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Crafting Time: Speculative Archaeology and Inorganic Becoming

Introduction

The practice of design is among the disciplines generating the most dramatic consequences for our environment. The will to build stable, perennial objects crossing time, combined with a strategy for constant renewal, programmed obsolescence, and trend generation is at the heart of the waste problem as much as the legacy of designers' actions. How to question this fate and develop alternative strategies? If a circular economy and bio design is the current answer, different approaches could be explored. The ecological crisis is essentially a temporal issue. It forces us to analyze the consequences of our actions over thousands of years. At the same time, however, it is a great acceleration, where every year counts, and the choices for drastic change have become stressfully urgent. The project presented in this article tries to take a different stance toward our legacy to future generations with a desire to act in the present. Entitled "petrification," this research has given rise to more than seven years of material and conceptual explorations. Started as a very pragmatic method to generate a new local craft, it then led to question the relations between organic and inorganic matter, the symbolic power of petrification as a material and cultural transformation, and the relations between technicity and culture through an interpretation of Gilbert Simondon's theory of technology. This research project has been essentially an investigation, full of discoveries, twists and turns. In the following pages, I will give an account of this situated investigation and its multiple facets.

Weaving, Folding, Cutting—Without Translations

The project begins in 2015 in the context of the maker movement. The idea of bringing production to as many people as possible, of designing objects or repairing them in local workshops, of a *democratic making*, was then developing in communities of designers, engineers, hackers, and companies. I was involved in several collective projects of this type—and would be considered a "maker." I was often invited to carry out innovation projects over short periods of time, also called hackathons, in schools, companies, or for public institutions. In this context, it was essential to find materials and tools that would allow everyone, whatever their degree of knowledge or sensitivity to DIY, to express their ideas, to shape them, and to refine them. In these hackathon contexts, we would bring 3D printers, laser cutters, or other digital fabrication tools. Of course, these machines required skills, knowledge, or mediation that were often in-

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appropriate. I then realized the power and democratic aspect of paper and cardboard. Much more than modeling clay or drawing, these cellulosic materials were known to everyone. They implied tools and techniques that every actor could easily understand, and at the same time allowed to generate forms surprisingly sensitive and complex. Over and over, paper and cardboard were becoming the central material and came to be, in my experience, the most shared, universal, and democratic tool to materialize ideas. Cutting, making patterns, assembling, folding, creating structural lines, tensioning—all these operations are experienced from an early age, and remain known to all levels of society (fig. 1).

Fig. 1: Emile de Visscher, petrified paper origami, 2017. Experiments conducted with students from the PIG workshop at Chimie ParisTech, Paris.

However, the paper or cardboard prototype is, most of the time, only a temporary initial form. In a design process, paper has a long tradition.[1] This first handmade shape then requires a series of translations: it is measured, modeled on a computer, translated into technical parts, reproduced by a series of various processes that, after manufacturing, can finally be assembled and become functional objects. In all these translation processes, the tools of modeling, manufacturing, and their constraints intervene, and modify the initial idea. They may lose the immediacy and the power

1 Konstantin Grcic, "I Love to Hear Someone Cutting Cardboard," *The Art Newspaper*, January 1, 2010, https://www.theartnewspaper.com/2010/12/01/interview-with-designer-konstantin-grcic-i-love-to-hear-someone-cutting-cardboard.

of the first forms and the immediate intelligence of hand manipulations. How to skip these translation processes? Is it possible to directly transform paper and cardboard experiments into functional objects without all these biases? I realized that I had to find a way to transform the organic into the inorganic, that is, to find a way to petrify these materials. This process exists in nature. It can be found in the deserts of Arizona, where whole trees, preserved from decomposition, are progressively infiltrated by minerals that crystalize and transform organic matter into stone. This geological manifestation became the center of my research to understand its mechanisms (fig. 2).

