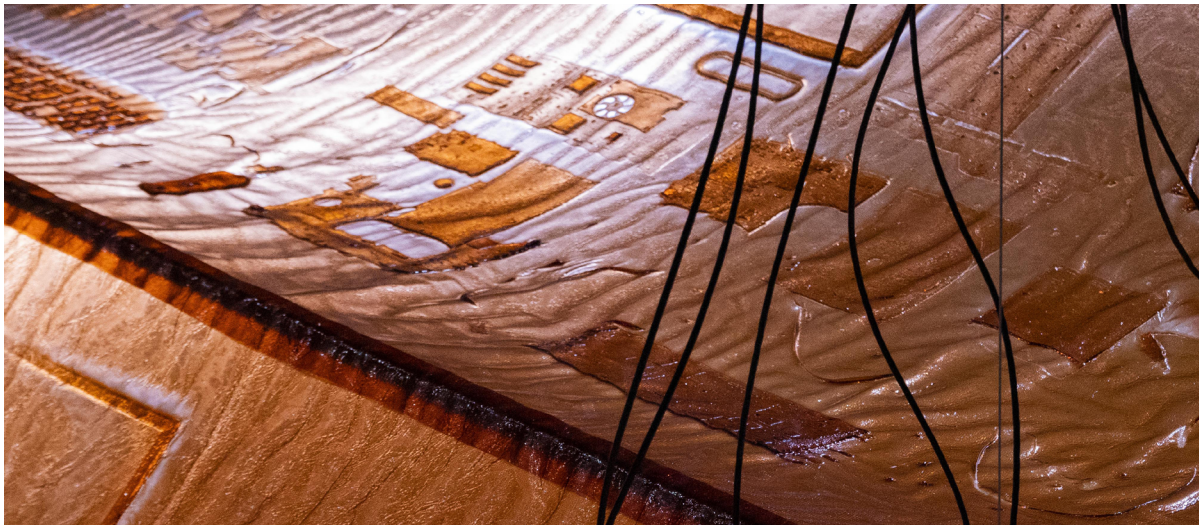
LIVING ARCHITECTURE SYSTEMS GROUP



Fossilation
Nurturing Slow Expectations

Fossilation Collective and Géraldine Gomez
Edited by Alice Jarry and Marie-Pier Boucher

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Contents

I. INTRODUCTION

Fossilation is a membrane made of bioplastic or food waste biomass. It weighs 60kg and measures 750cm x 223cm. The piece was originally presented at the "Matières d'images" exhibition held at the Centre Pompidou in Paris in February 2021 (Hors Pistes Festival, curator: Géraldine Gomez). Designed as a large transparent canvas that hovers horizontally over the ground, its bright colour is slightly animated by the fluctuating lights that shine through it, and its variable thickness generates patterns of images. The long flexible band recalls a film strip on which a few frames appear in succession. Many cables extend directly from the membrane towards the ceiling and appear to be held there as if by static cling. Arranged like tentacles in search of food and energy, sensors and suspended cables running along the exposed piping (a signature architectural feature of the Centre Pompidou) also interface with the membrane, converting the building's residual flow, energy, activity, and traffic into electricity. This energetic and electrical "grip" on the building interferes with the light arrangement that illuminates the membrane, modulating its intensity and creating an effect reminiscent of a flickering film strip projecting faintly onto the ground. The membrane is imprinted with counter-forms depicting bare, obsolete electronic components – flat screens, cables, computer components and peripheral devices. The forms progressively merge and fade into the media, like an open-pit mine being gradually filled, frame by frame, creating a fossilized imprint of our era.

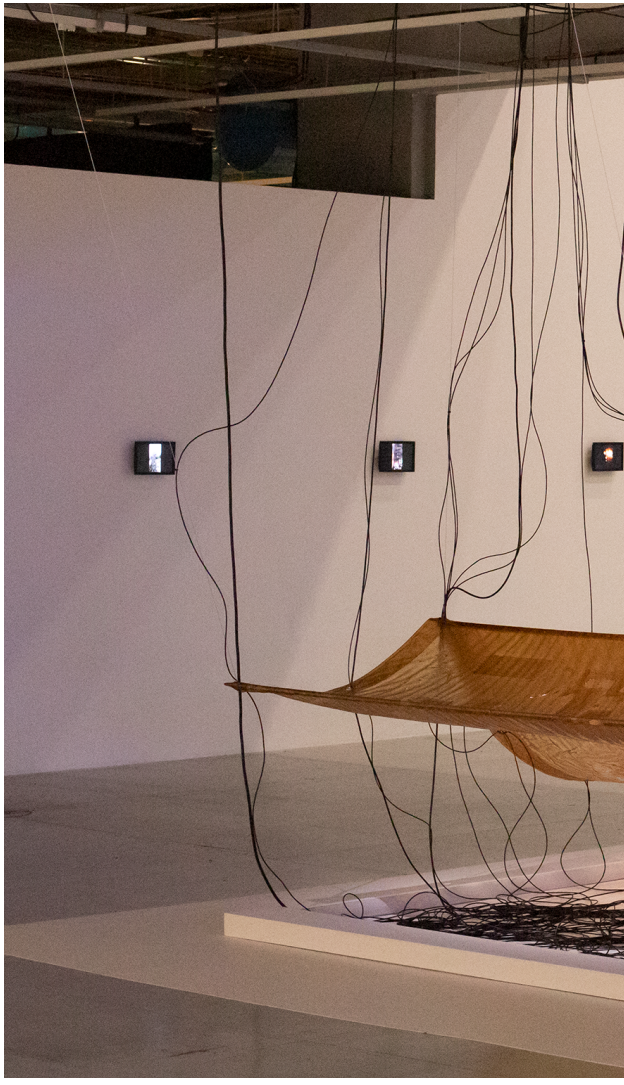


Image 1 *Fossilation* at the "Matières d'images" exhibition held at the Centre Pompidou in Paris in February 2021 (Hors Pistes Festival, curator: Géraldine Gomez).

II. THE ECOLOGY OF IMAGES

Hors Pistes Festival , The Ecology of Images
Centre Pompidou, Paris, February 2021

"Images are more real than anyone could have supposed. And just because they are an unlimited resource, one that cannot be exhausted by consumerist waste, there is all the more reason to apply the conservationist remedy. If there can be a better way for the real world to include the one of images, it will require an ecology not only of real things but of images as well."

Sontag, 1977, p.141

Image 2 *Fossilation* at the "Matières d'images" exhibition held at the Centre Pompidou in Paris in February 2021 (Hors Pistes Festival, curator: Géraldine Gomez).

The arrival of a train, workers exiting a factory: we rarely notice to what extent the birth of cinema ushered in by the Lumières brothers borrowed its symbols from the Industrial Revolution, in this case celebrating mobility and speed. Humans push boundaries, reduce distances, with the help of technology. More than just progress into unknown territory, it is civilization as a whole that's moving forward and crushing everything in its path: nature, of course, but also the cultures of indigenous communities.

Since the tales of conquest of the early twentieth century, in which nature was a hostile entity that needed to be conquered and subjugated, the paradigm has reversed itself. Today, nature needs to be protected from humans and their greed. Ecological issues are now part and parcel of mainstream cinema.

That being said, the Lumières brothers' train hasn't stopped running, and neither has its network stopped expanding: it now services, beyond movie theatres, the many terminals that are projected onto our retinas, and it is no longer possible for us to turn a blind eye to the rare materials required by our phones, the cables under our oceans, the energy needed to cool our servers. *Would it be possible to contemplate a kind of digital sobriety, given the current state of emergency, as Susan Sontag was already advocating? Can we devise ecological actions to counter this influx of images?*

Géraldine Gomez, Curator

III. FOSSILS

"For every form retains life, and a fossil is not merely a being that once lived, but one that is still alive, asleep in its form."

Gaston Bachelard, 1994, p.113

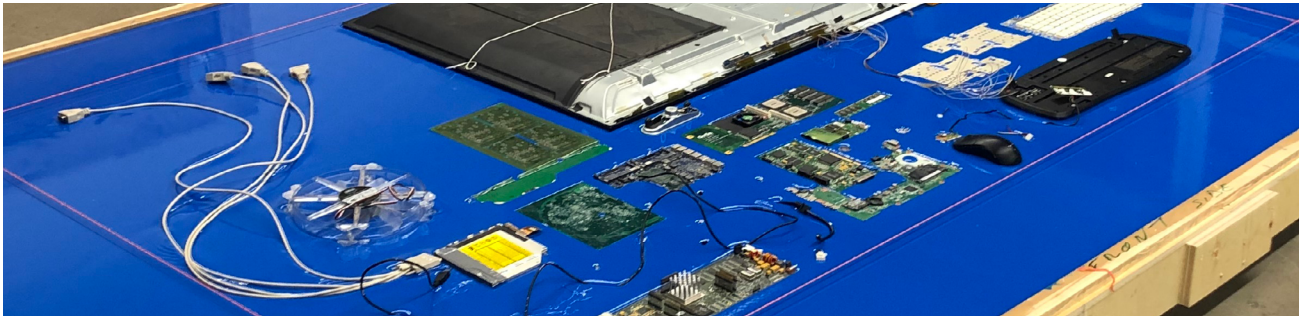
Fossilation draws on the concept of the fossil as the active remnant or the trace of an organism that has been preserved in Earth's crust. By imprinting - or fossilizing - obsolete electronic components, which are used daily to enable the production and circulation of images, *Fossilation* transforms the clay, the silicon, and the bioplastic membrane into lively substrates for engaging with the material nature of communication. *Fossilation* is itself sustained by energy, information, matter, time and space, which are finite resources within the closed system of planet Earth. Its fossils thus become a form of critical vigilance, reminding us that images are embedded in both visible and invisible extractive practices that impact ecosystems and communities.

Image 3 (top left) Prototype prior to final installation: fossils of obsolete electronic devices imprinted in clay. Milieux Institute (Concordia University, Montreal).

Image 4 (top right) Eldonia ludwigi Walcott, 1911 (Burgess Shale formation, middle Cambrian; Walcott Quarry, above field, British Columbia, Canada).

Image 5 (bottom) Making of *Fossilation*'s silicon mould. Milieux Institute (Concordia University, Montreal).

Image 6 (following page) Detail of electronic fossils imprinted in bioplastic. Centre Pompidou (Paris).



