

Abstract

The range of art forms and genres dealing with soil is wide and diverse, spanning many centuries and artistic traditions, from prehistoric painting and ceramics to early Renaissance works in Western literature, poetry, paintings, and sculpture, to recent developments in cinema, architecture and contemporary art. Case studies focused on painting, installation, and cinema are presented with the view of encouraging further exploration of art about, in, with, or featuring soil or soil conservation issues, created by artists, and occasionally scientists, educators or collaborative efforts thereof.

1 Introduction

Soils are too important to be studied by soil scientists alone. We live in a world where disciplinary boundaries often define our work world. Within the realm of science, boundary crossings and territorial mergers are typically of the nearest-neighbor type: i.e., biology + chemistry = biochemistry. Extensions outside of the earth sciences, to the arts and humanities, are less frequent. The last decades show, however, that the activities of the soil science community and its traditional partners were insufficient to protect our soils and landscapes. To encourage more holistic approaches to soil protection our community must open the doors to develop new perspectives by investigating transdisciplinary projects. Soil and art, as well as soil and history, soil and culture, soil and economics, and soil and religion represent just a few opportunities for expanding the scope of soil research and soil protection.

Until now, no other planet is known where life is possible. Thus our soil and atmosphere are unique. And consider the medium that is soil – a presence in the daily life of all of us as we tread upon and gain sustenance from the earth. This presence and reality has not escaped the view and attention of visual artists. In this contribution we aim to show how soil art helps to reveal the interconnectivity of soil, life and culture.

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1.1 The soil vision

Soil is a word whose meaning varies according to the context, even within the sciences. The patriotic soil (as the “soil of France”) and the agricultural soil have very little in common. Even in the environmental and geological sciences, there are often large differences between the soil (or subsoil) of the geologist, the archaeologist, the geotechnical engineer and the soil of the soil scientist or pedologist (in some countries pedology is another word for soil science, in others it is a distinct branch of soil science). For the non-scientific, public at large, including artists, soil is mainly the surface on which we walk.

In soil science, numerous definitions for soil have been published but all agree with this kind of minimum definition:

Soil is the volume of the very superficial layer of the planet Earth consisting of a loose material (the earth) and limited by the ground at the surface and the rock (or parent material), which it derived, at depth.

The soil thickness can be from some centimeters to more than 10 m.

Soil is organized in different layers named “horizons” and the whole of the horizons is the “soil profile” (Fig. 1). It means that Soil is not only “earth” but a “natural body” with a self organizing ability that depends upon different factors, such as climate, topography, geology, biology (including human activities), and time. Hence, earth as a material must not be equated with Soil as an organized natural body.

The foundation of pedology with this vision of soil is attributed to the Russian scientist Vasilii Dokuchaev with the publication in 1883 of his thesis *The Russian Chernozem*. According to Dokuchaev, soil is a natural body and ought to be considered as the 4th natural kingdom of nature, equivalent to the mineral, animal and vegetable kingdoms.

With exception of farmers, foresters and builders, the non-scientific public typically has had a very low awareness to soil. Their only soil vision is a soil surface vision, where that which lies below is unseen, unimagined and unconsidered.

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The 3-dimensional soil vision that continues as a foundation of modern pedology could only have appeared after the work of Dokuchaev (1883) and the introduction of the soil profile concept.

Every soil scientist knows how students or friends are astonished and fascinated when they discover the Soil profile (Hartemink et al., 2014). A new world appears for them with this organization of multi-colored horizons – a world filled with living creatures. This first soil vision is always emotional. As Hartemink (2014) said at the 20th World Congress of Soil Science: “The soil profile speaks to us... The soil profile tells us stories”.

Moreover, the soil profile gives us clues to how the land had been and should be managed. The soil profile is in this sense a visual narrative of some of the services and functions it performs. Since the beginning of mankind soils have provided goods and services to human societies. These include:

- food production,
- earths for pigments, for ceramics or for building constructions,
- earths as medicines or for religious and spiritual activities.

Many of these roles involved artistic activity (see, for example, Fig. 2).

The notion of soil functions, goods and services has been greatly extended since the mid-20th century with the emergence of the environmental movement and of science aimed at addressing environmental quality: the role of the soil is not only to provide foods and fibers but its optimal management also considers regulation of climate, mitigation of pollution, maintenance of biodiversity, etc. It also needs to be considered in the framework of ethical, spiritual and artistic dimensions. As we will see, some artists’ works are related to a general surface vision, or more incidental depiction of the soil including the profile vision while others are more focused on environmental questions.

1.2 Envisioning soil

The range of art forms and genres dealing with soil is wide and diverse, spanning many centuries and artistic traditions, from prehistoric painting and ceramics to early Renaissance works in Western literature, poetry, paintings, and sculpture, to recent developments in cinema, architecture and contemporary art (Landa and Feller, 2010; Toland and Wessolek, 2010, 2014).

With the emergence of environmental awareness and activism during the second part of 20th century, individual artists became inspired by the need to manage nature in a sustainable way. Environmental art, ecological art, and land art are some of the more well-known genres that took up issues of land use, ecology and agricultural change in the latter half of the 20th century.

With the increasing recognition of the soil as an important compartment of the terrestrial ecosystems (since the Earth Summit held in Rio de Janeiro in 1992), and of the numerous ecosystem services that it can provide, different artists all around the world have expanded their practices to include soil (and not simply the landscape in general) as a subject of artistic inquiry. In this sense, we can speak of an emergence of “Soil Art.”

This was first proposed by Wessolek (2002): “It is my personal concern to encourage the foundation of a new art style, perhaps named ‘Soil Art’.” and later defined by Toland and Wessolek (2010).

For our purposes here, we define Soil Art as:

artistic work about, in, or with soil or soil protection issues, that is produced by artists in a multitude of genres and media, to be understood, among other things, as artwork that may contribute to wider environmental and soil protection discourses (adapted from Toland and Wessolek, 2010).

Since the scope of this area of artistic activity is so large and diverse, it will be impossible to give examples of all artistic forms and genres in a single article. Rather

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than attempt a comprehensive overview, we will offer selected examples that reflect our observations and inquiries as soil scientists with focused interests in art:

- Sect. 2 (paintings) by C. Feller, with additions by A. Toland and G. Wessolek,
- Sect. 3 (installation) by A. Toland and G. Wessolek,
- Sect. 4 (cinema) by E. R. Landa.

2 Paintings

2.1 Before 20th century – representation of soil in art

This part mainly covers paintings in Western culture. Relations between soil and art are numerous and date to Antiquity.

On one side – soil as the medium itself – soils have been used as a material for art as pigments (since the prehistoric wall paintings in caves) (Ugolini, 2010), pottery (clays), etc., and more recently in contemporary paintings to give special effects to the subject (Van Breemen, 2010). On the other side, soil was frequently represented in paintings, mosaics or sculptures from the Antiquity until the present, in the form of lines or surfaces, as an element of the landscape but not as the main subject of the representation. In many cases, it was a schematic representation, as if the artist often appeared to have consciously failed to observe the soil (Feller et al., 2010) as in *Venus standing in a landscape* (see: <http://www.louvre.fr/oeuvre-notices/venus-debout-dans-un-paysage>).

