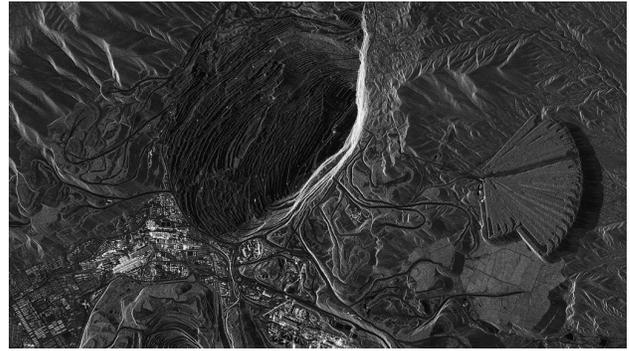


# The Underground Frontier

Godofredo Pereira

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Techno-scientific modes of seeing, classifying, and measuring the earth are reformulating the ways in which territorial disputes are currently played out. Due to the mobilisation of science by capital we today inhabit an earth that is being reduced to discrete components. The extreme case of this condition is what I will call the *underground frontier*: The underground is no longer simply the space where resources are located, but has itself been converted into a resource. However, if one wishes to investigate the processes by which the underground has been converted into a resource and the role of technoscience in these processes, one should be prepared to investigate the spatial and political assemblages of which technoscience is part: how it is mobilised, used, financed, and how it becomes part of wider political, cultural or legal claims.

## Axiomatics

The *underground frontier* emerges from a context in which the earth and its constituent elements are increasingly abstracted into discrete sets of data. According to Laymert Garcia dos Santos, this is a consequence of the information paradigm which, emerging from cybernetic debates, proposes to understand the whole world, human or non-human, animal or machine, according to a common epistemic principle.<sup>[1]</sup> Indeed, from genomics to finance, the world today is conceived as a problem of coding, of managing increasing amounts of data. Equally important is to notice how this process of coding has invested in (and benefited from) constant advances in technologies of data collection, analysis and interpretation. Up in the sky a vast network of public and private satellites is today equipped with multispectral remote-sensing tools to analyse surface conditions for mineral prospection or land use analysis; the increase in computer processing power allows the global

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climate to be modeled and simulated via quantitative methods with increasing detail; and down below, oil spills are classified and fingerprinted according to chemical composition while biotechnologies are increasingly dependent on bioinformatics for the modeling of living systems. This multiplication of technological abilities is allowing an extensive classification of the earth in its minute details, a process whereby the sampling of minerals for energy extraction and the sampling of microorganisms for medical purposes fulfill similar purposes: be it human, animal, microbial or geologic, all aspects of the earth are made into resources once they are translated into datasets—the epitome of what Heidegger described many years ago as the *age of the world picture*, where the entirety of nature is framed as a standing-reserve (*bestand*).<sup>[2]</sup> This condition, whereby resource extraction becomes the paradigm, I have called the *axiomatic earth*.<sup>[3]</sup>

The important point here, however, is that once captured by quantification procedures, the earth is made commensurable with capitalist modes of valorisation and therefore becomes abstracted by capital as quantities whose differential relations are productive of surplus values.<sup>[4]</sup> In this context science becomes a motor of accumulation: each new analysis allowing for new forms of valorisation and circulation. The epitome of this process is the transmutation of both people and materials into “decoded flows” in the operation of contemporary financial devices.<sup>[5]</sup> Thus the constitution of the underground as a frontier, as well as the specific kinds of disputes that emerge therein, cannot be uncoupled from the modes of seeing and knowing the earth that are characteristic to the capitalist partnership with technoscience. Rather, it is paradigmatic of the most violent extremes of this process. I specifically use the term technoscience following Boaventura Santos in the claim that the two (technology and science) cannot be detached to prevent the common claim of science’s presupposed neutrality.<sup>[6]</sup> After Stengers and Haraway we know that science is neither homogenous nor necessarily *eliminativist*. Yet the project of “decolonizing science”<sup>[7]</sup> requires us to start by understanding how science has been used to undermine other forms of knowledge production.<sup>[8]</sup>