IV. *FOSSILATION*'S INGREDIENTS

Used Materials

Per 1 Fossilation

Bioplastic	Quantity*
Silicone	
Silicone molding paste	1200 g
Gédéo Siligum	300g
Glycerine	24 l
Pine resin	450 g
Granulated beeswax	500 g
Grape seed oil	500 ml
Tea tree oil	60 ml
Gelatin powder	8160 g
Agar Agar powder	900 g
Onion	450
Other Chemicals	
Spray bottle	1
Hydrogen peroxide	1 l
Bleach	3.5 l

Electronics	
Piezoelectric sensor	
Piezoelectric disc	2
Piezoelectric wafer plate	10
Piezo element	50
Peltier Module	
Thermoelectric cooling plate	50
Circuit components	
Energy harvesting power management board	1
Energy harvester breakout	3
Backup capacitor	16
Computer parts heatsink	110
Integraded circuit parts	110
Electrolytic capacitor	120
Wire splitter terminal	300
Lighting System	
LED aluminum profile	14 m
LED strips	8 m

Hardware	
Acrylic sheet	4
Cable entry end caps	4
Cable ties	136
Threaded brass nut	300
Stainless steel washer	300
Steel hex nut	300
Wood screw	353
Steel socket head	600
Cables	1633 m
U-shaped aluminum profile	18 m
Aluminum angle profile	18 m
Wax paper	300 m
Velcro	800 m^2
Gelatin filter roll	9,3 m
Double-sided gelatin tape	600 m
Kitchenware	
Mold star	2
Silicone baking mats	3
Cheese cloth	6
Stationery	
Paper	20
Double sided tape	1250 m^2
Scrapbooking accessories	180
Wrapping tape	7200 m^2
Wood	
Wooden transport box	1
Spruce wood	143 m
Spruce plywood	42 m^2

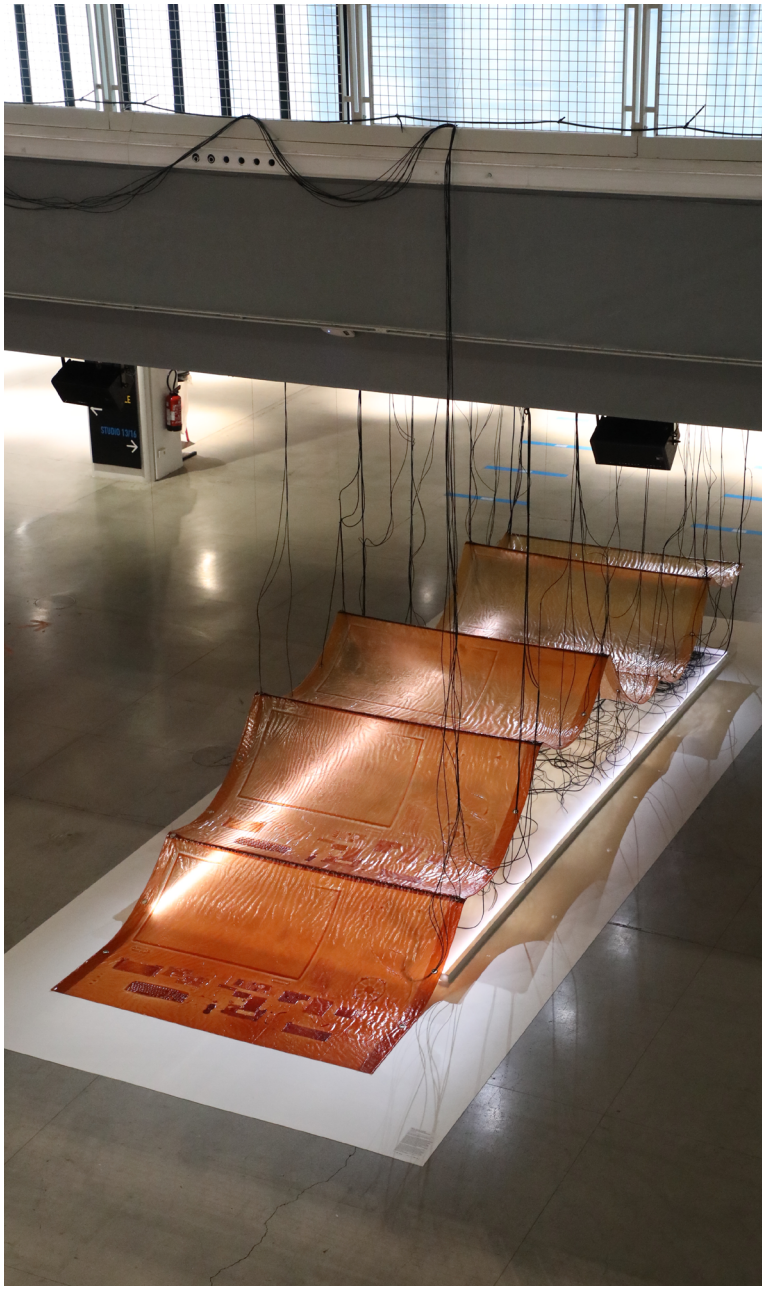


Image 7 (previous page) Top view of the installation.

Images 8 to 10 (above) Experimentation with various gelatin-based bioplastic recipes and onion dyes.

V. BIOPLASTICS

Since it was first synthesised in 1907, plastic plays an increasingly important role in creating an industry of disposable items. In the 1960s, advancements in manufacturing processes facilitated mass-production of goods and propelled new design aesthetics. An example of this tangent was the work of industrial Designer Verner Panton - and his famous moulded Panton chair - who leveraged the malleability of plastic to advance a new experimental approach to forms, colours, and manufacturing.

Today, plastic has become a hegemonic material that permeates every aspect of our built environment. It wraps our food, holds our electronics, and is used for toys, tools, art, and architecture. Impacting human bodies, fauna, and ecological milieux, plastic is symptomatic of the current ecological crisis. This material demands us to address overproduction and the end-of-life of products, but also to invent new speculative and critical imaginaries that reshape our material culture in a more sustainable way.

Made with by-products from the food industry, *Fossilation* delves into these questions to inquire how plastic-like materials can engage in unforeseen couplings with the environment. *Can bioplastics be made to look, feel, and shapeshift like common plastics*? Fossilation uses materials such as gelatin, agar, glycerin, starch, and food waste scraps to imagine plastics within this new paradigm. In *Mythologies* (1953), Roland Barthes argues that plastic is a miraculous substance that is a sudden transformation of nature and considers it less a thing than a "trace of a movement" (p.97). If plastics have co-evolved with our environments and can be traced through both ideas and structures, *Fossilation's* membrane is an invitation to reckon with the legacy and formal potential of this material.

Bioplastics offer an alternative to the use of fossil polymers and an exploratory playground for sustainable material exploration. In *Design, Ecology, Politics: Towards the Ecocene* (2018), Boehnert argues for the importance of ecological literacy, defined as an enabling capability that provides an understanding of the ecological impact of human actions. This involves developing new ways of conceiving and making ecologically viable ways of living. Ecological literacy also foregrounds the need for collective political actions rather than individual proposals, which, it is suggested, cannot fight against industrial production. To challenge this *status quo* and trace an open movement that emphasizes the social role of designers and artists, *Fossilation's* team engaged critically with ecological literacy through the production of small- and large-scale surfaces.

Images 11 to 15 (below and following page) Experimentation with various gelatin, agar-agar, and composite-based bioplastic recipes and onion dyes.


Test 0
Test 1
Test 2
Test 3
Test 4
Test 5
Test 6
Test 7
Test 8
Test 9
Test 11
Test 14
Test 15
Test 16
Test 17

FOSSILATION'S BIOPLASTIC RECIPE

Fossilation ingredients

- 1 kg of onion skins
- 12.5 kg of gelatin
- 100 cloves
- 100 drops of tea tree oil
- 100 g of pine resin
- 110 l of water
- 15 kg of glycerol
- 84 square metres of tulle
- miscellaneous obsolete electronics
- 136 l of silicon rubber
- 28 panels of plywood

Onion juice preparation (for 8 l)

- In a casserole dish bring 9 l of water to boil.
- Peel the onions and reserve the peels. Have fun with the actual onions! See page 37 for inspiration.
- Put the peels in the casserole dish.
- Add 8 cloves, 8 g of pine resin and 8 drops of tea tree oil (the pine resin, cloves, and tea tree oil are used as natural antibacterials to avoid fungal and bacterial contamination during the drying process).
- Let simmer on medium heat for about 1.5 hours.
- Let the mixture cool.
- Filter the juice with a strainer and pour into the casserole dish (you should get approximately 8 l of deep amber liquid).
- Repeat 14 times.
- Store in the refrigerator.

Images 16 to 20 (above) Making of a bioplastic photogram at the Milieux Institute (Concordia University, Montreal).

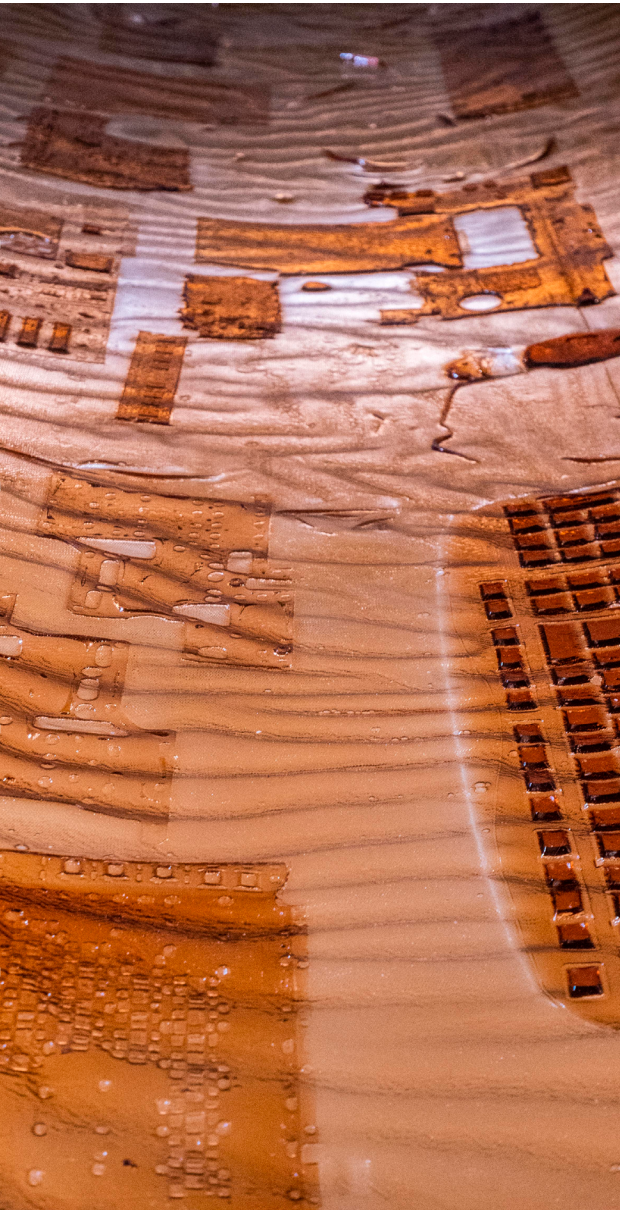


Image 21 (above) Detail of an imprinted bioplastic photogram.

