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## ► To cite this version:

Germain Meulemans, Marine Legrand, Anaïs Tondeur, Yesenia Thibault-Picazo, Alan Vergnes. Soil Fictions: Addressing Urban Soils between Art, Soil Ecology, and Anthropology. Collaborative Anthropologies, 2018, 10 (1-2), pp.20-44. 10.1353/cla.2017.0001 . hal-02882883

**HAL Id: hal-02882883**

**<https://hal.science/hal-02882883v1>**

Submitted on 27 Jun 2020

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## Soil Fictions: Addressing Urban Soils between Art, Soil Ecology, and Anthropology

Germain Meulemans, Marine Legrand, Anaïs Tondeur, Yesenia Thibault-Picazo, Alan Vergnes

**Abstract:** This paper examines how artistic collaborations between anthropologists and natural scientists can help address challenges that themes relating to the Anthropocene and more than human realities pose to academic disciplines. It draws on a one- year collaboration among two anthropologists, two artists, a soil ecologist, and a geographer working toward an exhibition on the heavily anthropogenic soils of cities. The preparation of speculative Soil Fictions— narrative installations shown in the exhibition— allowed experimenting with new modes of inquiry that proved complementary to more traditional ethnographic methods. The authors argue in favor of wider recognition of such experiments within anthropology.

**Keywords:** Soil, artistic collaborations, environmental anthropology, residence, fiction, narration, galalithe, biomining

**Article citation:** Germain Meulemans, Marine Legrand, Anaïs Tondeur, Yesenia Thibault-Picazo, Alan Vergnes (2018) « Soil Fictions: Addressing Urban Soils between Art, Soil Ecology, and Anthropology », *Collaborative Anthropologies*, Volume 10, Numbers 1-2, Fall-Spring 2017-18, pp. 20-44. DOI <https://doi.org/10.1353/cla.2017.0001>

The words “collaborative anthropology” cover a wide range of different practices and experiments, many of which have to do with a collaborative partnership between an anthropologist and local communities (Lassiter 2008). Anthropologists, in the cases described by Lassiter, engage in practices of collecting information, analyzing it and writing about it in a prolonged dialogue with people met during fieldwork, who thus become “co- ethnographers” (Lassiter 2008). Experiments in collaborative anthropology have contributed to a critique of the “lone ethnographer,” of what Erickson and Stull (1998) call a “religion of academic individualism,” which has prevailed in anthropology since Malinowski. In comparison to other

kinds of collaborative anthropology, working with artists is a relatively new subject, despite important publications paving the way since Marcus and Myers's (1995) *Traffic in Culture* and more recent work by Schneider and Wright (2010). In this essay we reflect more particularly upon the role that collaborations between art, anthropology, and ecology can play in regard to current approaches in environmental anthropology. We base our argument on a collaborative experiment within which anthropologists, natural scientists, and artists collaborated together in order to address a specific topic: anthropogenic soils.

In July 2015 two environmental anthropologists, two artists, a soil scientist, and a social geographer took part in the early meetings of a project aimed at developing a collective experiment that would take the form of a residence in a contemporary art center near Paris. Together we conceived of a project that would address soils and how they intertwine with the lives of humans. More particularly, it would investigate how these relationships unfold in an era in which most humans live in cities and are therefore little confronted to what we usually understand to be "soil." The underlying question of the project was how to develop an ecological approach to soils that would not be at odds with the daily experience of Anthropocene urbanites— who are confronted more often with polluted, sealed, or otherwise anthropogenically transformed soils than with agricultural or so-called natural soils. This project was called Soil Fictions. Over the seven months of the project, we gathered in a house within the park of Chamarande, near Paris, for five weekends, and were in touch with each other several times a week for the rest of the time. We exchanged ideas, books, papers, and sketches, and learned to do research together in a prospective, forward-looking, and generative way. We had the chance to be allocated modest funding by the Coalition for Art and Sustainable Development (COAL), a French curator association that supports artists working on social and environmental issues and promotes exhibition projects operating at the crossroads of art and the environmental sciences. We used this funding to reimburse travel expenditures, remunerate the two artists in the group (who had no paid academic jobs), and buy material for the production of our installations.<sup>1</sup>

Even though only Alan Vergnes, the soil scientist, and Germain Meulemans, one of the anthropologists, had worked on soils before, all the participants were interested in environmental questions and in the challenges natural and social science disciplines face before matters such as the Anthropocene. When we started the residence, we knew we were working toward an exhibition, but all the rest was open for us to develop. From the experiment emerged seven collaborative installations— seven Soil Fictions— developed in pairs or trios. Some of

these in turn gave birth to several workshops with the public and continue to be presented in other settings up to the present.

### **World- Making in Environmental Anthropology**

This essay examines how such collaborative experiments can contribute to current debates in the anthropology of the environment. In recent years, studies in the anthropology of the environment have increasingly shifted their starting point from a “fixist” ontology, which takes “nature” for granted and examines variations in the human understanding of it, to an “emergent” ontology, which strives to understand entanglements between humans and the environment in terms of emergent trajectories. A major inspiration has been Marilyn Strathern’s impulse to understand the world as “fractal” rather than “fragmented.” In her seminal book *Partial Connections* (1991), Strathern suggests that we cannot see the world all at once, or should not think of it in terms of “parts and wholes,” because the world is always multiply enacted. Processes of “world- making”— the socio- material enactment of the world— produce “multiple realities,” and we always only have access to making “partial connections” between these. There is not one world or one reality, but realities that cohabit and sometimes enter into “friction” (A. L. Tsing 2005), and anthropology’s task therefore becomes to account for these multiple realities and the way they interact. Along with other influences ranging from multispecies ethnography (Haraway 2003) to ecological phenomenology (Ingold 2000), this has encouraged anthropologists to provide pluralistic accounts of ways of inhabiting and making worlds, each of which has its particular twist and entails different kinds of tensions and attention.

Since the turn of the century these discussions have been continued through anthropological propositions associated with the “ontological turn” which have set out to “take seriously” the ways of thinking of people encountered in fieldwork— be they Amerindian peoples from Lowland South America (Viveiros de Castro 2014) or anti-globalization activists (Escobar 2008). The core of this endeavor is not to see people’s ideas, behavior, or culture as something that should be explained but as embedding knowledge with which it is legitimate for the ethnographer to think. It is thus an impetus for the ethnographer to move beyond a representationalist framework, and use these theories that arise from fieldwork as tools or aids for thinking, to grant them the power to open Western scholars to other kinds of realities and “introduce thoughts [they] would not otherwise entertain” (Strathern 1991, 39). The aim is to

ally with these knowledges to operate the “permanent decolonization of thought” (Viveiros de Castro 2014) against the distinctively human and Western kind of reality on which much of anthropology is premised.