This complicity of science, technology, and capital can be clearly discerned in the *underground frontier*. In fact, the emergence of the underground as a frontier is predicated on investments in technology and science. For instance, the

expansion into areas of difficult access or the ability to extract unconventional resources is reliant on investments in technologies of soil perforation and geotechnical intervention. But more than that, the underground itself could not exist without technoscience and the ways in which it has radically altered our regimes of perception: today, sensing machines allow us to visualise the underground; powerful computers allow us to process data from the depths of the earth; simulation machines allow us develop algorithms that model the earth’s future behaviours. At a distance, hyper- and multispectral radiometers mounted on satellites orbiting the earth at 12,500 mph classify the surface of the earth; geophones and thumper trucks capture seismic reflections and refractions from the earth’s depths that are then processed by complex algorithms into 2d sections or 3d cubes; boreholes are drilled to sample the earth’s its composition. The underground we know is a fabrication, produced according to what Johnston – following Guattari – would call a *machinic vision*.<sup>[9]</sup> The point is not that the underground is today more adequately represented, nor that we can see more of it, but that what we perceive cannot be disconnected from both the mechanisms we use and the ambitions we develop while using them. In other words, the constitution of the underground as a problem of thought and a frontier of capitalist expansion is immanent to the specific forms and practices of knowledge production that determine what I call here the *axiomatic earth*.

As a consequence of this, it becomes clear how the emergence of new technologies is inseparable from the emergence of new disputes. In the same ways that in the 19th century the construction of the vertical dimension of territory – as a consequence of the co-evolution of geological sciences and the industrial revolution – constituted the problem in law of distinguishing between underground and surface property regimes<sup>[10]</sup>, so today technoscientific perceptions of the underground raise a series of new problems. The most immediate of these problems is that of the underground becoming a strategic geopolitical domain, leading to its militarisation (not by coincidence, as the military is the main source of funding of scientific research) in the forms of surveillance programmes. Some of these, like the Transparent Earth project by the Defence Advanced Research Projects Agency (DARPA), propose to directly model the full subsurface of the earth.<sup>[11]</sup> According to Bishop “a host of projective tools and developmental sensors will be deployed, including algorithms that estimate and predict tectonic shifts and other

subterranean movements”.<sup>[12]</sup> But over and above understanding subterranean spaces as strategic military sites, it is the geopolitics of resources that has come to dominate the new underground disputes, particularly in two areas: disputes over use and resource ownership, due to the often ambiguous relation between property regimes based on surface jurisdictions and an underground domain that exceeds them; and disputes over the consequences of resource extraction, such as soil or aquifer contaminations that cross below jurisdictions, emissions from burning fossil fuels that migrate into the atmosphere or particulate materials that are spread by wind.<sup>[13]</sup> All these are problems that were previously framed in a very different way, or did not exist at all. Like the underground we know today, they could not be seen, perceived, measured, classified, quantified or even debated.

### Attraction

If the *underground frontier* has been expanding since the early days of European colonialism, the recent acceleration in the quest for energy and mineral resources prompted by investments in new technologies of seeing and measuring has taken this process to an entirely new level. Between 2000 and 2010 global oil production capacity recorded a massive increase, from 80 to 90 million barrels per day (mbd) (and is expected to rise even more), which is even more amazing if we consider peak oil theories that indicated a progressive decrease in oil extraction due to the expected global depletion of reserves.<sup>[14]</sup> This revival of resource extraction results from large-scale investments in new technologies of extraction (particularly horizontal drilling and hydraulic fracturing) that are able to harness non-conventional gas and oil resources such as extra heavy oils, tar sands, tight oils/shale and pre-salt oils. At the same time hydrocarbons located in hard-to-reach areas like the Arctic, in deep offshore reservoirs or militarily unstable areas have also become the object of massive exploration—not to mention the immense pressures for the removal of legal and political obstacles to extracting oil and gas from nature reserves and protected areas. As Labban argues, oil is not so much about reserves but about the willingness to find them.<sup>[15]</sup> Countries such as Angola or Canada are now part of the list of major oil exporters—their new-found riches granting them new geopolitical powers. And this expansion of hydrocarbon extraction has been accompanied

by an expansion in the mineral prospection of gold, copper, and lithium. Today, nations like Mongolia (copper and coal) Peru (copper and zinc) and Mozambique (coal and gas) have been added to the list of established mineral exporters like Chile, the US or China.<sup>[16]</sup> The extraction of both minerals and fossil fuels is part of a race that is taking place due to large-scale Chinese industrialisation and expansion of consumer electronics markets, but also due to industrial development in India and other BRICs nations. As such, the knowledge we have about their size, known quantities of reserves – or even the simple fact of their existence – is in fact a function of both capital and technological investments.