Preparation for bioplastic membrane

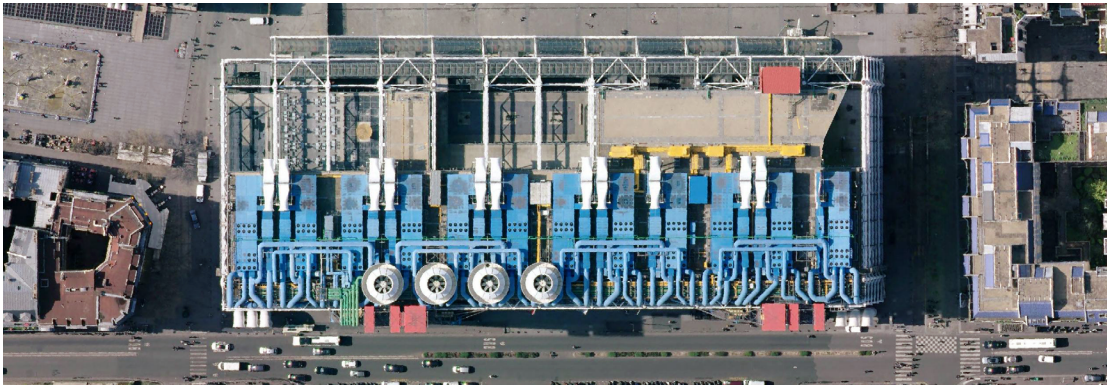
· Blend the gelatin powder with the glycerol (more glycerol will increase material flexibility, but too much will increase the risk of condensation and greasiness).
· Add the onion juice (dye) to the gelatin-glycerol mixture.
· Blend carefully.
· Reheat (the polymerization process happens when the solution reaches approximately 90 degrees Celsius).
· Remove any foam to avoid air bubbles forming cavities in the final product.
· Make a silicone mould using plywood panels and rubber.
· Create imprints of obsolete electronic devices while the silicone is still soft.
· Lay the tulle in the mould to increase mechanical resistance.
· Pour the bioplastic onto the silicone mould.
· Remove any air bubbles.
· Let dry for a few days or until water content is fully evaporated.
· Gently remove the membrane from the mould.

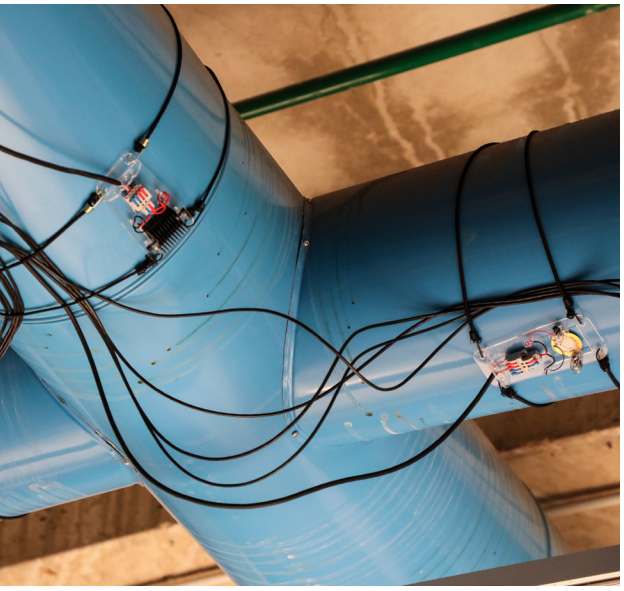
VI. SYSTEMS ARCHITECTURE FOR ENERGY AND LIGHT

Fossilation is incomplete. Without a life-support system or associated milieu, it remains asleep in its form. To sustain its process of concretization, it needs to engage in a symbiotic relation with its surroundings. To activate this relation, *Fossilation* creatively adapts the architectural system of the Centre Pompidou and develops a network of sensors that monitor, digest and process heat, cold, and the vibrations produced by the movements of visitors to modulate the lighting of the piece.

Imagined and created by Renzo Piano and Richard Rogers, the Centre Pompidou was designed as an architecture of transparency, revealing its structural and functional arteries. For its inauguration in 1977, Francis Ponge described this architectural system as a "moviment". More than a monument, a "moviment" is an inclusive system that behaves as a cultural tool: a flexible infrastructure that can adapt and evolve over time. The metal structure of this "cultural machine" (Piano, 1987) puts all the components of the building's operation in plain view. The knotty pipe architecture translates the different energy flows with various colour codes: blue for air circulation, green for water circulation, yellow for electrical systems and red for visitor and staff circulation.

Images 22, 23 (below)
The Centre Pompidou in Paris and its signature colourful architecture.

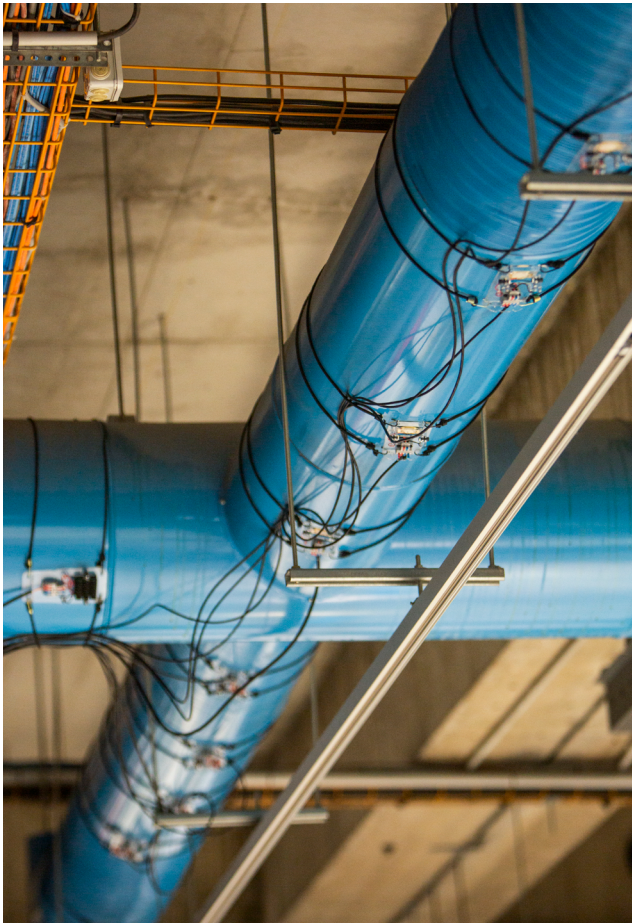




Images 24, 25 (top and right)
Piezoelectric and Peltier modules harvesting the residual energies of the building (vibrations and heat waste).

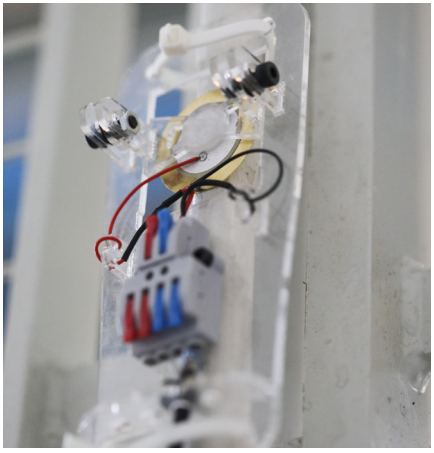
HARVESTING THE MUSEUM'S RESIDUAL ENERGIES

Akin to the Centre Pompidou, *Fossilation* is conceived in resonance with architecture imagined as a system that adapts and evolves over time. The suspended bioplastic membrane, connected to the building by a network of electric cables and sensors, is designed to attend to the energy flows that cross the museum. However, *Fossilation* does not seek to imitate the Centre Pompidou's architecture. It rather engages in a symbiotic relation with the museum, in which the infrastructure's fluctuations are mobilized by the membrane, enabling it to reach the scale of the building in a tentacular fashion. In so doing, *Fossilation* formulates a series of questions: *How can the energy flows from the built environment collaborate and interfere with the installation, the public, the infrastructure, and their metabolic processes? What could the behaviours of these energies result in?*



Power generation technologies are hardly 100% efficient due to the Second Law of Thermodynamics, which states that the output energy of a system cannot exceed its input (Clausius, 1850). In their short essay *The Rest of Now* (2015), the Raqs Media Collective define a residue as something that has been excluded – or lost – from the processual history of a material, energetic, social, or technological system. In the context of buildings and infrastructure, friction, heat waste, and loss from energy conversions can all be considered as human-made residues. *Fossilation* offers a critical response to the traditional viewpoint of extractive industries – which maximize energy outputs without considering environmental or social inputs – by tapping into two types of residual energies: heat waste and mechanical vibrations. Sixty-nine sensors of two different types were designed to interface with the Centre Pompidou's interior structure. The first type is a piezoelectric plate that could either transduce the vibration created by the water flowing in the basement's pipes, or be attached to the railings of the main stairs to capture the visitor's steps and haptic interactions with the building. The second type consists of a small Peltier tile that induces a current based on a temperature differential. This differential is created by placing one side of the tile on a hot or cold water pipe, leaving the other side in contact with the indoor air. In both cases, the sensors are attached to a perforated acrylic sheet to better interface with their material environment. Each grip on the building results in a low voltage current that is then probed and digitized by the main microcontroller of the installation.

Residual energies not only transform the membrane into a physical interface by linking visitors bodies to the building's internal movements, they also interact with the installation's lighting apparatus. *Fossilation* is illuminated from above and below by two distinct systems. The one below consists of two LED tube rails positioned on the ground to follow the work lengthwise. The one above is composed of 4 LED projectors with DMX control. These projectors are placed at the height of the museum's pipes to illuminate the surface of the membrane and project its material imprint, as an image, onto the floor.