However, in some exceptional cases, the depiction of the soil (as a surface or a soil profile in the paintings) is remarkable. But even in these cases, the focus is on another object or subject. Feller et al. (2010) distinguish three reasons to show a soil profile in paintings from Renaissance to the 18th century:

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2.1.1 Soil profile for the Resurrection of the Dead

In the *Last Judgment* by Rogier Van der Weyden (1432) (Fig. 3) the resurrection of the dead required the artist to show the soil profile. The complete painting exhibits numerous such soil profiles. Details of emergence of men and women going out of soil profiles (lower part of the painting) are so true to reality that it might be titled “Birth of a Pedologist”.

2.1.2 Soil profile for displaying plant roots

In the paintings of the Renaissance, the representation of a ditch or a soil cut in a painting served very often as an excuse to picture roots. In the *St John the Baptist* by Hieronymus Bosch (1450–1516) the figure of St John leans towards a sharp vertical exposure of soil that includes a strange large root: (http://en.wikipedia.org/wiki/St._John_the_Baptist_in_the_Wilderness). A large root also appears in *The Tempest* painted by Giorgione (1477/78–1510) ([http://en.wikipedia.org/wiki/The_Tempest_\(Giorgione\)](http://en.wikipedia.org/wiki/The_Tempest_(Giorgione))). These works were just some examples of paintings in which large forked roots were made evident.

The representation of roots was not due to chance, but chosen for its symbolic value. The root presented in detail in the foreground of the *St John the Baptist* painted by Bosch could be from the mandragora as suggested by Marjnissen and Ruyffelaere (1987). The mandragora root is thick, hairy and forked, in a humanoid form. The roots of *mandragora* genus (mandrake) were extensively used by alchemists and in magic rituals. (See: <http://mandragore.bnf.fr/jsp/rechercheExperte.jsp>, Manuscrits occidentaux, cote: français 12322, fol. 180v, flore: plantain, ca. 1520–1530, Notice no 80/206).

It was also a religious symbol for Christians for whom it was linked to Genesis and aspects of Christ’s life. This was the primary reason of its representation in art until the 18th century. (For further details, see Feller et al., 2010).

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2.1.3 Soil profile displayed by the ploughing

From the 14th and during the 15th century, especially in the *Très Riches Heures*¹ we see representations of agricultural tasks and toils. Here, the soil is depicted with a clear concern of realism and technical specificity, including the tilling of the soil. Herein is an early artistic and technical representation of what agronomists and pedologists describe as an agricultural profile. In addition to this example, Peter Brueghel the Elder (1525/30–1569) might be also be cited for *The Fall of Icarus* (Fig. 4). Icarus is the tiny figure at the bottom on the right-hand corner, with only his legs visible, while in forefront of the canvas, attention is centered on the good Flemish ploughman tilling furrows. That was the triumph of daily working life over Utopia (“falling from the sky”). Beside the ploughman serving as a reference for agriculture, Brueghel the Elder did not fail to symbolize other of the world’s riches – animal husbandry in the form of the shepherd leaning on his staff, and the wealth of the sea shown in the form of a busy fisherman. It should be also noticed that forked roots are included in the agricultural profile – perhaps meant to be mandrake!

Toward the end of the 16th century landscapes and presentations of nature in painting were in some sense discovered as an independent motif. Typical representatives are Dürer, Cranach, Burgkmair, Bosch and Poussin. Incidentally, this development coincides with the emergence of the French model of horticulture (André Le Nôtre, Gardens of Versailles) (Wessolek, 2002). Later, in the the 19th century agricultural art developed a lot at and ploughed soil inspired many artists such as Rosa Bonheur (1822–1899) with the *Labourage Nivernais* (1849) (Fig. 5).

¹The *Très Riches Heures du Duc de Berry*, or *Très Riches Heures*, is the most famous and possibly the best surviving example of French Gothic manuscript illumination, showing the late International Gothic phase of the style. It is a book of hours: a collection of prayers to be said at the canonical hours. It was created between ca. 1412 and 1416 for the extravagant royal bibliophile and patron John, Duke of Berry, by the Limbourg brothers. . . The calendar images, which are the most commonly reproduced. The “calendar” images vivid representations of peasants performing agricultural work (source: Wikipedia).

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2.2 From beginning of 20th century – teaching the soil: from science to art

Nowadays, in modern soil textbooks, soil profile are shown and described with photographs.

But the early scientific depiction of soil in painting dated from the beginning of the 20th century, either as splendid illustrations in textbooks on soil (Fig. 1) or prepared for educational exhibitions in amphitheatres, generally as canvases representing different types of soil (Fig. 6). One could consider that as a kind of transition from science to art.

The two oil canvases (60 × 100 cm) represent soil profiles (Fig. 6). These canvases were published as illustrations in the soil science textbook of Demolon (1952, p. 86bis) and were anonymously displayed in the 1940's for a soil science course.

In an art exhibition on “The Earth” (2005, Uzès, France), C. Feller presented these paintings, without any technical explanation. The visitors generally found these canvases splendid, and asked if they were painted by a contemporary artist?

Nowadays, some soil scientists such as Gerd Wessolek and Alexandra Toland (Technische Universität Berlin), Ken van Rees (University of Saskatchewan), and Jay Stratton Noller (Oregon State University) use artistic techniques in their teaching (Fig. 7), have included soil science students in art activities, and have invited artists to participate in soil science research and teaching endeavors. Soil scientists have referenced paintings by Jacob and Salomon van Ruysdael, Paul Gauguin, Hieronymus Bosch, Peter Brueghel the Elder, and Ambrogio Lorenzetti in communication on historical farming practices, land use, and soil geomorphologic processes (Feller et al., 2010; Hartemink, 2009; Jenny, 1968), and drawn upon various painting techniques in soil awareness-raising activities, such as the *Painting with the Colors of the Earth* program with Irena Racek in Austria (Szlezak, 2009), or the soil painting program at the Museu de Ciências da Terra Alexis Dorofeef (Earth Science Museum) in Brazil (Muggler, 2013). Also, paintings by soil scientists are a way of presenting soil scientific concepts in a visual way. Figure 7 exemplarily explores formal aesthetic features (color, texture, structure, composition of horizons) to describe soil properties. Such aesthetic features are often

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used in field descriptions for soil mapping but are not referred to as such. Capturing the profile in a painting is an exercise in aesthetic observation and documentation that allows the field scientist, student (or artist) to capture subtle details not possible in tabular, written form.

5 One could mention too the following some other French soil scientists involved in “Soil Art” or “Earthworks” as:

- Folkert Van Oort (INRA, France), using undisturbed soil material (collected from soil horizons) applied to canvas and representing natural Soil- or Geo-landscapes (see Feller et al., 2010),
- 10 – Bénédicte et Louis-Marie Bresson (INRA, France) using disturbed soil material applied to canvas to create artificial soil profiles or landscapes, and
- Dominique Schwartz (Strasbourg University, France) with his beautiful photos of soils (Fig. 8).

