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Desert Drone

Mapping the Rare Earth Frontier in Western Australia

Sacrifice zones are where the so-called negative externalities are located. They are not ephemeral or intangible: they have a specific geography that can be mapped. The destruction of landscapes and lives in pursuit of rare earth mining has generally been considered a fair price to pay, generally by those who do not live in the sacrifice zone.

KLINGER 2017, 11

A few weeks before the devastating peak of the 2019-20 Australian bushfire season, colloquially known as the *black summer*, I arrived in Leonora, a small mining town located in the outback of the Goldfields-Esperance region of Western Australia. Leonora is only a little more than an hour's flight from the state capital Perth, but the geography is entirely different. The Goldfields is sparsely populated, with less than 40,000 inhabitants in an area larger than the US state of Texas. Deserts form a major part of it, with the Little Sandy Desert and the Gibson Desert in the north, and the Great Victoria Desert in the south-east, but it is one of the most geo- and biodiverse regions in the world. The sand dunes and salt lakes are host to endemic species, and the abundance of minerals is staggering. I was here to do fieldwork at Mount Weld, a mining site located some 120 km east of Leonora, which contains one of the richest deposits of rare earth minerals in the world.

For years now, my artistic research has revolved around the global mining industry, and in particular the geography of rare earth extraction. Remoteness is a key feature. The three largest rare earth mines are located in desert regions: the Mountain Pass mine in California's Mojave Desert, the Bayan Obo in the Gobi

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Mount Weld rare earth mine,
Goldfields, Western Australia.
Photo: Christian Danielewicz

Desert, and Mount Weld in the Goldfields. Most people are probably oblivious to these locales, but the minerals that are mined here are used in everything from mobile phones to hybrid car batteries, flat-screens, guided missile systems, and wind turbines. In short, rare earth elements enable all our hardware and software, making it lighter, faster, stronger, and longer lasting. Without these minerals just about everything would come to a standstill.

Contrary to popular belief, rare earths are not rare. But why then are the minerals mined in only a few far-off places around the world? One of the world's foremost experts on global rare earth geography, Dr. Julie Michelle Klinger, argues that we cannot begin to understand the rare earth situation without critically examining the sorts of spaces in which rare earths are mined. According to Klinger, the spaces of rare earth extraction are often cast as *frontiers* "imagined as empty of (indispensable) people yet full of the particular variety of riches fancied by extralocal actors" (Klinger 2017, 13). The rare earth frontier, Klinger explains, "is found in borderlands and hinterlands, in places where local landscapes and lives are deemed sacrificable in the name of some greater good" (Klinger 2017, 11). Evidently, another key feature of rare earth mining is social and environmental destruction.

From the Gobi Desert to the Goldfields

The research presented in this article is based on fieldwork at Mount Weld, but my preoccupation with rare earth extraction initially began elsewhere. In 2016, I



Weikuang dam.
Google Earth satellite image.

travelled to Baotou, also known as the rare earth capital of the world, to document the infamous tailings dam Weikuang (Danielewitz et al. 2016). Baotou is an industrial hub located on the edge of the Gobi Desert in the Chinese province of Inner Mongolia. Ore from the Bayan Obo mining district, which is the largest rare earth mine in the world, has been processed at the refineries on the outer ring of the city since the 1950s. Here, on the outskirts of Baotou, lies Weikuang, an enormous mineral waste repository containing more than 200 million tons of radioactive sludge: the

by-product of rare earth processing. Once you have seen Weikuang, you cannot unsee it. This is the hidden cost of a tech-saturated world based on a deeply inequitable, global division of toxic labor and waste. Cancers and respiratory diseases are rife in the villages around Weikuang as the toxic waste sinks into

the soil and contaminates farmlands; the villages are mainly inhabited by ethnic Mongolians.

The steppe of Inner Mongolia has been a rare earth frontier for decades. As Klinger points out, “its history of border-marking and resource extraction has been ‘written in blood’” (Klinger 2017, 14). But as rare earth minerals have taken centre stage in the escalating trade war between the US and China, the geopolitical landscape is changing and thus the toxic waste of rare earth production is flowing—and returning—to other parts of the Global South. In 2010-11, a Chinese embargo caused an explosion and subsequent meltdown in prices on rare earth elements. At the time, more than 90% of the global consumption of rare earths was produced in China. Beijing argued that the move to cut exports had to do with domestic environmental concerns, but the blocking of shipments conspicuously followed a territorial dispute with Japan. Whatever the reasons, the embargo created the perfect conditions for rival producers to enter the global market. In 2001, the Australian mining company Lynas Corporation had begun to focus on developing a particular rare earth deposit following the closure of the Mountain Pass¹ mine in California, which had been the last remaining rare earth mine outside China. In the heat of the late 2010 tensions between China and Japan, Lynas stepped in and signed an agreement for a three thousand ton export with a Japanese rare earth trading company; extraction began at Mount Weld in 2011.

