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PSYCHOGEOPHYSICS OF TECHNOLOGY

The strata of the Earth is a jumbled museum. Embedded in the sediment is a text that contains limits and boundaries which evade the rational order, and social structures which confine art. In order to read the rocks we must become conscious of geologic time, and of the layers of prehistoric material that is entombed in the Earth's crust. When one scans the ruined sites of pre-history one sees a heap of wrecked maps that upsets our present art historical limits.

—ROBERT SMITHSON

A lesson from the early geological discourse of the eighteenth century: earth is a massive heat engine. Inside it lies the bursting hot molten core as a seemingly eternal and yet historically formed source of energy. The rise and movement of landmasses from the seas is the breath of the earth. What sounds like the later Gaia theory of the earth as a living entity is already in limited ways part of the earlier geological discourse. Inhale, exhale. The soil is a central mediating element. Agriculture cultivates life, but soil is media—or like the currently increasing demand for synthetic soil suggests, “soils are a form of technology.”¹ More than two hundred years before the realization that production of soil might be a great business for the increasingly polluted planet, James Hutton's worldview is focused on the idea of the earth as a big machine: it sounds very apt considering that the industrial age is just round the corner. The earth is an old machine and still not devoid of the Christian connotations and a belief in the intelligent design. Nothing is accidental but rather is governed through a higher order.

Depth means time, but it also means heat. Deep down is the hot core. The internal heat is one of life that melts the gravel, sand, and other formations under the seabed and consolidates them into rock, to paraphrase Rudwick.² The solids are end results of long processes of a natural historical kind. And yet, it is history, but in the sense Manuel Delanda pitches as a sort of a new materialist metaphysics of metallic affects: metals have to be accounted as chemical catalysts.³ However, they do not catalyze only chemical reactions but social, political, economic, and, indeed, media technological ones too.

The previous chapter outlined some ideas for an alternative deep time of the media. It was a start at least. My suggestion in this book is to excavate this deep layer of media technologies that, besides connotations of depth (the reality of mines as essential to existence of contemporary technological culture), points toward temporalities: the rethinking of what media historical times count as part of our analysis—the long-term durations of geological formations, of mineralization across millions of years, as well as the millions of years of decomposition of fossils to form the fossil fuel layers essential for the modern technological world. We also have to account for the effects on the climate in broadest terms and the way in which media technologies play a double role. This double role is articulated as follows:

- 1 Media technologies as an epistemological framework, which enable one to perceive, simulate, design, and plan in terms of the environment and the climate; media compose the framework that allows us to talk about, for instance, climate change in the way in which we do nowadays.⁴
- 2 Second, we can consider media technologies as the aftereffect, the afterglow,⁵ that will remain as the fossilized trace of designed obsolescence and gadget-culture, as well as the massive infrastructures around which media function: energy, raw material production, and mountains of discarded keyboards, screens, motherboards, and other components.

This chapter develops these themes, but with a special connection to art methods and aesthetics. Indeed, this is again characteristic of the just mentioned double bind; the enabling aesthetics of even being able to talk

about such scales as “the climate” or even its change on a geological time scale; and the aesthetics of this change as a form of critique that intervenes in and feeds off from the geophysical. This chapter introduces one of the main concepts of the book: *psychogeophysics*. This concept and an art practice or a mix of methods is an expansion of the psychogeographical familiar from the Situationist vocabulary. Psychogeophysics argues that we need to extend beyond the focus on the urban sphere to the geophysical for a more fundamental understanding of the modulation of the subject that is stretched between ecologies of capitalism and those of the earth. This discussion of aesthetics as a pertinent revamping of Situationism—here a nod is in place to McKenzie Wark’s recent years of highlighting the relevancy of Situationist theorists, practices, and themes with a particular eye to some of its neglected figures⁶—is taken to a rather extreme direction that talks about geophysics and media technologies in connection.

The chapter discusses the psychogeophysical “manifesto” (published in *Mute* magazine) as an extended “Situationism” of the geophysical media arts.⁷ In this context, the conceptual discussion is connected to some recent art and hacktivist projects, which engage with the provocative concept. Such projects include Martin Howse’s *Earthbooth* and Florian Dombois’s *Earthquake* sonification but also other relevant takes that address earth durations, sounds, and sensations.

Psychogeophysical Dérives

Questions of aesthetics unfold in a different way if you start to ask them from a nonhuman perspective. A question of aesthetics—as a question not necessarily of art and its value but of perception and sensation—unfolds in alternative ways when considering animals. In literature, Josephine the singing mouse (in Franz Kafka’s short story) is one curious story of such fictitious animal worlds and aesthetic appreciation, but in biology and experimental psychology, it is a matter of measurable temporal rates and thresholds of perception. The rates of perception of different animals are so very different from the human senses: it is not cognitively or affectively easily accessible how a bird perceives, a fish senses sound, or a bee is embedded in a different world of color sensations. This brings the question from philosophy of aesthetics to the fields of physiology and

experimental psychology emerging in the nineteenth century with figures such as Helmholtz and others taking the front stage with their material and empirical investigation: how do you measure the objective and physiological thresholds of animals, including humans?⁸ But what happens if you start asking such questions from the perspective of the nonorganic?