2.3 Soil in realism and abstraction: case studies from the 20th century

15 Here we will give two examples of well-known painters who were instrumental in bringing soil themes to a wider audience. These two examples stem from two very different and opposed artistic traditions: European abstract painting and American regionalism, which favored realistic representation over abstraction.

20 Art critics such as John Arthur (1989, 2000) and Lauren Della Monica (2013) have described realism in landscape painting as an ongoing tradition in American Art, suggesting that our understandings and relationships with the land are embedded in the American cultural experience, as depicted by 19th century painters such as Frederic Church and Winslow Homer and later by, for example, Georgia O’Keefe and Alex Katz.

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2.3.1 Grant Wood (USA)

One of the most well-known proponents of American landscape painting is Grant DeVolson Wood (1891–1942), an American painter. He is best known for his paintings depicting the rural American Midwest, particularly the painting *American Gothic*, an iconic image of the 20th century (http://en.wikipedia.org/wiki/Grant_Wood). *Arbor Day* (1932) is well-known to soil scientists all around the world (see: <http://www.wikiart.org/en/grant-wood/arbor-day-1932>). *Arbor Day* (from the Latin *arbor*, meaning tree) is a holiday in which individuals and groups are encouraged to plant and care for trees. The first Arbor Day was held in the state of Nebraska on 10 April 1872 (http://en.wikipedia.org/wiki/Arbor_Day). Its founder, J. Sterling Morton, went on to become the Secretary of Agriculture of the United States (1893–1897).

But in the Grant Wood painting, the planting of the tree is not the main subject of the painting rather, it is the soilscape, with its clearly evident schematization of soil horizons. This contrast between the title and the subject is interesting. It reminds one of the Brueghel painting *The Fall of Icarus* where the main subject was not Icarus, who is quite invisible, but rather a Flemish ploughman tilling the soil. Such a painting really belongs to Soil Art, for the object of inspiration for the artist is clearly the soil and its horizons.

2.3.2 Jean Dubuffet (France)

While painters of genres past used their medium to document specific land formations and land use practices (van Breemen, 2010; Zika, 2001; Feller et al., 2010), many contemporary painters use soil materials more abstractly to explore the physical qualities of a given place rather than to realistically represent it. This turn towards abstract painting must be understood as a backlash against established norms of visual expression dominant in the 19th century.

With regard to the soil, the *Texturology* series of works by the French modernist painter Jean Dubuffet (1901–1985) is perhaps the most famous example of the “turn to-

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wards abstraction". At the height of action painting and abstract expressionism most notably characterized by artists such as Jackson Pollock and Willem de Kooning, Dubuffet began using a plastering technique called the "Tyrolean" method in the early 1950s to create large format paintings celebrating the complexity of the soil (Alley, 1981).

5 He discovered he could do splendid paintings using the soil of his garden. About his series *Topographies* or *Texturologies* or *Materiologies* (Fig. 9), he wrote (15 April 1958) to his friend Henri Matisse (Dubuffet, Catalogue Gianadda, 1993, p. 104):

"...J'entends par là une nouvelle série de 'tableaux d'assemblages' représentant des morceaux de sols..."

10 ("...I mean by that a new series of paintings representing an assembling of pieces of soils...")

Between 1950 and 1960, Dubuffet created numerous such paintings with "pedological" titles as:

- *Terre mon biscuit* (Earth, my biscuit). April 1953.
- 15 – *Terre orange aux trois hommes* (Earth orange with three men). May 1953.
- *Histologie du sol* (Soil Histology). October 1957.
- *Série Texturologie* (Texturology series). 1957–1958.
- *Mécanique du sol Texturologie* (Soil Mechanics). December 1958.
- *Topographie honneur au sol* (Topography in honor to soil). December 1958.
- 20 – *Terre mère* (Mother earth). December 1959–May 1960.

Many other painters before 1970 have used soil as a material or represented soil as a background feature, but it was rare for soil for to be central and presented for itself, as with Grant Wood and Jean Dubuffet. We could mentioned Mark Rothko (1903–1970) with his *Terre et Vert* (1955) (Earth and Green) from the Museum Ludwig, Cologne,

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Germany. The painting is divided in three horizontal colored parts: red for soil, green for vegetation, blue for sky, but it belongs more as a representation of a landscape than of a soil.

2.4 Soil in contemporary painting

In the latter half of the 20th century, more and more painters began considering the soil as a subject of inspiration and artistic creation. Two further examples are the works of Paul Rebeyrolle and Anselm Kieffer.

2.4.1 Paul Rebeyrolle (France)

Paul Rebeyrolle (1926–2005) was born in Eymoutiers (France).

“He has gained recognition as one of the foremost twentieth-century French painters. His striking works of art, centred on violent yet noble themes up hold freedom, combat injustice, intolerance, and the enslavement of both mankind and nature; constituting an authentic testimony of our time” (<http://www.espace-rebeyrolle.com/menu.htm>).

Paul Rebeyrolle’s famous *Grands Paysages* (Large Landscapes) (1978), made with soil, straw, compost, etc., show torrents of water flowing freely between earth massifs, capturing the eroding power and danger of natural forces (Fig. 10).

Many other Rebeyrolle’s paintings are related to soil as *La Souche* (1999)(The tree stump) or paintings about seasons as *Le Printemps* (1967) (The spring).

2.4.2 Anselm Kieffer (Germany)

Anselm Kieffer (1945–) is one of the most famous artists in the world from the end of 20th and beginning of 21st century. Until recent years, this German artist partially lived in Barjac in the south of France (Gard) in a vast domain of “garrigue” (a type of low, soft-leaved scrubland ecoregion and plant community in the Mediterranean forests, woodlands, and scrub biome) that he transformed into an huge work of art: a concrete architectural landscape with buildings and towers in ruins, a cathedral of soil and con-

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crete and a network of tunnels at the landscape scale as giant earthworm galleries giving access to small houses as art chapels showing very large paintings or other art works. It seems this artist develops a special relationship with soil. Some of these paintings (as many others in different museum or private collections in the worlds) show cultivated fields, which could have caught on fire, a vision of devastation. It looks very dry and bare, but some of these paintings exhibit a glimmer of hope as *Aperiatum Terra et Germinet Salvatorem* (“Let the earth be opened and send forth a Savior”) (2005–2006). The painting was done with oil, acrylic, emulsion, shellac and clay on canvas with colored flowers catered at the bottom evocating the new birth of life (Fig. 11).

These cultivated landscapes are composed with mixed materials including soil but also with reinforced concrete as in the 2004 gigant art work *Von den Verlorenen gerührt, die der Glaube nicht trug, erwachen die Trommeln im Fluss* at the Sydney’s Art Gallery (Australia) (<http://www.artgallery.nsw.gov.au/exhibitions/new-contemporary-galleries/featured-artists-and-works/anselm-kiefer>).

