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Bremner, L.

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DISSIDENT WATER

Lindsay Bremner

INTRODUCTION

The discovery of gold on the Witwatersrand in South Africa in 1886 gave rise to the exploitation of the world's largest gold reserves. This turned the earth inside out, inaugurating new associations of air and earth, science and politics, humans and nonhumans. Very rapidly, these relations were organised into two apparently distinct realms: an above-ground world of capital, labour, commerce, politics, and culture (the city) and a below-ground world of minerals, rocks, and science (geology). Cartographic representations constructed these two worlds as separate and as having little if any relation to one another, while for those who worked underground, of course, geology was palpable and felt in the body. Nevertheless, it was not until rising acid mine water, a toxic by-product of mining operations separated, or dissented, from the underground place assigned to it and rose to the earth's surface, that geology became a vibrant force in the political life of the city.

This essay lays out the consequences of this liquid intrusion of the underground into above-ground affairs. It echoes Maria Kaika's critique of modernity in *City of Flows, Modernity, Nature and the City* (2005), in which she argued that when a city's invisible networks such as storm water drains, electrical conduits, or Internet cables malfunction, the "contradictions of the commodification of nature by multiple socio-ecological processes of domination/subordination and exploitation/repression that feed the capitalist urbanisation processes" are exposed (Kaika 2005: 49). My essay argues that acid mine water not only made the commodification of nature visible and generated protest on its behalf, it also opened up possibilities for new modes of

political, spatial, and aesthetic practice. I make this argument by aligning Jacques Ranciere's (1999) notion of *politics* as occasions when those who previously had no right to be counted as speaking beings demand to be heard, with Bruno Latour's (1999, 2004) notion of a *proposition* as an occasion when entities, human or nonhuman, bring about conditions of uncertainty, mobilising collectives in search of articulation.

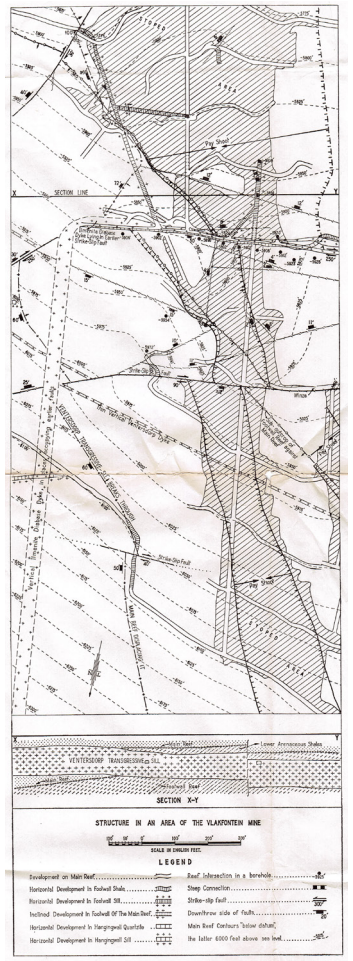
THE POLITICS OF DISSIDENCE

Ranciere identifies the foundation of politics as the staging of conflict over the distribution of bodies: "those that one sees and those that one does not see, those who have a logos— memorial speech, an account to be kept up—and those who have no logos, those who really speak and those whose voice merely mimics the articulate voice to express pleasure or pain" (Ranciere 1999: 22). He illustrates this with a story by Livy, retold by Pierre-Simon Ballanche, of the secession of the Roman plebeians on Aventine Hill. Faced with a situation in which they were denied symbolic enrolment in the city, the plebeians established another parallel order by conducting themselves as speaking beings who shared the same properties as those who denied them their voices. In doing so, they found that they too were endowed with intelligent speech and were the equals of those in higher power. This violated the space of the city and gave them a place in the symbolic order of speaking beings. Politics exists, Ranciere argues, when those who "have no right to be counted as speaking beings make themselves of some account, setting up a community by the fact of placing in common a wrong that is nothing more than this very confrontation, the contradiction of two worlds in a single world: the world where they are and the world where they are not, the world where there is something between them and those who do not acknowledge them as speaking beings" (Ranciere 1999: 27).

