



Case studies of soil in art

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Abstract. The material and symbolic appropriations of soil in artworks are numerous 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 film, architecture, and contemporary art. Case studies focused on painting, installation, and film are presented with the view of encouraging further exploration of art about, in, and with soil as a contribution to raising soil awareness.

1 Introduction

Soil is a word whose meaning varies according to context. The patriotic understanding of soil (as in the “soil of France”) and the agricultural understanding of soil have very little in common. Even in the environmental and geological sciences, there are often vast differences between the soil of the geologist, the archaeologist, the geotechnical engineer, and the soil scientist, or pedologist. In the history of soil science, numerous definitions have been formulated, but all tend to have one or more of the following criteria in common: the presence of, or ability to sustain, life; the state and position of the soil as unconsolidated porous matter occupying the topmost layer of the earth, from the surface to the parent rock below; and the ability to demonstrate a record of physical and chemical change (genesis) due to myriad environmental factors over time (Certini and Ugolini, 2013).

Until now, no other planet has been identified with such a substrate fulfilling these criteria. The Earth’s soil is unique in our universe, and yet represents a presence in daily life so common that it is taken for granted. For the non-scientific public at large, soil is mainly the surface on which we walk, or an obscure part of the larger landscape. Because of its life-giving sustenance for all humans and other living beings, soils are far too important to be studied by soil scientists alone. But we live in a world where disciplinary bound-

aries define our work. Within the realm of science, boundary crossings – or what Julie Thompson Klein (1990, p. 65) refers to as “border disciplinarity” – are typically of the nearest-neighbor type: i.e., biology + chemistry = biochemistry, or geology and physics = geophysics. Extensions of soil science outside the agricultural or earth sciences, to the arts and humanities, are far less frequent. The last decades show, however, that the activities of the soil science community and its traditional partners have been insufficient in protecting our soils and landscapes. Soil degradation due to poor agricultural practice and lack of regulation and soil loss due to sealing and urban sprawl continue to occur at an alarming rate.

To encourage more holistic approaches to soil protection, our soil science community must open the doors to develop new perspectives by investigating and initiating transdisciplinary projects. Art, history, anthropology, sociology, psychology, economics, and religious studies represent just a few fields for expanding the scope of soil protection and raising soil awareness. In this contribution we aim to show how artists help reveal the interconnectivity of soil, life, and culture, and in so doing offer a different lens for appreciating the 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 paintings and sculpture, to recent developments in film, 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, especially since the Earth Summit in Rio de Janeiro in 1992, individual artists all around the world began to include soil (and not simply the landscape in general) as a subject of artistic inquiry. Environmental art, ecological art, and Land Art are some of the more well-known genres that took up issues of land use, soil ecology, and agricultural change in the latter half of the 20th century.

Following Wessolek's (2002) personal vision "to encourage a new art style, named *Soil Art*", we have assembled a set of case studies that we feel expose the possibilities of this vision. For our purposes of case selection, we will 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 and awareness-raising discourses" (adapted from Toland and Wessolek, 2010). This definition does not presume the recognition of a new art genre but rather narrows our field of inquiry and opens the door for future discussion.

Since the scope of artistic activity with and about soil is so large and diverse, it will be impossible to give examples of all artistic forms and genres in a single article. Rather than attempt a comprehensive overview, we will offer selected examples, from Renaissance paintings to contemporary installation works, to feature films, which reflect our observations as soil scientists with focused interests in art:

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

2 Painting

2.1 Roots, resurrection, and rural life – examples from the Renaissance

Examples of soil in paintings are numerous and date to antiquity. On the one hand, there is 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), and more recently in contemporary paintings to give special effects to the subject (Van Breemen, 2010). On the other hand, soil has been represented in paintings and mosaics in the form of lines or surfaces as an element of the landscape. In some cases, it was a schematic representation, as if the artist 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>).