The memory of a rock is of different temporal order to that of the human social one.⁹ Abbé La Pluche in *Le Spectacle de la nature* (1783) reminded how “the stones and metals have truly preserved for us the history of the world.”¹⁰ The capacities, embodied modes of sensation, memory, and time, offer at least partial conditions for a number of aesthetic ideas, which are not restricted to “art” per se but resonate with issues in geology and astronomy.¹¹ Such broader definitions of media and aesthetics also allow us to consider the connections of the organic human bodies in the organic and nonorganic surroundings.

Of course, there are traditions and examples in twentieth-century art and philosophy eager to engage with the rock world. Land art, environmental arts, but also such a figure as Roger Caillois prove the case in point. The quasi-surrealist Caillois’s fascination with stones sets as part of his long-term investment in the mystical but also the wider allegorical relations with nature. This resulted in a nice collection of rocks (systematized according to categories of *bizarre*, *insolite* [unusual], and *fantastique*) but also a philosophical investigation of the nonorganic, temporality, and myths.¹² Indeed, Caillois’s *Writing of Stones* (1970) hints at the transition from admiring stones as objects to their transformative power as well as their archival status as visual media: images of fossil imprints of long lost, imaginary cities as well as the intimation that in the rock and the mineral is another force that the stone itself can produce—a force of alteration.¹³ From rocks as objects to minerals, metals, and the geological strata as forces of production—from objects of appreciation and knowledge to enabling catalysts in the way a metallurgical perspective has it—a metal is defined by what it can do.¹⁴

Postanthropocentric discussions concerning aesthetics, technology, and the environmental necessitate an inclusion of a new ecology of relations between humans, animals, and the nonorganic. Indeed, as Jane Bennett notes as a spokesperson for vibrant materialism, “culture is not our own making, infused as it is by biological, geological and climatic

forces.”¹⁵ Such an articulation of the postanthropocentric is happening across a range of fields, including, for instance, animal aesthetics. Matthew Fuller’s “Art for Animals” is exemplary in this case.¹⁶ But it also happens in other formations of art that take into serious consideration the organic and nonorganic realms of perception and sensation. In other words, perhaps there is an ethical urgency to consider the posthuman—the lack of certainty of what constitutes the human brought about by scientific, technological, and ecological forces. Of an increasing necessity is, as Rosi Braidotti flags, the need to engage with a “planetary, geo-centred” perspective.¹⁷ In other words, in such accounts and in the psychogeophysical focus of this chapter, I do not engage with an Aesthetization of Nature that might separate humans from their environment—a point Tim Morton also raises in *Hyperobjects*¹⁸—but with the opposite: to establish proximity, map the links, the continuum of medianatures¹⁹ where the natural ecology is entirely entangled with the technological one. Morton refers to this as the *viscous* quality of hyperobjects, but this chapter talks of some similar themes from an art and technology perspective.

So indeed the question: how do the soil, the crust, the rocks, and the geological world sense? It is definitely a dilemma anyone deep into Alfred North Whitehead would find attractive, but let’s consider it from the perspective of media and aesthetics. How do things like earthquakes and the tide, electromagnetism and radiation of other sorts, fit in? Those might be Morton’s hyperobjects, but they also fit with some ways of speaking and some operations focused on geophysical aesthetics. Perhaps the way to question these is not through a conceptual metaphysical discussion and essays but through excursions, walks, experiments, and assays? Indeed, what if the method is more pertinent to the description of the London Psychogeophysics Summit of 2010 activities. Instead of a metaphysical essay on the nonhuman, take a walk outside, for instance, in East London:

The London Psychogeophysics Summit proposes an intense week-long, city-wide series of walks, fieldtrips, river drifts, open workshops and discussions exploring the novel interdisciplinary frame of psychogeophysics, colliding psychogeographics with earth science measurements and study (fictions of forensics and geophysical archaeology). Centred around SPACE, open events include practical

workshops in building simple geophysical measurement devices from scrap materials, fieldtrips for study and long-term use of such devices in the city, measurement and mapping of physical and geophysical data during city-wide walks, deployment of strategic underground networks, fusion of fiction, *dérive* and signal excursion, studies of river signal ecologies alongside short lectures and discussions of broad, interdisciplinary psychogeophysical themes.²⁰

The concept of psychogeophysics is introduced as a complementary term to that of psychogeography—a much more familiar concept in twentieth-century art vocabularies following up on the Situationists. But if the psychogeographical was an analysis of the specific effects of the urban environment on our senses and affective orientation, then the geophysical twist brings in a stronger nonhuman element that is nonetheless aware of the current forms of exploitation but takes a strategic point of view on the nonorganic too. The method might at first seem rather similar: take a walk. Derive and drift, fuse fiction with the places that you visit, frequent, or just pass by. Approach your surroundings through the eyes and writings of Pynchon and J. G. Ballard. But don't think what you see is the only level of reality—there is also the invisible and the underground. The underground might open a different way of investigating the notion of affordance: what enables things to be perceived as they are designed to be perceived so as to sustain our habits.²¹ In a Guy Debord–Situationist manner, originating from the late 1950s, the psychogeographical does not denounce the physical landscapes—after all, the term still carries with it “geography.” In fact, Debord does not fail to mention “soil composition or climatic conditions”²² when progressing toward the speculative methodology of psychogeography. The latter is introduced as a mapping of the habitual patterns of the city life, and it offers ways to find variations to break and short-circuit the media–economic conjunction of the psyche with the urban environment. However, what follows from the psychogeographical mission statement are primarily meditations concerning the urban. Indeed, the urban sphere has been privileged in later instances too, giving it a special place in the critical methodologies that offer cartographies of the late modern capitalism—a capitalism that suits the spectacle so often fixated on the media *cultural* condition.