3 Case studies of soil in installation art

Installation art provides artists with unlimited media and tools with which to explore the soil as social, ecological and political subject. This is not to say that that more traditional forms such as painting and sculpture are not sufficient to capture the complexity of the soil, but that installation introduces dimensions of time, space, and sensory experience beyond traditional fields of vision. “By inviting the viewer literally to enter into the work of art, and by appealing not only to the sense of sight but also, on occasion, to those of hearing and smell, such works demand the spectator’s active engagement” (Grove Art Online, 2009). The prevalence of installation as a visual art form can be seen in the “emergence of soil art,” in that it gives artists new tools for exploring our relationships to the soil as medium and its functions for society. Rosenthal (2003) has categorized installation art into two main groups, filled-space installation, and site-specific installation, to which many examples of land art and public outdoor interventions with soil

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belong. Let us look, for example, at the “filled-space” type of installation art, and differentiate between two directions: (1) installation as immersive spatial experience that relies heavily on architectural design, and (2) installation as Gesamtkunstwerk,² or an assemblage of multiple forms that symbolically, materially, or thematically relate to one another concerning the values and functions of soil in society.

3.1 Immersive experience

3.1.1 *Walter de Maria (USA) and Urs Fischer (Switzerland)*

To begin with the first type of installation, installation as immersive experience, we can think about the soil in terms of its unique spatial qualities. On the one hand soil is solid ground – a dense, stable, immobile field upon which to walk, stand, and build. On the other hand, soil is a porous zone in perpetual flux – a complex labyrinth of moist pore spaces and fractalous crevices churning with microscopic life. Regarding the first vision of the soil, we can cite two well know examples from New York, Walter de Maria’s *New York Earth Room* (1977, Fig. 12a) and Urs Fischer’s *You* (2007, Fig. 12b). For the *New York Earth Room*, the pioneering Land Artist, Walter de Maria, filled an entire Manhattan loft with soil from a Pennsylvanian farm, only to be viewed (and smelled) through a small doorway blocked off by a Plexiglas window. The installation of earth materials completely occupies the viewers’ experience, bringing the physical, visual awe of Land Art into a familiar, indoor, architectural space.

“By filling a loft space in Manhattan with earth, De Maria makes a theatrical use of space. It is the space itself which is being shown, transformed by both the quantity and nature of the material. . . A sense of exclusion is expe-

²The term Gesamtkunstwerk was first introduced by the philosopher Karl Friedrich Eusebius Trahndorff in an essay from 1827 and later popularized by Richard Wagner to describe the use of multiple art forms in his Operas.

rienced by the viewer, as the space occupied by the work cannot be entered” (Kastner and Wallis, 1998).

Thirty years later and only ten blocks away, Swiss artist, Urs Fischer, “installed” a formal antithesis of de Maria’s *Earth Room* by excavating rather than depositing about the same amount of earth from the depths of Gavin Brown’s gallery floor and inviting the viewer to actually enter into the work of art at his or her own risk. Here too, the viewer is overwhelmed by the earth materials that challenge the architecture of the exhibition space. The solid ground necessary for any architectural venture gives way to a new and somewhat ungrounding spatial experience. In *Earth Room* and *You*, typical conceptions of earth materials, such as ploughed fields or excavated pits for construction work, are brought indoors to disrupt the viewers’ normal relationship to the materials and the space they occupy, calling for deeper contemplation of and confrontation with both.

3.1.2 Philip Beesley (Canada)

Another example of immersive installation soil art explores the more porous, labyrinthine qualities of the soil as spatial entity without actually moving a grain. An ongoing research project by architects Philip Beesley, Rachel Armstrong, Hayley Isaacs, Eric Bury and Jonathan Tyrell, *Hylozoic Soil* (Fig. 13) is an interactive environment of tiny sensors, “groves of frond-like ‘breathing’ pores, tongues and thickets of twitching whiskers” and other mechanized components that make up what Beesley envisions as a prototypical model of “immersive architecture and synthetic ecology” (Beesley and Armstrong, 2011). With far more potential than the massive, inert, singly-functioning building material it is commonly treated as, the soil is seen as a responsive framework for myriad encounters and a physical template for social and biological evolution. Where Maria and Fischer challenge the viewer’s experience of architecture by installing soil within the familiar framework of walls and floors in *Earth Room* and *You*, Beesley and his partners challenge the very idea of architecture by redefining that framework of walls and floors as a system of reactive pore spaces that imitate the soil.

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Hylozoism refers to the Greek philosophy that life may be found in all matter. Hylozoic *Soil* is a multisensory kinetic installation that uses the sculptural metaphor of fertile soil to bring architecture, usually inert, to life. It simultaneously references the microbial aesthetics of mycorrhizal plant-root-fungi interdependence and the metaphysics of Graham Cairns-Smith's controversial clay-life hypothesis³. Like the hyper-reactivity of clay particles, the delicately responsive structures of *Hylozoic Soil* are predetermined to evolve and change based on human (or other biological) presence. A meshed network of movement sensors, air filters, and flasks filled with ferrofluids sends feedback signals of light and rippling movement triggered by the smallest presence of otherness within the system (Beesley and Armstrong, 2011). It is this juxtapositioning of life as container and as contained that creates tension in Beesley's work.

As an installation, or architectural prototype, *Hylozoic Soil* succeeds in momentarily transporting human experience to the scale of a Collembola, reminiscent of multimedia exhibits that magnify the soil microcosm in natural history museums and soil educational exhibitions⁴. But Beesley and his partners have created more than an installation to contemplate the complexity of the soil. They use the concept of the living soil to challenge accepted notions of architecture by focusing on the fantastic universe of soil pore systems – the spaces in between – rather than the predictable boundaries of cubes and spheres that separate life (via traditional architectural structures) from the wilderness beyond. Beesley remarks,

“In opposition to design principles of the past century that favoured optimal equations where maximum volume might be enclosed by the minimum

³In his controversial book, “Seven Clues to the Origin of Life”, Cairns-Smith (1985) proposed that clays were a proto-organic vehicle or template for biological replication.

⁴See, for example, soil pore space scale models at the *Dig It! The Secrets of the Soil* exhibit at the Smithsonian's National Museum of Natural History, the *Unter Welten* exhibit at the Museum am Schölerberg in Osnabrück, and the *Unter Unseren Füßen* exhibit of the Senckenberg Museum of Natural History in Görlitz.

possible surface, the structures in Hylozoic Ground prefer diffuse, deeply reticulated skins. . .” (Beesley and Armstrong, 2011).

If we think about the immense surface area of an ideal soil, with pore spaces matching aggregates, and sand, silt and clay fractions evenly distributed to allow for optimized flow of water, air, nutrients, and biota, we approach a new vision of architecture where no space is empty and no structure is stationary. A handful of loam becomes the ultimate installation and architectural template for life itself.