But in other cases, the depiction of the soil (as a surface or a soil profile in the paintings) is remarkable, even when the focus is on another subject. Feller et al. (2010) distinguish three motifs of soil profile representation in paintings from the Renaissance:

- i. Visualization of the soil profile for the resurrection of the dead

In *The Last Judgment* by Rogier Van der Weyden (1432) (Fig. 1), the resurrection of the dead required the artist to show the soil profile. The complete painting exhibits numerous soil profiles. Details of the emergence of men and women from soil profiles (lower part of the painting) are so true to reality that they might have been painted by a pedologist.

- ii. Visualization of the soil profile for displaying plant roots

In several Renaissance paintings, the representation of a ditch or a soil cut in a painting served very often as an opportunity to picture roots. In *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 are just two examples of paintings in which large, forked roots were made evident. The representation of roots was not due to chance, but was chosen for its symbolic value. The root presented in detail in the foreground of the *St. John the Baptist* painted by Bosch is most likely the mandragora root, as suggested by Marjnissen and Ruyffelaere (1987). The mandragora root is thick, hairy and forked, and in a humanoid form. The roots of the *Mandragora* genus (mandrake) were extensively used by alchemists and in magic rituals based on their psychotropic properties (see Feller et al., 2010, p. 12, Fig. 1.6).¹ The mandrake was also a religious symbol for Christians, for whom it was linked to Genesis and aspects of Christ's life (for further details, see Feller et al., 2010).

- iii. Visualization of the soil profile to depict rural life and agricultural practices

¹To view images of mandragora, (1) go to <http://mandragore.bnf.fr/jsp/rechercheExperte.jsp>; (2) click on "Département des Manuscrits (occidentaux)"; (3) at "Cote", enter "français 12322"; (4) click on "Les images numérisées"; (5) at "Folio" box, enter "180v"; (6) hit "Chercher", then click on the individual images to view.



Figure 1. R. Van der Weyden. Details of *Le Jugement Dernier* (*The Last Judgment*). Circa 1432. Musée Hôtel-Dieu, Hospices Civils de Beaune, Beaune, France (© Hospices de Beaune).

In the 14th and 15th centuries artists also turned their gaze towards the soil in their depiction of agricultural practices. In the *Très Riches Heures*,² for example, we see representations of specific 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 also be cited for *The Fall of Icarus* (Fig. 2). Icarus is the tiny figure at the bottom in the right-hand corner, with only his legs visible as he descends into the sea, while in front 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”). Besides 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.

²The *Très Riches Heures du Duc de Berry*, or *Très Riches Heures*, is the most famous example of French Gothic manuscript illumination. 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 Duke of Berry by the Limbourg brothers. The “calendar” images are vivid representations of peasants performing agricultural work.

2.2 Abstraction, experience, and inspiration – examples from the 20th century

Our next two examples stem from two very different and opposed artistic traditions of the 20th century: European abstract painting and American regionalism, which favored realistic representation over abstraction.

2.2.1 Grant Wood (USA)

Art critics such as John Arthur (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. One of the most well-known proponents of American landscape painting was Grant DeVolson Wood (1891–1942). 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 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. Years before the creation of the first World Soil Day on 5 December 2012, the first Arbor Day, held in the state of Nebraska on 10 April 1872, could also be seen as a day to celebrate the soil. While the founder of Arbor Day, J. Sterling Morton, went on to become the Secretary of



Figure 2. P. I. Bruegel. *La chute d'Icare* (*The Fall of Icarus*). 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).

Agriculture of the United States (1893–1897), the connection between this American traditional and its agricultural context is evident in Grant Wood's painting, as the schematization of soil horizons is equally as prominent as the planting of the tree. This contrast between the title and the obvious attention to the soilscape below the main subject (the tree planting) is interesting to consider. It reminds one of the Bruegel painting *The Fall of Icarus*, discussed above, where the main subject was not Icarus, who is quite invisible, but rather a Flemish ploughman tilling the soil. In both examples, the soil and its horizons provide for a richer visual narrative that links cultural tradition and working practices to the soil below.

2.2.2 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), painters of the European Abstract tradition used 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 salons. 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 what art historian Grant Kester (2011) has described as the “turn towards 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).