Wark does an invaluable job in describing the general idea of the psychogeographical and how it relates to 1950s thinking of the city (especially Paris), the Letterist International and the relations to art practice of the *dérive*. In the hands of Debord and Ivan Chtcheglov, this methodology is not merely a social scientific mapping of the interpersonal stretched between the objective surroundings and the subjective indoors. Instead, it is a more radical take on the subjective as a fold that is guided through such stratified sets of places and vectors. Wark argues how the turbulence of such a geographic is one important condition for the cartography of currents, fixed points, and vortexes.²³ The term and its relation to the *dérive* contain many implications about productive time and leisure time. However, let's first focus on the primacy of the urban and how it is critiqued in the more recent geophysical variations.

The term *psychogeophysics* is introduced in 2010 by the London Psychogeophysics Summit Collective.²⁴ In *Mute*, the collective demands in a rather manifest way a rescaling of the psychogeographic focus into a more earthly one: the notion of psychogeophysics is meant to offer a provocative distancing from some aspects of psychogeography. With rather strong articulations that at times resemble Deleuze and Guattari's critique of the interior- and couch-focused mind-set of psychoanalytic theory as opposed to the great outdoors of schizoanalysis, psychogeography is critiqued as being an example of a methodology for the house-dwelling mind-set. It is claimed to be occupied with the civilized urban states of mind and architecture, of indoors and the urban structured sets of living. In the view of psychogeophysics, what is ignored are the wider geological contexts in which habitual life can even start to be structured:

Psychogeophysics; just as the entire weight of the earth conspire [s/c] to pull down suspended objects (gravity; a relatively weak but keystone force) the human condition is being shaped by the entire earth: psychology as plate tectonics of the mind.²⁵

The text continues to attack the "INMB (In My Back Yard) regionalism and general lack of ambition to look beyond the city and beyond the contemporary" that is seen as characteristic of the psychogeographical bias. After all, to adopt the tone of the Summit's manifesto of psychogeophysics,

cities come and go, neighbourhoods go from bust to boom in cyclical fashion. The psychogeophysical angle, which has everything going for it, is already deluded by procedural navel gazing (the big fat belly of the google-jugend) and an irrational belief in the supreme objectivity of measurement and raw data.²⁶

Some of the concepts, especially referring to the plate tectonics of the mind, remind of Robert Smithson's earthwork art discourse. Especially in his 1960s text "A Sedimentation of the Mind: Earth Projects," Smithson introduces language that strongly resonates with the ecological thought of Gregory Bateson, but in an art and geology context. It's already in Smithson's ideas that one finds a continuity, a topological twist, and a connection between the mind and the earth that extends into a dynamic aesthetic relation: of erosion, wearing away, compositions, and decompositions. The brain and the earth share the processual structuration that expands into what Smithson calls "abstract geology,"²⁷ which also enables a different way of understanding technology, unrestricted to the actual technological devices and systems but encompassing the wider field of materials.

The London Psychogeophysics Summit uses the language of low-frequency horror of planetary dimensions alongside connotations of obsolescence to summon the image of the world of psychogeophysics. It relates to the inadequacy of aesthetic methods rooted in the city, shopping streets, and cozy indoors to actually address the relations of geology and contemporary capitalist life. The psychogeophysical cartography is meant to reveal the tension between the human settlements and the environmental. This force and tension is one that is pitched as more radical than of green politics; it is one of dimensions that mobilize the Kantian sublime into a contemporary technological culture perspective:

A mountain is more important than Paris, a volcano is more important than Cairo, an earthquake is more important than Dubai, the geomagnetic north is more important than all cities in the Americas together. A billion+ years of void, Los Angeles sinks into the ocean (cataclysm), a billion+ years of void. A billion+ years of void, a garden fence falls to the ground (cataclysm), a billion+ years of void.

Geophysics not geography defines us. Lat/Lon systematics can not contain earth masses on the move. Mount Fuji does not need Google.earth.²⁸

Psychogeophysics aims for planetary scales of aesthetics. It can be seen taking the original Situationist city-focus born in the urban sphere of Paris of the 1950s and 1960s to engage with the geophysical as the uncontained element beyond the urban. Indeed, what Gary Genosko has referred to as the new four elements, or the mobilization of the elements of earth, fire, air, and water²⁹ in contemporary biopolitics and environmental contexts, is one way of understanding the persistence of the material. The “elemental” is present in Smithson’s pitch for an alternative to McLuhan’s human-focused theory of technology, and in Genosko’s hands, it provides a way to understand how the psychogeophysical might pan out as part of a wider contemporary field of discussion on aesthetics, the environmental, and the extended ecological politics.

Indeed, whereas posthumanities discourse has been instrumental in opening up the humanities to the animal as part of the social and economic field (exploited in various industries) as much as the animal inside us (critique of anthropocentrism with approaches emphasizing the non-conscious),³⁰ we might need to figure out more specifically the continuum across the organic and the nonorganic. In recent collections, such as *Making the Geologic Now*,³¹ this cartography is present, but the psychogeophysical seems to trigger an alternative field of inquiry in which some recent art projects and practices offer their version of the manifesto’s message. It is in this sense that psychogeophysics performs the continuums across the biological, the nonorganic, and the social. It can also offer an ethico-aesthetic perspective to the minerals inside us and the metals and rocks out there enabling technological gadgetry—an abstract geology.