“Rare earths in, surplus waste out”

When I arrived in Leonora by the end of the decade, Lynas had become the second largest rare earth miner in the world. With Mount Weld, the Australian outback has seen the opening of a new rare earth frontier, and this is a frontier that extends beyond the continent. The supply chain links Mount Weld to Leonora, where containers with rare earth oxide are transferred onto a train and transported to the Port of Fremantle, south of Perth. From there the containers are shipped to Lynas Advanced Materials Plant in Kuantan, Malaysia, where cracking and leaching processes refine the oxide and separate contaminants, such as radioactive thorium and uranium. Thus the operation follows the cynical rationale of the advanced political economies of the Global North, described



Black Square (Residue). 2016.
Installation by Anu Ramdas and
Christian Danielewitz containing
radioactive thorium from
Weikuang dam, and an iPhone
with a looping video recording of
slurry pipes at the waste deposit.
Photo: Kim Fristedt Malmberg.

by professor of sociology Stephan Lessenich as “externalization societies.” Lessenich argues that the Global North systematically transfers the consequences of its excessive consumption to other world regions, that is, the poorer countries in the Global South: “Rare earths in, surplus waste out—thus runs the import-export strategy of the externalization society” (Lessenich 2019, 68).

Before Lynas began to operate in Malaysia, the country already had a history of radioactive contamination caused by rare earth processing. Through the 1980s, a processing plant, partly owned by Mitsubishi, was dumping thorium in an open waste facility close to the village of Bukit Merah, which led to a health disaster with reported cases of leukemia and birth defects. The plant was closed in 1992 but it took almost another 20 years before a clean-up was effectuated. When it was revealed that Lynas had been granted a new license to refine rare earth oxides, it triggered Malaysia’s largest environmental campaign ever: the “Save Malaysia, Stop Lynas” petition. The campaign gathered more than a million signatures. But that didn’t stop Lynas. Despite massive protest, the company has been piling up thousands of tons of radioactive residue in a repository on the outskirts of Kuantan.

Professor in environmental studies Rob Nixon uses the term “slow violence” to describe the socioenvironmental impact of e.g. climate change, toxic drift, and deforestation. Slow violence takes place gradually and often invisibly. Consequently, a major challenge according to Nixon is how to represent it: “How to devise arresting stories, images, and symbols adequate to the pervasive but elusive violence of delayed effects?” (Nixon 2011, 3). As an artist working across a range of media and formats in different geographical and cultural contexts, I have been grappling with questions of representation for a long time, but to confront slow violence poses a particularly difficult challenge. It requires, as Rob Nixon points out, “that we plot and give figurative shape to formless threats whose fatal repercussions are dispersed across time and space” (Nixon 2011, 10).

The road to Mount Weld

In the weeks prior to my arrival, it had proven difficult to find someone in Leonora to assist me on my trip to Mount Weld. I intended to film the mining site with a drone, which meant that I had to find a way to access Lynas’ territory. The fact that I didn’t have official permission to enter the area eventually narrowed down potential assistants to just one person: a retired schoolteacher who had once before, some 40 years earlier, visited Mount Weld. In a four-wheel drive vehicle, we set out from Leonora to Laverton through a landscape of red dirt, salt lakes, and mulga bushland.²

Laverton, formerly known as British Flag, is a small town located on the edge of the Great Victoria Desert. Once infamous for its frontier location, with a reputation as one of the wildest settlements in the Goldfields, it is now the westernmost gate to the great Outback Highway, and the closest town to Mount Weld. The desert, more than any other place, evokes the notion of a frontier, and Laverton still prides itself on being a frontier settlement. When we left the town and drove south on a dirt road leading into mining territory, the vegetation appeared to grow thicker. The road, lined with black slurry pipes, was intersected by other dirt roads going in different directions, some of them with signs warning that unauthorized vehicles would be reported. On the way we passed the Sunrise Dam and Granny Smith gold mines located on the eastern margins of Lake Carey, a large Tertiary salt lake that has been used by the indigenous Wongatha people for thousands of years, but is now affected by the discharge of waste water from mining activity.