Dubuffet discovered he could do splendid paintings using the soil from his garden (Fig. 3). About his series *Topographies* or *Texturologies* or *Materiologies*, 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. (I mean by that a new series of paintings representing an assemblage of pieces of soils.)

While other painters before 1970 used soil as a material or represented soil as a background feature, it was rare for soil to be central and presented in and of itself, as with the work of Jean Dubuffet. Between 1950 and 1960, Dubuffet's paintings even carried “pedological” titles, such as the following:

- *Terre mon biscuit* (Earth, my biscuit). April 1953.
- *Terre orange aux trois hommes* (Orange earth with three men). May 1953.
- *Histologie du sol* (Histology of soil). October 1957.
- *Série Texturologie* (Texturology series). 1957–1958.
- *Mécanique du sol Texturologie* (Mechanics of soil texturology). December 1958.



Figure 3. Jean Dubuffet with soil (1958) (© Archives Fondation Dubuffet, Paris; photo: Jean Weber and © Fondation Gianadda, Martigny).

- *Topographie honneur au sol* (Topography in honor of soil). December 1958.
- *Terre mère* (Mother Earth). December 1959–May 1960.

2.2.3 Anselm Kiefer (Germany)

In addition to works by Joseph Beuys, Hans Haacke, and Herman Prigann, Anselm Kiefer (1945–) is one of the most prominent German artists of 21st century to directly use and depict the soil as an artistic expression of political critique. Until recent years, Kiefer lived for part of the year in Barjac in the south of France (Gard) in a vast domain of “garrigue” (a type of low, soft-leaved scrubland in the Mediterranean woodlands) that he transformed into a huge work of art: a concrete architectural landscape with buildings and towers in ruins, a cathedral of soil and concrete, and a network of tunnels that evokes the landscape in the scale of giant earthworm galleries giving access to small houses as art chapels showing very large paintings or other art works.

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

It seems that this artist has developed a special relationship with soil: in architecture, with digging the soil in the manner of an earthworm; in painting, with the representation of soil landscape. Some of these paintings (as in many others by Kiefer in various museum and private collections around the world) show cultivated fields which could have caught on fire – a vision of devastation. It looks 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



Figure 4. Anselm Kiefer. *Aperiatur Terra et Germinet Salvatore*. 2005–2006. (© Anselm Kiefer, courtesy of the artist.)

flowers gathered at the bottom evocating the new birth of life (Fig. 4).

2.3 Teaching the soil – a place for painting in the soil science curricula

One of the main objectives of teaching soil science is to convey the concept of a three-dimensional, organized natural body – the pedosphere. Soil is organized into different layers named “horizons”, and the whole of the horizons is the “soil profile” (Fig. 5), with a thickness from some centimeters to more than 10 m.

It means that soil is not only “earth” but a “natural body” dependent upon different factors, such as climate, topography, geology, biology (including human activities), and time. Hence, earth as a material (and Earth as a planet) must not be equated with soil as an organized natural body. This vision of the soil is attributed to the Russian scientist Vasilii Dokuchaev, who suggested in his 1883 thesis *The Russian Chernozem* that the soil be considered the fourth natural kingdom of nature, equivalent to the mineral, animal, and vegetable kingdoms.

Every soil scientist knows how students 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. For some, the first time seeing a soil profile can be an emotional experience. As Hartemink (2014) noted at the 20th World Congress of Soil Science, “The soil profile speaks to us. . . . The soil profile tells us stories”. Nowadays, in modern soil textbooks, soil profiles are shown and described with photographs. But the early scientific depictions of soil in paintings dated from the beginning of the 20th century, either as splendid illustrations in textbooks on soil or prepared for educational exhibitions in lecture halls, generally as canvases representing different types of soil (Fig. 6).

The two oil canvases (60 × 100 cm) shown in Fig. 6 represent soil profiles. These canvases were published as il-

lustrations in the soil science textbook of Demolon (1952, p. 86) and were anonymously displayed in the 1940s 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 an artist.