Hence a range of artworks that actually tap into this geological materialism might be in a key position to open our eyes and ears to something rather different: they offer visuals and sounds of the nonhumans. Even Félix Guattari’s language of ecology of the mind seems to pale next to such tectonic psychological vocabularies, which, however, do not come without predecessors.

Art of Geology, Machines of Soil

To which regime of aesthetics do geological formations, earthquakes, the soundscapes of ice melting, or, for instance, the various radiations that form the electromagnetic sphere belong? What sort of aesthetic vocabularies are at our use when we want to interface the geological and the human made? The aesthetic discourse, including Immanuel Kant's *Critique of Judgment*, has set a specific way of relating to the outside world, but more specifically what is of interest is the relation to the geological—such a fashion theme especially in the early nineteenth century in Germany and in Britain, fueling literature and philosophy.³² The subterranean world of the eighteenth and nineteenth centuries was not merely about geology and mines, but as Rosalind Williams argues, terms such as *the sublime* and *fantasy* were also part of the imaginary of the underworld.³³ This included a fascination with ruins since the eighteenth century, with the archaeological fever entering painting: Giovanni Battista Piranesi's imagery is a good example of the reimagination of the classic Roman Empire in the late eighteenth century; John Martin's "The Destruction of Pompeii and Herculaneum" (1822) is emblematic of the awe-inspiring horrors of geophysical forces as sublime threats to the human civilization and contributing to the mythological status of this famous volcanic eruption. The various images of ruins of abbeys and such are an integral part of British painting alongside other themes that demonstrate this fascination with the archaeological, ruins, and the geophysical decay of the urban.³⁴ In the more recent decades of artistic discourse, various suggestions have paved the way for a reemergence of geology and the great outdoors as part of critical arts—not least in landscape art, and for instance geopoetics, "concerned, fundamentally, with a relationship to the earth and with the opening of a world."³⁵

For sure, a quick glance of the photographic art of landscapes and geology still reminds of the rather classical aesthetic predispositions that one inherited from eighteenth- and nineteenth-century philosophy and the contrasting sentiments of measures of man and the immeasurability of Nature. This was carried over from landscape painting to the technologies of national parks, flagging one sort of a capture of the ideal natural beauty by means of techniques of reproduction. Richard Grusin argues that in the American context, national parks mark a technological mode

of reproduction of nature.³⁶ This is an idealized set of conditions through which nature becomes represented as well as enmeshing geography, geology, nation building, and aesthetic concerns. Places of geophysical uniqueness such as Yellowstone Natural Park or the Grand Canyon became landscapes and environments of geologically loaded aesthetics already in the nineteenth century. Immanuel Kant's aesthetic vocabulary was reemployed by, for instance, Clarence Dutton's 1882 *Tertiary History of the Grand Cañon District*, alongside its Atlas part. In narratives and images, the Grand Canyon is shifted from discourses of beauty to those of the sublime—cognitively inaccessible and well described by Grusin:

Insofar as it is represented in terms that resemble the accretive operation of erosion and sedimentation, Dutton's account of the epistemology of sublime perception is finally geological. For Dutton, there is no fundamental difference between his geological and his literary passages, between his scientific and his aesthetic purposes.³⁷

In Dutton's prose and images, the landscapes become a geological cartography of plateaus and strata, of "Jurassic remnants"³⁸ now conveyed with such aesthetic description and prescription as a sort of an archive of nature remediated. This idea of the sublime as the aesthetic of the geological deep time is demonstrated by Rosalind Williams: geological thought but also the "aesthetic discovery of industrial technology"³⁹ are supported by this sort of aesthetics in the nineteenth century. Landscape painting goes hand in hand with birth of geology (as a modern discipline and a mind-set).

But in a longer perspective, a lot of the art of the geologic admits the role of the human in the more than poetic engineering of the planet. This is a point picked up for years now by the Anthropocene discussions, and motoring several important aesthetic interventions too. Indeed, such aesthetic questions are in prime position to raise the substantial ethical question for humanities: can we remain *just-humanities* in an age of planetary scale engineering and massive changes to the very physical ground on which we live?

Instead of the Anthropocene, let's discuss psychogeophysics as a minor concept. I mean "minor" in the sense of its visibility even in artistic discourse, as well as minor in the Deleuze and Guattarian sense of

gathering forces of the potential, of variation and of deviation: it is an experimentation finding ambulant potential lines rather than aimed at establishing an axiomatic Master Set of Principles.⁴⁰ In our case, the aesthetic question is further removed from sole considerations of art per se and is more closely about the temporal and spatial conditions in which perception becomes possible. This sort of perception is, however, partly removed from the human being into a wider assemblage that takes into account the wider climatological and geophysical spheres. In this context, Katie Paterson's installation piece "Vatnajökull (the sound of)" is a fascinating project, which concretely connects technological infrastructures of transmission with the soundscapes of the geophysical.

Have you ever wondered how glaciers sound? What is the (an)ruf of the glacier?