For Ranciere, politics belongs by definition to human subjects; nonhumans do not qualify to participate in the demos, for the disruption of a symbolic order must be accompanied by engagement in reasoned discourse. Bennett (2010) challenges this view, arguing that Ranciere's model suggests possibilities for a more vital materialist account of democracy. Nonhumans, she argues, are able to act or argue against the partitioning of the sensible and catalyse a public able to engage, on their behalf, in reasoned discourse. Ranciere seems to hint at this in his discussion of questions of identification and representation, of who speaks for whom and how this is interpreted in political discourse. In this arrangement, the third person is essential. Politics is never a simple dialogue between two equal parties, but rather a situation where their very equality as speaking beings is at stake. Politics arises when the distinction between who speaks and who does not speak is uncertain, thus "creating a stage around any specific conflict on which the equality or inequality as speaking beings of the partners in the conflict can be played out" (Ranciere 1999: 51).

For Latour (1999, 2004), this idea to relations between humans and nonhumans. He replaces the opposition between nature as mute objects and society as speaking subjects with the idea of

human and nonhuman "actants," or "propositions," which "are not positions, things, substances or essences, made up of mute objects facing a talkative human mind, but occasions given to different entities to enter into contact" (Latour 1999: 141). Propositions are associations of humans and nonhumans before they are fully articulated or constituted as members of a collective. Through contact over the course of an event, propositions perform in certain ways, their definitions are modified, and their attributes and competencies in relation to one another are played out. While he expressly denies equivalence between human and nonhuman propositions, writing, "Inanimate things, do you then have a soul? Perhaps not; but a politics, surely" (Latour 2004: 87), Latour establishes an equivalence between them. The door is thus opened for nature to enter the political arena and for political life to be reformulated. The nonhuman becomes a "scandal at the heart of an assembly that carries on a discussion requiring a judgment brought in common" (54).



It is these conceptions of the political that rising acid mine water, by decanting, staged. While it was underground, its politics were only immanent; by dissenting from its spatial disposition, by gaining visibility and materially entering the world of human affairs, it became a proposition, mobilising heterogeneous publics to speak on its behalf and laying out new political, spatial, and aesthetic agendas.

GOLD MINING AS A REGIME OF INVISIBILITY

The act of wresting minerals form the earth has historically required the subjugation and the demeaning of both nature and humankind, as faceless pairs of hands and unseen labouring backs descend into the dark, inhuman hell of tunnels to strip away the organs of nature. (Mumford 1934 in Bridge 2009: 45)

The transformation of the underground into a frontier for capital accumulation is both an unimaginable technological feat and an unprecedented debasement of humans and nonhumans alike. The deep-level South African gold mine is one of the most extreme forms of this exploitation of nature. It is a vast infrastructural network of shafts, tunnels, pumping stations, conduits, vents, pipes, ropes, and cables that continuously move water, air, electricity, dynamite, equipment, ore, and people between surface and depth.

Section through the Vlakfontein gold mine, Nigel, East Rand, South Africa
Source: Haughton (1964). Credit: Geological Society of South Africa

Underground, humans drill holes into the walls of narrow, inclined stopes using hand-held machines, exposing their bodies to heat, silica dust, and other toxins. Rock faces are dynamited. Fractured ore is gathered and dropped down ore-passes, then hauled by rail or truck to shafts where it is hoisted to the surface. Here it is crushed, milled to dust, and dissolved in a solution of cyanide. Zinc or carbon is added to the solution to precipitate gold, which is then smelted and purified. The waste generated by this process is discharged onto slimes dams—vast metabolic mountains of toxic sludge that leach into groundwater and emit radioactive contaminants into the air. For the broad public, the underground and mining processes are visible only in the form of these slimes dams piled up on the surface of the earth and the mineshafts that mark thresholds into the underground. In South Africa, such invisibility was enhanced by a number of mechanisms, including the allocation of rights (the law) and the representation of space, (cartography).