Soil scientists who have written about historical farming practices, land use, and soil geomorphologic processes have often referenced paintings such as those discussed in this chapter, as well as others by Jacob and Salomon van Ruysdael, Paul Gauguin, Hieronymus Bosch, Peter Brueghel the Elder, and Ambrogio Lorenzetti, in their communications (Feller et al., 2010; Hartemink, 2009; Jenny, 1968). They use artistic examples to make the story of the soil profile come alive.

Other soil scientists – for example Gerd Wessolek and Alexandra Toland (Technische Universität Berlin), Ken van Rees (University of Saskatchewan), and Jay Stratton Noller (Oregon State University), and Folkert Van Oort and Bénédicte and Louis-Marie Bresson (INRA, France) – go beyond showing famous case studies of paintings to include artistic techniques and artistic collaborations in their teaching practices. A transdisciplinary confluence of soil science and art is achieved by including soil science students in artistic activities, and inviting artists to participate in soil science research and teaching endeavors.

Paintings by soil scientists are a way of presenting soil scientific concepts in a visual way. Figure 7 explores formal aesthetic features (color, texture, structure, composition of horizons) to describe soil properties. Such aesthetic features are often 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 or student to capture subtle details not possible in tabular, written form.

Painting techniques are also often used in soil awareness-raising activities, such as the “Painting with the colours of

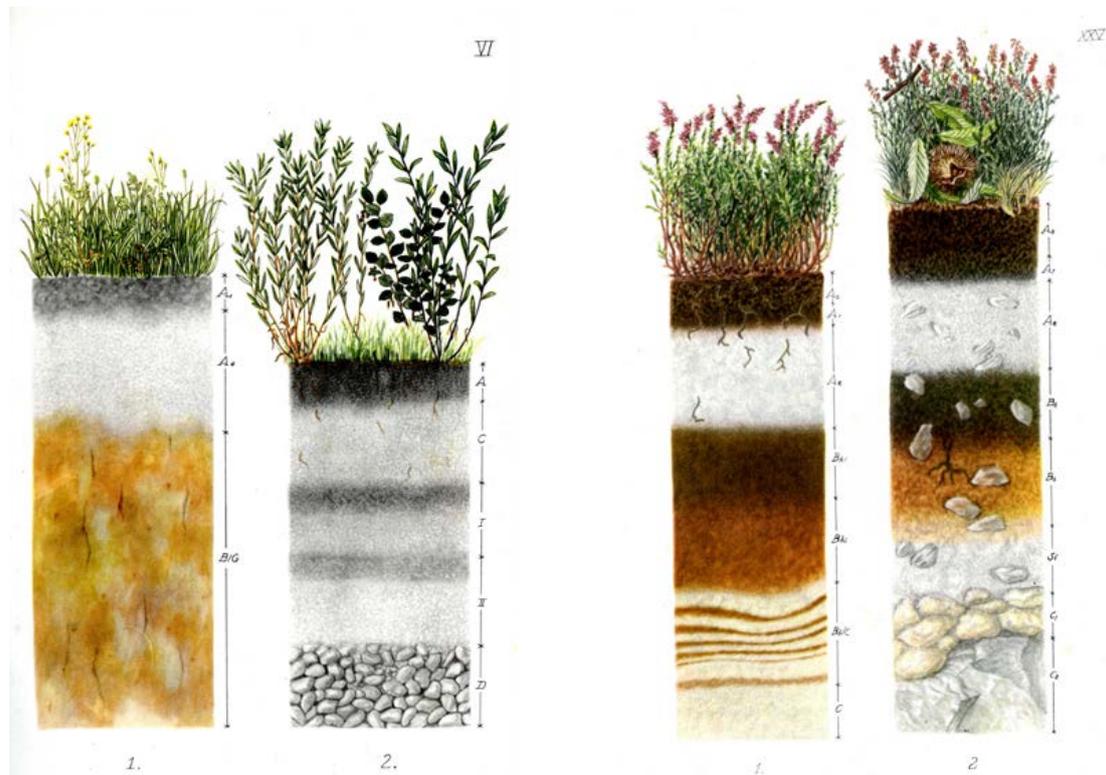


Figure 5. Soil profiles and associated vegetation represented as paintings in Walter Kubiena's textbook (1953) *Bestimmungsbuch und Systematik der Böden Europas (The Soils of Europe)*