3.2 Gesamtkunstwerk

3.2.1 Claire Pentecost’s (USA)

“As a term that gained currency in the 1960s to describe a construction or assemblage conceived for a specific interior, often for a temporary period, and distinguished from more conventional sculpture as a discrete object by its physical domination of the entire space” (Grove Art Online, 2009),

installation art has become a household name in the contemporary art world. By its nature, installation art can reference and appropriate all other visual art forms, cherry-picking different styles, media, and techniques to condense meaning into three-dimensional spatial experience. Many artists and critics have referred to (installation art) as an expression of the concept of *Gesamtkunstwerk*, a total work of art, as it appears to borrow from a vast spectrum of disciplines (de Oliveira, 1993). This reading of installation art as a total work of art consisting of many related parts is exemplified by a further example, Claire Pentecost’s acclaimed contribution to dOCUMENTA 13 in Kassel, the *Soil-Erg* (Fig. 14).

In the rotunda of the historic Ottoneum, a theatre turned hospital turned gallery turned natural history museum, Claire Pentecost assembled a series of drawings, sculptures, worm compost, and appropriated museum pieces that all revolved around a central theme – the soil as post-capitalist currency and common resource that anyone

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can create by learning how to compost. As part of this well-researched “Gesamtkunstwerk,” Pentecost participated in a three-month residency program at the University of Kassel’s Faculty of Organic Agricultural Sciences, offered workshops at dOCUMENTA 13 on composting, soil health, and capitalist alternatives to land-grabbing, and developed a series of pillar-like vertical planters in and around the city together with designer and philanthropist Ben Friton of the CanYa Love Foundation. The installation at the Ottoneum served as the visual centerpiece of *Soil-Erg*, visited by thousands of people over the course of the summer.

Lining the walls of the Ottoneum are oversized soil coins, too big and crumbly to fit in anyone’s pockets, and forty-three drawings in earth-based pigments that reference the graphic style of banknotes. The series of *Soil-Erg* bills features images of historic figures of sustainable agriculture such as Rachel Carson, Wangari Maathai, and Vandana Shiva, as well as influential ecological artists and writers such as Joseph Beuys and Henry David Thoreau, and a cast of non-human soil workers from snails and bees to fungal mycelium and bacteriophagic nematodes. “The center of the installation itself is the proposal of a new system of value based on living soil” a symbolic and very literal stack of compost pressed in the shape of gold bars,

“sculptural objects from handmade soil, or compost (that) represent units of a new currency, the soil-erg (provisional name), proposed as a replacement of the petro-dollar” (Pentecost, 2012).

Mounted on another wall of the Ottoneum like the ghost of an affluent fossil fuel past is the Richelsdorfer Mountain Cabinet from 1783, a scale model of Hessen’s geologic strata once used for teaching the fundamentals of extraction. Next to the historical cabinet appropriated from the natural history museum’s collection, a new cabinet squirms with worm compost produced in part by the food scraps of visiting dOCU-

MENTA guests, offset by a list of current “land grabbing” deals between sovereign countries in Africa, Asia and South America and multinational agribusiness concerns.⁵

If we go back to the sheer gravity of Walter de Maria’s *Earth Room*, we recognize not only a playful approach to redefining architectural space, but also an underlying anti-capitalist statement intended to free art from the commodification and value control of the market economy – a reoccurring debate of installation art.

Claire Pentecost extends such ideas about the de-commodification of art to the soil, using sculpture, drawing, writing, lecturing, photography, collaborative engineering, participation, composting, gardening, and research as a Gesamtkunstwerk to not only explore but demand new systems of value for the soil.

“Made of soil and work, the soil-erg both is and is not an abstraction. Symbolically, it refers to a field of value, but that value is of a special nature: soil must be produced and maintained in a context. It is completely impractical to circulate it. It is heavy, and, because of the loose structure required of good soil, it falls apart. . . The physical nature of soil the soil-erg both evokes and denies the possibility of coinage. If currency as we know it is the ultimate de-territorialization, the soil-erg’s value is inherently territorialized” (Pentecost, 2012).

3.3 Archives

A third direction in installation art is the archive, as represented by two artists on either side of the planet, herman de vries and Koichi Kurita.

⁵Pentecost cites the following websites for her list of land-grabbing info presented in the Soil Erg installation: <http://farmlandgrab.org/> and <http://oaklandinstitute.org>.

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3.3.1 herman de vries (Netherlands)

One of the first and most renowned artists' soil archives is herman de vries' *erdmuseum* in Eschenau and his related *from earth* works.⁶ Initiated in 1979, the *erdmuseum* consists of 7000 soil samples from all over the world, many of which were painstakingly collected by the artist himself. All samples have been dried, pulverized, packed into bags, and stored in cardboard boxes marked with the date and location of the finding. These samples are further represented as earth rubbings on uniform grids on paper, the *erdkatalog*, which is also organized according to time and place of discovery. In a minimalist handling of material, a political overtone is imbued in the work. All samples are unique in color and origin. All have been handled equally. None have been emphasized, singled out, or excluded, even samples from history-laden sites like Chernobyl or the concentration camp at Buchenwald. Mel Gooding (2006) remarks on de vries' ability to distil the intrinsic qualities of "self-ness" from the materials he collects:

"Crushed to a powder, reduced to its basic mineral 'suchness', rubbed down with the tips of the fingers into a simple rectangle of colour, the earth itself is transformed not into the sayable abstraction of the word, but into a material sign of its self-ness."

The *erdmuseum* furthermore exhibits a scientific rigor in its execution. As de vries explains in an interview with John Grande, his methods are partly informed by experiences he gained in his former career as a biologist.

"a systematic approach is one possible way artists can work. i learned this discipline from science."

de vries continues with an emphasis on interdisciplinarity:

"science on its own cannot provide us with a complete understanding of the world and our life. art and science can be complementary. by fusing both,

⁶Note: lowercase letters are a signature of de vries' philosophy of objectivity.

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and directors clearly recognize that soils can form a visually striking element that adds mood and texture to the viewing experience. Some filmmakers have recognized the human connection to the soil and have used it in their storytelling. A few screenwriters and filmmakers have gone even further, and moved from the typical view of soils a static backdrop on which the action is played out, to a view of soils as a dynamic ecosystem feature.

About a decade ago, when I partnered with Christian Feller to edit *Soil and Culture*, I made a conscious effort to write about an artistic medium that I love – “film” to be formal, but really for me “the movies” – and its varied depictions of soil. The survey paper for that volume, *In a supporting role: Soil and the cinema* (Landa, 2010) represented my journey to seek out and explore such films. In recent years, other films, viewed solely as a movie fan, continued to enter my newly focused consciousness, and technical films, viewed early in my career as a soil scientist, came back to mind. Within that retrospective and prospective setting that I now occupy, I am continually exposed to cinematic depictions of soils, soil processes, and soil life, and have come to appreciate these films in a new light. This perspective truly adds to my viewing pleasure, and I have also come to see film as a familiar and effective, common ground (literally!) for talking to non-soil scientists about the nature and properties of soil. “What have you seen lately?” is a constant question for movie fans, and I will share some thoughts from my recent viewing – some films re-visited, some new to me, all with the hope of creating dialog on both film as an art form, and on soil as a component.