In this context we can identify a series of what I would like to call *underground attractors*: unique areas of geopolitical dispute, frontier conditions brought about by the acceleration of extraction in such areas as the Arctic region; the Amazonian hinterlands; the Orinoco oil Belt in Venezuela; the Athabasca Tar Sands in Canada; or the East and South China Seas. Within non-linear or dynamic systems theories the term *attractor* refers to a system’s behavioural tendency. In time, any given system tends to repeat certain behaviours, even if never in the same way. For this reason I will use the term *underground attractors* in reference to the ways in which the *underground frontier* seems to function. It is obviously hard to claim that the history of any of these cases consists of a single system; neither is it relevant to define what exactly that system is made of. And yet to a certain extent the analogy seems capable of grasping a series of important aspects of *underground frontiers* insofar as these territorial conditions remain predicated on the extraction of resources. It captures how the frontier has temporal cycles, which despite historical variances seem to repeat the same pairing of territorial transformations with violent disputes. In Chile the frontier was established with the extraction of gold in the early 18th century, followed by nitrates, mostly in the late 19th century, and copper since the beginning of the 20th century. Each of these different cycles was paralleled by legal transformations and new infrastructural projects. Silver was the motor of war against local indigenous peoples; nitrate originated a war and a civil war; and copper was the motive for a coup’ and subsequent genocide.<sup>[17]</sup> More importantly, in itself, the term *attractor* conveys the ways in which social and political imaginations are and have always been captured by a will to harness

the precious riches of the earth: from the sixteenth century quest for the El Dorado by Spanish and Portuguese conquistadores, underground riches have been central to expansionist projects but also to nationalist claims or claims of sovereignty and independence.<sup>[18]</sup>

### Laws and Logistics

The extraction of mineral resources requires a complex series of legal frameworks, which are theoretically supposed to regulate the relation between different interested parties, but which historically have been used to legitimise plunder, land grabbing, and dispossession. Starting from the example of the Potosi mines in Bolivia, where approximately eight million indigenous slaves lost their lives, Mattei and Nader<sup>[19]</sup> trace how the rule of the law was central to the Western imperialist and colonial project (for instance, the doctrine of terra nullius denied the existence and prior rights of original inhabitants),<sup>[20]</sup> and argue that it has expanded into a mechanism of global plunder working within regimes of transnational law and supporting the neoliberal project. We witness this role of law at work today in the multiplication of special economic zones, enclaves with exceptional taxation regimes and labour regulations that circumvent the democratic accountability of the nation-state, having become today the most common territorial mechanisms of capital expansion. Oil extraction and mining operate through state-sponsored enclave regimes, this being one of the reasons why many argue they undermine the state's legitimacy.<sup>[21]</sup> In a broader account, David Harvey argues how the role of law has been central to the increase of "accumulation by dispossession" actively promoted by neoliberal structural adjustment policies and the partnership of the state with private capital. This is a process that is not exclusive to the appropriation of fossil fuels or mineral resources but part of a wider process of destruction of the commons: promoting the conversion from common or collective property rights to private rights, and expelling peasant populations.<sup>[22]</sup> Anna Tsing goes even further in declaring the cynical deregulation of legal and illegal to be not a collateral consequence but in fact a central aspect of the constitution of resource frontiers: "Frontiers are not just edges; they are particular kinds of edges where the expansive nature of extraction comes into its own. Built from historical models of European conquest, frontiers create wildness so that some and not others may

reap its rewards [...]"<sup>[23]</sup> According to such accounts it is not that the violence of resource extraction needs to be accounted for in law, but that law itself, and its history, is inseparable from the policies and violence of resource extraction.