the earth” program with Irena Racek in Austria (Szlezak, 2009), the soil painting program at the Museu de Ciências da Terra Alexis Dorofeef (Earth Science Museum) in Brazil (Muggler, 2013), or the soil painting exercises with Marcela Moraga at the Global Soil Week in 2015. Beginning with Wessolek's international “art and soil” calendar in 2004, the calendar has become a popular format for displaying soils from an aesthetic perspective. Since that time, several soil science societies have developed similar calendars as an effort to raise soil awareness. These examples aim to encourage a direct physical, personal, and aesthetic experience with materials otherwise rarely seen.

3 Installation

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 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). Rosenthal (2003) catego-

rized 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 belong. We will focus on the “filled-space” type of installation art here, and differentiate between two directions: (i) installation as an immersive spatial experience that relies heavily on architectural design, and (ii) installation as *Gesamtkunstwerk*,³ 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

³The term *Gesamtkunstwerk* was first introduced by the philosopher Karl Friedrich Eusebius Trahdorff in an essay from 1827 and later popularized by Richard Wagner to describe the use of multiple art forms in his operas. Although the term has been hotly debated by art history scholars regarding works from the Modernist period to the neo-avant-garde movements of the 1960s, it may be used to interpret installation art as a work of art consisting of many related parts.



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

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 crevices churning with microscopic life. Regarding the first vision of the soil, we can cite two well-known examples from New York City: Walter de Maria’s *New York Earth Room* (1977, Fig. 8) and Urs Fischer’s *You* (2007, Fig. 9). For the *New York Earth Room*, the pioneering land artist, Walter de Maria, filled an entire Manhattan loft with soil from a Pennsylvania 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 experienced 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.



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

3.1.2 Philip Beesley (Canada)

Another example of immersive installation soil art explores the more porous, labyrinthine qualities of the soil as a 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. 10) 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 considered, the soil is seen as a responsive framework for myriad encounters and a physical template for social and biological evolution. Where de 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.

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 fer-

tile 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 hypothesis.⁴ 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 springtail, reminiscent of multimedia exhibits that magnify the soil microcosm in natural history museums and soil educational exhibitions.⁵ But Beesley and his partners have created more than an installation to contemplate the

⁴In 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.

⁵See, for example, soil pore-space-scale models at the *Dig It! The Secrets of the Soil* exhibit at the Smithsonian Institution’s National Museum of Natural History, Washington DC; the *Unter Welten* exhibit at the Museum am Schölerberg in Osnabrück, Germany;



Figure 8. Walter de Maria. *New York Earth Room*. 1977. Long-term installation at 141 Wooster Street, New York City. Photo: John Cliett. Courtesy of Dia Art Foundation, New York.

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 favored optimal equations where maximum volume might be enclosed by the minimum 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 a 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.

and the *Unter Unseren Füßen* exhibit of the Senckenberg Museum of Natural History in Görlitz, Germany.

3.2 *Gesamtkunstwerk*

3.2.1 *Claire Pentecost (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. Some artists and critics have referred to installation art as a development of the concept of *Gesamtkunstwerk*, a total work of art, as it appropriates a spectrum of different artistic disciplines brought together into one work (de Oliveira et al., 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. 11).

In the rotunda of the historic Ottoneum, a theater 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 can create by learning how



Figure 9. Urs Fischer. *you*. 2007. Excavation in gallery space (Gavin Brown's Enterprise, New York). Installation view. Collection of The Brant Foundation, Greenwich, Connecticut (© Urs Fischer. Courtesy of the artist and Gavin Brown's Enterprise, New York. Photo: Ellen Page Wilson; additional photos at https://www.gavinbrown.biz/artists/urs_fischer/works).

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 Fritton of the CanYa Love Foundation. The installation at the Ottoneum served as the visual cen-

terpiece 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 43 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



Figure 10. Philip Beesley et al. *Hylozoic Soil*. 2007. Installation at the Musée des Beaux Arts, Montreal, Canada, 2007 (© PBAI, courtesy of the artist).

