of your work on disaster is about working together and about adaptability. Is there anything you would like to say about how those adaptations are manifesting in this current moment?

CB: Yes, it's a tricky thing to navigate. In a way, I think I reconcile it by thinking about picking my battles. I think there is a lot to offer through the models of the internet—despite

the fact that it also contains so many problems (inherent bias, data collection and surveillance, overt commodification, and on and on) and the physical realities of what allows us to connect online in the first place is equally troubling in terms of environmental impact. But, the internet as it is now is here and I don't see it changing anytime soon, so I'm trying to look at the ways in which it can be beneficial and trying to pull from those elements and utilize them to bring people together IRL. I know I feel like my community has expanded because of the ability to connect across distance, and I think it is a critical part of how we are going to tackle the pressing issues we face as a global community. I think there needs to be some real life engagement that trickles down from the online in order to make these connections stick though—for me, the goal is to find ways that I can pair my seed-saving project with the networks created online that do this.

SC: Do you think working on *Plastic Heart* with the Synthetic Collective will have any lasting impact on the way you approach art making (or community making; or research and art)?

CB: Definitely! This is one of the first times I've been part of an exhibition that has been so invested in talking about the issues of carbon footprint and I really appreciate the chance to be part of this thinking. The couple of times I've asked galleries to work with text in a way that didn't use vinyl were basically met with "it's too hard to do otherwise" and I also gave in to that thinking. I think it's time that galleries and museums came up with an alternative standard. We spend so much time thinking and talking about these issues within the arts in theory—it's time we start putting them into practice. I really appreciate that the Synthetic Collective is taking on this work and creating a working model for the rest of us to pull from later on—I plan to keep thinking and learning and working on how I can follow the example in my own work.

SC: Putting together *Plastic Heart* in this particular moment has been truly interesting, because the direction of the exhibition shifted to account for the pandemic. This was partly because everything was postponed, and because we had to think of different ways of making the space accessible, but also because plastics occupied such a central role in the pandemic. You worked with us to gather information on the pandemic quandary that plastics save lives in the short term and create totally unsustainable futures in the long term and I hoped you might want to comment on that research. I think one of the main ideas of the SC is that we can somehow visualize that quandary in a way that makes it easier to understand and thus resist. How did you understand some of the research you did in the context of the exhibition?

CB: That's the thing about the complexity of it all—when you try to consider potential solutions it can be overwhelming because those considerations need to take place within the framework of our current overall system. The research I did into the public perceptions about plastic during COVID-19 was really illuminating. You're right

about our collective inability to think in the long-term and to consider the complexity surrounding plastics. It wasn't surprising to discover, but the degree to which we are in denial about it still really struck me. It is a complex issue—for sure—but our quick acceptance of single-use plastics, as an example, without any evidence that it would help stop the transmission of COVID-19 was staggering. That this was pushed by the plastics industry itself is no surprise, but I was still blown away by how rapidly people fell into the trap, and how just utterly behind we are when it comes to thinking critically about issues of waste and the environment. All of this is by design, I know it, but I still was surprised to see just how much work we really have left to do. We are so terribly behind and I'm just not sure we have time to wait around for people to get up to speed.

I have been thinking a lot about "risk assessment" as we go through COVID-19, and how governments and health authorities base their public policies by balancing risks from a numbers perspective so that the human casualties or the environmental harms turn into a number to be considered along with the rest. If our overall society viewed risk assessment differently, considered the repercussions of the destruction of the environment and the impacts of climate change along with the impacts on communities—especially those at higher risk (Black, Indigenous, and communities of colour)—in ways that also included care and justice, alternative strategies for plastic would be much easier to both see and implement. As it is, we're just going in circles: continually finding temporary solutions that just lead to more problems and more complexity without much consideration for what the future will look like. It's pretty exhausting.

POLYMERIC MEDIA: DECISION SUPPORT TOOLS

Decision Support Tools are frameworks that aid large organizations or corporations in making decisions. DST was designed as an economic model to guide management pathways by organizing a range of up-to-date factors and predictions. The following tables attempt to reconsider DST in the context of the many unknowns that haunt polymeric media. It troubles the model by presenting both known and unknown information on common plastics as a way to reflect on the complexities of its ubiquity and futurity. This DST has been made with artists and arts workers in mind as potential user or non-user of plastics in artistic practice or daily life. It is not intended as instruction or equivalent to safety data sheets.