Woman in the Dunes (1964) and *Dune* (1984) focus on not only the dynamism of the moving sands, but also on the subsurface water of the dune as a key ecosystem feature. Soil is central to the story of planet Arrakis in *Dune*, the David Lynch film based upon the 1965 novel by Frank Herbert. Indeed the “planetary ecologist” who is the hero of the *Dune* saga was based upon an Oregon soil scientist (Landa 2010). A 2013 documentary *Jodorowsky’s Dune*, on the unsuccessful mid-1970s attempt of surrealist director Alejandro Jodorowsky’s to adapt and film Herbert’s novel, is reviving

interest in both the Lynch film and in Herbert as a potent force in the environmental movement.

The natural history of the prairie and the abundance derived from the soil is exquisitely depicted in *Days of Heaven*, the 1978 film by acclaimed director Terrence Malick. Characterized by rich images and sparse dialog⁷, this circa 1915 tale of life on the wheat farms of Texas (actually filmed in Alberta and Montana), includes a brief but memorable time-lapse photography sequence by cinematographer Ken Middleham⁸. The footage (originally shot for the 1979 documentary *The Secret Life of Plants* (Weber, 2007)) is accompanied by a soundtrack composed and conducted by Ennio Morricone. Images of unfurling seedlings and probing roots have a special magic for scientists and non-scientists alike — see, for example, the 10 January 2014 cover of *Science* magazine showing a lateral root emerging from the main root of a young *Arabidopsis thaliana* plant (<http://www.sciencemag.org/content/343/6167.cover-expansion>).

Indeed, moving images of elongating roots seem to beg for music, a fact not unnoticed by Auburn University plant physiologist Elizabeth (“Betty”) L. Klepper and her US Department of Agriculture/Agricultural Research Service colleague Morris G. Huck. Their 16 mm film, *Time-lapse photography of root growth*, depicting research at the Auburn rhizotron (Fig. 15) where cotton roots in soil were observed through glass panels while the plant tops were exposed to field conditions (Taylor, 1969; Huck et al.,

⁷For soil scientists, an endearing and perhaps unscripted line (33:10–33:26) in *Days of Heaven* has a 12-year old girl, played by Linda Manz, musing in voice-over about her future, as she studies a clod of soil and lowers her ear to the earth: “I could be a mud doctor. . . Checking out the earth. . . underneath.”

⁸For an in-depth look at the time-lapse photography of Ken Middleham (1927–2001), see: *Filming the Invisible: The story of Ken Middleham, Cinematographer* at <http://www.youtube.com/watch?v=cDEILm1hfSQ> and <http://www.youtube.com/watch?v=azlXfxqFVQo>. Middleham was the natural history cinematographer on *The Secret Life of Plants* (<http://www.youtube.com/watch?v=sGI4btrsiHk>), and the soundtrack to accompany his images there was composed and performed by Stevie Wonder.

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1970) premiered at the 11th International Botanical Congress in Seattle in the summer of 1969.

The film opens with a classical musical soundtrack that appears to be a re-write of Luigi Boccherini's "Celebrated Minuet"⁹ (<https://www.youtube.com/watch?v=epJahNtJzss>). Klepper wrote the film's narration that was later recorded by a staff member from Auburn University Television. He recommended several possible accompanying music selections to the research team. Klepper and Huck selected one that had a dramatic upturn in the music at a point in the edited, final version of the film where a root growing down a pane of glass has disappeared behind the soil and suddenly reappears (e-mail, Klepper to Landa; 21 April 2014). The film was given new life in 1999 with its re-release on DVD by the American Society of Agronomy/Crop Science Society of America/Soil Science Society of America, and has been a popular instructional video (Kirkham, 2011).

The works of Klepper/Huck in the scientific sphere, and of Middleham in the commercial film world, are early examples of the convergence of film with the soil and plant sciences. More recently soil scientist/geo-archaeologist Paul Adderley (University of Stirling, Scotland) and composer Michael Young (University of London) have collaborated on: *Exposure: Understanding Living in Extreme Environments* (<http://www.ground-breaking.net/exposure.html>), an installation that integrates sight and sound across scales ranging from the microscopic to the landscape scale, and that depicts both the physicality of soil and its role as a cultural archive of past civilizations (an experimental 12-minute video from installation is available at <http://soundsrite.uws.edu.au/soundsRiteContent/volume4/YoungInfo.html>).

Modern rhizotron facilities, sampling devices adapted from engineering and medicine (including borescopes and laparoscopic samplers), and advanced, three-dimensional tomographic imaging techniques offer new opportunities for creative explorations at

⁹The Boccherini minuet has been used in the soundtrack of a considerable number of feature films (<http://www.imdb.com/name/nm0090530/>), including the Coen brothers *The Lemony Snicket's A Series of Unfortunate Events* (2004).

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the interface of science and art, with the potential of attracting new collaborators and audiences to soil science.

Ken Middleham's talents in micro-scale motion picture photography were also put to use in the 1974 science fiction film *Phase IV*, where ants become a threat to human civilization. Middleham provided the insect photography – which has appropriately been described as “creating a sort of animal acting verisimilitude that has gone unmatched on film before or since” (Gilchist, 2012). But from a viewer's perspective of the entire film – aptly described as “an ecological parable set within the science fiction genre” (Bass and Kirkham, 2011, p. 257), soil is primarily manifested not in the microphotography of ant activity, but on the macro-scale, in towering geometric obelisks made of soil. Rising from the desert floor, they are ominous, and the massive and alien occurrence of soil in these ant observation towers, and later in the film, in the form of massive solar reflectors, combined with the storyline and soundtrack, are highly effective conveyors of threat to the viewer. (Having observed much smaller, cylindrical, indurated-soil ant nests in Oregon (Landa, 1977), this image had particular resonance with me – the unfamiliar soil feature in that case provoking curiosity.)

Phase IV director, Saul Bass (1920–1996), was a noted graphic designer whose corporate logos (e.g., the United Airlines “flying U” and blue/red/orange stripes) are known to all, and whose design of motion picture title sequences and advertising posters made him a sought-after talent in Hollywood – the directors with whom Bass worked included Otto Preminger, Alfred Hitchcock, Stanley Kubrick, and Martin Scorsese (who wrote the Foreword to the Bass and Kirkham book). There is a strong linear character in many of the Bass graphics, and this signature style is reflected in the imagining and construction of the soil pillars for the only feature film that he directed.

Bass conceptualized and designed all of the earthen manifestations of the ant civilization in the film – the tunnels, towers, reflectors, and the final chamber (email from Jennifer Bass, 6 May 2014). The film critic of London's Sunday Times picked up on the linkage of design, imagery and mood, calling *Phase IV* “a film of design, of un-sentimental forces set against one another in lines, curves, angles, shining surfaces.