### **Emergent Ontologies and Art**

In recent years several anthropologists have mentioned artists as a potential ally for the ontological anthropology to which we refer. For example, Tim Ingold (2015) stresses that a “world of becoming” is unknowable outside our affective engagement within it. In this regard Ingold encourages anthropologists to “[heal] the rupture between imagination and real life” (2014, 383). In this, Ingold argues, anthropologists can find common cause with artists, who also craft speculative, exploratory, and experimental inquiries into the ways people live and inhabit their environments. Donna Haraway, in her recent writing, similarly advocates for an “art-science activism” (2016) that departs from the ambition of representing the world in either poetic or realistic renderings, but jointly engages in exploratory inquiries and conjures up a “sensible materialism with all its pushes, pulls, affects and attachments” (2016, 68).

These calls warn us not to oppose too rigidly fiction and reality, imagination and facts, or invention and description (Sukla 2015). They echo with practices that were common in the early days of our modern scientific disciplines. As Preston (2015) shows, until the eighteenth century, doing science was not as strictly separated from writing literature. Many scientists wrote fictive travel stories, and these were not regarded as just an ornament, or a way to communicate better, but rather as a way to further one’s understanding, to participate in the research process. One example among many others is the French astronomer Camille Flammarion, who is well known both for his scientific breakthroughs and for his hybrid creative work. As the historian of science Bernadette Bensaude-Vincent (1989) explains, Flammarion claimed to be both a poet and a scientist, as two inseparable facets of the same personality and creative process. His scientific books, such as *Real and Imaginary Worlds* (1864), were written in a unique lyrical style, and he organized popular events such as a great sun celebration in front of the Eiffel Tower and competitions for drawing the phases of the moon. Imagination, experimentation, and observation in these examples walked hand in hand in the crafting of knowledge. Fiction, both a poetic venture and an exercise of the imagination, is prime in creating and opening up worlds rather than just exploring the world. Every fiction is a door to a new universe that brings the reader, but also the writer, into other points of view, other senses of what is normal or not. Such

a take on the power of fiction strongly resonates with Holbraad, Pedersen, and Viveiros de Castro's definition of ontological anthropology as a "could be" experiment in which the emphasis is as much on "be" as on "could" (Holbraad, Pedersen, and Viveiros de Castro 2014), which these authors exemplify with the following dialogue: "'Imagine a cyclical time!' marvels the relativist; 'Yes, and here is what it could be!' replies the ontological anthropologist" (Holbraad, Pedersen, and Viveiros de Castro 2014).

### **From Interdisciplinary to Artistic Collaborations**

Before we continue addressing the kind of displacement that fiction and art can bring about, let us briefly review how collaboration between anthropology and the natural sciences often works in the particular spectrum of the environmental sciences— in which collaboration is often described as a central concern (Nye et al. 2013; Hall et al. 2015). Many authors have argued in favor of interdisciplinary collaboration in the face of the sheer complexity of environmental topics (Ostrom 2009; Chapin, Kofinas, and Folke 2009). Since there are very few corners left on the planet where human influence is not perceptible (Ellis and Ramankutty 2008), it has been argued since the 1970s at least that social scientists should collaborate with natural scientists in order to embrace the multifaceted realities of topics such as climate change, the loss of biodiversity, or the spread of invasive species.

These discussions often come down to the topic of interdisciplinarity (Welch- Devine and Campbell 2010; Gragson 2013). In the past thirty years there has been a growing demand for bringing social scientists to work in research programs on environmental or conservation issues. Natural scientists are generally more accustomed to certain forms of collaborative work than are anthropologists. In their disciplines the sharing of tasks within the lab and multiple authorship for publications tend to be the norm. However, natural scientists' collaborative model revolves around a division of labor that is hard to reconcile with ethnographic immersion. Generally fewer in number than their natural science peers in these partnerships, anthropologists tend to struggle to participate in building the general analytical frameworks on which collaborations rely. Furthermore, gaps persist between what is expected from them and what they can do or are willing to do. In the worst cases they tend to be convened only to work on the "social aspect" of the problems at hand. They are asked to anticipate negative consequences of policies and play the role of foretellers (Balmer et al. 2016). As Balmer and colleagues observe, "The onus in collaborations tends to be on social scientists to work towards

integrating themselves” (Balmer et al. 2016, 74), as they are required to deliver results, which, in their form, are compatible with those delivered by the natural sciences. As any anthropologist would attest, this is certainly not an efficient way to approach the complexity of environmental issues.

Pre- set divisions of labor are also present in many contemporary attempts to bring together art, anthropology, and the soil sciences. Those exemplified in Landa and Feller’s (2010) important volume *Soil and Culture*, or in Adams and Montag’s (2015) *Soil Culture*, are often concerned either with analyzing representations of soils in art or with using art to communicate better a scientific concern for the importance of soils. Art, in this view, is regarded as a medium to transfer scientific knowledge or to “bridge the communication gap” (Toland and Wessolek 2010). The idea behind this is that scientists, because of their reliable research tools and methodologies, are better aware of the consequences of the way we treat the environment than are members of the general public. However, to them, the need for a shift in the public’s behavior regarding these problems is not being communicated fast or efficiently enough. People resist the needed cultural change. This is clear in Buckland’s contention: “Perhaps cultural approaches can succeed where the hard facts of science have failed” (Buckland 2012, 1). By being concerned with cultural or artistic interpretations of soils, these accounts tend to repeat a boundary between hard and sensible knowledge of soils, between knowledge and art, and between facts and values. Such an approach risks foreclosing the possibility for art, science, and anthropology to impact one another deeply when collaborating.

Nevertheless, it seems that the current states of anthropology and the soil sciences produce an unprecedented situation for exploring convergences between the two fields. Since the multiplication of studies of “living soil” in the 1990s, the paths taken by soil ecology bear interesting resonances with the endeavors of ontological anthropology. In the view of soil ecologists, soils themselves cannot be understood outside the particular processes that constitute them. Soil ecologists do not study soils as objects that furnish the environment but as hubs of transformative processes. Soils are primarily *pedogenesis*: processes of soil formation that enfold other movements of the environment such as the decay of organisms, the passage of seasons, the climate, or indeed the modes of dwelling of humans that inhabit the surface.

The lesson of soil ecology is that even though soil may at first give an impression of wholeness and solidity, this feeling is quickly unsettled once one engages with it more closely. The writings of Maria Puig de la Bellacasa (2017), for instance, attract our attention to soil as the fold of complex organic matter and minerals, vibrant with potential for other life to thrive. Such

an approach to soil belies the preconceptions behind the story of contemporary soil use, based on a strict separation between soils dedicated to agriculture and often mediated by the implementation of monoculture. It shows that this is not the story of a liberation from the vagaries of nature, but one of forgetting entanglements (Tsing 2012). This bears an ethical element as well, as it opens up different horizons for our relationship with soils and raises the question about the role of human actions in the future of soils. Soils are no longer an inert surface, a backdrop for our actions, but evolve and change depending on the ways in which we care for them or not.