	**COMMON USE**
	**PROPERTIES**
	**ADDITIVES**
	**SAFE HANDLING**
	**HAZARDS**
	**ENVIRONMENTAL FATE**

POLY(METHYL METHACRYLATE) / ACRYLIC GLASS / PLEXIGLAS™ / LUCITE™ / ACRYLITE™ / PERSPEX™ c. 1928.

	Display, signage, framing, security barriers, retail fixtures, light diffusers, artificial nails, blacklight reactive tattoo ink, sneeze guards, bone cement, and bone replacement.
	Glassy, amorphous, rigid, optically clear or cloudy, dimensionally stable, with high refractive index. Subject to stress cracking and crazing. Poor resistance to many chemicals, in particular, polar solvents (esters, ketones, chlorinated hydrocarbons).
	May contain talc and other fillers to decrease cost, butyl acrylate (acrylic rubber) to improve impact strength, and/or methacrylic acid to improve temperature resistance.
	Wear gloves, safety glasses, and respirator when cutting or heating. Fumes from heat applications should not be inhaled.
	PMMA is combustible and burning releases toxic substances, including carbon monoxide and formaldehyde.
	High environmental stability compared to polystyrene and polyethylene, but tensile strength decreases with increased water absorption. Colourants can cause migration (leaching) in water. No appreciable aging in 10–30 years of outdoor exposure. Longevity ~ Unknown

POLYVINYL CHLORIDE (PVC) 3* c. 1928

	Signage, billboards, siding, flooring, windows, doors, carpet backing, water and sewage pipes, toys, shower curtains, shrink and stretch films, exhibition labels, car interiors, backpacks, raincoats, 3-ring binders, playgrounds, traffic cones, mud flaps.
	Moderate toughness, flame resistant, poor light resistance, sinks in water. Distinct sweet sharp odour caused by plasticizers perchloroethylene.
	May contain up to 80% additives including brominated flame retardants, vinyl acetate to enhance stability and colour, di-2-ethylhexyl phthalate (DEHP) to create flexibility, durability, sheen, and adhesive capabilities, phthalic acid esters for softening.
	The many additives and plasticizers in PVC can off-gas volatile organic compounds (VOCs). Fumes are most noticeable when new, but can last for years in interior spaces. PVC should be allowed to off-gas in open air or well-ventilated area for at least 28 days before close handling
	Off gassing VOCs include formaldehyde, benzene, perchloroethylene, persistent organic pollutants (POPs) PCDDs (dioxins) and PCDFs (furans) are released in open burning and building fires. Hydrochloric acid can be released when stabilizers become exhausted.
	Least recyclable of all plastics due to the heavy use of additives. Recycling rate: 0.5%. Poor resistance to heat and light causing colour change and deterioration. Weathering results in surface embrittlement and crazing/ cracking. Plasticizers are not bound to the polymer matrix, which makes them susceptible to leaching. This slow extraction over time can cause accretion, swelling, partial dissolving, oily discharge, and possibly hydrochloric acid gas under extreme moisture and light exposure. Persistent organic pollutants (POPs) in the environment accumulate on the surface of PVC at 30x the rate as PE or PP. Longevity ~ Unknown

POLYETHYLENE (PE) / low density (LDPE) 4* / high density (HDPE) 2* c. 1933.

	HDPE: opaque packaging for household items, buckets, crates, recycling bins, plastic lumber LDPE: carrier bags, bubble packing, vapour barrier, cling and stretch wraps, films (and other coverings), lamination, shrink/ stretch film, pouches, flexible tubing, squeeze bottles, liners for cereal boxes.
	LDPE: tough, flexible, low tensile strength, heat deflection and low melting point. HDPE: high degree of crystallinity, strong, hard, dense, rigid, low-stress crack resistance.
	Wide range of plasticizers, flame retardants, antioxidants, acid scavengers, light and heat stabilizers, lubricants, pigments, anti-static agent, slip compounds, and thermal stabilizers.
	Standard ventilation is adequate for contact.
	Buildup of fine dust may cause an explosive reaction with air.
	HDPE currently has a market for recycling, but optical sorters can't identify black plastic against a black converyor belt, therefore most recyclable black plastic is not recycled in Canada. In the environment PE can accumulate/ adsorb persistent organic pollutants (POPs), and floats in water and thus small fragments and especially pellets can be mistakenly consumed due to resemblance to fish eggs. Longevity ~ Unknown