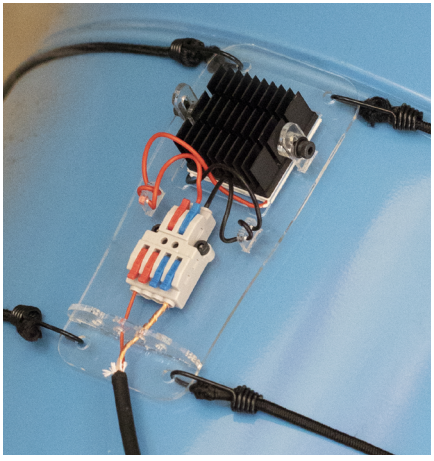
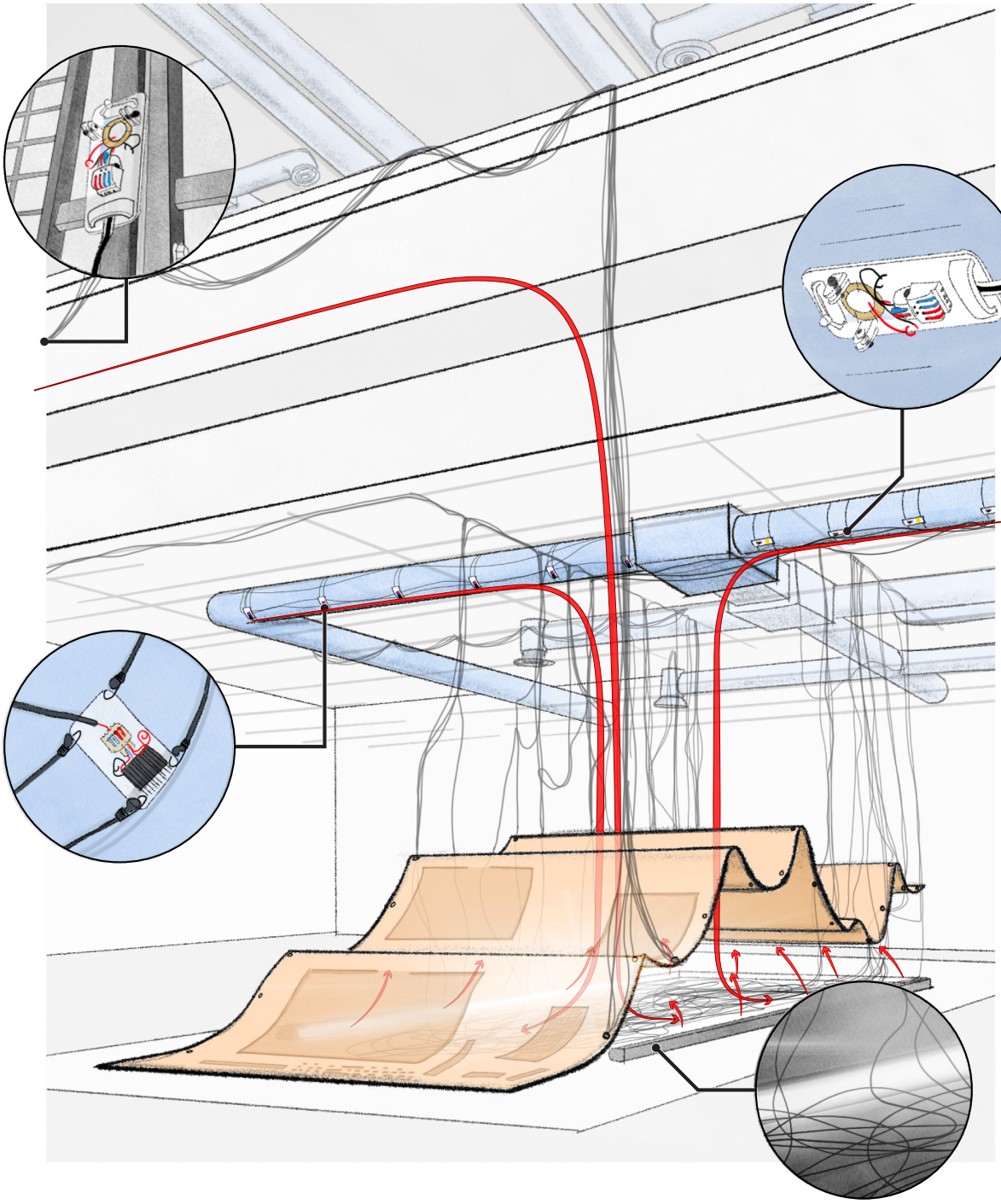
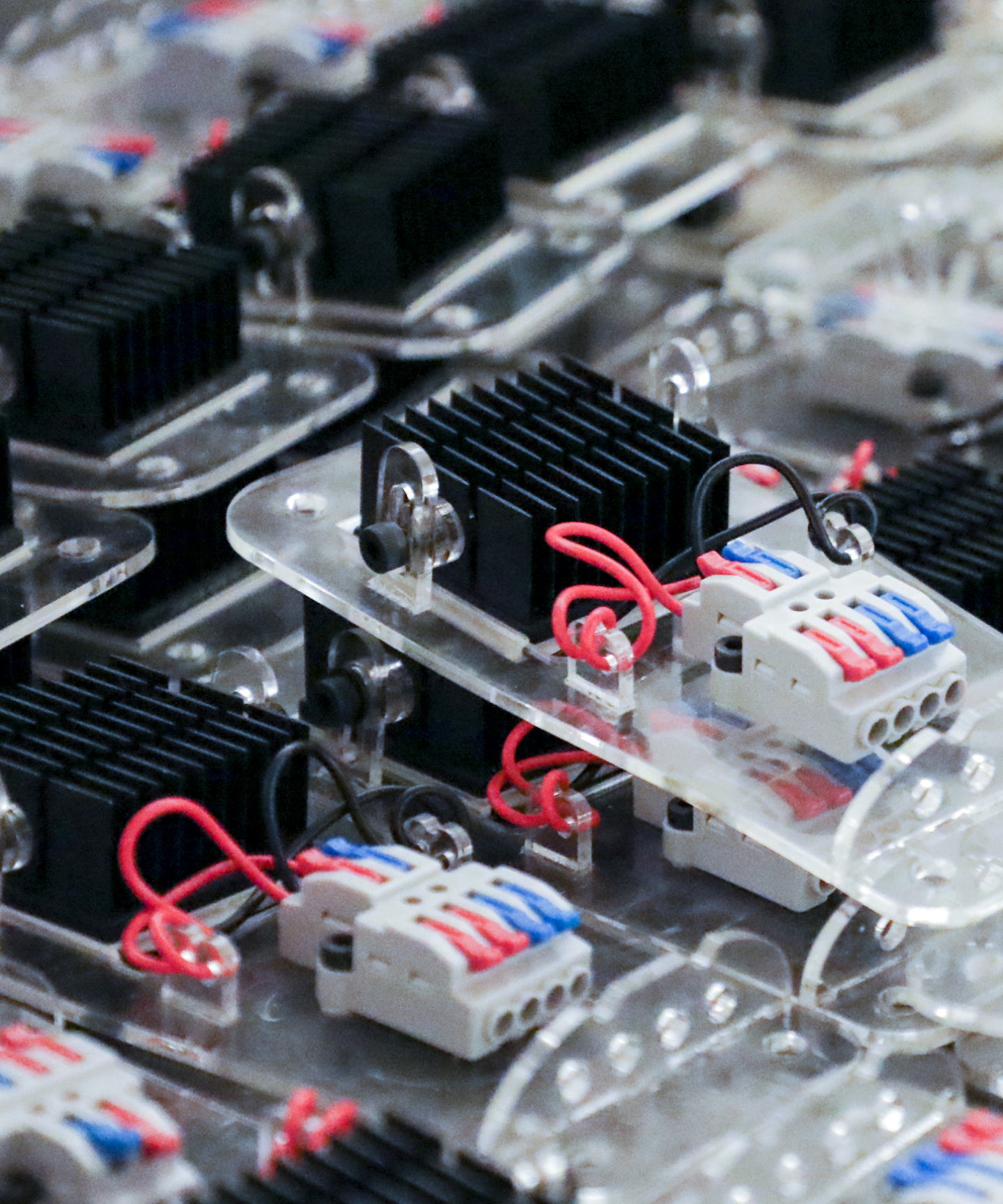