Henry David Thoreau, and a cast of non-human soil workers from snails and bees to fungal mycelium and bacteriophageic nematodes. The installation proposes a new system of value based on living soil. At the center of the room compost made from local food waste is symbolically pressed and stacked into the shape of gold bars, representing units of a new currency – the soil-erg.

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 Hesse'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 dOCUMENTA guests, offset by a list of current "land-grabbing" deals between sovereign countries in Africa, Asia, and South America and multinational agribusiness concerns.⁶

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 intention to free art from the commodification and value control of the market economy – a reoccurring debate of installation art. A pile of earth cannot be as easily auctioned as

a landscape painting or ceramic bowl. Claire Pentecost extends such ideas about the de-commodification of art to the soil, using sculpture, drawing, writing, lecturing, collaborative engineering, public participation, urban gardening, and composting as a *Gesamtkunstwerk* to not only explore but also 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 deterritorialization, the soil-erg's value is inherently territorialized (Pentecost, 2012).

While human societies have long benefited from the goods and services of the soil, including food production and medicines; materials for pigments, ceramics, and building constructions; and materials for religious and spiritual activities, the notion of valuing and protecting the soil on account of its goods and services is a more recent phenomenon of the mid-20th century. With the emergence of emissions trading and environmental economic accounts in the early 1990s, natural functions have become increasingly instrumentalized and institutionalized under the rubric of *ecosystems services*

⁶Pentecost cites the following websites for her list of land-grabbing info presented in the Soil-Erg installation: <http://farmlandgrab.org/> and <http://oaklandinstitute.org>



Figure 11. Claire Pentecost. *Soil-Erg*. Installation at dOCUMENTA 13 (2012). (© Claire Pentecost, courtesy of the artist, photo Jürgen Hess.)

(Gómez-Baggethun et al., 2010), which is effectively an economic approach to understanding and valuing natural functions as “goods”. The role of the soil is not only to provide foods and fibers; its optimal management also considers regulation of climate, mitigation of pollution, maintenance of biodiversity, etc. But this system of goods and services must also be considered in the framework of ethical, spiritual, and aesthetic dimensions. By choosing a unit of energy for the title of her installation (erg is short for the Greek word for work, *ergon*, and represents the equivalent of 10^{-7} joules), Pentecost places an abstract value on the soil that challenges the restrictive vision of soil as provider of goods and services that can be monetarily quantified for dominant market economies.

4 Film

In the visual arts, soil is sometimes “in your face” – it is the foreground, the medium, the center of attention, as in the works of the above-mentioned artists. In contrast and not unexpectedly, this is rarely the case in Hollywood films. Nevertheless, location scouts 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 as a static backdrop on which the action is played out to a view of soils as a dynamic ecosystem feature.

Woman in the Dunes (1964) and *Dune* (1984), two films previously discussed in detail in Landa (2010), focus on not only the dynamism of the moving sands but also on the sub-surface 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 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 dialog,⁷ 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 Mid-

⁷For soil scientists, an endearing and perhaps unscripted line (33:10 to 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.”

dleham.⁸ 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. 12) where cotton roots in soil were observed through glass panels while the plant tops were exposed to field conditions (Taylor 1969; Huck et al., 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, E. L. Klepper to E. R. 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

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=azIXfxqFVQo>. Middleham was the natural history cinematographer on *The Secret Life of Plants* (<http://www.youtube.com/watch?v=sG14btrsiHk>), and the soundtrack to accompany his images there was composed and performed by Stevie Wonder.

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 Ladykillers* (2004).

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 min video from the 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 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” (Gilchrist, 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 featured 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; the massive and alien occurrence of soil in these ant observation towers and in the form of massive solar reflectors, combined with the storyline and soundtrack, is a highly effective conveyor 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.

The director of *Phase IV*, 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 (e-mail from J. 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 unsentimental forces set against one another in lines, curves, angles, shining surfaces. Beautiful, but always threatening, mysterious, forbidding.”