POLYURETHANE FOAM (PU) c. 1937

	Thermal insulation, cushioning, car interiors, mattresses, quilting, floor underlay, packaging, acoustic baffles, shoe insoles, sponges, toys, pillows, packaging.
	Elastic cell structure. Highly flammable. Porosity improves thermal and acoustic insulation.
	May contain brominated flame retardants especially foam manufactured prior to a de facto phase-out in 2013 (US). Silicone surfactants to act as a stabilizer while foam expands and hardens, isocyanates mixed with polyols to create gelling reaction, isocyanates mixed with water and carbon dioxide to give the foam its height/shape/size (blowing). Tin (II) (Stannous Octate) in polyester foams for mattresses and similar products, amine catalysts to create open or closed cell structure.
	Spray foam: wear chemical resistant clothing, gloves, eye protection, and respirator. Application cure time: 23-72 hours. Cool, moist conditions can lengthen curing time. Post-application or solid foam: Drilling, sanding, or welding produces harmful dust and aerosols. No ignition sources should be used around polyurethane foams. Foams can ignite and produce intense heat, toxic gases, and dense smoke.
	Prior to solidifying, spray foam is a chemical cocktail that can cause lung irritation, vision problems, and burns to internal organs. If improperly mixed part a/b chemicals can remain toxic. While these chemicals are considered inert in the final product, the manufacturing process can expose workers and nearby communities to the volatile chemical components. Subject to hydrolysis, accelerating aging by water, and oxidation.
	Useful life of up to 50 years. Flame retardant HBCD is a known endocrine disruptor that can especially affect aquatic animals. Longevity ~ Unknown

POLYCARBONATE (PC) c. 1953 *

	Safety helmets, computers, beverage bottles, baby bottles, power tools, appliance housing, window glazing, face shields, sunglasses, automotive parts.
	Exceptional high light transmittance, impact toughness, dimensional stability, and creep resistance. Poor scratch and solvent resistance. Waxy, mild odor.
	Contains Bisphenol-A (BPA). May contain silicone to improve scratch and solvent resistance, and benzotriazoles and hydroxyphenyltriazines for UV protection.
	Keep away from heat, flame, and strong oxidizing agents. Store in a cool place and protect from sunlight. Avoid dust-air mixtures and static charge build up.
	Human exposure to BPA is widespread and can occur through diet, air, dust, and water. BPA is toxic at high levels, and even at very low levels it may be capable of endocrine (hormone) disruption by acting like estrogen.
	Material does not decompose. Degrades significantly when exposed to UV rays for prolonged period and remains high-grade for only 3 years before yellowing, loosing ductility, fogging and ultimately undergoing fragmentation. Degradation can cause emissions of carbon monoxide, carbon dioxide, aromatic compounds, hydrocarbons, and phenolics. Longevity ~ Unknown

POLYSTYRENE (PS) c. 1930 / EXPANDED POLYSTYRENE (EPS) / STYROFOAM ™ c. 1954

	Single-use food and product packaging, parts for optical, electrical, and medical goods, cutlery, takeaway cups, solo cups, cosmetic containers, egg cartons, takeaway containers, packing peanuts, foam food trays, cushioned packaging, building insulation.
	Low density (98% air) chemically resistant to diluted acids and bases, easily molded into a variety of products, does not hold up against hydrocarbon solvents, low oxygen and UV resistance, brittle, poor impact strength.
	May contain antioxidants, process lubes, flame retardants, antistatic agents, methyl methacrylate for higher clarity and improved resistance to UV and various chemicals, acrylonitrile to improve chemical resistance and heat stability, butadiene for high stress tolerance and better impact resistance and/or maleic anhydride for improved heat resistance.
	Wear impervious gloves and protective clothing. Wash hands if in contact with skin. Wear safety goggles with side shields. Do not wear contacts while working with polystyrene.
	Non-reactive under normal conditions and safe storage. Avoid dust-air mixtures or static charge buildup. The component styrene is a known carcinogen and neurotoxin, and can leach from EPS in hot temperatures. In the environment, fragments are ingested by animals causing starvation and clogged digestive systems.
	Due to its lightness, expanded polystyrene can easily drift into water systems making it a common form of marine plastic pollution. Photodegradation by the sun causes embrittlement, powdering, yellowing, fragmentation. Longevity ~ Decades to centuries, when exposed to sunlight.