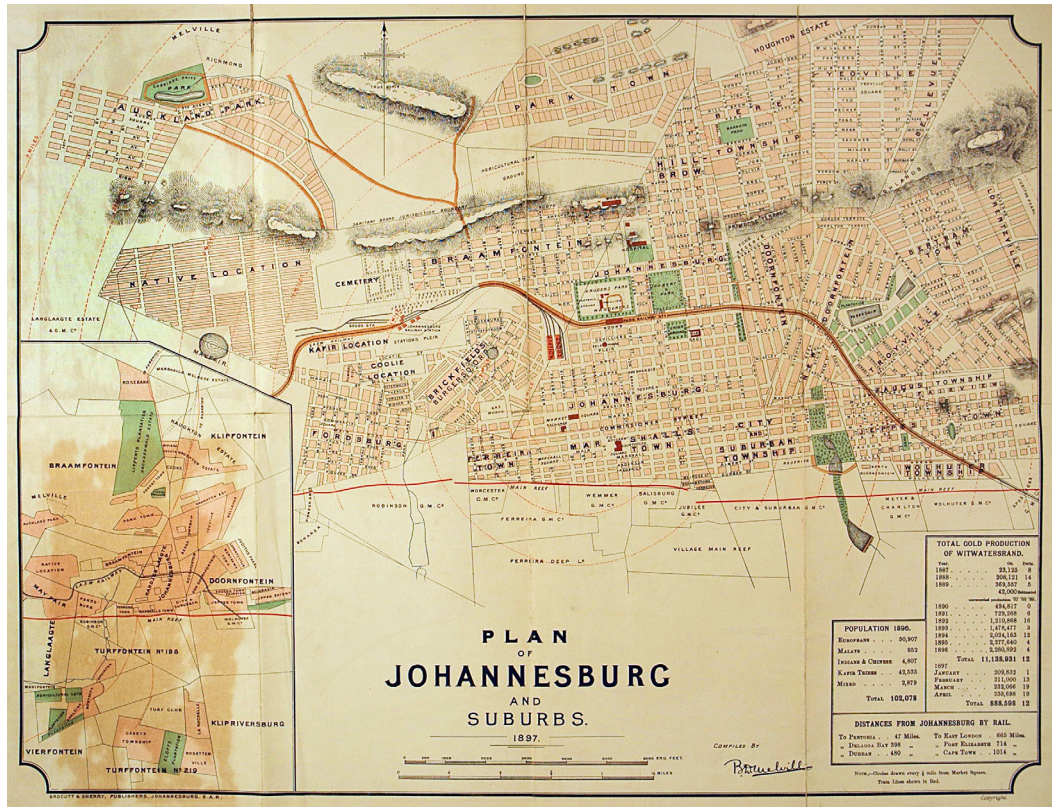
Before the discovery of gold, the Zuid-Afrikaansche Republiek (ZAR)'s *grontwet* (ground law) gave ownership of any minerals found under a piece of land to the owner of that land; mining

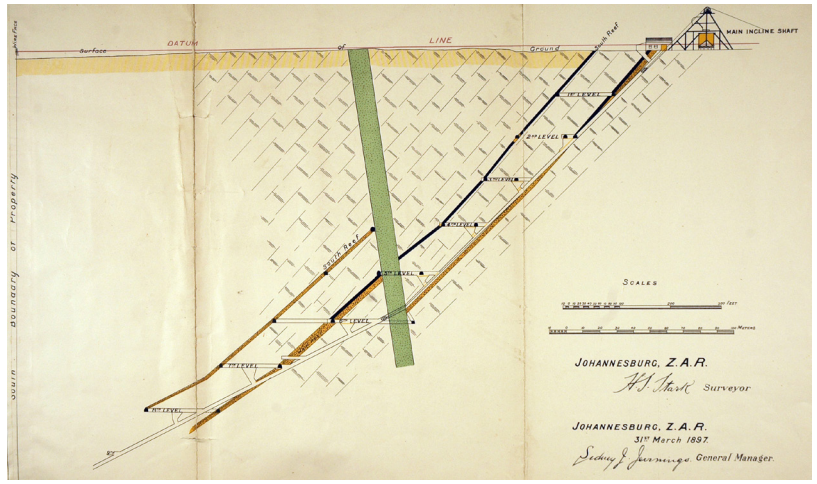
Slimes Dam, Soweto, South Africa. Photograph: Lindsay Bremner
Mine headgear, Randfontein, South Africa. Photograph: Lindsay Bremner

these minerals was permitted without permission from the state. However, by the time gold was discovered on the Witwatersrand in 1886, a policy of state control over mining through proclamation had been instituted. This meant that once the precious metal was discovered, a piece of land was proclaimed a goldfield. This gave the state control (not ownership) over the land and its underground minerals, and licensing provisions entitled the state to grant a title (a *mynpachtbrief)* to a third party to mine the land. The landowner retained ownership over the land and its minerals until they had been severed from the earth, when they became the property of the party that had mined them. This preserved the common-law rights of land and mineral ownership, while those with the skills, expertise, and capital to mine gold were given the rights and incentives to do so (Stott 2008). This allocation of extractive rights as separate from land rights established the relations of production underpinning the modern South African political economy and the legal, governmental, and cartographic practices that supported it (Van Onselen 1982a, 1982b).