When we started the Soil Fictions meetings, we agreed that we should not rely on usual disciplinary divisions of labor when engaging in the project. The anthropologists among us argued against the model in which each discipline contributes a specialized study, which remains to be stitched to other specialized study in order to obtain a bigger picture. All of us agreed that we would make much more of this collaboration if we let the other participants' methodologies and epistemologies impact ours. We suggested that art can be a research method; it can be a way of doing anthropology and not just of communicating it. We believed that artistic collaborations could participate in establishing anthropology as a key discipline within the growing "metadiscipline" (Forêt, Hall, and Kueffer 2014, 67) of the environmental humanities, and we were attentive to Jen Clarke's advice that "the reconfiguration of anthropology is only possible when art is not only an object of research; anthropology with art involves a correspondence *between* the disciplines, thinking with art, radically" (Clarke 2015, 232, Clarke's emphasis). We thus wanted the residence to be a genuinely joint research project bringing together art, anthropology, and the soil sciences, in which we would learn from each other's practices by doing work together (Schneider and Wright 2010).

### ***Galalithe*: Thinking through Soil Processes, Inventing Rituals**

In the collaborative work we undertook in the residence, the mutual openness that reigned was reminiscent of the way anthropologists do fieldwork. Furthermore, for the anthropologists among us, the very theme we addressed, the transformed soils of urban areas, was to us an inherently anthropological topic. An important direction was to explore the question of how a different kind of relationship to anthropogenic soils could be possible, and what forms of ethics this might require and engender. This is well exemplified in the installation *Galalithe*, by anthropologist Marine Legrand and artist Anaïs Tondeur.<sup>2</sup> Both of them wanted to find ways to



reconnect to the life of soils in the mode of a ritual of nourishment. The piece suggests an ecofeminist ritual of re-bonding with soils, by means of a synthetic bowl made from human breast milk which they offered to earthworms. The enactment of the ritual was filmed and shown in the exhibition alongside one of the bowls.

In our residence sessions we had been discussing how in ancient Greece, as in many other human groups, divinities of the Earth had to be honored with propitiatory rites in order to remain on good terms with them. For those who practiced these rites, the Earth was not considered as a background, or a resource to be exploited, but as something they had to care for. For example, the practice of *libations* consist in pouring wine, oil, beer, honey, milk, or other liquids on the ground or on an altar. Libations have various meanings depending on the historical and cultural contexts in which they take place, but they often share characteristics with sacrifices and other kinds of offering. They provide a way to get in communication with divinities or invisible forces in order to ask for protection or purify oneself (Hubert and Mauss 1897). In the ancient Mediterranean world, animal generative fluids such as blood, sperm, milk, or honey formed the base of complex ritualistic practices linked to birth, death, immortality, and the renewal of fertility (Tétard 2004; D'Onofrio 2014). Today contemporary spiritual movements explicitly refer to environmental issues and tend to draw strong links between the ground, the Earth, and the sacred. These navigate in a blurry place between ancient Greek worship of Gaia and the syncretic, contemporary Latin American cults to Pacha Mama. Marine Legrand and Anaïs Tondeur were interested in the idea that for those who practiced libation rites today or in the past, the Earth would generally not be considered as a background or a resource to be exploited, but as a protective entity, which could also be dangerous and must be cared for in order to receive from it in return. They wondered how they could thank the soil for sustaining their lives, and how to feed it ritually with something coming from the heart of their being.

The starting point was a reference made by Anaïs to a Dogon practice that consists in planting stars (represented by tiny seeds) in the ground to celebrate the renewal of life (Temple 1976). Marine, for her part, found that the theatrical and oneiric dimension of an offering performance appealed to her. At first, two rituals were imagined. The first one implied an offering to the worms, while the other focused on the relations between sky and ground at a wider scale, implying seeds.

Anaïs and Marine decided to focus on the idea of an offering to the worms, as Anaïs started to toy with the idea of using breast milk. She had given birth to her daughter just before the start of the residence, and she was then still breastfeeding her newborn daughter. Could there be a

more personal substance than breast milk to feed the earth? Anaïs used it to create two cups of galalithe – a homemade synthetic material based on milk casein that looks like semi-translucent ivory. In this, she took inspiration from engineers who, in the 1930s, experimented with synthetic materials (Brigando 1941). One of them, galalithe, was produced from casein extracted from milk and resulted in a material close to ivory in its aspect. At the same time, Marine brought information about Paris suburbs environmental and industrial history, which she had been working on in her thesis. Gathering in cafés for endless conversations, Marine and Anaïs shared ideas coming from their different academic and literary sources. They read different materials and took extensive notes during their discussions. Anaïs wrote keywords and drew; Marine wrote and shared texts in which theory and poetry met. Anaïs reacted to these texts with her own commentaries and sensibility.

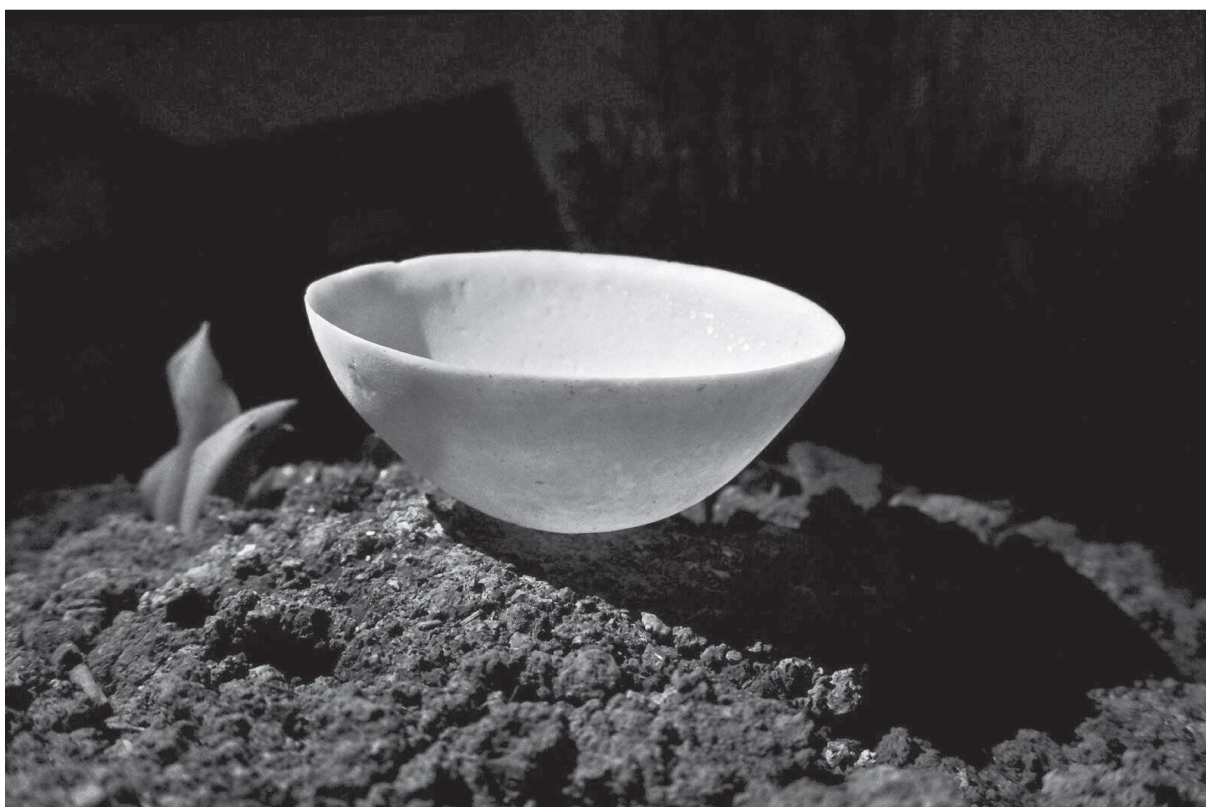


Fig. 1. An extract from the film of *Galalithe*, showing the galalithe bowl being deposited as part of a ritual of thanking earthworms.