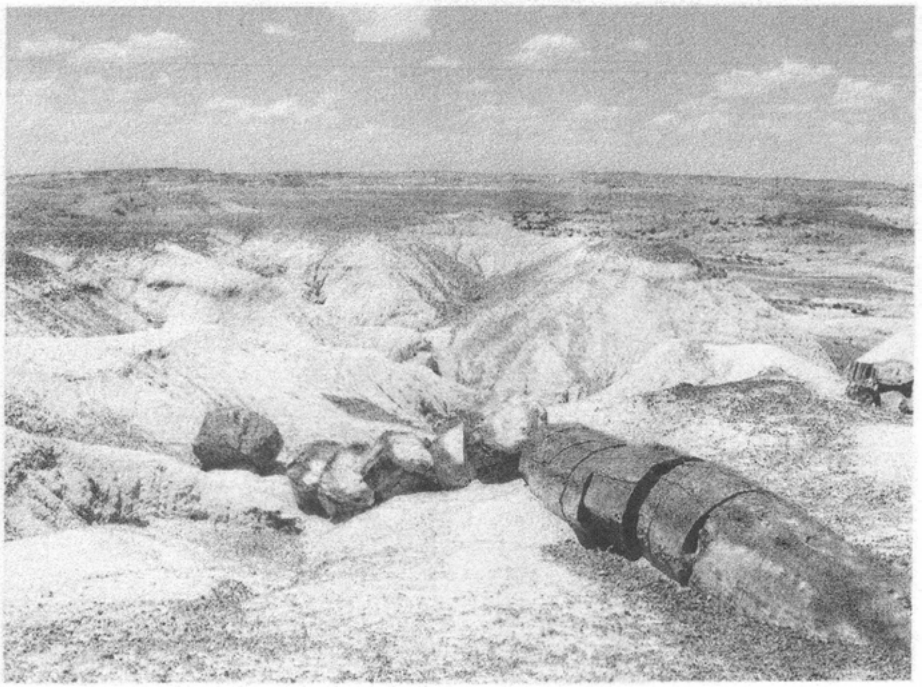

Fig. 2: Stefan Pauli, petrified tree in Petrified Forest National Park, United States, 2001.

Technophany: Myths, Labs, and Video Games

During an initial literature overview, I stumbled upon a popular science news reporting on a Californian laboratory that had succeeded in *petrifying* cellulose: "Achieving what would take millions of years in only a few days, scientists have drastically sped up the process of petrifying wood."[2] Of course, the scientific article of the chemis-

2 Brandon Miller, "Presto! Instant Petrified Wood Created in Lab," *Life Science*, January 27, 2005, www.livescience.com/110-presto-instant-petrified-wood-created-lab.html.

try lab itself did not talk about petrification, but rather about *bio-mineralization templating*. The method used involved a soaking in acid to remove the lignin of the wood cubes, followed by an infusion of silica to finally cook the carbon/lignin composite in an atmosphere furnace at 1,400° C (fig. 3). During this firing, the carbon and silica could be transformed into silicon carbide (SiC), whose mechanical properties are close to diamond. The aim of the process was to produce silicon carbide filters, the filtration quality of which would depend on the porosity of the chosen wood. Several aspects were interesting here: the use of the term "petrification," the history of silicon carbide, or the transformation of biological structures for technical applications.

Fig. 3: Emile de Visscher, atmosphere furnace used for the petrification process, 2016.

While materials science is usually looking for performance and control of its properties, the use of biological materials in engineering, mechanics, and design remains, in my experience, a problem. Too composite, too anisotropic, too tied to the ways in which it was grown, or the context of its production, biological matter is considered irregular, impossible to predict, and unscalable. In my engineering studies, they were not studied—we were limited to metals, plastics, and industrial ceramics. All of them were "solid," isotropic, scalable, stable, resistant to their direct environment, and thus allowed a prediction of the behaviors, calculation of their properties, and design with CAD software. But in this article, the strategy was different. Instead of using fully controlled and artificial materials, and then try to construct a complex foam system to generate filters out of them, these scientists use the structural intelligence of a natural material to obtain complex shapes, and transform the material into a stable

and rigid structure.[3] Bio-templating, as a form of making, is in this sense closer to ancestral craft traditions than to modern engineering, as it relies on the intelligence, properties, and singularities of organic matter rather than reconstructing complex structures from passive and amorphous materials. It is, in a way, a matter of "making with,"[4] of telling other geo-stories than the *tabula rasa* and hylomorphic ones (fig. 4).