Together with legal frameworks, the attraction of the underground is also predicated on the implementation of a vast network of planetary logistics,<sup>[24]</sup> which manage the transnational flows of raw materials, commodities, and labour. The attraction of oil and minerals is, after all, due to the global necessity of these commoditised natures as regards the operation of global transport, industrial and agricultural systems. Following Lefebvre closely, geographer Neil Brenner describes this re-territorialisation of capitalist expansion over the whole earth as a process of planetary urbanisation,<sup>[25]</sup> a spatial politics of circulation that tends to ignore distinctions between urban and non-urban conditions, replacing them with a net that is traced across the entire world, so that it "would be ever more directly instrumentalised and operationalised to serve the voracious pursuit of capitalist industrial growth".<sup>[26]</sup> By taking into consideration its legal dimensions we can see how this expansion is not simply a matter of infrastructures but of complex assemblages of heterogeneous components, including scientific, technological, and social ones. The Niger Delta in Nigeria or Venezuela's Orinoco Oil Belt's extractive assemblages include pipelines, refineries, and reservoirs as much as they include security fences, oil bloc maps or petrochemical research labs. They constitute what call territorial machines, apparatuses or assemblings of legal, spatial, logistic, and subjective systems, leaving a clear imprint over the surface of the earth as they trace new territorial geometries that extend deep into remote hinterlands on the African or South American continents.<sup>[27]</sup> This is a list composed of access roads, water canals, mining towns, tailings ponds, and, more dramatically, the digging of gigantic canyons by open-pit mines, such as Chuquicamata in the Atacama, the river dredging and damming of deltas or the massive clearance of tropical forest or savannah—transformations that take place on such a large-scale that they can only be grasped from aerial photographs or satellite images. In this light, the use that I have made previously of the term attractor closely obeys the diagram provided by Manuel Delanda in *A Thousand Years of Non Linear History*,<sup>[28]</sup> when he argues that we should understand these alterations of the earth's surface as the process by which the forces of underground attractors slowly mineralize

over the surface of the earth. But what Delanda fails to mention is how violent such “mineralization” is, both to the environments and to the peoples that inhabit the *underground frontier*.

## Politics

Finally, what I would like to point out is how there is a multiplicity of subaltern actors that find in this tension characteristic of the *underground frontier* a space to insert political claims: indigenous peoples, social movements, student movements or local communities have recently taken disputes in the *underground frontier* as an opportunity to propose radical political transformations. More than that, they have done so by incorporating, instead of denying, techno-science and resources in their claims. An important example has recently been given by the indigenous peoples of Guatemala who have organised for the first time into a political platform to contest the 2015 elections. This is a movement whose main common cause is the necessity to claim control over the environment and the extraction of natural resources against state-protected private companies.<sup>[29]</sup> Another important case was the focus of the Chilean students’ movement of 2011 on copper re-nationalisation, bringing back a project central to Allende’s government. And, in fact, even nation-states themselves see the *underground frontier* as a possibility for re-invention, a process whose recent developments in South America (with Bolivia and Ecuador’s constitutional reforms) has been extensively described by legal scholar Boaventura Santos, amongst others.<sup>[30]</sup> All these are projects that have in common the establishing of a new relation between resources and politics. But the reason these emerging political projects are possible, is that today techno-scientific tools of enquiry and analysis bring forth, like never before, the complex entanglements between man and nature, providing a different perspective regarding the histories and realities of resource extraction. They do so, firstly, by bringing together problems that were previously seen as unrelated, such as environmental and labour disputes; secondly, they bring to the fore violence that was previously ungraspable; and, finally, they allow political claims to be articulated in novel ways, as was the case of the Ecuadorian Yasuni ITT project that mobilised science not against the state but in support of alternative modes of development.<sup>[31]</sup> Of course not all politics can be made commensurate with

technoscience. And yet, the more the attraction for the underground El Dorado leads to the development of technosciences, the more these tools become available for other purposes – co-determining the imaginations of alternative political possibilities.

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[2] Heidegger, Martin, 1977, *The Question Concerning Technology, and Other Essays*, New York: Harper & Row.

[3] Axiomatics is a term that comes from logics and mathematics. An axiom is a starting point of a theory, a self-evident truth (postulate or hypothesis) that serves as the basis for the construction of a formal system, whereas axiomatics are a set of axioms that define a formal system. An axiom is a rule that is necessarily indifferent to the nature of what it refers to. What I am interested in here is this tension between an instrumental form of knowledge and the problematic limits of that same instrumentalisation, i.e. the distance between the axiom and the world, that becomes the internal limit to the axiomatic system. By using the term axiomatic I also refer to Deleuze and Guattari’s description of capitalism. Cf. Daniel Smith, “Axiomatics and Problematics as Two Modes of Formalisation: Deleuze’s Epistemology of Mathematics”, in Duffy, Simon, 2006, *Virtual Mathematics: the Logic of Difference*, Manchester: Clinamen Press.

[4] Deleuze, Gilles, and Félix Guattari, 1983, *Anti-Oedipus: Capitalism and Schizophrenia*, Minneapolis: University of Minnesota Press.

[5] For a discussion of financial semiotic regimes and their reliance of the management of decoded flows see Lazzarato, Maurizio, 2014, *Signs and Machines: Capitalism and the Production of Subjectivity*. Los Angeles, Calif: Semiotext(e).