Marine and Anaïs decided to create two galalithe cups. They deposited one of them in an urban park area that bore the mark of past industrial activities, as an offering to its microorganisms, a performance to help them regenerate the soil. The fluxes flowing between mother and child,

and assuring the life of the latter, joined with the fluxes of the life of earth, which sustain human life too. The other cup was displayed in the exhibition, along with a short film that evoked its making. Anaïs created the scenario for this accompanying video, asking regularly for Marine's opinion. Based on their successive conversations, they started to write more straightforwardly about the different symbolic layers implied by such an offering performance. In *Galalithe*, the gesture of giving, the choice of the material, and the form of the cup were a celebration of the fact that thanks to worms (among other players), soil is fertile. While performing this ritual, Marine and Anaïs were led to draw progressive associations between the exploitation of women and that of soils since the rise of modern "extractivism" (Merchant 1981). Like soils, the bodies of women have often been treated only through the lens of fertility. One reply to this appropriative approach to the world— often fought against by feminist thinkers (Warren 2000) – is to develop approaches based on care and attachment. These affects are presented as womanlike in patriarchal discourse, but to ecofeminist writers, the fact that an appropriative approach desperately lacks them might be the very cause of many ecological problems (Merchant 1981). Because it is enactive, *Galalithe* displaces the usual descriptive approach of anthropology, while taking inspiration in ritual and symbolic forms that are familiar to anthropologists— such as the relation enacted by gifts and counter-gifts between humans and nature. It reenacts them to see what this does to us to relate our own vital processes of feeding, and producing food for babies with our bodies, to the alimentary processes of worms.

### **Fieldwork-Like Collaboration**

Collaborating in such a way that we let ourselves be impacted by the methodologies and epistemologies of other practitioners is not necessarily easy work. It requires moving beyond disciplinary habits in which each of us is trained, such as the usual defiance of anthropology toward the natural sciences, or the reciprocal suspicion of the natural sciences of anything that cannot be translated into "facts." We think that for anthropologists, collaborative fiction making is a useful tool for approaching the natural sciences in a way that avoids the traps of describing them as "objective" or fundamentally different from local knowledge. But more importantly perhaps, it also allowed us to avoid the debunking tone that social scientists may use when addressing the work of natural scientists.<sup>3</sup>

As Grégory Quenet (2017) notes, narration allows us to recognize the situatedness of scientific concepts— or of more general concepts such as "the environment"— without debunking them

as mere social constructions, thus situating scientific discourse while at the same time “taking it seriously” (Viveiros de Castro 2014). Collaborative practices based on taking other epistemologies seriously need a certain amount of generosity in introducing how we do research to practitioners who may be unfamiliar with our disciplines. Likewise, these practices require us to cultivate multiple forms of curiosity. By curiosity, we mean being open to what collaborators have to teach us. This involves resisting the simple extraction of a particular skill or of information that seems directly helpful to us. It means resisting to predefine, in the other’s practice, what might be interesting or important for our own research practice, as for example, when collaborating with an artist is envisaged as a means to compensate for a deficit in the public understanding of science. As Despret (2002) would argue, a good collaboration is first and foremost an apprenticeship of relevance.<sup>4</sup> Taking collaborators’ practice seriously starts with seeking what matters to them, what is important in their world, rather than seeking what we need to extract to build a “bigger picture” that will eventually erase the specificities of each practice. A collaborative endeavor based on this principle would be about adding complexity to the problems at hand, multiplying the perspectives in which they can be thought, rather than trying to synthesize the various knowledge practices for which these problems matter. As Gan and colleagues put it, “curiosity is an attunement to multispecies entanglements, complexity, and the shimmer all around us” (Gan et al. 2017, 11). At the end of the Soil Fictions project, we felt that curiosity acted as a foundation for a mode of inquiry open to the world, ready to follow problems in their rhizomatic and multi-strata unfolding. Hence curiosity is a good means to achieve better collaboration, but collaboration is also a good means to become even more curious in a variety of different ways.

In fact, this does not differ radically from how anthropologists understand what good fieldwork is. The idea was to let research questions emerge from the inquiry, and let the inquiry remodel the research itself. Problems, questions, and topic are thus not things to be “circumscribed,” or “pinned down,” but things to be followed in the world, to see where they might lead us. This meant that we had to remain *disponible* to whatever our collaborators or our inquiry would bring about. The concept of *disponibilité* has been reclaimed by Judith Okely from the work of surrealist artist André Breton, and she writes: “Anthropological practice has resonances with Breton’s emphasis on being *disponible*— being accessible to events, people and objects while in search of encounters” (Okely 2012, 54). *Disponibilité* describes a state of attentiveness in which the seekers should remain in order to be ready when events, objects, or people come to them. These encounters include found objects (“*objets trouvés*”), such as myths, events, words,

and revelatory signs.<sup>5</sup> The meaning of these is understood in fragmented ways (Strathern 1991), until they temporarily crystallize. Indeed, we never thought of the pieces shown in the exhibition as finished artwork but only as a temporary stage in our ongoing research. In many ways our research was truly research on soils, on the ways in which we could know them, and on the conditions in which different disciplines might join together in doing so. As we worked on the different Soil Fictions, each one of them became an iteration in which we were open to reformulating both the questions and the working definition of what would enter the scope of our inquiry— we thus started to be interested in plant metabolism, the politics of paving the streets, or ancient rituals of libation. Each Soil Fiction encapsulates a different research process stimulated by the previous iteration, allowing us to embark on paths we developed collaboratively. Each of these was speculative, but at the same time they were consistent with questions that arose from relationships between humans and soils. Each Soil Fiction combines natural history with local stories and acts like a link- making dispositive, a “boundary object” (Star and Griesemer 1989) that makes palpable and thinkable an interface between worlds. Soil Fictions thus work as speculative devices for sensing worlds otherwise.

### **Thematizing: *The Earth Harvesters***

In our conversations within the residency, we reflected upon the forms of collaboration that could be drawn not only between us but also with the life forms that dwell in soil. How do and *could* humans work with soil’s complex processes? Alan told us about how soil ecologists study the ways in which worms digest and transform soil materials, thereby enriching the soil. He also mentioned scientists’ ambition to rely on ants to help decontaminate soils. Yesenia started to wonder what became of this in soils transformed by humans, such as the soils of landfills. Would worms digest and transform plastic molecules? What would an anthill developing in such soils look like? We discussed similar examples involving plants and worms as well and wondered whether morphological changes could be found in these organisms once they started to live in heavily polluted soils.