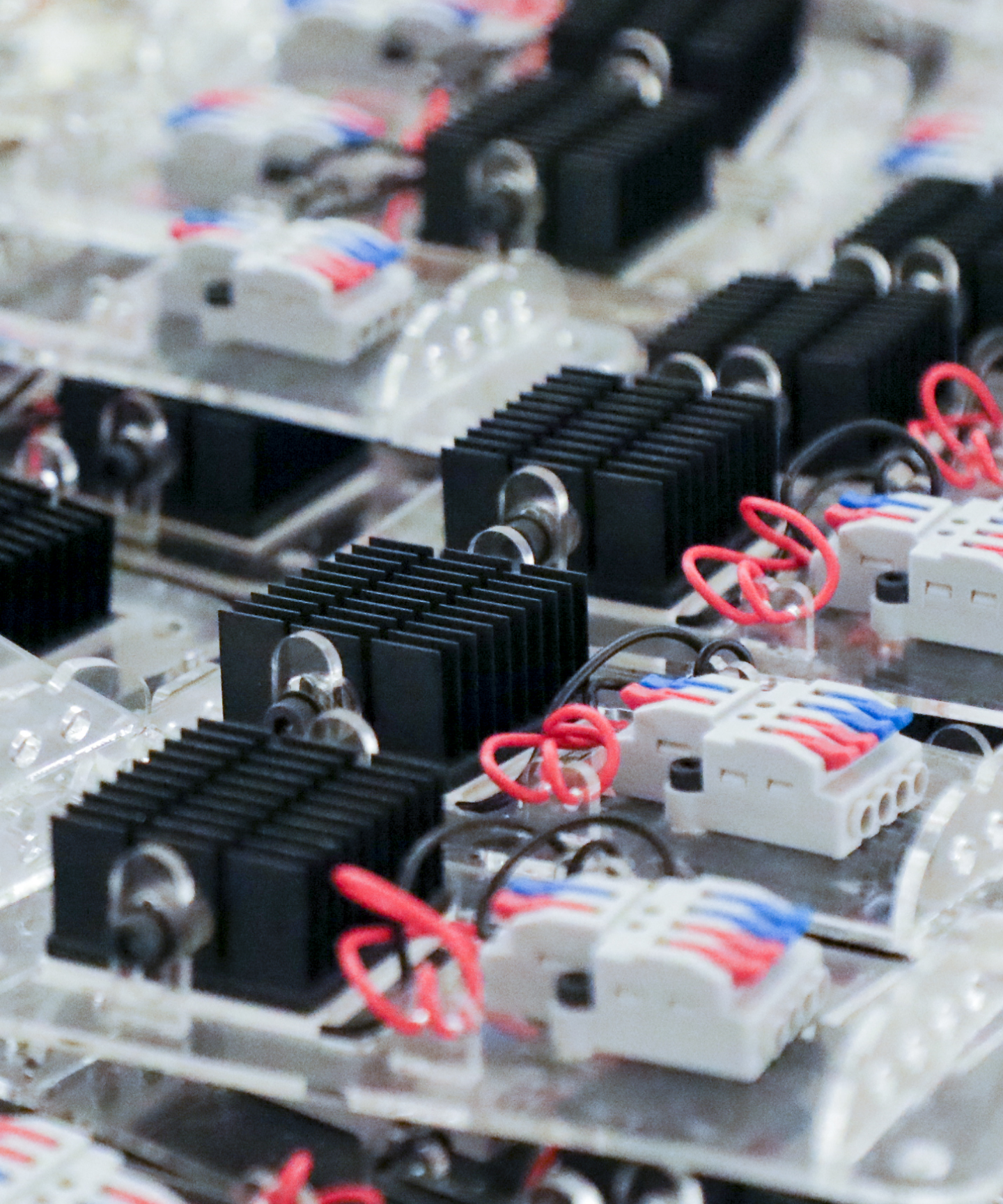
Image 26 (top) Detail of a piezoelectric module attached to the staircase and capturing vibrations.

Image 27 (bottom) Detail of a Peltier module attached to a pipe and harvesting heat waste.

Image 28 (following page) The residual energies harvested by the sensor modules are transformed into electric signals and processed by the main microcontroller of the installation to create fluctuating light patterns.



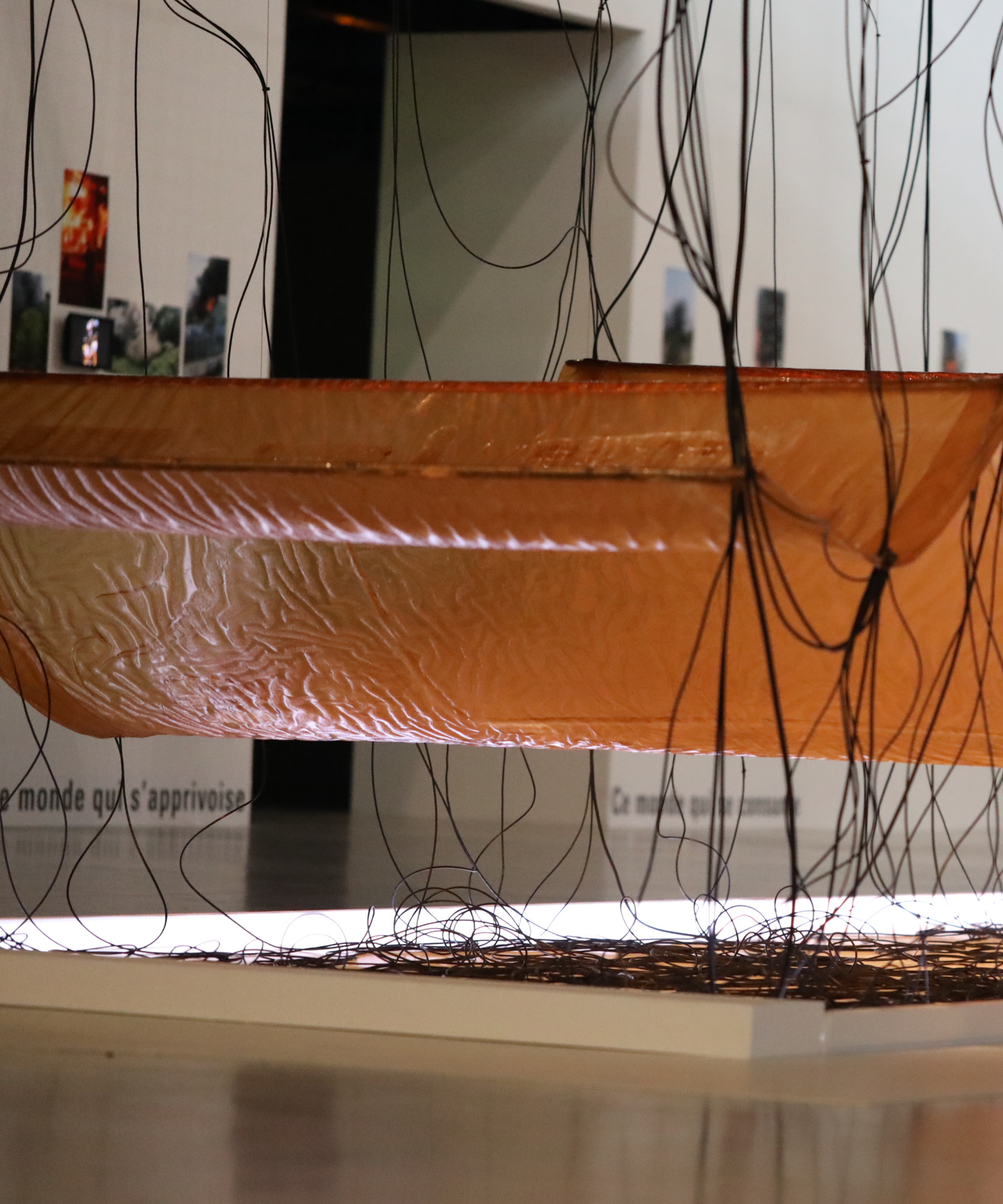




The haversted energies produce variations that influence the tint and the rhythm of the work. They either induce light vibrations and oscillations along the tubes or slowly impact the temperature of the light projected from above. Equally, another set of piezoelectric sensors - placed both on the blue ventilation tubes and on the suspended cables of the staircase leading to the building's basement - triggers singular light modulations when capturing signals from the comings and goings of visitors on the steps of the stairs. It is this process as a whole that enables the electronic fossils to wake up and to gradually become visible through the membrane.

Image 29 (previous page) Detail of the Peltier modules.

Images 30 to 33 (bottom and following pages) Light patterns and shadows produced by the interference of the building's residual energies with the membrane's imprints.


e monde qui s'apprivoise

VII. NURTURING SLOW EXPECTATIONS

Bio-oriented practices force us to refuse the shortcuts of easy and convenient solutions. Partaking in sustainable art practice is a processual adventure that requires time and also produces original temporalities. *Fossilation*'s team chose to put its own process to a temporal test, by practicing slowness as an ethos. First, in prototyping a system of energy harvesting that uses microbial fuel cells. Second, in prototyping an active material (bioplastic) that responds in unforeseen manners to variations in its environment. These two processes make the material life of images tangible and are at odds with the velocity of today's media which constantly announce the next compression of space and time. As such, *Fossilation'*s regime of slowness images two processes: 1) the slow sedimentation of our communication infrastructure into the Earth and; 2) the potential for unnatural couplings between energetic and material dynamics to give rise to systems that are simple and low-cost.

PROTOTYPING MICROBIAL FUEL CELLS

Most of the energy used daily involves a form of extraction in addition to being produced at the cost of heavy environmental damage. *Fossilation's* initial research-creation process investigated the radical concept of slow energy. This involved the creation of a microbial energy harvesting system and experimentation with its metabolic processes. Microbial energy harvesting generates around ~100 mV and ~2 mA, while modern digital devices generally require a minimum of 3.3 V at several A. This ultra-low energy draw may be dismissed by some as background noise and hence not worth the effort to harvest. However, it may also offer a creative insight into alternative energy expectations.

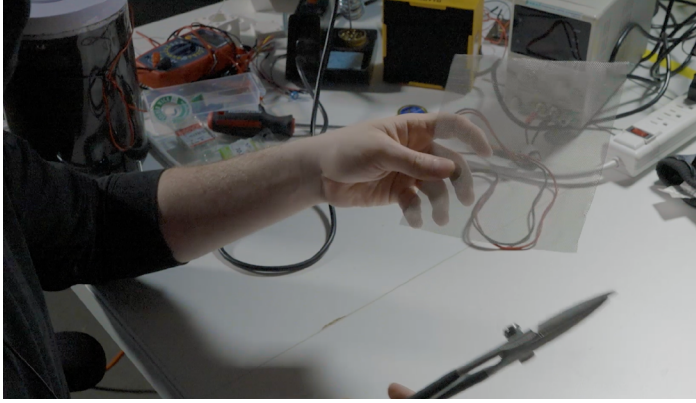
Microbial fuel cells (MFCs) can harvest the microbe's ionic energy and convert it to a "usable" format, in line with digital devices, through a series of electronic step-ups and transformations.

Image 34 (top) Detail of a Microbial Fuel Cell electrode.

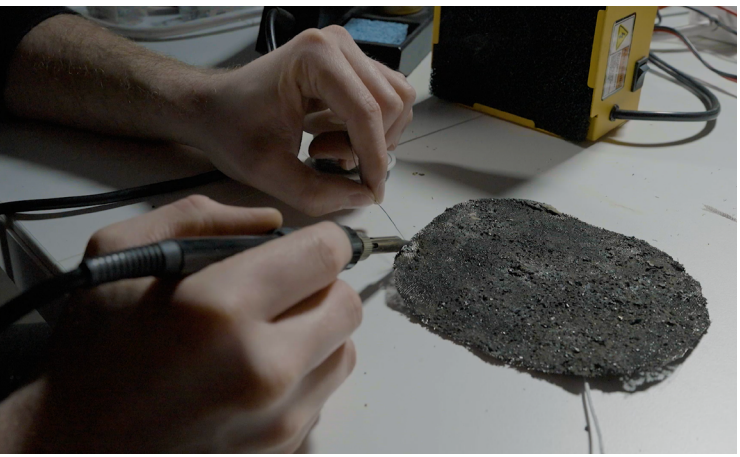
Image 35 (bottom) Detail of an open Microbial Fuel Cell.