An underwater microphone lead into Jökulsárlón lagoon—an outlet glacial lagoon of Vatnajökull, filled with icebergs—connected to an amplifier, and a mobile-phone, which created a live phone line to the glacier. The number +44(0)7757001122 could be called from any telephone in the world, the listener put through to Vatnajökull. A white neon sign of the phone number hung in the gallery space.⁴¹

Dial-a-glacier is a reminder of the acoustic spheres and dislocations of the slowly melting oceans—a weird phone call to the geologic sphere of the planet. Here the transmission media become also a measurement device that allows access to the otherworldly, yet constantly present through the variety of representations concerning climate change. The melting ice and the icebergs are signals of a slow change triggering and triggered by a multiplicity of causalities involving humans, technology, and an odd heritage of industrial culture. Even soundscapes of oceans are an aesthetic measurement device of the climate change and the arts of the *Anthrob-scene*. As a parallel to Paterson's piece, consider the scientific news about the rising ocean acid levels causing the change in the acoustic environments too. This is especially affecting whales' methods of communication across the transmission media of water but is a wider aesthetic index of change: the oceans and glaciers as acoustic media are inscription surfaces of the industrial period aftereffects and act also as massive geological amplifier of signals. What's more, especially in the case of acid levels

of oceans, it is a sort of a time machine, transporting us back to an earlier Cretaceous period from 145 (± 4) to 66 million years ago.⁴²

The psychogeophysical fascination with tectonics is anticipated by such artworks as Florian Dombois's *Earthquake* sonifications.⁴³ Auditory seismology presents itself as a time-critical⁴⁴ methodology of understanding the geophysical events through establishing a relation between the ear and the temporal unfolding of earthquakes as sonic processes. But it also lends itself to a media artistic methodology, an apt example of what we nowadays call arts–science collaboration. Psychogeophysics is anyway a rather minor current in the contemporary media arts scene, but it is able to speak to the issues of deep seas and deep crust in ways that actually feel very pertinent. It returns posthuman theory as a sort of planetary venture that summons what Deleuzians might call a Becoming-Earth, and it also challenges the stabilizing and romanticizing notions of the earth.⁴⁵

The earth and its geophysical sphere does not stop with the ground or the underground. It extends as part of the climate and the electromagnetic sphere, brilliantly mapped by Douglas Kahn in his recent *Earth Sound Earth Signal*. Kahn's quirky media history of the electrical arts goes back to the natural electrics as examples of how the earth participates in the much later projects too, from Alvin Lucier's brainwaves art to Joyce Hinterding's work with natural electromagnetic phenomena.⁴⁶ Projects emerging in the middle of the twentieth century in the sound arts established more than just talking about nature or the individual human being. Instead, connections between the outer space and the brain were experimentally woven in ways that signal a much earlier phase of what nowadays is branded as a *new* focus on the nonhuman realm. What is more, the media history of early-nineteenth-century technological assemblages of measurement of the atmosphere and the earth is the media archaeological point of departure for so much of later sonic and electromagnetic arts. It is in this context that one finds the double articulation of technological episteme of knowledge concerning the natural sphere and its rearticulation in media artistic–technological practices!⁴⁷

Reading Kahn, we can understand how both theoretically and media historically the circuiting of the earth has moved from the underground upward. As Kahn highlights, the underground of technologies starts before

the avant-garde of the twentieth century and even outside clandestine military operations clouded in secrecy: “During the nineteenth century, communication went underground—nothing necessarily secretive or subaltern, even the most common telegraph and telephone messages followed a technological circuit that was returned and completed through the earth.”⁴⁸ The closed metallic circuit is predated by the open earth circuit.⁴⁹ The ionosphere became part of international network culture by the 1920s with radio, outer space after World War II with the beginning of the military-enabled satellite age. The geophysical communication culture of technical media is part of an expansion of the circuit: from the underground to above the ground, to the ionosphere where intentional human messages share the signal space with whistlers, and then the space—an extended rim of the Anthropocene (and the Anthrobscene of space junk) that we discuss further in chapter 5.

Kahn’s account fits in with the geophysical focus on aesthetics I want to address through the provocations of psychogeophysics. What distinguishes Kahn is his mapping of the energetic history of technical media circuited with the expanded earth. Natural “things” such as radiation, electromagnetism, and Earth magnitudes are leaking into art vocabularies and as such smuggle a bit of the nonhuman into the otherwise often very human-centered focus of aesthetics. Indeed, aesthetics becomes twisted into a different set of questions. It becomes connected to themes usually considered “scientific,” begging the Latourian question: what are the aesthetics of matters of fact, and in what sort of social and aesthetic assemblages do we produce something that relates to our usual assumptions concerning knowledge, including scientific?⁵⁰ But it also returns the question: what is it that actually affords our sense of aesthetics and media anyway? What is the earth and the ground and the ungrounds of our aesthetics, our perception, our sensation, and the sensibility of the nonhuman subject?

Earth Computing as Psychogeophysics Cartography

Kahn’s natural history of media (arts) resonates with the focus of psychogeophysics, although the latter is a rather more unruly practice-based endeavor. In the midst of the Anthropocene discussions and ongoing

development of the theme of “materiality” in relation to media studies and new materialism, a range of artists are engaging with this geological materiality of devices and infrastructures also in ways that connect to a politics of digital culture. Jamie Allen and David Gauthier’s *Critical Infrastructure* project that stemmed from their transmediale 2014 festival residency is emblematic of this investigation of what sustains media environments (Figure 6). Besides referring to itself as a “media archaeology of the present” and “the post-digital as the infra-digital or infra-technical,”⁵¹ *Critical Infrastructure* adopts the terms and even methods of geology too. Using geological and architectural survey equipment, the artist–technologists investigate what underpins the increasingly invisible realms of technology: both the subterranean realms of the security and surveillance industries and the critical materials and their supply chains, part of the economic security regimes.