As our discussions continued, we started to focus more particularly on plants. This emphasis was brought about by Alan, the soil ecologist in the group, who witnessed a growing enthusiasm in soil ecology for techniques that rely on plants or insects to decontaminate polluted soils. Phytoextraction and phytomining are techniques of soil remediation that are said to be “nature-based.”<sup>6</sup> Phytomining is often considered to be a promising technique in a context of metals

growing rarer. It is even occasionally referred to as a way of solving problems related to contaminated soils.

Alan brought specimens of *Vicia faba* beans, which under certain conditions can gather aluminum in their tissues, and sunflowers, which can accumulate cadmium—one of the most common and toxic pollutants found in soils. We started to discuss what was evoked for us by these plants' becoming “helpers” for human problems. Yesenia started to manufacture plant sculptures that evoked the possible evolution of three botanical species known for their extractive properties: the mushroom *Sarcosphaera coronaria*, an arsenic extractor; mustard leaves (*Brassica juncea*), a cadmium accumulator; and the broad beans (*Vicia faba*) we had been toying with. Encased in a glass cabinet, these white-waxed specters of future plants and mushrooms seemed to float with their metal seeds. In Yesenia's imaginary, these new species would concentrate in their grains and seeds the substances extracted from toxic soils. She was interested in the idea that such “metallic seeds” could lead to merging of the practices of digging for metals and gathering plants. This, to her, disclosed a problematic yet productive convergence between narratives coming from the mining and the agricultural worlds, and it led to a different understanding of what “extracting” could mean. She therefore suggested that miners of the future would be then renamed *earth harvesters*. This became the title of our installation.

However, since our early discussions on phytoextraction, Alan had occasionally expressed that he felt uncomfortable with these techniques. When we asked him why he seemed hesitant to develop an installation that would address them, he first explained that the current public enthusiasm around these techniques should be limited by drawbacks in their application. He started to take some time doing research on phytoextraction and regularly sent the group scientific papers reviewing its limitations. He would sometimes forward samples of heated e-mail conversations he had with his colleagues over these technologies to Yesenia and Germain. We learned that in the case of heavy metals such as copper, lead, nickel, or arsenic, these techniques are efficient only in lightly to moderately polluted soils (Conesa et al. 2012; Mahar et al. 2016). Even in this context, the period for soil cleansing is generally up to ten years, which is perceived as an unacceptable time for most soil owners (Conesa et al. 2012). We then learned about the technical debate over chelating agents such as ammonium fertilizers or elemental sulphurs, which are supposed to boost the process of decontamination, but were raising many criticisms at the time of the residence due to their potential contamination of ground-water tables. We then followed the growing controversy of ensuing proposals to use genetically

modified accumulator plants to improve the accumulation process (Mahar et al. 2016; Sarwar et al. 2017).

What came out of these discussions was that beyond the technical drawbacks of these technologies, our biggest source of unease was that their promise of resolving the problem of soil pollution seemed to distract the attention of both scientists and the public from the question of what was needed in order to stop contaminating soils in the first place. The development of phytomining could be used as an excuse for pursuing today's problematic soil use practices—the very ones that led to the contamination of many soils—without further examination of their future consequences. As some authors have highlighted, an overconfidence in human capabilities to restore contexts subjected to environmental hazards often interferes negatively with what should be the primary goal of environmental policies: to preserve ecosystems rather than to restore them (Moreno-Mateos et al. 2015). At one point Alan decided to present the project to colleagues in his university department. Several of them not only agreed that the project raised difficult ethical questions but warned Alan that his status of university-paid scientist granted him an authority that meant he had to be particularly careful in regard to what could be perceived as a public approbation of a questionable technological development.

Because of this, Germain and Alan found that the installation, as it was at that point, bore the risk of giving an un-nuanced image of these technologies. It seemed as if the earth harvesters were literally reaping the benefits of soil pollution. They suggested tweaking the title toward a less positive tone and proposed to rename it the “Crumbs of Progress.” They argued that such a title would remind visitors that the great narrative of “progress” had not disappeared but had been recycled into discourses bearing on “innovation”—which are often associated with technologies such as phytoextraction. This title implied that the seduction of high-tech methods tended to hide the fact that they relied on the same modernizing impetus as the problems they aimed to solve (Latour 2015). Yesenia, for her part, felt that such a title would disclose our own position in regard to these technologies too directly, and she argued that instead of a straight critique, we could try to be more subtle and have different stories cohabit in friction within the narrative of the installation. This, she argued, would actually be more prone to fostering debate within our audience.

Germain and Alan agreed that playing with different possible ways of understanding the installation would be interesting. They finally found agreement: if they could add one element to the installation that would create a tension and let the visitor hesitate about their intention, then it would transmit the very hesitation that they experienced when developing it. In order to

create this tension, Yesenia developed an accompanying short film suggesting the landscape in which these specimens could thrive. The film starts with a view of an urbanized landscape, a wasteland, punctuated by antennas in the foreground. Some clues are left undefined: is this a post- industrial site, or post- apocalyptic landscape? Have the plants been genetically modified by a mighty human urban gardener, or did they adapt by themselves to this polluted environment now unfit for humans? The complete story remains to be imagined by the viewer, who also gets to decide whether the installation is utopic or dystopic.