The crystal formed by this process, silicon carbide, is not without interest and history. A ceramic form that exists in nature, moissanite, was named after the French chemist Henri Moissan, who first discovered it in the Diablo Canyon in Arizona. It is present in very small quantities on our planet's crust and is always the result of an external contribution by meteors (fig. 5). Natural silicon carbide is older than our solar system and is considered a "pristine interstellar material."[5] It has extensively been studied to understand the nuclear and chemical processes occurring in the formation of stars. However, the synthesis of such a rock precedes its discovery in craters. Suggested by Franz Jakob Berzelius in 1824, the first produced SiC material was eventually achieved by Eugene Acheson in 1892, which he called "Carborandum" and started to produce industrially. Its mechanical properties are impressive, and its heat resistance and lightness make it useful for many applications, in aerospace, heating systems, or grinding tools. As such, silicon carbide could be considered the cursed brother of diamonds, quite similar in many applications, but never considered as valuable, precious, or metaphorically charged in society and common applications.

But to me, the most interesting discovery was the use of the term "petrification" in Miller's article. Why use this term? What does it refer to? The technical process, beyond the mechanical qualities, was calling for a deeply rooted collective metaphorical reference. As I dug into the literature, I realized that petrification was present everywhere in society. It can be found in video games, science fiction movies, comic books: stories about the power to transform living beings into stone, and about stones that come to life. But in a much deeper sense, it comes from myths all over the world. Whether in Japanese, Australian, Indian, South American, or Central African mythology, and even in the Bible, there are stories of humans turning into stone.[6] Celtic and Icelandic mythology, for example, associates rock formations with trolls petrified by the sun. In the European context, Medusa is without doubt the figure that petrification is constantly referring to. Medusa is one of the three Gorgons, those who gaze into her eyes turn into stone, her hair is made of snakes, and she is defeated

3 To learn more about these strategies: Paris Oskar, Ingo Burgert, and Peter Fratzl, "Biomimetics and Biotemplating of Natural Materials," *MRS Bulletin* 35, no. 3 (2010): 219–25.

4 "Making with" can be read through the lens of "Sym-poiesis," a concept developed by Donna Haraway. See Donna Haraway, "It Matters What Stories Tell Stories; It Matters Whose Stories Tell Stories," *a/b: Auto/Biography Studies* 34, no. 3 (2019): 565–75.

5 To know more about the exact origins of the "cosmic chemical memory" of silicon carbide: Jim Kelly, "The Astrophysical Nature of Silicon Carbide," *UCL online*, img.chem.ucl.ac.uk/www/kelly/history.htm.

6 "Petrifaction in Mythology and Fiction," Wikipedia, last modified July 16, 2023, https://en.wikipedia.org/wiki/Petrifaction_in_mythology_and_fiction.