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Beautiful, but always threatening, mysterious, forbidding.” (Bass and Kirkham, 2011, p. 258). Although the story is set in Arizona, the outdoors filming was done in the Rift Valley of Kenya, and Bass had to be careful not to get a giraffe in the shot (email from Jennifer Bass, 6 May 2014).

5 Bass’ surreal epilogue to the film (cut by Paramount Pictures and not on the presently available DVD) was screened for the first time in Los Angeles in 2012 (Gilchist, 2012). Available at <http://www.youtube.com/watch?v=beLpsWaUDNk>, it is a stunning summation that is a must-see to get the unambiguous storyline and to appreciate Bass’ artistic vision in its full realization. Marketed by Paramount as a B-horror movie, *Phase IV* had
10 only a small footprint in the US, but was a hit in France (Bass and Kirkham, 2011). Hopefully Saul Bass’ pioneering work will receive greater attention when scholars and movie buffs gather to discuss environmental films, and future audiences will get to see the uncut version of *Phase IV*.

As soil scientists, our view of soil in films is admittedly atypical. A case in point is
15 the 2011 film from director Lech Majewski, *The Mill and the Cross*. A truly unique film inspired by a still image – Pieter Bruegel’s 1564 painting *The Procession to Calvary* depicting Christ carrying the cross to the crucifixion in a reimagined 16th century Flemish setting – it has a scene in which a woman is buried alive. The grave has box-like, vertical walls. But even more visually powerful than the geometry are the color contrasts
20 and the strong horizon boundaries in the soil exposed on the pit walls:

- a very dark surface which grades to a somewhat lighter brown,
- then a very sharp demarcation to a thick white layer.

Captivated by the image, my first thoughts were:

- was that the natural color in the soil pit? If yes, was the filming location specifically
25 chosen for this look?
- Alternatively, were computer generated imagery or other methods used to enhance some profile color effects?

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I had a series of e-mail exchanges with director Lech Majewski on these questions (e-mails Majewski to Landa: 31 December 2012; 26 February 2014). The scene was shot near Katowice, Poland on an old slag-deposit field. The choice of the pit site was just chance – the look of the soil had nothing to do with the selection of the filming location; rather, the slope was chosen to give a good view of the monks in the same shot. The lesson to me was clear – Not all depictions of soil, even if eye-catching for a soil scientist, are conscious acts of filmmaking. But one can dream. . .

5 Conclusions

As Dokuchaev introduced a more holistic, three-dimensional vision of the soil, artists have been exploring the complex visual, cultural, and symbolic dimensions that are embodied in that three-dimensional soil space. As a consequence of experiences in working on soil and art topics, we conclude that:

- Investigations and discussions focused on soils and landscapes can be made much more appealing and relevant to lay audiences by including artistic approaches.
- Soil science professional societies should encourage new transdisciplinary explorations in areas such as soil and culture, soil and religion, soil and history, etc. Only when our community becomes more broadly based will soil protection become more relevant for the public at large and for decision-makers.
- Artists expand the realm of soil science research with visual, cultural and symbolic forms of inquiry, offering new ways of visualizing, interpreting and interacting with soil.
- An overall aim should be to integrate human aspects, including art, in our work.

Author contributions. Co-authors of this article are soil scientists but each one has her/his own interest(s) in art. Hence, Sect. 2 (paintings) was written by C. Feller with additions by A. Toland

and G. Wessolek, Sect. 3 (installation) by A. Toland and G. Wessolek, and Sect. 4 (cinema) by E. R. Landa.

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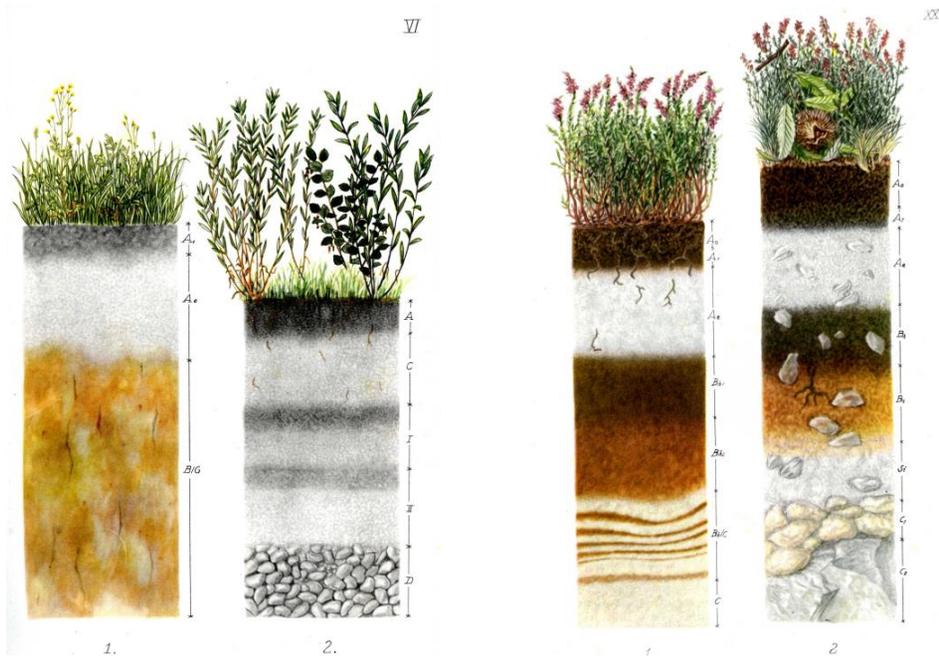


Figure 1. Soil profiles and associated vegetation represented as paintings in Walter Kubiena's textbook (1953): *Bestimmungsbuch und Systematik der Böden Europas (Soils of Europa)*.

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Figure 2. Lascaux Cave, Montignac (Dordogne, France). Frieze of the Bulls, left wall. Photo copyright N. Aujoulat, MCC/Centre national de préhistoire). These caves contain some of the best-known Upper Paleolithic art. These paintings are estimated to be about 17 300 years old.



Figure 4. P. I. Bruegel. *La chute d'Icare (The Icarus Fall)*. circa 1568. Musées Royaux des Beaux-Arts de Belgique, Brussels, Belgium (Inv. 4030). Photo: RoScan, J. Geleyns (© Musées Royaux des Beaux-Arts de Belgique, Brussels, Belgium).

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Figure 5. Rosa Bonheur (1822–1899). Detail from *Labourage Nivernais*. 1849. Oil on canvas. Musée d'Orsay (personal photo of C. Walter). © musée d'Orsay, Paris, RF 64, acquisition of French government in 1848, initially for Musée de Lyon).