In 1886, the city of Johannesburg came into being as a mining town on a triangular site at the centre of the eight farms that had been proclaimed as public diggings after gold had been discovered. This site was called an *Uitvalgrond*, an Afrikaans word meaning "surplus ground," the definition the ZAR gave to land leftover between farm portions whose perimeters were determined by the distance a farmer could ride in a day from his or her farmstead. The surplus ground that became the city of Johannesburg was crossed by a line of mining claims in the south and was therefore considered by the ZAR to be a mining camp, managed by the state through a Mining Commissioner and a Diggers Committee. The state granted *Voorkeurrechte*, or preferential rights, for use of its urban stands in much the same way that it granted *mynpachtbriefe* to mine for gold. This meant that the city and the mine were part of a legal, institutional, and spatial continuum. In December 1887, however, Johannesburg was given permission to elect a Sanitary Board, and in 1897 it was granted a limited form of municipal government (Beavon 2004). This inaugurated the legislative separation of town and mine, consolidated from 1900 onwards, when the British occupied the city and granted formal municipal powers (Beavon 2004). From then on, the city was subjected to one legislative regime and mining to another.

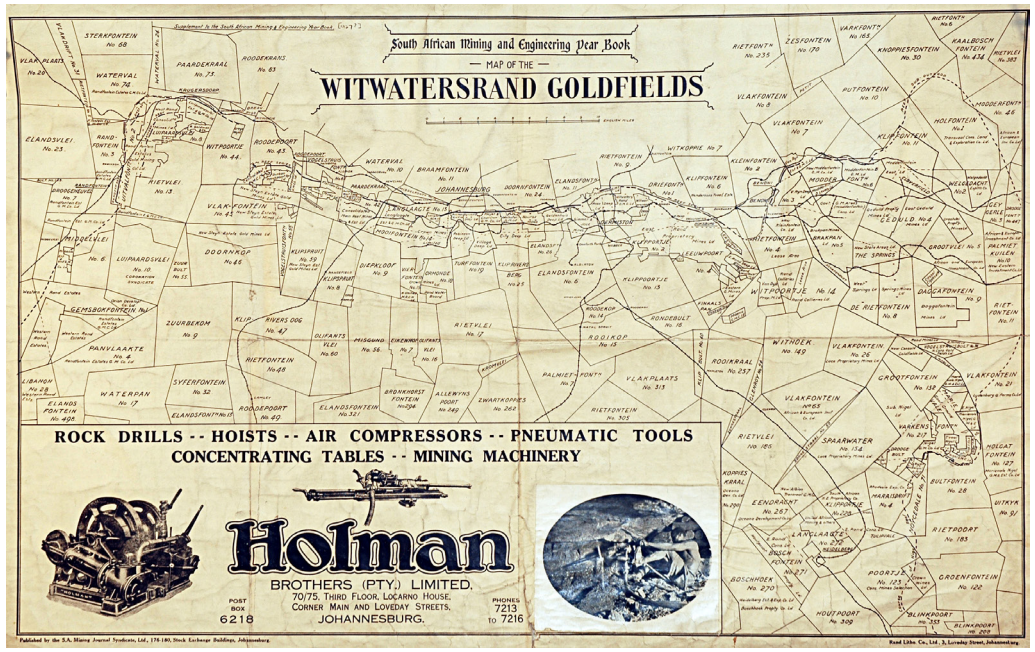
This schism is apparent in two maps dating from 1897. In the first, titled *Plan of Johannesburg City and Suburbs*, street grids, railway lines, and townships clearly designate a town in the making. One can read the faint register of the original *uitvalgrond* triangle, but the city has already exceeded this boundary, spreading east and west along a valley and northwards over the Witwatersrand ridge. Early signs of the future racialisation of urban space are evident in names like "Coolie Location," "Kafir Location," and "Native Location," though at this time the city was still a site of racial cohabitation (Bremner 2005). South of the city, mines are named and drawn as surface areas, with no registration of their underground topography or even of the location of their shafts or surface workings. A locational map on the bottom left-hand corner of the document omits the mining properties altogether and simply overlays township portions on farm portions. The only indication that this was a mining town is a table in the bottom right-hand corner that shows quantities of gold produced between 1887 and 1897.