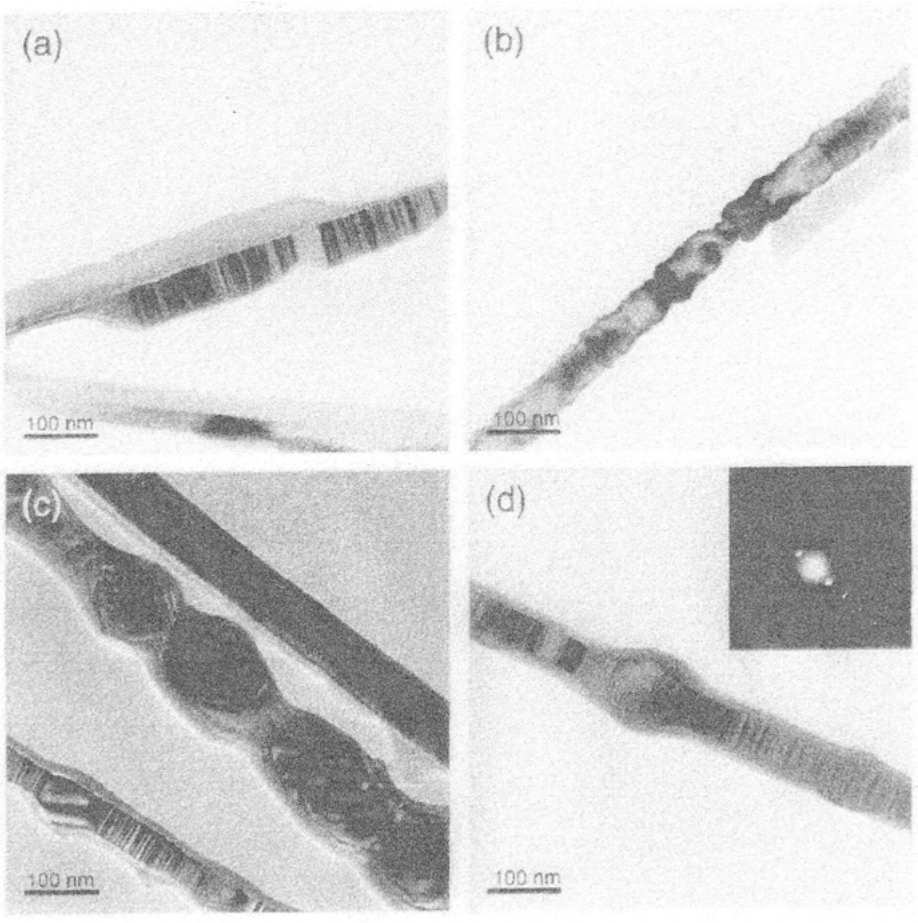

Fig. 4: Scanning electron microscopic images of SiC materials. In Yongsoon Shin, Chongming Wang, Gregory J. Exarhos, "Synthesis of SiC Ceramics by the Carbothermal reduction of Mineralized Wood with Silica," *Advanced Materials* 17, no. 1 (January 2005): 75.

by Perseus who uses a shield to protect himself and cut off her head, from which will come Chrysaor and Pegasus (fig. 6). Perseus will then take Medusa's head with him to defeat his enemies and eventually offer it to Athena, who will place it on her shield and thus obtain the power of petrification as a weapon to protect the Athenians. Symbol of a violent, uncontrollable, and dangerous femininity, at the antipodes of the strong and protective Athena, Medusa gives an account of an ambiguous position, powerful but enticing, seductive but dangerous, uncontrollable but potentially useful.

The petrification of wood we are talking about here is not only a technical process opening new manufacturing possibilities. It is also a cultural process bringing into play collective knowledge, dreams, and fundamental fears. The philosopher Gilbert Simondon had a term to qualify this quality: "technophany." In a series of conferences given