At one point, we realized that we were somewhat lost. We had been on the road for a couple of hours since we left Laverton and had not encountered any other people during that time, but as we got out of the car we noticed a white truck coming towards us. It turned out to be an aboriginal family acquainted with my assistant, which was no strange coincidence given the fact that he had been teaching for almost 50 years at different schools and missions in the area, including the Mount Margaret Aboriginal Community on the northern shore of Lake Carey. The older woman in the front passenger seat was holding a rifle. While native title rights³ to Mount Weld have never been claimed, the area around it has been used extensively by indigenous Australians as a hunting ground since long before it was turned into a zone of extraction.

Some 30 years ago an ethnographic survey had been conducted, apparently in consultation with the indigenous communities, to determine aboriginal areas of significance in relation to Mount Weld. The survey concluded that mining activity would not “disturb any areas of cultural significance.”⁴ In the face of the predatory corporate power wielded by mining companies, the Native Title Act is merely a “right to negotiate” land rights. Since the 1970s, a series of legislative acts supposed to protect aboriginal land rights have been passed, but at the same time, hundreds of sacred sites have been destroyed by mining companies. In May of 2020, the mining giant Rio Tinto—a company with a downright appalling record of human rights violations—blasted the 46,000 years old rock shelters at Juukan Gorge in the northern part of Western Australia, after receiving ministerial consent. It was from Rio Tinto that Lynas acquired the rights to extract Mount Weld’s rare earth deposits in 2001. Before we parted with the family, they pointed us in the direction of the mine.

Enter the grid

Julie M. Klinger points out that “the frontier narrative, when invoked, represents a set of spatialized intentions to transform a place that is unknown and ungoverned into the known and disciplined: to penetrate the impenetrable, to transform untapped minerals into wealth and power” (Klinger 2017, 13). Seen from above, the area around Mount Weld indeed appears like an orderly grid of dirt roads cutting through the dense vegetation, crossing one another. There is a main road on the outer western fringe of the mining site which leads to the main entrance, but we had to get off this road to approach the open pit from what we figured was the rear side, that is, the opposite side of this entrance. When we entered the gridlike maze of mulga trees, the offline GPS app I was using showed a blank space devoid of topographical features. Neither the narrow dirt tracks we were following nor the mine itself showed on the digital map. Only the main road, which we had left, was still visible.

In their article “Entering a Risky Territory: Space in the Age of Digital Navigation,” Valerie November et al. argue that “far from increasing the feeling of dematerialization, digital techniques have rematerialized the whole chain of production” (November et al. 2010, 584). The GPS is generated by satellites in orbit around the Earth sending signals to the phone, which are produced with minerals (i.e. rare earth elements) that may well have been extracted from the actual territory (the open pit mine at Mount Weld) we were searching for. Or to put it another way, the minerals that are extracted from the hidden territory we were trying to locate are contained in the technologies we were trying to locate it with. The rare earth frontier is “out there,” but it transcends local geographies and extends into our technologies. As professor and new media theorist Jussi Parikka writes, “media history conflates with earth history; the geological materials of metals and chemicals get deterritorialized from their strata and reterritorialized in machines that define our technical media culture” (Parikka 2015, 35).

The map and territory revisited

“The map is not the territory” is a well known expression coined by scientist and philosopher Alfred Korzybski in 1931.⁵ However, in the age of digital mapping the relation between map and territory—this particular territory—becomes entangled in such an intricate way that we must reconsider the relation. Once inside the maze, I changed the mode of navigation to drone view. The advent of drones has been a game-changer for activists mapping and documenting large-scale corporate destruction of natural environments, particularly in the forestry, agricultural, and mining sectors. With a double-click anyone can visit every mining



Mount Weld rare earth mine,
Goldfields, Western Australia.
Photo: Christian Danielewitz

site with Google Earth, but drones have enabled activists to get up close and expose environmental wreckage as it happens. On a vast continent like Australia, where the economy is heavily dependent on extraction industries that generally operate in remote areas with restricted access and limited regulatory oversight, drones have become aerial agents of resistance. Currently, only airports have geo-fences that prevent drones from taking flight, but it might only be a matter of time before mining corporations start pressuring drone manufacturers to put geo-fences up around their operations.