SILICONE / POLYSILOXANE c. 1930–1940

	Cookware, mold making, medical gels, implants, lubricants, sex toys, foams, adhesives, caulking, surfactants, ceramic composites, seals, and gaskets.
	Soft, flexible, tasteless, odourless, hydrophobic, non-stick, with deadening power. Viscoelastic, having both viscosity and elasticity. Non-toxic when cured. Dimensionally and chemically stable, medically biocompatible. Weak intermolecular forces, easily subject to abrasion and prone to swelling if exposed to oil.
	May contain pigmented sealants (carbon black, titanium dioxide, pigment blue 15, iron oxide) and petroleum distillates.
	Wear respirator, safety glasses and nitrile gloves (uncured silicone will react with and dissolve latex gloves). Do not use in a confined space without adequate ventilation. Store in original container at room temperature. Not soluble in water. Wash hands thoroughly after use.
	Cured silicone is physiologically inert and doesn't react with other chemicals or compounds. Methyl ethyl ketoxime is given off as a vapour during the curing process. Contaminations with foreign substances before curing can cause inhibition, restricting the curing process. Health effects are not fully known, and siloxane is a suspected carcinogen.
	Resistant to extreme temperature, UV, ozone, and weathering by rain, snow, sleet, frost or wave action. Resistant to bacteria and fungi. Longevity ~ Unknow

OTHER (NON-POLYMERIC MATERIALS):

CALCIUM SULFATE DIHYDRATE / GYPSUM PLASTER / DRYWALL / SHEETROCK / GYPROC

	Drywall board, ceiling panels, filler compound, compost bulking agent, soil amendment, grease absorber, dental moulds.
	Inherently brittle, crystalline material which has relatively low tensile, compression and flex. Usually light grey, crumbles when cut and broken, absorbs water, compound acquires rock-like qualities when dry. Architectural barrier to fire.
	May contain mica crystal as an accelerant, boric acid as an anti-mildew agent. Wax emulsion to hinder water absorption. Potassium sulfate to enhance compressive strength. May also include starch, reinforcing fibres, deformation inhibitors / anti-sagging agents, bonding agents, anti-shrink additives, recalcination inhibitors, foam stabilisers, bactericides, fungicides, pH adjusters, colouring agents, fire retardants, and fillers (such as particulate minerals or plastics, which may in some embodiments be in expanded form).
	Gloves, safety glasses, and dust mask should be worn when cutting or sanding.
	Breathing dust from drywall may cause persistent airway irritation, coughing and breathing difficulties. May contain acetaldehyde, formaldehyde, strontium.
	Eternally recyclable in a closed-loop. Landfilling drywall is banned in many cities, and it must be taken to a drop-off depot. However, a large amount of construction waste management is outsourced and transported to less regulated landfills or incineration plants. In the conditions of a landfill, anaerobic bacteria convert the sulfates in drywall into toxic hydrogen sulphide gas. Incineration of drywall causes potential release of sulphur dioxide gas, a contributor to acid-rain formation.

* Plastics recycling is a complicated and largely facile system invented by the plastics industry. The Society of the Plastic Industry Symbols or Resin Codes mimic the Möbius loop of the recycling symbol but do not indicate recyclability. #1 #2 are the only plastics readily recycled, but markets for their recycling continue to decline. #3 #4 #5 #6 #7 do not currently have markets for recycling and therefore are landfilled, incinerated, or exported.

** On May 12th, 2021, the Government of Canada added "plastic manufactured items" to Schedule 1: List of Toxic Substances under the Canadian Environmental Protection Act (CEPA).

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