[6] Santos, Boaventura de Sousa, 2007, "A discourse on the Sciences", in *Cognitive Justice in a Global World: Prudent Knowledges for a Decent Life*, Lanham: Lexington Books.

[7] Cf. Stengers, Isabelle, 2005, *Introductory Notes on an Ecology of Practices*, <http://hdl.handle.net/2013/ULB-DIPOT:oai:dipot.ulb.ac.be:2013/94833>.

[8] On the internal heterogeneity of science see Stengers, I, 2011, *Cosmopolitics II*, Minneapolis: University of Minnesota Press.

[9] Johnston, John, 1999 "Machinic Vision", *Critical Inquiry*, 26 (1): 27.

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[11] Ryan Bishop, 2014, "Transparent Earth: The Autoscopia of Aerial Targeting and the Visual Geopolitics of the Underground". *Forensis: the architecture of public truth*. Berlin: Sternberg Press.

[12] *Ibid.*, 586.

[13] On the atmospheric politics of aerial pollutants see Lahoud, Adrian, "Floating Bodies", in *Forensic Architecture (Project)*, Anselm Franke, and Eyal Weizman. 2014. *Forensis: the architecture of public truth*. Berlin: Sternberg Press.

[14] Maugeri, Leonardo, 2012, *Oil: the Next Revolution: the Unprecedented Upsurge of Oil Production Capacity and What it Means for the World*, Cambridge, MA: Harvard Kennedy School, Belfer Center for Science and International Affairs, 1.

[15] Labban, Mazen, 2008, *Space, Oil, and Capital*. Abingdon, England: Routledge, 48.

[16] And all this only in regard to inorganic resources, leaving out of the picture agribusiness, such as large-scale cattle herding or soya farming

that is pushing the hinterland frontiers of Sub-Saharan Africa, South America and Asia.

[17] See Mitchell for an analysis of the political affordances that each resource and its mode of extraction allow. Mitchell, Timothy. 2013. *Carbon democracy: political power in the age of oil*. London: Verso.

[18] This is in many aspects the continuation of the colonial project, the history of which is presented with amazing clarity by Eduardo Galeano when describing Latin America's history of quests for gold, silver or copper, which started with Portuguese and Spanish colonialism and is today promoted by the international financial and banking institutions (the International Monetary Fund (IMF), the World Bank, USAID, the Agreement on Trade-Related Intellectual Property Rights (TRIPS), etc), Galeano, Eduardo, and Cedric Belfrage, 1997. *Open Veins of Latin America: Five Centuries of the Pillage of a Continent*, New York: Monthly Review Press.

[19] Mattei, Ugo, and Laura Nader, 2008, *Plunder: When the Rule of Law is Illegal*, Malden, Mass: Blackwell Pub.

[20] The term Terra Nullius is used to describe a quasi-legal mechanism common to European colonial powers (17th and 18th centuries) whereby any land that would be considered empty could be acquired by a sovereign state; and that the laws of that state would henceforth be applied to that territory. As a consequence, its peoples would, at best, become subjects of the new sovereign power, and at worst killed or enslaved. Importantly, existing social and political arrangements, customary laws, forms of property or ownership were disregarded.

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[22] Harvey, David, 2006, *Spaces of Global Capitalism*, London: Verso, 43.

[23] Tsing, Anna Lowenhaupt, 2005, *Friction: an Ethnography of Global Connection*, Princeton, N.J.: Princeton University Press, 27, 28.

[24] Mezzadra, Sandro, and Brett Neilson, 2013, *Border as method*, Durham: Duke University Press.

[25] Brenner, Neil, 2014, *Implosions/Explosions: Towards a Study of Planetary Urbanization*, edited by Neil Brenner, Berlin: Jovis.

[26] *Ibid.*, Introduction, 17.

[27] 'Territorial machines' proceed both by operations of striation (classification and delimitation) and by the production of models of subjectivity (the idea of energetic sovereignty, or the images of eco-friendly development).

[28] De Landa, Manuel, 1997, *A Thousand Years of Nonlinear History*, New York: Zone Books.

[29] <http://upsidedownworld.org/main/guatemala-archives-33/5149-indigenous-guatemalans-create-political-platform-in-2015>

[30] Santos, Boaventura de Sousa. 2010. *Refundación del estado en América Latina: perspectivas desde una epistemología del Sur*. La Paz, Bolivia: Universidad Mayor de San Simón, Centro de Estudios Superiores Universitarios.

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