Mount Weld did not (yet) have a geo-fence, which made it possible to navigate the area from above. By way of this double vision, simultaneously at ground level and bird's-eye view—creating a vertical loop of entangled material flow and signals between drone, phone and underground—we followed the dirt tracks deeper into Lynas' territory until we reached the large mounds of overburden surrounding the open pit. There, from the drone's point of view at an altitude of 130 meters, the pit itself was revealed like a wound in the landscape. The geological matter flowing from the open cut mine, which is sprawled across a two-billion-year-old spent volcano, is divided into multiple flows of dirt and minerals

with different destinations once it is unearthed. The toxic flow, also known as *hidden flow* in mining terminology, parts into *domestic* hidden flows (e.g. the enormous mounds of excavated soil called *overburden*) and *foreign* hidden flows (the toxic matter which is externalized through the process of refining at Lynas' plant in Malaysia). The hidden flow is the byproduct of the so-called *material flow*, that is, the entire market-driven supply chain from the extraction of raw materials to the production of, *inter alia*, image- and communication technologies, such as drones, phones, cameras and satellites. Documenting the socio-environmental destruction wrought by rare earth mining thus becomes an act of utilizing the material flow to uncover the hidden flow. As the drone hovers high above the mine, the dichotomy between map and territory collapses. The map does not lie outside the territory; rather "the map animates the mediated relationship between technologies and worlds" (Hind, Lammes 2016, 80).

Fieldwork between artistic research and activism

The sacrifice zones of rare earth production are located in specific geographies that can be mapped, as Klinger points out in the epigraph to this article. However, mapping the toxic flows of rare earth production with digital image technologies cannot be done without recognizing the intricate material connection between those technologies and the territories that are mapped. But how, then, do we communicate this recognition? "How do we both make slow violence visible yet also challenge the privileging of the visible?" asks Rob Nixon. When the media tend to venerate the spectacular, he writes, how can we convert into image and narrative the disasters that are slow moving and long in the making? (Nixon 2011, 3). In his book, Rob Nixon emphasizes the importance of environmental writer-activists: "[...] writers, filmmakers, and digital activists may play a mediating role in helping counter the layered invisibility that results from insidious threats, from temporal protractedness, and from the fact that the afflicted are people whose quality of life—and often whose very existence—is of indifferent interest to the corporate media" (Nixon 2011, 16).

Visual artists working in vulnerable geographies may also play a mediating role in making unseen and imperceptible forms of slow violence visible and indeed tangible. And even more so, I would argue, when it comes to the socio-environmental impact of the production of tech minerals such as rare earths. As an artist working primarily with mineral-based image technologies in territories of mineral extraction, my intention is thus not only to document the wasted landscapes, but also to investigate the inextricable intertwinement of technology and geology, map and territory, image and materiality. Rare earth

frontiers are located in specific geographies that can be mapped, but the truth is that it is almost impossible for end consumers of digital devices to escape some form of—more or less oblivious—complicity in the market-driven supply chains of raw materials. Even social enterprises such as Fairphone, which has done a great deal of research to map unethical suppliers of minerals, admit to having enormous difficulties with tracking the labyrinthine global network of supply chains behind our tech. An artistic approach might not overthrow unjust policies anytime soon, but it has a powerful potential to engender a more profound visual apprehension of the complex entanglement between technologies and ecologies, and the devastating social and environmental repercussions of the current modes of extraction and production.

NOTES

- 1 MP Materials acquired Mountain Pass in 2017, and resumed rare earth mining on US soil in early 2018.
- 2 A mulga is a small Australian acacia tree.
- 3 See *Native Title Act 1993*.
- 4 Quoted from The Public Environmental Review for the Mt Weld Rare Earths Project by Ashton Rare Earths Ltd, 1992. Section 8.1.8.
- 5 Alfred Korzybski's original phrasing "A map is not the territory it represents, but if correct, it has a similar structure to the territory, which accounts for its usefulness", first appeared in print in the paper "A Non-Aristotelian System and its Necessity for Rigour in Mathematics and Physics" from 1931. The paper was reprinted and published in his book *Science and Sanity*, 1933, pp. 747-761.

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Christian Danielewicz's contribution has been peer reviewed.