Plan of Johannesburg and Suburbs, 1897. William Cullen Library, University of the Witwatersrand, Johannesburg
Johannesburg Z.A.R, 31st March 1897. Johannesburg Public Library

The second map, titled *Johannesburg, Z.A.R.* is a sectional drawing of a mine, which shows two inclined gold reefs, a geological fault, a mineshaft, and eight underground mining tunnels. No indication of the identity or location of the mine is given other than that it is approaching its southern property boundary. The ground surface is a wavy line subsumed by a firm, level datum from which subterranean levels are plotted. Whereas on the first map the city was only drawn in plan, on the second the mine is only drawn in section. Where mining maps do make use of the plan, as in *A Map of the Witwatersrand Goldfields* published for the *South African Mining Engineering Year Book* of 1927, cities and towns vanish, appearing only as underlined names (i.e., Johannesburg, Benoni, Roodepoort) subsumed by a patchwork of mining claims.



These examples reveal that urban maps and underground maps privilege different views and offer different readings of space, and bear little if any relation to one another. The underground, though extensively surveyed and mapped, was kept firmly out of sight. The above ground was constructed as a tumultuous human world of social re-production: a world of modern economic, political, and social life, mapped and spoken for by artists, administrators, health authorities, legislators, lobbyists, planners, politicians, professionals, unionists, writers, etc. The below ground, on the other hand, was an apparently mute, nonhuman geotechnical world, the province of engineers, professionals, scientists, and seismologists who spoke its recalcitrant depths in the language of measureable data

Map of the Witwatersrand Goldfields, 1927. Johannesburg Public Library

and scientific fact. Evidence that the two realms existed in "a set of relations in which each relies on the existence of the other, in which they are entwined or enfolded, suggestive of the other, interpenetrating, (though) separating out at different points" (Nuttall 2009: 83) was eradicated.

THE POLITICAL LIFE OF RISING ACID MINE WATER

Water is both indispensable to mining and yet dramatically transformed by it. Early in the history of gold mining in South Africa, water was used primarily for dust suppression after blasting. Mines were shallow enough to be ventilated through airshafts opening directly onto the earth's surface. However, as mines became deeper, air circulation had very little cooling effect, so water began to be used as a coolant. Mines penetrated the aquifer, meaning that operations were effectively taking place under water and voids had to be drained. Water was mediated by and subjected to multiple modes of engineering. A complex network of discourses, practices, technologies, skills, trades, and materials was deployed to alter its behaviour and spatial disposition. It was evaluated, modelled, and tested. Scientific laboratories, associations, and journals were set up to study it, discuss the problems associated with it, evaluate new technologies, and propose more effective ways of managing it. Complex systems of dams and pressure-reducing valves were introduced underground. Later, water was refrigerated on the surface, dropped down shafts, circulated through cooling coils, sprayed onto rock faces, pooled, and then pumped to the surface again. Different types of water, some of which was contaminated by sulphides and other minerals, and other types, which were less contaminated and drove machinery, travelled on their journeys through mines in separate pipes (Stephenson 1983).

On these journeys, water was chemically transformed. Mining introduced oxygen into deep geological environments where it had never been before. This led to the oxidisation of underground minerals, the most widespread of which was pyrite (FeS_2), commonly known as fool's gold. As it oxidized, pyrite produced acids and released heavy metals and sulphates. The water in mine voids leached these out, producing a highly acidic, saline solution. This was compounded by the presence of toxic metals (arsenic, cadmium, copper, cobalt, uranium, and zinc) in mining voids, which were mobilized in the acidic water (Akcil and Koldas 2006). While mines were operational and water levels stabilised by pumping, little pyrite oxidation occurred below them and few metals were leached from above. When mines closed and pumps were turned off, however, contaminants were leached out and water levels rose (Johnson and Hallberg 2005; McCarthy 2010). This is what occurred on the Witwatersrand goldfields after 2002. Mine closures and a number of socio-environmental, legislative, and political recalibrations created the conditions for water to seek its pre-mining piezometric level. Rainwater filled abandoned mine shafts, and unmaintained underground water reticulation systems began to leak. Toxic underground water rose and eventually decanted onto the surface and into the political spotlight. This provided me the opportunity to reflect on the political ecology that had been kept out of sight in the first place, and what new modes of political, spatial, and aesthetic practice it had made possible.