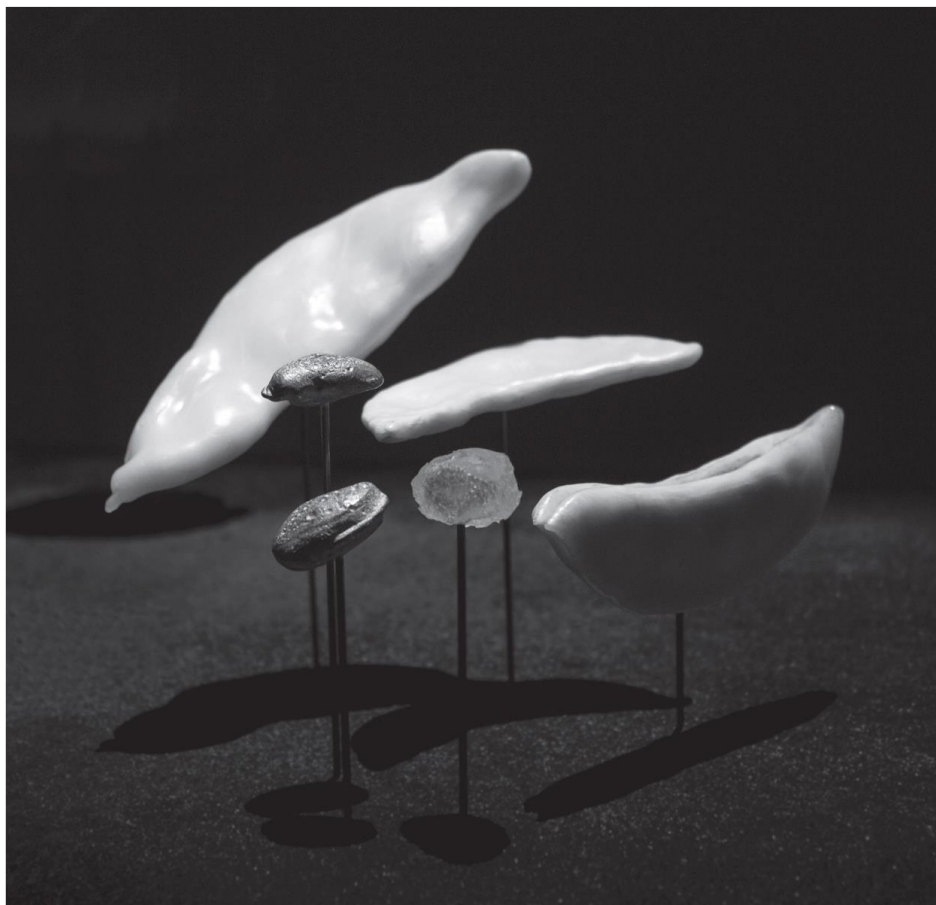


Fig. 2. Three specimens from *Biomining or the Earth Harvesters*.

In the end, the installation *Biomining or the Earth Harvesters* became more than just speculation on what future extractive plants could look like. Through the means of fiction, it protracted the current debates that surround remediation technologies. It invited people to question the conditions under which such technologies, sometimes marketed as a solution to the derelict effects of unsustainable modes of life and production, bear the risk of becoming instrumentalized as a way to escape from our responsibilities toward the environment. In one



of the possible futures we considered, extreme soil pollution has left cities uninhabitable; this is their bitter reality prior to gaining the status of urban mines.

Hence, in the Soil Fiction *The Earth Harvesters*, we used design as a tool to extrapolate from today's debates concerning phytomining and speculate on how things could be in different plausible futures. This related to what Dunne and Rabby consider to be the core of speculative design: "using [possible futures] as tools to better understand the present and to discuss the kind of future people want, and, of course, ones people do not want" (Dunne and Rabby 2013, 2–3). The intentionally simplified scenarios on which we worked served as provocations to foster debate. Our aim was to question contemporary hopes of finding technical fixes to the "wicked problems" of soil pollution and human resource exploitation (Rittel and Webber 1973), and to engage these controversies by bringing the debate to a non-expert audience.<sup>7</sup>

### **A Diffractive Anthropology?**

In concluding this article, we would like to refer back to the pluralist ontology that inspired our collaborative residence and suggest that our collaboration can be understood as a process in which we mutually tried and impacted our respective practices and methodologies. To use an expression from Barad (2007) and Haraway (1997), each Soil Fictions experiment provided a different "diffractive reading" of what soil-human relations might be in the Anthropocene. In the field of physics of light in which Barad was originally trained, diffraction is what happens to a sea wave or a light beam that passes through a lens or an aperture. The beam is changed by the obstacle encountered into patterns of interference—like interfering circles in water. At the beginning of the twentieth century, this physical phenomenon led to a reconsidering of physicists' assumptions about matter and meaning. By borrowing this term, Haraway and Barad aim to question metaphors widely used in the social sciences, such as those of "perspective," "ways of seeing," "modes of representation," or "reflexivity." To Haraway (1997) for example, the concept of reflexivity is not a good solution to the problem of representation. Built to encourage critical reflection on the researcher's own role in the constitution of knowledge, it is based on the optical metaphor of reflection and mirroring. Discussions referring to reflexivity generally bear on how to improve this "mirror." It thereby still sets the endeavor of social studies at the level of renderings that may be more or less faithful to the "real" situation. It is still founded on representationalism and entails a distinction between the knower and the known that continues to hold the world at a distance. Diffraction, instead, aims not to reflect the world

but adds something to it. Diffraction patterns incorporate the trajectory of the waves, but they also transform it and bring about a difference. The notion of diffraction is consistent with the ontological proposition on which we based our collaboration. To Haraway and Barad, diffraction is not only a metaphor: it is at once a method and the basic fabric of the world's processes. Hence it brings together ontology and epistemology, ways of knowing and world making.

Diffraction thus provides a way into a pluralistic understanding of the world, in which we can give consistency to different hypotheses and follow them in unsuspected consequences that can impact our modes of being and knowing. Our Soil Fictions overlap in some aspects, but take different paths in others, as each of them allowed us to think with soils in different ways. With each of them comes a different mode of attention, of inquiring, of raising ethical concerns and ways to care for soils. The value of such multiplicity is that it allows the scholar to step back from narratives that are too grand, too global, and too encompassing. This echoes particularly well with the way we think of collaboration, as learning to feel and think through soils, with others.

Soil Fictions involved doing anthropology with artists – rather than about them, or about art – but also with the natural sciences – here represented by soil ecology. Unlike purely deconstructive approaches to science, we have been interested in working with some hypotheses held within the scientific field of soil ecology – such as the idea that soils are endowed with life. We met scientists, visited labs, and dug into the history of science, making our collaborations often seem like fieldwork recognizable to more conventional anthropology. All the people involved in the residence placed great importance on field inquiries in their personal work. The artworks and installations of Yesenia and Anaïs usually develop in their work outside the residence are the results of inquiries in which they meet scientists and follow them in their work in ways that resemble anthropological studies in some respects. We were thus already linked to a certain extent by the correspondences of our practices. Yet the activity is of a different kind from classical ethnographic fieldwork. For instance, it goes against the idea of the “lone ethnographer” and cannot be situated in the same timeframe as usual ethnography. Fieldwork here is more distributed and shorter, as artists or biologists cannot usually spend several months or years on fieldwork, as ethnographers would. It occurred to the anthropologists and the ecologist among us that the temporality of such an interdisciplinary collaboration was rather different than what we were used to. Whereas we, the scientists, sometimes felt that working on an exhibition could allow us to “pause” ourselves, to take more

time and sidestep our usual topics, we sometimes had the impression that our artist colleagues went “too fast,” jumped too boldly on a hypothesis. Even though the long-term, immersive aspect of fieldwork is less present in such an experiment, the multiplication of smaller fieldwork leads brings about an exploratory ethnographic mode, which may act as complement to more classical ethnographic fieldwork.

As we explained in the introduction, our engagement in Soil Fictions was based on the premise that we would not be learning about our collaborators and their practices but *with* them and *from* them. Our “fieldwork” in the residence did not rest on a “study of soils,” but on an inquiry *with* soils, and *with* our collaborators, exploring the unexpected corners of environmental thinking and where they might lead us. Perhaps this is a return to the fundamentals of anthropology— a discipline that can be defined, after Gregory Bateson (1972), as about learning how to learn. Our discussions were indeed productive of unexpected directions of research and unlike anything we could experience in most regular academic seminars. We felt that beyond learning about soils, we learned about our respective modes of knowing them. This involved taking these different modes seriously— something that fiction allows us to play on usefully. The point is not whether we believe in our stories or whether we believe they will come true. It is rather that these stories enact the creation of worlds that become palpable through them— worlds at the interface between the soil sciences, art, and anthropology.