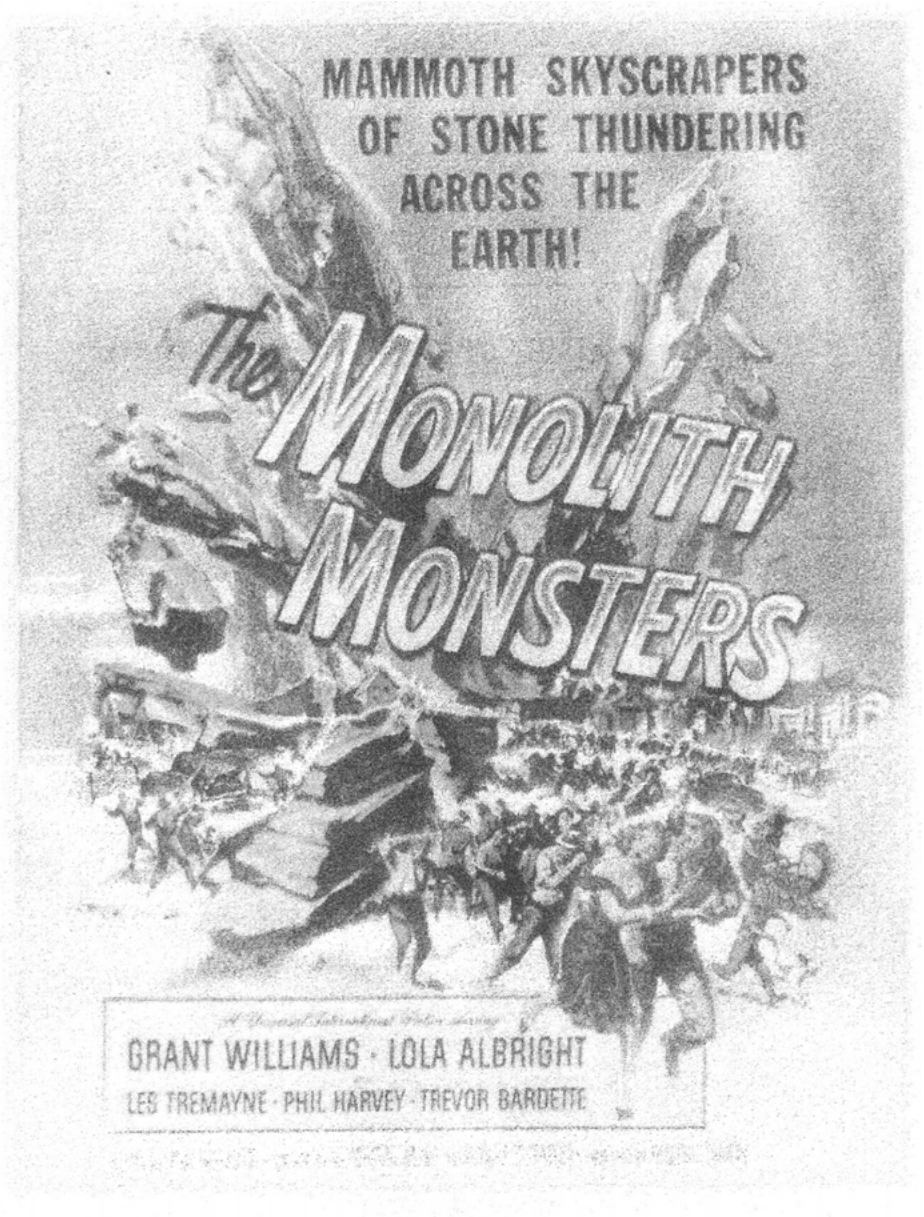

Fig. 5: William Reynold Brown, *The Monolith Monsters*, 1957, poster art.

Fig. 6: Sir Edward Coley Brune-Jones, *The Death of Medusa I*, 1882, mixed media on paper, 1245 × 1169 mm. Southampton City Art Gallery, United Kingdom.

between 1960 and 1961,[7] the French philosopher of technology argued for the idea that certain technological processes had capacities to make play of cultural contents, that they had the capacity to inscribe themselves in the society not by their functions, their political contexts, or the speeches that they supported, but by their operativity itself, by their inherent technicality. The petrification process, the passage from the organic to the inorganic, the capacity not to be affected by death, but to be blocked in a state-stone, makes play of all these collective references. The term technophany itself

7 Gilbert Simondon, "Psychosociologie de la technicité (1960–61)," in *Sur la Technique*, ed. Gilbert Simondon (Paris: Presses Universitaire de France, 2014), 37.

makes direct reference to myths, because it was constructed in relation to Mircea Eliade's "hierophany."[8] Indeed, this historian and theoretician of alchemy, magic, and the sacred had established a term to speak about the way in which certain objects, in ancient cultures, could at the same time represent the sacred and make it exist in society, without losing their functionalities. An object would then have several existences: it would exist beyond functionality. But Eliade also stated a loss of this quality in modern times. According to him, objects were now considered in one dimension only, "not more than themselves,"[9] locked in their own existence of commodities. In reaction to this conclusion, Simondon speculated the existence of such relations in contemporary technical objects. He thus looked for links between technicity and culture, between operativity and symbolic dimensions—as a way to reunite these two regimes whose modes of existence have "dephased" according to his theory.[10]