More directly related to the manifesto are the experimental projects by the group microresearchlab (Berlin/London) and, for instance, the



Figure 6. The *Critical Infrastructure* installation investigated the conflation of geological machinery and metaphors with the realm of big data mining. Poetically, one could say that the project infused the social mediasphere with the lithosphere–pedosphere. Project by David Gauthier and Jamie Allen. Courtesy of Transmediale/Simonetta Migano Transmediale/Elena Vasilkova 2014.

Crystal World projects by Jonathan Kemp, Ryan Jordan, and Martin Howse.⁵² In recent years, we have seen the three iterations of the *Crystal World* (“decrystallization,” “recrystallization,” and the “*Crystal World*”) executed in various ways with chemicals, natural elements, and DIY tinkering that brings out a rougher edge to opening up hardware than just circuit bending. For instance, the *Crystal World* exhibition—with its different versions in Berlin and London—presented a twisted take on the periodic table of Mendeleev from the 1860s. Mendeleev’s table itself was not only empirical but also speculative, suggesting the rhythmicity of chemical elements.⁵³ Some of these projects are closer to laboratory experiments than an exhibition. But instead of a stabilization of materials as in scientific processes, they aim to look for variations and the strata of the earth reterritorialized as technology (see Figure 7).

Through different methods, Howse, Kemp, and Jordan investigated the process of crystallization and decrystallization as defining digital culture. In this limelight, “computers are highly ordered set of minerals” and the (de/re)crystallization methods backtrack their material lineages just like tracking the deep times of geological stratifications. This details the mineral and metal basis of computational technology (from coltan to gold, copper, etc.) but also the processes of extracting and constructing. Besides reproducing the processes of extraction of valuables from discarded technology, the projects also test as to how far art vocabularies and methods can go. It sets itself beyond the usual institutional prescriptions as a way to elaborate the aesthetic method through “construction of high heat and high voltage synthetic geologies, crystalline signal processing, speculative geophysics, anthropocenic (re-)fossilizations, and diffracted odic imaging,”⁵⁴ where the work of computational hacking becomes reattached to lineages of alchemy. This is where the base elements—in this case, from fungi to mud—are connected with the supposedly refined evolved material bits of advanced technologies, such as computers, but ones whose insides are exposed to what they consist of, for example, copper and aluminum in a constellation of elements of postapocalyptic mood. Besides workshops, the *Crystal World* projects such as the one in London are weird installations of computer culture, which, however, feature the odd inside-outs of “rust and lumps of scavenged copper and zinc in a solution of silver nitrate.”⁵⁵

The Crystal Open Laboratories and exhibitions are psychogeophysical investigations, which establish a link between the technological–chemical methods, information technology, and capitalism. The projects summon the narratives of fiction from Ballard to Pynchon but also a different sort of a material history than we inherited from the Marxist legacy. In these practices, (new) materialist critique becomes embedded in geological times of crystallization, applied to an understanding of labor and the specific political economic settings in which material is catalyzed into information technological machines of reproduction of social relations. This refers to the psychogeophysical cartography, not merely of city streets, but of the link between architectures of computing (especially hardware) and the geological strata. Indeed, this is why the *Crystal World* projects need to be recognized for what they are: an investigation of the mineral and substrate materialities as well as the materialities of global media production. In short, there are multiple sorts of materialities in play. In this way, the Marxist thesis of living labor being consumed as well as objectified into dead labor of machines is implicitly rephrased as a process of crystallization but arguing that such machines are not exactly dead. They sustain the living geophysical strata inside them, an archaic trace of a past life that engines the new medium. In this sense, the work and methodology of Kemp, Jordan, and Howse have an interesting relation to fossils and the archaic level.

One can appreciate the bending of the concept of the medium in this operation: from a communicational definition of the term, they hark back to its biological and geological roots, but without neglecting the wider political economy, which is about mobilization of energies and matter. Indeed, the political economic is not just “old” materialism compared to the new science and technological materialism cultural theory nowadays appreciates. Instead, the projects and psychogeophysics are investigating the continuum between cultural techniques and materiality of the earth; of information and its substrates; of the wretched of the earth and their uses and disuses in media technological settings.

In Martin Howse’s *Earthcodes* project, the uses and abuses of speculative hardware are taken into a further viscous proximity with the earth. In Braidotti’s terms, this would be literally a more geocentric take on digital culture: it approaches the earth as a motherboard and investigates



Figure 7. Jonathan Kemp, *Crystal World v. 2.0*, 2012. Various precipitation products, including sulfates and phosphates, after the continuous cycling for six weeks of weak acid–Grand Union Canal water over an installation of computer junk and rock ores. Courtesy of the artist.

practical possibilities of booting your computer directly from the soil. The experimental hardware configuration allows the operating system to boot from the soil with the custom-made USB device that can be plugged into the ground. The resulting “telluric operating system” is one which in the project acts as a media archaeological excursion to media history as well as a media geological dig reviving “the use of underground flows of electricity or telluric currents which were first exploited as generators of power within the telegraphic communications apparatus of the nineteenth century.”⁵⁶ The telluric operating system is a twenty-first-century version of the original since the mid-nineteenth-century version discussed “telluric currents” of interest to both the geological discourse and expeditions and the emerging electricity-based technical media. Media acted both as based on electricity and also functioning as measurement devices for existence and demonstration of such Earth circuits and currents.