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## Notes

<sup>1</sup> The project also greatly benefited from the help and insight of Nathalie Blanc, social geographer at CNRS and scientific sponsor of the residence, and of Maëva Blandin and Loïc Fel from COAL.

<sup>2</sup> A full presentation of the work can be accessed at <http://cargocollective.com/soilfictions/Galalithe-Taking-care-of-the-soil>.

<sup>3</sup> The 1990s were a time of radicalization, with the humanities playing the card of social constructivism on the one hand, and the dominance of various forms of deterministic reductionism within the natural sciences (Stengers 2011). This episode is often referred to as the “science wars” (Latour 1999). At the time, Cultural Studies argued that nothing existed outside of discourses and narratives. The aim was to debunk the pretention that categories such as gender or nature were “natural” and therefore unquestionable.

<sup>4</sup> In Despret’s understanding of “relevance” the sciences can only be really interesting when they do not set out to “answer” questions already asked. The sciences, for Despret, are relevant when they forge both new questions and answers. In this they complicate preexisting knowledge rather than just replacing it. Soil Fictions are far from observation or inscription devices meant to oppose new data to preset theories. As we shall see, we view them as an open set of boundary- drawing practices in which the world is diffracted and reconfigured.

<sup>5</sup> For the anthropologists and ecologists among us— belonging to disciplinary fields dedicated to the practice of fieldwork— the Soil Fictions residence was not a way to synthesize or broadcast the lessons of fieldwork. Rather it was a continuation of fieldwork, a way of interrogating its features in yet another mode. As an ecologist, Alan had been working on urban soil fauna since 2005. Urban soils were also the topic of Germain’s thesis in

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anthropology, and Marine had been working on the management of urban parks in her PhD, completed the year before. Just as ethnographers “follow” lines of inquiry in fieldwork, we continued to follow soils through crafting fictive apparatuses. Several Soil Fictions were built on lessons from the field and thus extended the reach of fieldwork into new realms.

<sup>6</sup> Since the 1990s the technologies of phytoextraction explore the natural properties of plants to remove toxic elements such as heavy metals from soils contaminated by human activities (Sarwar et al. 2017; Gerhardt, Gerwing, and Greenberg 2017). Known as hyper-accumulators, some plants – and their associated microorganisms – absorb toxic elements from the soil by their roots and concentrate them into their stems and leaves. Plants thus “contaminated” are then harvested, displaced, and often burned to produce energy through biogas (Mahar et al. 2016). In their ashes some metals are still present in a pure and high grade form, which can be harvested too (Mahar et al. 2016; van der Ent et al. 2015). The harvest of metals or chemicals from soils through plants is referred as phytomining (van der Ent et al. 2015) or biomining when other organisms such as fungi or bacteria are also involved.

<sup>7</sup> The term “wicked problem” was coined by the engineers Rittel and Weber in 1973. It refers to problems that have technical aspects but are at once social, technical, and cultural. Rittel and Weber argued that such problems are therefore difficult to define in regard to usual notions of the “public good,” and render meaningless the very idea of there being a definitive “optimal solution.”

## References

- Adams, Clive, and Daro Montag. 2015. *Soil Culture: Bringing the Arts Down to Earth*. Falmouth: Centre for Contemporary Arts and the Natural World.
- Balmer, Andrew S., Jane Calvert, Claire Marris, Susan Molyneux-Hodgson, Emma Frow, Matthew Kearnes, Kate Bulpin, Pablo Schyfter, Adrian Mackenzie, and Paul Martin. 2016. “Five rules of thumb for post-ELSI interdisciplinary collaborations.” *Journal of Responsible Innovation* 3, no. 1: 73–80.
- Barad, Karen. 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press.
- Bateson, Gregory. 1972. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. Chicago: University of Chicago Press.
- Bensaude-Vincent, Bernadette. 1989. “Camille Flammarion: Prestige de la science populaire.” *Romantisme* 65: 93–104.
- Brigando, Jeanne. 1941. “La caséine et ses dérivés plastiques.” *Le Lait* 21: 17–28.
- Buckland, David. 2012. “Climate is culture.” *Nature Climate Change* 11: 1–4.

---

Chapin, F. Stuart III, Gary P. Kofinas, and Carl Folke. 2009. *Principles of Ecosystem Stewardship: Resilience- Based Natural Resource Management in a Changing World*. Berlin: Springer.

Clarke, Jennifer. 2015. *Working between Art and Forestry: Towards an Ecology of Practices*. PhD diss., University of Aberdeen.

Conesa, Hector M., Michael W. H. Evangelou, Brett H. Robinson, and Rainer Schulin. 2012. "A critical view of current state of phytotechnologies to remediate soils: still a promising tool?" *Scientific World Journal*, 1–10.

D'Onofrio, Salvatore. 2014. *Les fluides d'Aristote: lait, sang et sperme dans l'Italie du sud*. Paris: Les Belles Lettres.

Despret, Vinciane. 2002. "La différence comme occasion de pertinence: La question de l'animal." *Cahiers de Psychologie Clinique* 18, no. 1: 9–28.

Dunne, Anthony, and Fiona Raby. 2013. *Speculative Everything: Design, Fiction, and Social Dreaming*. Cambridge MA: MIT Press.

Ellis, Erle C., and Navin Ramankutty. 2008. "Putting people in the map: anthropogenic biomes of the world." *Frontiers in Ecology and the Environment* 6, no. 8: 439–47.

Erickson, Ken C., and Donald D. Stull. 1998. *Doing Team Ethnography: Warnings and Advice*. Thousand Oaks, CA: Sage Publications.

Escobar, Arturo. 2008. *Territories of Difference: Place, Movements, Life, Redes*. Durham NC: Duke University Press.

Flammarion, Camille. 1864. *Les mondes imaginaires et les mondes réels: Voyage astronomique pittoresque dans le ciel*. Paris: Didier et Cie.

Foret, Philippe, Marcus Hall, and Christoph Kueffer. 2014. "Developing the environmental humanities: a Swiss perspective." *GAIA* 23, no. 1: 67– 69.

Gan, Elaine, Anna Tsing, Heather Swanson, and Nils Bubandt. 2017. "Introduction: Haunted landscapes of the anthropocene." In *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene*, edited by Anna Tsing, Heather Swanson, Elaine Gan, and Nils Bubandt, 1– 15. Minneapolis: University of Minnesota Press.

---

Gerhardt, Karen E., Perry D. Gerwing, and Bruce M. Greenberg. 2017. "Opinion: Taking phytoremediation from proven technology to accepted practice." *Plant Science* 256 (March): 170–85.

Gragson, Ted L. 2013. "The contribution of anthropology to concepts guiding Itser research." In *Long Term Socio- Ecological Research*, edited by Simron Jit Singh, Helmut Haberl, Marian Chertow, Michael Mirtl, and Martin Schmid, 189–214. Dordrecht: Springer.