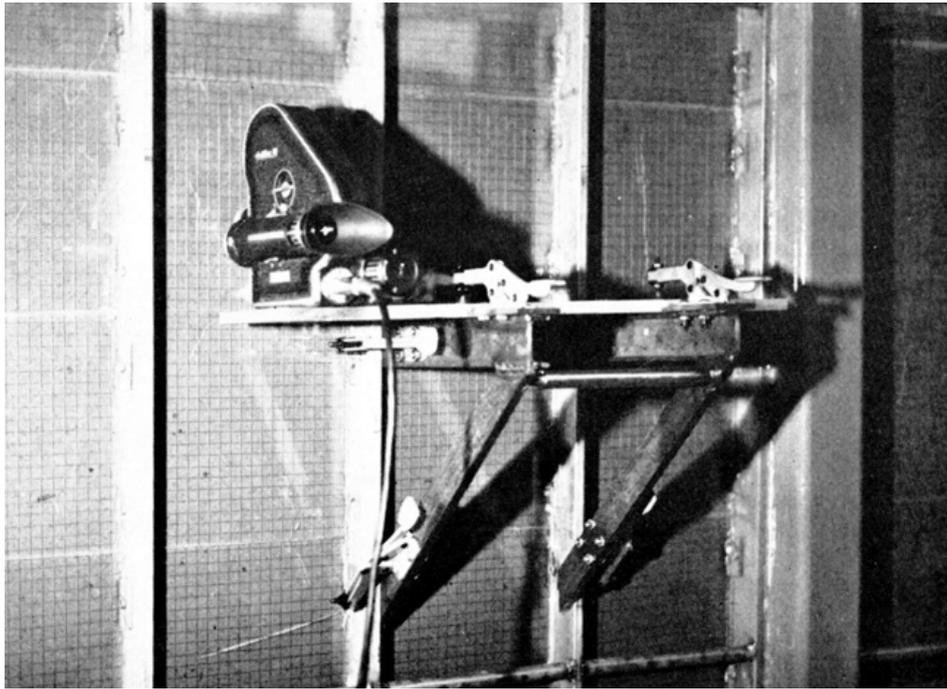


Figure 12. Time-lapse photography setup used by Klepper and Huck at the Auburn rhizotron to examine root behavior behind glass panels (courtesy of Alabama Agricultural Experiment Station). The camera support could be moved to allow photography of any part of the visible root system. The 1/2 in. square grid-wire mesh embedded in the glass panes provided a measuring scale and would reduce shattering if the glass broke (from Taylor, 1969).

(Bass and Kirkham, 2011, p. 258). Although the story is set in Arizona, the outdoor filming was done in the Rift Valley of Kenya, and Bass had to be careful not to get a giraffe in the shot (e-mail from J. Bass, 6 May 2014).

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 (Gilchrist, 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 Pictures as a B-horror movie, *Phase IV* had 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 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 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 chosen for this look?
- Alternatively, were some profile color effects enhanced through computer-generated imagery or other methods?

I had a series of e-mail exchanges with director Lech Majewski on these questions (e-mails, L. Majewski to E. R. 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 for 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

Art is one way of communicating the complex visual, cultural, and symbolic dimensions embodied in the soil. We

have presented a set of case studies taken from three formal artistic traditions: painting, installation, and film. While some examples are more incidental depictions of the soil, others are focused on environmental, social, and political questions surrounding soil and land use. Although the examples stem from our personal interests in the given genres, we come to the following conclusions:

- Artworks focused on soils and landscapes provide a different way of appreciating the soil and could therefore be valuable for soil conservation and soil awareness raising efforts.
- Professional soil science societies should encourage interdisciplinary collaboration in areas such as soil and art, soil and culture, soil and religion, and soil and history.
- At the same time, the soil science community can offer the art world a new analytical lens to examine soil and environmental protection issues.
- 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.

In contrast to soil scientific work, artistic work is designed to touch our emotions and provoke discussions on environmental, social, and political change. Both science and art are necessary for raising soil awareness. Only when the soil science community is more broadly based will soil protection become more relevant for the public at large and for decision makers.

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