Images 36 to 43 (following page) Making of a Microbial Fuel Cell at the Milieux Institute (Concordia University, Montreal).


AQUARIUM
MASTERS
CARBON




SPAGE
SPAGE



This process, however, takes hours to days whereas it would usually be expected immediately. To rely on MFCs for even a single aspect of daily human activities thus demands nurturing patience with technology, assumed to be fast-paced. While this expectation comes from precedents set by the immediacy of fossil fuels, a transition away from them is also an ongoing experiment in slowing down our digital lives.

Applications for large scale MFC plants exist within waste-water remediation processes (Munoz-Cupa, C. *et al.*, 2021). Outside of practical uses, MFCs can be approached as a productive and critical experiential method for perceiving and adapting to other-than-human processes. As colonies of microbial organisms and their ionic production are conditioned by their food consumption, which is in turn tied to their health, the prototyping process behind *Fossilation* is an opportunity to form a relationship with both the living and "technology", thus associating energy with ecosystems rather than resources.

HARVESTING SLOW COLOURS

Fossilation used onion dye for its colour, reminiscent of old films. Approximately 160 g of dry yellow onion skin combined with 18 l of water were needed to create the darkest photogram of the membrane. While a large onion produces an average of 2 g of peels, the six photograms - and their approximate 100l of onion juice - need 450 onions or 900 g of peels. *How can we follow and engage with the onion's life-cycle through the different shades and colour-depth of the membrane?*

Opening up the project to food foraging practices, a revaluation and rematerialization of waste nuanced the experimentation and collective experience of slow materiality. The initial strategy involved reaching out to friends and striking deals with Montreal's grocery stores. This search expanded beyond immediate circles to neighbourhood and digital foraging. The team began

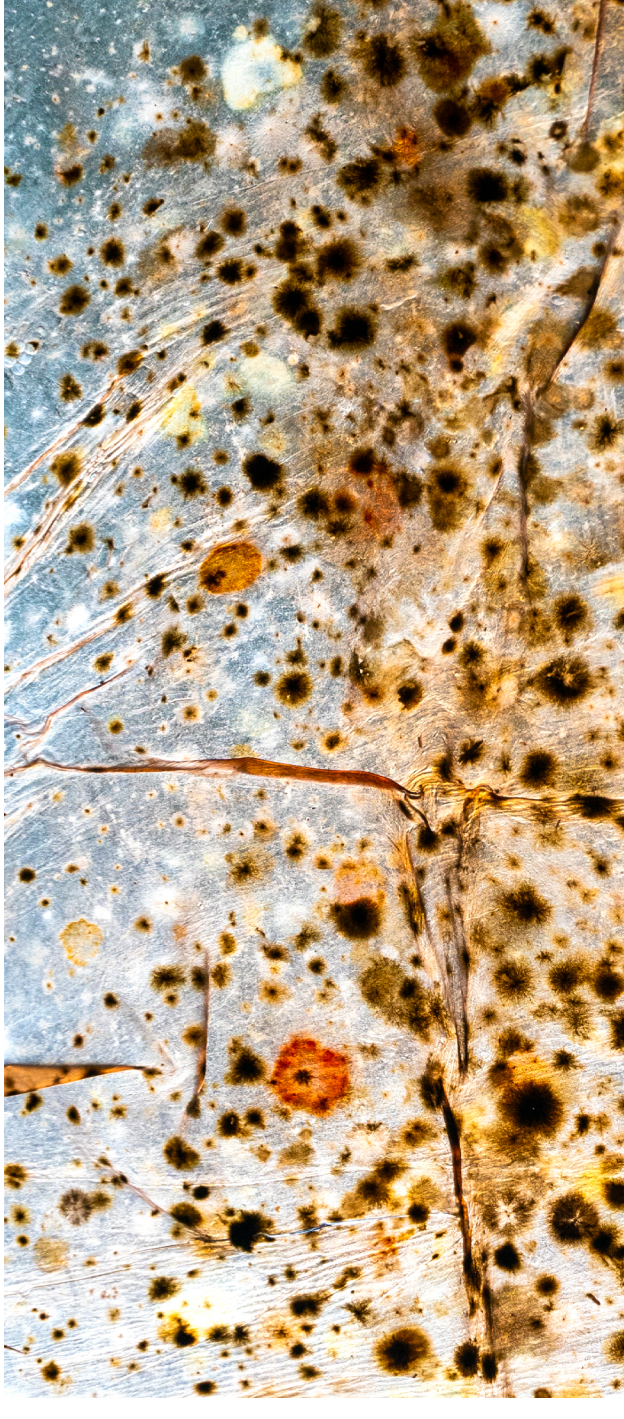


Image 44 Growth of molds and bacteria on a bioplastic sample.

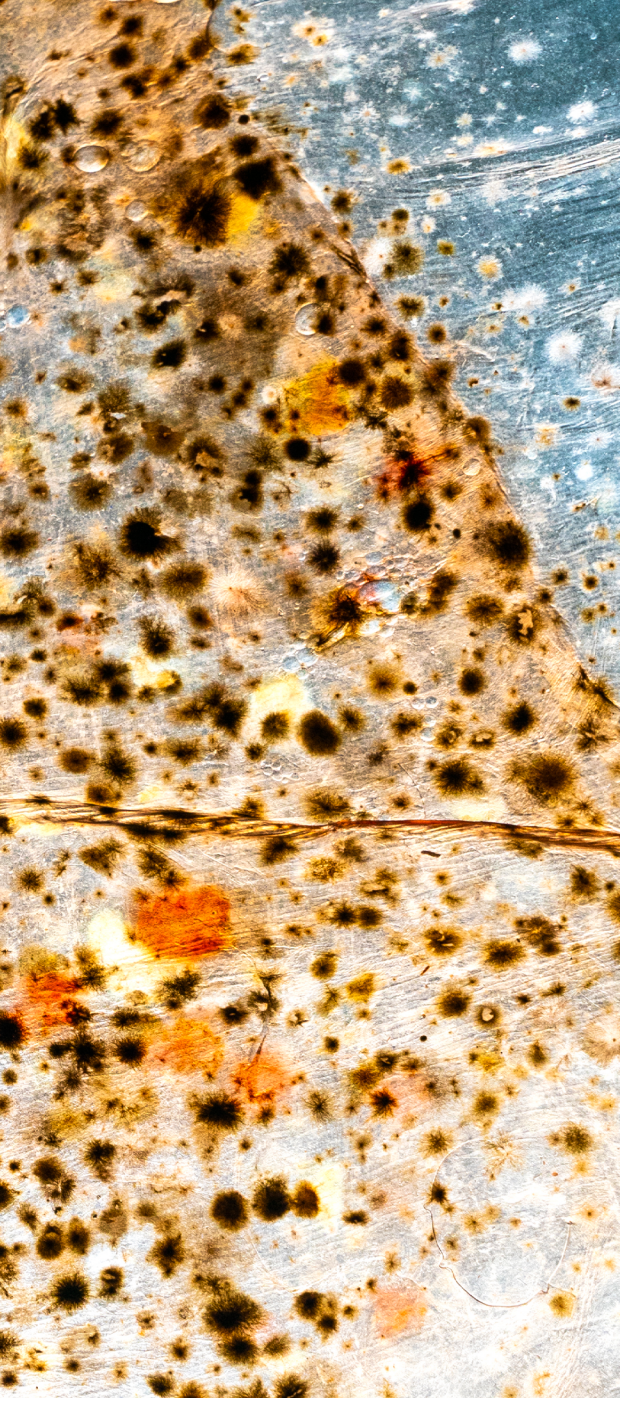


Image 45 (following page)
Fossilation's variable shades are produced thanks to variable concentrations of onion dye in *each photogram.*

to look through the bottom of bins at grocery stores and send mass emails to restaurants that might be sympathetic to the cause. A biweekly onion collection schedule was established. As the process unfolded, onions without peels accumulated in individual refrigerators as a collective good. Each week, the team cooked and shared multiple batches of caramelised onion pies (see p.38), French onion soup, and onion jams. As the temporality, form, and texture of *Fossilation* emerged as onions were peeled, slow colours allowed for a broader socio-environmental attachment to materials, the living, and human partners.