Hall, Marcus, Philippe Foret, Christoph Kueffer, Alison Pouliot, and Caroline Wiedmer. 2015. "Seeing the environment through the humanities: a new window on grand societal challenges." *GAIA— Ecological Perspectives for Science and Society* 24, no. 2: 134–36.

Haraway, Donna J. 1997. *Modest-Witness@Second-Millennium. FemaleMan-Meets-OncoMouse: Feminism and Technoscience*. New York: Routledge.

—. 2003. *The Companion Species Manifesto: Dogs, People, and Significant Otherness*. Chicago: Prickly Paradigm Press.

—. 2016. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press.

Holbraad, Martin, Morten Axel Pedersen, and Eduardo Viveiros de Castro. 2014. "The politics of ontology: anthropological positions." *Theorizing the Contemporary, Cultural Anthropology* website, January 13, 2014. <https://culanth.org/fieldsights/462-the-politics-of-ontology-anthropological-positions>.

Hubert, Henri, and Marcel Mauss. 1897. *Essai sur la nature et la fonction du sacrifice*. Paris: Presses Universitaires de France.

Ingold, Tim. 2000. *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. London: Routledge.

—. 2014. "That's enough about ethnography!" *HAU: Journal of Ethnographic Theory* 4, no. 1: 383-395.

—. 2015. *The Life of Lines*. London: Routledge.

Landa, Edward R., and Christian Feller. 2010. *Soil and Culture*. Dordrecht: Springer.

Lassiter, Luke Eric. 2008. "Editor's introduction." *Collaborative Anthropologies* 1, no. 1: vii–xii.

Meulemans et al.: Soil Fictions • *Collaborative Anthropologies* • 10:1–2 • fall–spring 2017–18

---

Latour, Bruno. 1999. *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge MA: Harvard University Press.

—. 2015. "Fifty Shades of Green." *Environmental Humanities* 7: 219–225.

Mahar, Amanullah, Ping Wang, Amjad Ali, Mukesh Kumar Awasthi, Altaf Hussain Lahori, Quan Wang, Ronghua Li, and Zengqiang Zhang. 2016. "Challenges and opportunities in the phytoremediation of heavy metals contaminated soils: A review." *Ecotoxicology and Environmental Safety* 126 (April): 111–21.

Marcus, George E., and Fred R. Myers. 1995. *The Traffic in Culture: Refiguring Art and Anthropology*. Berkeley: University of California Press.

Merchant, Carolyn. 1981. "Earthcare: women and the environment." *Environment: Science and Policy for Sustainable Development* 23, no. 5: 6–40.

Moreno- Mateos, David, Virginie Maris, Arnaud Bechet, and Michael Curran. 2015. "The true loss caused by biodiversity offsets." *Biological Conservation* 192: 552–59.

Nye, David, Linda Rugg, James Fleming, and Robert Emmett. 2013. *The Emergence of the Environmental Humanities*. Stockholm: MISTRA (Swedish Foundation for Strategic Environmental Research).

Okely, Judith. 2012. *Anthropological Practice: Fieldwork and the Ethnographic Method*. London: Berg.

Ostrom, Elinor. 2009. "A general framework for analyzing sustainability of social-ecological systems." *Science* 325, no. 5939: 419–22.

Preston, Claire. 2015. *The Poetics of Scientific Investigation in Seventeenth- Century England*. Oxford: Oxford University Press.

Puig de la Bellacasa, Maria. 2017. *Matters of Care: Speculative Ethics in More than Human Worlds*. Minneapolis: University of Minnesota Press.

Quenet, Gregory. 2017. "Un nouveau champ d'organisation de la recherche, les humanités environnementales." In *Humanités environnementales: Enquêtes et contre-enquêtes*, edited by Guillaume Blanc, Elise Demeulenaere, and Wolf Feuerhahn, 225–70. Paris: Publications de la Sorbonne.

---

Rittel, Horst W. J., and Melvin M. Webber. 1973. "Dilemmas in a general theory of planning." *Policy Sciences* 4, no. 2: 155–69.

Sarwar, Nadeem, Muhammad Imran, Muhammad Rashid Shaheen, Wajid Ishaque, Muhammad Asif Kamran, Amar Matloob, Abdur Rehim, and Saddam Hussain. 2017. "Phytoremediation strategies for soils contaminated with heavy metals: modifications and future perspectives." *Chemosphere* 171 (March): 710–21.

Schneider, Arnd, and Christopher Wright. 2010. *Between Art and Anthropology: Contemporary Ethnographic Practice*. Oxford: Berg.

Star, Susan, and James Griesemer. 1989. "Institutional ecology, 'translations' and boundary objects: amateurs and professionals in Berkeley's museum of vertebrate zoology, 1907– 39." *Social Studies of Science* 19, no. 3: 387–420.

Stengers, Isabelle. 2011. "Wondering about materialism." In *The Speculative Turn: Continental Materialism and Realism*, edited by Levi Bryant, Nick Srnicek, and Graham Harman, 368– 81. Melbourne: re.press.

Strathern, Marilyn. 1991. *Partial Connections*. Walton Creek, CO: AltaMira Press.

Sukla, Ananta Ch. 2015. *Fiction and Art: Explorations in Contemporary Theory*. London: Bloomsbury.

Temple, Robert K.G. 1976. *The Sirius Mystery*. London: Royal Astronomical Society of Great Britain.

Tétard, Gilles. 2004. *Le sang des fleurs: Une anthropologie de l'abeille et du miel*. Paris: Odile Jacob.

Toland, Alexandra R., and Gerd Wessolek. 2010. "Soil art: bridging the communication gap." In *19th World Congress of Soil Science, Soil Solutions for a Changing World, 1–6 August 2010, Brisbane, Australia*, edited by Gilkes Robert and Prakongkep Nattaporn, 8–12. Crawley: International Union of Soil Sciences.

Tsing, Anna L. 2005. *Friction: An Ethnography of Global Connection*. Princeton, NJ: Princeton University Press.

—. 2012. "Unruly edges: mushrooms as companion species." *Environmental Humanities* 1, no. 1: 141–54.

Meulemans et al.: Soil Fictions • *Collaborative Anthropologies* • 10:1–2 • fall–spring 2017–18



---

van der Ent, Antony, Alan J. M. Baker, Roger D. Reeves, Rufus L. Chaney, Christopher W. N. Anderson, John A. Meech, Peter D. Erskine, et al. 2015. "Agromining: farming for metals in the future?" *Environmental Science & Technology* 49, no. 8: 4773–80.

Viveiros de Castro, Eduardo. 2014. *Cannibal Metaphysics*. Minneapolis: University of Minnesota Press.

Warren, Karen J., ed. 2000. *Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters*. Lanham, MD: Rowman and Littlefield.

Welch- Devine, Meredith, and Lisa M. Campbell. 2010. "Sorting out roles and defining divides: social sciences at the world conservation congress." *Conservation and Society* 8, no. 4: 339.