Telegraphists were the media epistemological pioneers of geophysical investigations.⁵⁷

Back now in the twenty-first-century computer culture, the *Earthboot* device is a tactical way of short-circuiting the massive global-level technological use of the earth and geology in corporate computing. The *Earthboot* project stems from a critical realization of the rather vampiric use of materials for proprietary means, packed as part of the hardware (Figure 8). The direct link to the substrate of the soil bypasses not only the usual hardware configurations and boot sequences but also the corporate chain of command—the “arche” in the sense of the command. Of course, this is a rather speculative take but exemplary of a cartography of geology intertwined with media technological capitalism.

The concept of substrate becomes a central part of the computational assemblage. Besides referring to the “complex industrial process to form an electrical logic gate,” the concept carries a speculative geophysical connotation that is teased out with a Kittler-influenced⁵⁸ reference to Bram Stoker’s *Dracula*. Software is a process of abstraction, but we need to consider the substrate in its poetic and yet technical materiality:

Despite software’s abstraction the geological maintains a particular attraction, as earth substrate, that which surrounds us, our material. Substrate equally presents a set of economic, political and economic consequences which contrast with software’s lack of coded visibility, its inevitable “encryption.” Stories such as Bram Stoker’s *Dracula*, itself based on an earlier catalogue of fictions, shift the question of material and substrate to the body. *Dracula*’s viral code is enacted at the interface with his substrate, the freshly dug earth which is transported to London and distributed around the capital; this infection vector.⁵⁹

Viral code refers in this context less to work of software agents than to the substrate.⁶⁰ In art historical terms, Howse’s contribution to psychogeophysics draws also on Smithson’s earth arts and the 1960s discourse of geophysics in the visual arts. The *Earthcodes* project refers directly to Smithson, but the link is rather evident anyway. The entry of metals as well as chemical processes to the art studio highlights both the use of materials of geological and ecological significance and also, importantly,

the nontechnological conditions of visual/media arts: for instance, oxidation, hydration, carbonization, and solution, which Smithson coins as “the major processes of rock and mineral disintegration.”⁶¹ Smithson’s emphasis on this geocentric materiality comes out as a move from industrial mass technologies to what he calls a more fundamental stratum that can affect our sense of artistic materiality: “The breakup or fragmentation of matter makes one aware of the sub-strata of the Earth before it is overly refined by industry into sheet metal, extruded I-beams, aluminum channels, tubes, wire, pipe, col-rolled steel, iron bars, etc.”⁶² This is a passage, which fulfills the promise hinted by Caillois: rocks, stones, and broadly speaking the geological, are not only objects of aesthesis, they are also the potential catalyzer of chemical and technological alterations. Such a view to geological resources and the geophysical sphere approaches metals as catalysts.⁶³ Psychogeophysical mapping takes as its object the way in which metals can catalyze not only new chemical reactions but

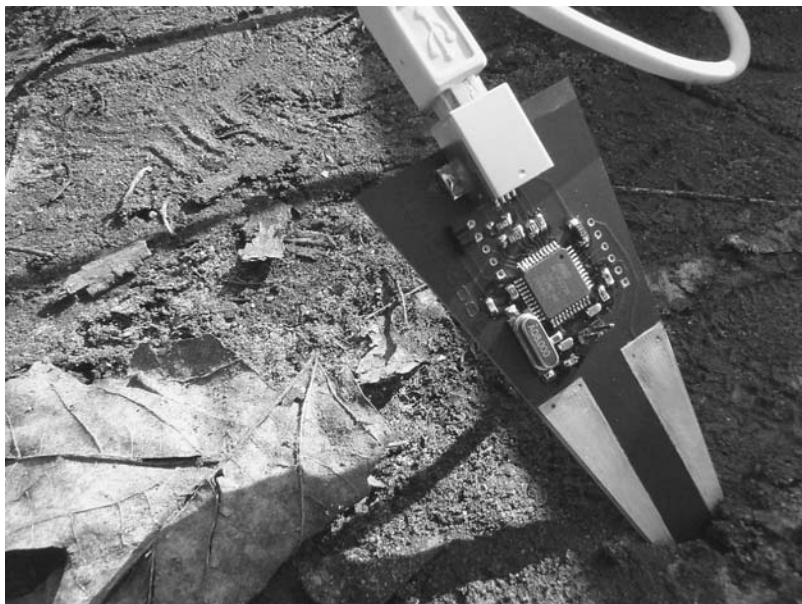


Figure 8. Martin Howse’s *Earthboot* rematerializes land art and Smithson’s abstract geology in the computer age: it constructs a speculative interface to use earth’s electricity to boot an alternative computer operating system. Courtesy of the artist.

also social and economic relations and clusters. It is a cartography of the hardwired power relations by following the metallic and chemical relations in speculative art practices. Instead of a cartography of the city, we are witnessing a cartography of the architecture of the technological that is embedded in the geophysical.