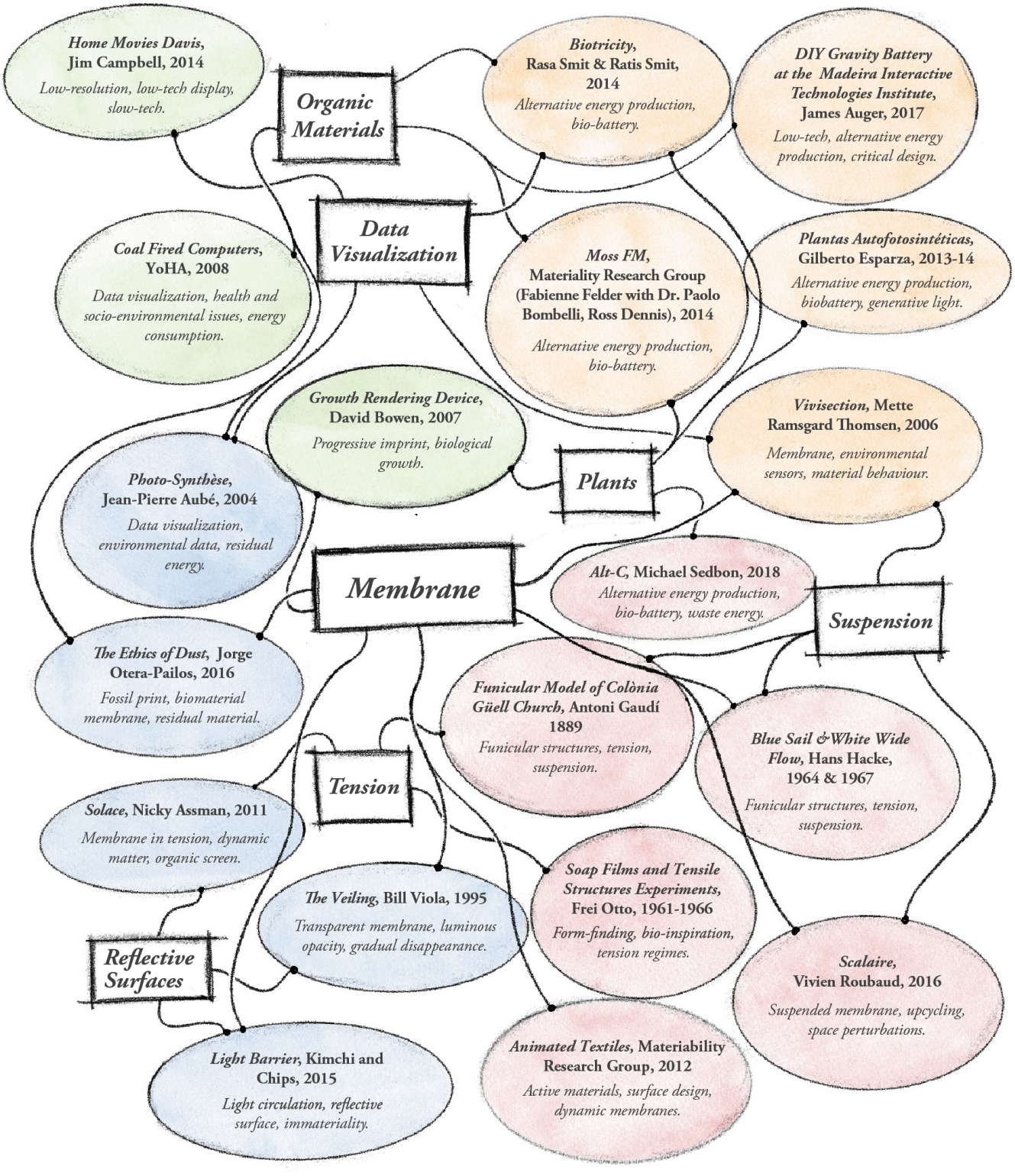
Because biomaterials also become alive as they decay – e.g. bioplastic sweat and run the risk of being contaminated – the onions brought about another series of constraints that impacted the making of the membrane as well as the conditions of its exhibition. That is, moisture and bacteria forming in the bioplastic raised aesthetic and sanitary concerns. This process gave rise to an interesting paradox: while *Fossilation's* aim was to produce a work that would be attuned to the natural cycles of the living, we were also asked to keep the living under control. Coming into a close encounter with problems of conservation, akin to those faced by museums, we actively worked on preventing contamination from weakening the membrane, and added cloves, a natural antifungal and antiparasitic agent, to the bioplastic recipe.

By implanting itself in the infrastructure of the Centre Pompidou, by collecting the residues of its various energy exchanges, by capturing the movement of its visitors, by reacting to the disturbances of its environment, and by considering the unpredictable actions of the living as an integral part of the temporal evolution of the work, *Fossilation* relays Burnham's (1968) system aesthetic principles. *Fossilation* does not care for progress so much as slow changes in relations, not so much for cutting-edge technology as low technology and not smart materials but sustainable ones.

VIII. MEMBRANE AS RELAY

What can membranes teach us about the ecology of our relations? What are Fossilation's affiliations in terms of practices and artworks? Fossilation examines how membranes can facilitate the mobility of information across systems. In *Surface and Apparition*, Yeseung Lee (2020) defines membranes as barriers that create and facilitate mediation or communication between subjects and objects. Mathias Grote (2019) examines membranes from a scientific perspective, arguing that they contain transport systems, such as carriers, pumps, and channels which deliver information to metabolites and receptors for communicating with the outside world of a cell. Membranes can be any translation layer, which converts, adapts, and conveys information from one milieu to another. Without membranes, information cannot be transferred within certain systems. *Fossilation* reinvests these relational understandings of membranes and translates them into methodological concerns to interrogate their potency to render visible the porosity between practices. It asks how membranes can create milieux instead of borders, that is, how they can keep the field of exchangeability open across practices. Even more critically, *Fossilation* interrogates how a membrane can act as a form of relaying memory. Not only through its capacity to do justice to the fossilized traces it carries, but also by implementing the possibility to continue the artworks that informed its realization. *Fossilation* relays a series of artworks as "a continuation that is also a metamorphosis" (Stengers, 2020, p.188 – our translation) and the non-exhaustive diagram presented here aims to make those porosities visible.

Image 46 (following page) Diagram of influential artworks. Green group works that examine the ecological footprint of images; orange indicates works informed by forces such as gravity; blue gathers works that explore imprints and light; and red focuses on works that address energy consumption issues.


Home Movies Davis, Jim Campbell, 2014
Low-resolution, low-tech display, slow-tech.
Organic Materials
Biotricity, Rasa Smit & Ratis Smit, 2014
Alternative energy production, bio-battery.
DIY Gravity Battery at the Madeira Interactive Technologies Institute, James Auger, 2017
Low-tech, alternative energy production, critical design.
Data Visualization
Coal Fired Computers, YoHA, 2008
Data visualization, health and socio-environmental issues, energy consumption.
Moss FM, Materiality Research Group (Fabienne Felder with Dr. Paolo Bombelli, Ross Dennis), 2014
Alternative energy production, bio-battery.
Plantas Autofotosintéticas, Gilberto Esparza, 2013-14
Alternative energy production, biobattery, generative light.
Growth Rendering Device, David Bowen, 2007
Progressive imprint, biological growth.
Vivisection, Mette Ramsgard Thomsen, 2006
Membrane, environmental sensors, material behaviour.
Plants
Photo-Synthèse, Jean-Pierre Aubé, 2004
Data visualization, environmental data, residual energy.
Membrane
Alt-C, Michael Sedbon, 2018
Alternative energy production, bio-battery, waste energy.
Suspension
The Ethics of Dust, Jorge Otera-Pailos, 2016
Fossil print, biomaterial membrane, residual material.
Funicular Model of Colònia Güell Church, Antoni Gaudí 1889
Funicular structures, tension, suspension.
Blue Sail & White Wide Flow, Hans Hacke, 1964 & 1967
Funicular structures, tension, suspension.
Tension
Solace, Nicky Assman, 2011
Membrane in tension, dynamic matter, organic screen.
The Veiling, Bill Viola, 1995
Transparent membrane, luminous opacity, gradual disappearance.
Soap Films and Tensile Structures Experiments, Frei Otto, 1961-1966
Form-finding, bio-inspiration, tension regimes.
Reflective Surfaces
Scalaire, Vivien Roubaud, 2016
Suspended membrane, upcycling, space perturbations.
Light Barrier, Kimchi and Chips, 2015
Light circulation, reflective surface, immateriality.
Animated Textiles, Materiability Research Group, 2012
Active materials, surface design, dynamic membranes.

IX. TEAM AND COLLABORATORS

Fossilation is a practice-based research project at the crossroads of art and design carried out by a collective of researchers and student-researchers from three reference institutions in the field of research-creation: Concordia University in Montreal (and its Hexagram International Network and the Milieux Institute for Arts, Culture and Technology), the École des Arts Décoratifs in Paris (and the EnsadLab laboratory and Chair in Arts and Sciences), and the University of Toronto Mississauga. Research-creation "supports the development of knowledge and innovation through artistic expression, scholarly investigation, and experimentation" (SSHRC, 2021). As a "speculative practice that invents techniques of relation" (Springgay & Truman, 2016), research-creation allows for the problematization of complex ethico-political issues by deploying collective means of reflection and action. As a form of thinking-in-movement (*ibid*), research-creation invites artists and designers to collectively re-examine their role and place at a time when collaborations and partnerships between humans and other than humans is of crucial importance.

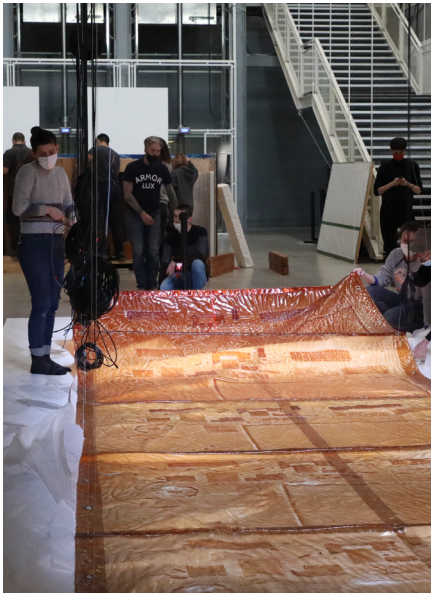
The project received support from the Social Sciences and Humanities Research Council of Canada (SSHRC), the Chair in Arts and Sciences of the École polytechnique, the École des Arts Décoratifs - PSL, the Daniel and Nina Carasso Foundation, Hexagram and Concordia University's Milieux Institute for Arts, Culture, and Technology. The project was developed for the "Matières d'images" exhibition as part of the 2021 Hors Pistes Festival, curated by Géraldine Gomez.