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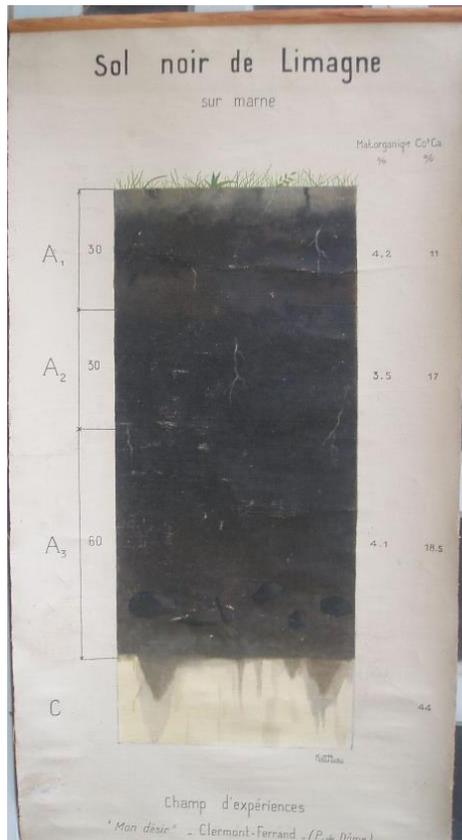


Figure 6. Paintings of soil profiles used by A. Demolon and colleagues for their lectures in Paris (in the 1940's). Unknown artist. Left: *Vertisol* from region Centre (Clermont-Ferrand, France); right: *Luvisol* from region Ile de France (Versailles, France) (private collection).

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Figure 7. G. Wessolek. *Soil Aesthetics Criteria*. 2007. (Courtesy of the artist).

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Figure 8. Dominique Schwartz. Photographs of the series “Geo-graphismes”. 2012. (Courtesy of the artist, <http://www.dominiksvarc.book.fr/galleries/geo-graphismes/>).



Figure 9. Jean Dubuffet and his *Matériologies*. 1960. (© Archives Fondation Dubuffet, Paris, Photo Jean Weber and © Fondation Gianadda, Martigny).

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Figure 10. Paul Rebeyrolle in front of *Les Grands Paysages*. 1978. (“Large Landscapes”). (Photo copyright Freddy Le Saux, Espace Paul Rebeyrolle, 87120 Eymoutiers, 2014).

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Figure 11. Anselm Kiefer. *Aperiatur Terra et Germinet Salvatorem*. 2005–2006. (copyright Anselm Kiefer, Courtesy of the artist and thank you to Editions du Regard).

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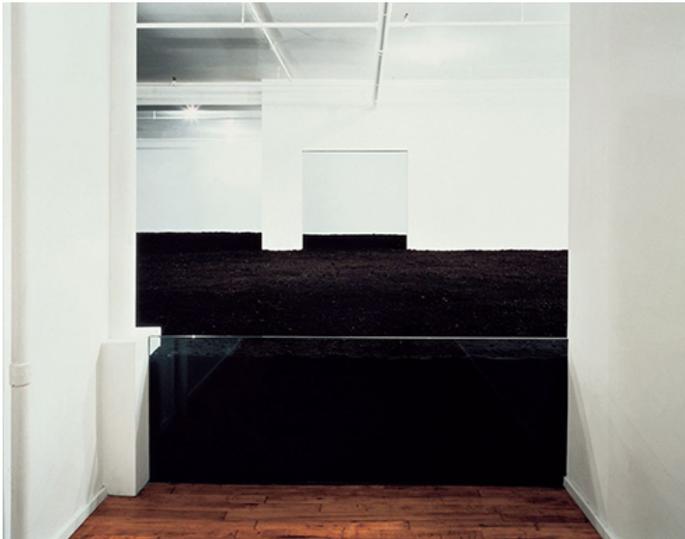


Figure 12. (a) Left: Walter de Maria. *New York Earth Room*. 1977. Long-term installation at 141 Wooster Street, New York City. Photo: John Cliett. Courtesy Dia Art Foundation, New York. **(b)** Right: Urs Fischer. *You*. 2007. Excavation, gallery space, 1 : 3 scale replica of main gallery space. Dimensions variable Installation view, “you”, Gavin Brown’s enterprise, New York, 2007. Collection of The Brant Foundation, Greenwich, Connecticut (copyright Urs Fischer. Courtesy of the artist and Gavin Brown’s enterprise, New York. Photo: Ellen Page Wilson).

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Figure 13. Philip Beesley et al. *Hylozoic Soil*. 2007. Installation at the Musée des Beaux Arts, Montreal, Canada, 2007 (© PBAI, Courtesy of the artist).

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Figure 14. Claire Pentecost. Soil Erg. 2012. Installation at dOCUMENTA 13. (copyright Claire Pentecost, Courtesy of the artist, photo Jürgen Hess).

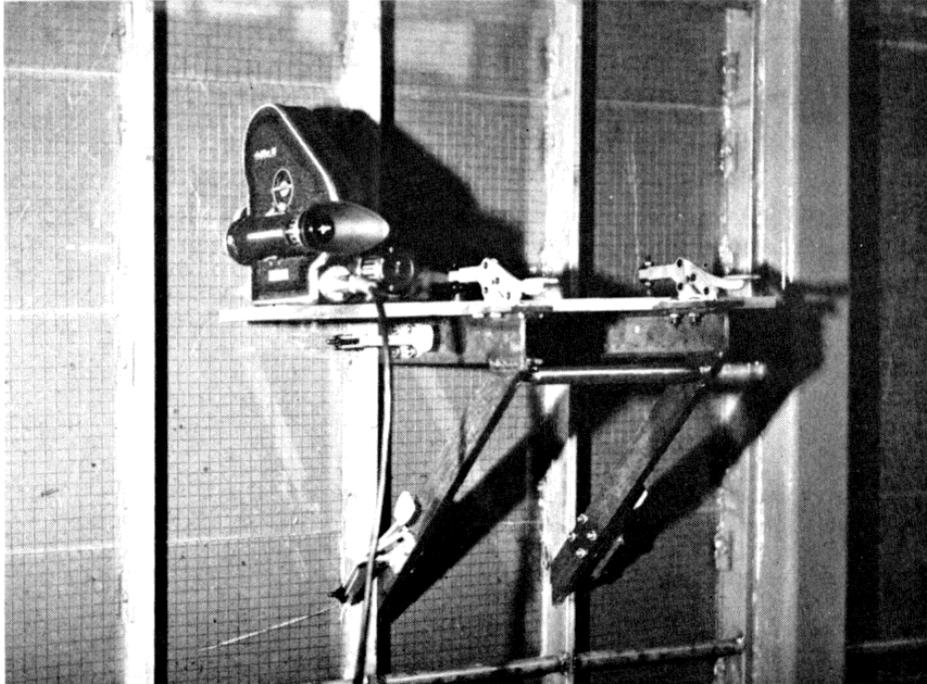


Figure 15. Time-lapse photography set-up used by Klepper and Huck at the Auburn Rhizotron to examine root behavior behind glass panels (Courtesy of Alabama Agricultural Experiment Station). The camera support could be moved to allow photography of any part of the visible root system. The 1/2 inch square grid-wire mesh embedded in the glass panes provided a measuring scale and reduce shattering if the glass broke (from Taylor, 1969).

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