Some of the psychogeophysics manifesto's claims are provocative (but I would claim playful) attacks on the urban focus of the Situationists. It's not that ecological critique was completely absent from the urban focus. It's anyway the case that cities live off and in their geophysical settings—cities are transformative, to quote Wark (discussing Chtcheglov): “[to] lay bare the process by which the city transforms nature into second nature, in the process making nature appear as a resource for the city's consumption.”⁶⁴ This stance should not be mistaken with a simplistic idea of a sustainable city, Wark notes. Cities erode, disappear, get digested by deserts, and crumble in geophysical events like earthquakes, similarly as a powerful sun flare carrying its electromagnetic pulse would have major consequences both for electronic communications and infrastructure (e.g., electricity). Sometimes we tend to differentiate between the humanistic focus on place as the meaningful terrain of living and the material terrain, which reproduces itself through geology, weather, and climate.⁶⁵ Volcanoes don't belong so much to the terrain of our critical theory or cultural geography, but there is a need to theorize the geology especially because any notion of geographic “place” is constantly articulated as much by meaningful acts of signification of inhabitants as it is by the geophysical forces.⁶⁶ The urban and nonurban lives are anyway infused with the geophysical, in a parallel manner like our brains, bones, and bodies are infused with the metallic and mineralization processes that in earth durations connect us to histories of hundreds of millions of years of planetary time. But it also means the necessity for a psychogeography or psychogeophysics that is able to talk about erasure of place–space–terrain, and how direct or indirect geoengineering has produced terrains through eradication. From war to engineering, Dresden to Hiroshima, one can in a manner of a hat tip to Paul Virilio talk about the aesthetics of disappearance as pertaining as a geophysical force of technological culture.⁶⁷

The Situationist methods are able to connect to realms of technology and computational culture too. Debord's definitions of the *dérive* were

already ready-made hacker manifestos of sort. “From a *dérive* point of view cities have psychogeographical contours, with constant currents, fixed points and vortexes that strongly discourage entry into or exit from certain zones.”⁶⁸ And Wark continues this passage from Debord, commenting on it: “The *dérive* discovers these contours. The city is an *aesthetic practice* irreducible to the interests of state or market.”⁶⁹ Replace the city with, for instance, the computer, and you have the beginning of a description and a road map for alternative computing that is keen to find the breaking points, illegitimate uses, and zones that were being discouraged to enter. The technological machine is an aesthetic practice irreducible to the interests of state or market. Add to this mix the geophysical, and one is close to understanding the thinking behind the project(s): how the planetary, geocentric aspects contribute to this technological reality of machines that are bound to geophysics—both as a resource and as an affordance. The underground of deep time (see chapter 2) discovers a reconnection with the experimental art practices that excavate the literal underground, the soil, the substrate, but in touch with technological art practices that speculate with possibilities of bypassing the monopoly relation to the earth that digital industries’ corporate capitalism is trying to maintain.

Literary history is filled with fantastic reference points for a geology of media or, more accurately, the geologic impact that cultural studies has to take into account. It ranges from Ovid to Thomas Pynchon’s cryptic notes: “Behind the hieroglyphic streets there would either be a transcendent meaning, or only the earth.”⁷⁰ Pynchon’s line (in *The Crying of Lot 49*, from 1966) predates Situationism’s similar famous slogan (“beneath the pavement is the beach”), but one is tempted to establish a fabricated link in our psychogeophysical context: Pynchon as a psychogeographic cartographer of technological culture—and in some aspects, even psychogeophysical, like the notes on permafrost in his recent *The Bleeding Edge* (2013) suggest.

The poetic history of geology of media and arts also includes writings on the meticulous arts of mining and metallurgy (not least Georgius Agricola’s *De Re Metallica*) alongside stories of copper and alchemy, material histories of media, of astronomy and the planetary dimensions, and of deep times becoming deep space. We were not even able to go to

examples such as Trevor Paglen's fantastic photographic research on the interlinkages of the mineral with the orbital, but that will follow briefly in chapter 5.

Pynchon's note toward the end of *Crying of Lot 49* about the hieroglyphic street is a parallel to Caillois's *Writing of Stones*. Stones are pitched by Caillois as a proto-alphabet, a narrative, an invitation to endless speculation, imagination, fabulation, and fleeting meanings that multiply in the seemingly immobile face of the rock. Pynchon's rather dry question is a useful way to orient in the cultural theory landscape as well. Indeed, what if we move from the paranoid interest of knowledge adamantly determined to find meaning, or to fix it to a religious or other transcendent entity to an active and dynamic reality constantly mobilized in relation to bio- and geopolitics of cultural production, but where also *geo* really refers to the ground and the underground? It is in a way the move from biblical time to the deep time and the geological realization of the earth (see chapter 2). Instead of the writings on the stones as hints of a hidden hermeneutic secret of the past or religious revelation, perhaps they are less signs in the semiotic sense than signals—signifying material aspects as part of the mixed semiotics⁷¹ in which geology transforms into media and media reveals their geophysical conditions.

The nonhuman and the unhuman⁷² return as tectonics, as earthquakes, as seabeds, layers of waste and synthetic geological formations, which we address in the coming chapters. It also folds as aesthetics of the deepest of times as well as what are the most recurring of times: those of the hieroglyphic inscribed on stones as perhaps a hallucinated meaning, a warning. In the words of Ovid again, "they penetrated to the bowels of earth and dug up wealth, bad cause of all our ills." This is the perfect one-liner for the Anthrobscene age.

The next chapter continues on obscenities of hard work and hardware. It moves from the undergrounds and substrates slightly upward to the surface with dust floating in the indoor and outdoor air. It offers a focus on the microparticles of dust as vectors for critical new materialist analysis. This is an expansion of the psychogeophysical mapping too: to use geophysical case studies, and the entanglement of the nonorganic with contemporary digital capitalism, as a way to understand some political economic implications of new materialism.⁷³

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