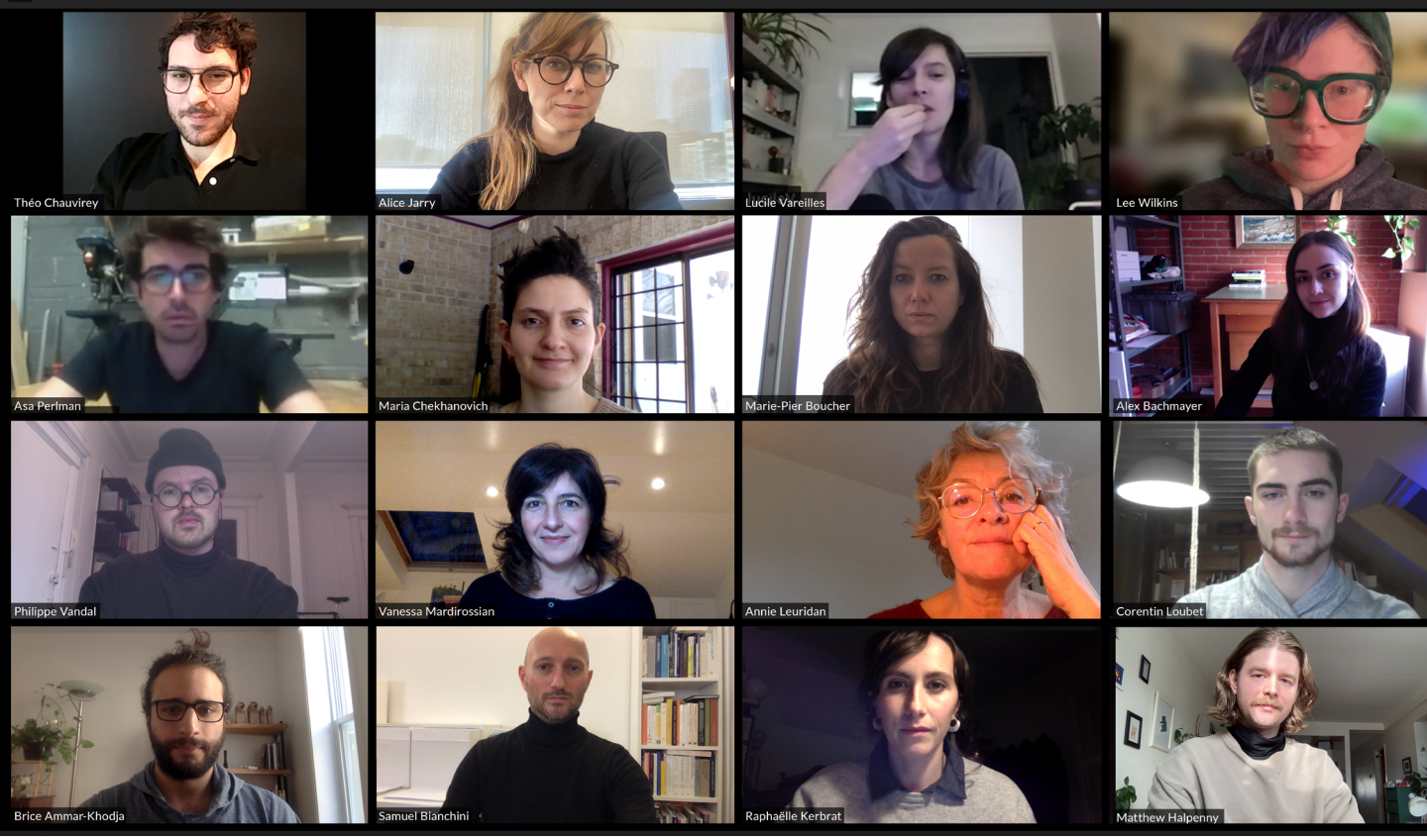
Image 47 (top) Making of the membrane at the Milieux Institute (Concordia University, Montreal).

Image 48 (bottom) Exhibition set up at the Centre Pompidou (Paris).

Image 49 (following page top) The *Fossilation* collective's weekly online meeting.

Image 50 (following page bottom) Exhibition setup at Centre Pompidou (Paris).




Théo Chauvirey
Alice Jarry
Lucile Vareilles
Lee Wilkins
Asa Perlman
Maria Chekhanovich
Marie-Pier Boucher
Alex Bachmayer
Philippe Vandal
Vanessa Mardirossian
Annie Leuridan
Corentin Loubet
Brice Ammar-Khodja
Samuel Bianchini
Raphaëlle Kerbrat
Matthew Halpenny

CREATION AND PRODUCTION TEAM

Direction: Alice Jarry, Marie-Pier Boucher, Samuel Bianchini

Experimenting and making the bioplastic membrane: Alexandra Bachmayer, Maria Chekhanovich, Vanessa Mardirossian with the collaboration of Brice Ammar-Khodja

Capturing the residual energy: Brice Ammar-Khodja, Didier Bouchon, Matthew Halpenny, Raphaëlle Kerbrat, Asa Perlman, Philippe Vandal

Light design: Annie Leuridan with the collaboration of Louise Rustan

Computer programming: Didier Bouchon

Supervision of the production of the work and its spatial installation: Lucile Vareilles

Technical support for production and/or editing: Théo Chauvirey, Corentin Loubet, Joséphine Mas, Simon Paugoy

Image 51 (following page)

Making of the membrane at the Milieux Institute (Concordia University, Montreal).

X. BIBLIOGRAPHY

Bachelard, Gaston. (1994). The Poetics of Space. Boston: Beacon Press.

Barthes, R. (1957). *Mythologies*. Paris: Les lettres ouvertes.

Boehnert, J. (2018). *Design, Ecology, Politics : Towards the Ecocene*. Bloomsbury Academic.

Burnham, J. (1968, September). Systems Esthetics. *Artforum,* 30-35.

Clausius, R. (1850). Ueber die bewegende Kraft der Wärme und die Gesetze, welche sich daraus für die Wärmelehre selbst ableiten lassen. *Annalen Der Physik Und Chemie*, *155*(3), 368–397. https://doi.org/10.1002/andp.18501550306

Grote, M. (2019). *Membranes to Molecular Machines: Active Matter and the Remaining of Life*. Chicago: University of Chicago Press.

Job, G. and Piano, R. (1987, April). Conception du centre Beaubourg. [Online video] Archives INA, Antenne 2, 22. Accessed at https://www.ina.fr/ina-eclaire-actu/video/i00011976/renzo-piano-conception-du-centre-beaubourg

Lee, Y. (2020). *Surface and Apparition: The Immateriality of Modern Surface*. London: Bloomsbury Publishing.

Munoz-Cupa, C., Hu, Y., Xu, C., & Bassi, A. (2021). An overview of microbial fuel cell usage in wastewater treatment, resource recovery and energy production. *Science of the Total Environment*, 754, 142429. https://doi.org/10.1016/j.scitotenv.2020.142429

Ponge, F. (1977). *L'Écrit Beaubourg*. Paris: Éditions du Centre Georges-Pompidou.

Raqs Media Collective. (2005). *The Rest of Now*. Accessed at https://works.raqsmediacollective.net/wp-content/uploads/2020/08/The-Rest-of-Now.pdf

Social Sciences and Humanities Research Council (2021). *Definition of Terms: Research-Creation*. Retrieved on January 23rd, 2022 at https://www.sshrc-crsh.gc.ca/funding-financement/programs-programmes/definitions-eng.aspx

Sontag, S. (1977). *On Photography*. New York: Farrar, Straus and Giroux.

Springgay, S. and Truman, S. E. (2016). *Propositions for walking research*. Dans Powell, K., Bernard, P. and Mackinley, L. International handbook for intercultural arts, 259-267. New York : Routledge.

Stengers, I. (2020). *Réactiver le sens commun: Lecture de Whitehead en temps de débâcle*. Paris: Les Empêcheurs de penser en rond.

XI. IMAGE CREDITS

Cover and Contents images	Photograph: Fossilation Collective, 2021
Images 1-3	Photograph: Fossilation Collective, 2021
Image 4	Photograph: James St. John, Wikimedia Commons, date unknown
Images 5	Photograph: Fossilation Collective, 2020
Images 6, 7	Photograph: Fossilation Collective, 2021
Images 8-15	Photograph: Fossilation Collective, 2020
Images 16-20	Photograph: Guillaume Pascale
Image 21	Photograph: Fossilation Collective, 2021
Image 22	Photograph: MarinadeArt, 2014
Image 23	Map data: Google, 2020
Images 24-27	Photograph: Fossilation Collective, 2021
Image 28	Illustration: William Couture, 2022
Images 29-35	Fossilation Collective, 2021
Images 36-43	Photograph: Guillaume Pascale
Image 44	Fossilation Collective, 2020
Image 45	Fossilation Collective, 2021
Image 46	Illustration: William Couture, 2022
Images 47-52	Fossilation Collective, 2021

Image 52 *Bon appétit!*

XII. *FOSSILATION*'S ONION PIE RECIPE: THE PISSALADIÈRE

Ingredients

· 6 large yellow onions
· 3 sprigs of fresh thyme
· 3 bay leaves
· A pinch of coarse salt
· Herbes de Provence
· About twenty black olives from Nice
· Anchovies (optional)

Recipe

· Cut the onions into small pieces.
· Stir in the onions in a pan with a little vegetable oil.
· Add all the herbs and salt.
· Cover and cook at low heat for about thirty minutes, stirring regularly (the onions should not brown).
· Put them in a colander and strain the liquid.

Meanwhile prepare the dough

· Sift the flour and add the baking powder, salt and herbs.
· Mix the milk and water and gently incorporate them into the flour.
· Add olive oil.
· Form a ball, roll it out on a floured surface and prick it with a fork.

Final steps

· Spread the onions (without the sprigs of thyme and bay leaf).
· Add the olives (and anchovies if desired).
· Bake for 25 minutes at 180˚C.

Fossilation
Nurturing Slow Expectations

Fossilation Collective and Géraldine Gomez
Edited by Alice Jarry and Marie-Pier Boucher

This research-creation folio presents the processual and technical development of a bio-inspired architectural installation that invests the ecological imprint of images. Originally presented during the 2021 ''Matières d'images'' exhibition held at the Centre Pompidou in Paris (Hors Pistes Festival), *Fossilation* is a large suspended bioplastic membrane that repurposes food waste. The installation includes an electronic and electrical apparatus that harvests the residual energies of the museum to create fluctuating light patterns. Membranes are porous interfaces that participate in metabolic exchanges and enable and foreclose the mobility of information across systems. By reinvesting the relational operations of membranes, *Fossilation* makes us more attuned to the extractive origins of our contemporary forms of communication and develops new forms of cooperation between materiality, technology, humans, and ecological milieux. The publication is organized around seven key thematics that pertain to the making of *Fossilation*: The Ecology of Images, Fossils, *Fossilation*'s Ingredients, Bioplastics, Systems Architecture for Energy and Light, Nurturing Slow Expectations, and Membrane as Relay. Together these organizing forces render visible the resonances and contrasts between the conceptual, material, technological and methodological dimensions of the piece. With an emphasis on slow and low-tech methods, this folio examines how *Fossilation* might contribute to next-generation living architecture. The authors conclude the discussion by sharing the *Fossilation* collective's onion pie recipe, the Pissaladière.

This folio on *Fossilation* might contribute to next generation possibilities of living architecture. The authors of this folio, Dr. Alice Jarry, Dr. Marie-Pier Boucher, Dr. Samuel Bianchini, Brice Ammar-Khodja, Alexandra Bachmayer, Théo Chauvirey, Maria Checkhanovich, Matthew Halpenny, Raphaëlle Kerbrat, Vanessa Mardirossian, Philippe Vandal, and Lee Wilkins are researchers and student-researchers from three reference institutions in the field of research-creation: Concordia University in Montreal, the École des Arts Décoratifs in Paris, and the University of Toronto Mississauga. Géraldine Gomez is the curator of the Hors Pistes Festival at the Centre Pompidou in Paris.

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