Speculative Archaeology: Anthropocene and Diversity

The newly called "petrification" project thus took on a new dimension, not only through these relationships to the past, but also to the future (fig. 7). For petrification has always been a reference to death, to the destruction of life, but also to what endures, to what passes through annihilation. It is a pharmakon, in the sense of a poison and a cure, a fantasy and a dystopia intertwined. The stone statue, if it does not live, is also the means used in all ages to keep track of the living, to perdure, thus its use for important people, kings, emperors, and artists. The idea of petrifying humans, of finding technical devices to make bodies last beyond death, gave rise to numerous researches, notably in Italy and France in the nineteenth century.[11] Some even called it "Androlithe,"[12] as a new stone made from petrified human flesh.

But this question—our death and survival—is back in a very urgent fashion: the Anthropocene makes us consider the end of the living world. As such, the Anthropocene is calling for a petrified planet—a vision of horror, of the end of life, of the end of diversity, of a mass of reinforced concrete and grayish plastic replacing the wilderness of fauna and flora, material legacies and inherited techniques. The end of sub-

8 Mircea Eliade, *Le Sacré et le Profane* (Paris: Gallimard, 1965), 17.

9 Mircea Eliade, *Images et Symboles: Essais sur le symbolisme magico-religieux* (Paris: Gallimard, 1980 [1952]), 249.

10 Gilbert Simondon, *Du Mode d'Existence des Objets Techniques* (Paris: Aubier, 2012), 164–65.

11 Marta Licata, Chiara Rossetti, Chiara Tesi, Omar Larentis, Roberta Fusco, and Rosagemma Ciliberti, "To Save a Corpse from Decomposition – the Purpose of Petrification in the Second Half of the 19th Century," *Acta Medica Academica* 48, no. 3 (2019): 328–31.

12 Gian Marco Vidor, "Androlithe et pétrification des cadavres humains au XIXe siècle," *Frontières* 23, no. 1 (2010): 66–73, https://doi.org/10.7202/1004025ar.

Fig. 7: Emile de Visscher and Ophélie Maurus, "Petrification: Material Transmutations and Speculative Archaeology," *able.journal* (2023), https://able-journal.org/petrification.

tle and diverse forms of life seems close, all of a sudden. What will be left? What will remain? What should remain?

To propose a process of transformation of fragile forms—paper, rope, fabrics, wools, cardboard foams—into stone, becomes then a means to question our future (fig. 8). A kind of speculative archaeology, the project asks us to choose what should remain, rather than to suffer the uncontrolled accumulation of waste. Can the Anthropocene layer be populated with diversity rather than industrial waste? Can we think of a joyful Anthropocene rather than just consider it a depressing fate? What will remain of the weak forms, the fragile techniques, the ephemeral materials, the know-how less visible than those of industry?

Conclusion: Democratic Enquiry

This issue should not remain in my hands. It must become a common object, a collective thing—a "res-publica." It is a question of inviting actuators of all kinds, designers, architects, craftsmen, researchers, to ask the question together and imagine our remains, our ruins, our heritage. To approach the question in functional, symbolic, aesthetic, political, geological, anthropological, mineralogical, archaeological terms, and to produce time capsules that build our collective visions of the future. Without providing definitive answers, these material experiments are ways to see beyond the end of the

Fig. 8: Emile de Visscher and Ophélie Maurus, samples, presented in "Petrification: Material Transmutations and Speculative Archaeology," *able.journal* (2023), https://able-journal.org/en/petrification/.

world, without getting stuck in technological fixes for sustainable growth. By inviting Matters of Activity colleagues working on bacterial cellulose, or industrial designers, or textile artisans, the project becomes a place to meet and discuss the aftermath of the world: of what will remain—or what should remain—of our fragile existences.