Acid mine water first became visible on the Witwatersrand in 2002, when it decanted from two abandoned mine shafts on the Randfontein Estates Gold Mine west of Johannesburg and flowed via a seasonal stream into a nearby nature reserve. Here it filled a hippo dam, turning its water yellow, and killed all aquatic life in addition to causing a number of animal fatalities. These localised calamities received little attention until media reports in 2005 revealed that the Cradle of Humankind, a significant World Heritage Site just downstream from the game reserve, was under threat of acidic water pollution. At the same time, Robinson Lake, a nearby mine-waste site was found to have water with a pH of 2.0 (equivalent to that of lemon juice or vinegar) along with elevated levels of uranium and heavy metals. The lake was declared a radiation hotspot and fenced off. Nearby, a luxury retirement village was abandoned when it was found to be exposed to radioactive airborne dust, and residents of Tudor Shaft, an informal settlement located on top of a neighbouring mine dump, were found to have inhaled or ingested dangerous amounts of radioactive material (Hervieu 2012; Mathews 2011; National Nuclear Regulator 2010).

By 2010, scientific and political studies on the water's radioactivity, heavy metal content, and archaeological impact, and on communities at risk from radiation and toxicity, had begun to identify the water's attributes and make it more knowable (Dugard et al. 2011; Winde 2009; Oelofse et al. n.d.; Adler and Rasche 2007). Its status and the threats it posed were debated in the public media (Funke et al. 2012;Pressly 2011.). Activists brought the Acid mine water and those

Toxicity of acid mine water. Data source: Oelofse et al. (no date).
Photo: Lindsay Bremner

Known sites affected by radioactivity on the West Rand, South Africa.
Map: Lindsay Bremner, from Google Earth

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The polluted Tweelopies Stream, Krugersdorp Municipal Nature Reserve, South Africa.
Photo: Lindsay Bremner

Robinson Lake, Randfontein, South Africa. Photo: Lindsay Bremner

affected by it to the attention of the public in public fora (Funke et al. 2012); artists visualised its impact on aquifers, dams, crops, and human health (Kritzinger 2012); and architects investigated whether the water could be viewed as a positive economic, political, infrastructural, and cultural proposition (Bremner et al. 2010; Coetser 2012).

What had occurred was that after the water became visible and began to circulate in expanding networks with other actants—streams, hippos, fish, farmers, the media, tour operators, scientists, mining companies, property developers, radioactive monitors, shack dwellers, venture capitalists, artists, architects, and others—uncertainty about its status abounded. Was it about mining, about waste, about water resource management, about air quality, about human health, about economic development, about land values, about legal liability, or about ecological rehabilitation? To whom or to what was it a matter of concern—the government, current mining companies, former mining companies, taxpayers, municipal authorities, shack dwellers, developers, farmers, people who live far downstream, people not yet born? If it was of concern to all of these and more, how did one put together an assembly that spoke a common language to discuss it, account for it, call it to order, assess its contradictory scenarios, and make decisions about how to deal with its consequences? Should this be in parliament, in appointed committees, in public gatherings, in scientific journals, in art galleries, in the media, or all of the above—or more? Its regime of visibility—its yellow and black metallic coating, white salt scum, acidic taste—and its practices—the dead aquatic life it left behind, the pipes it corroded, the itchy skin it produced, its radioactive sludge—mustered a riotous assembly of "policy entrepreneurs" (Turton n.d.: 13) or what Latour (2004) calls spokespeople or witnesses, operating in the spaces opened up in South Africa's post-1994 constitutional, legal, moral, and political environments, to articulate it across multiple registers.

In 2010, the water had become a national political crisis. Towards the end of that year, a Parliamentary Portfolio Committee visited the contaminated sites. A team of scientists was appointed to appraise, assess, and report on the situation. Their report, *Mine Water Management in the Witwatersrand Goldfields with Special Emphasis on Acid Mine Drainage* (South African Council for Geoscience 2010), acknowledged the toxicity of the water and recommended immediate steps to neutralise it, pumping it to prevent surface decant, and a long-term strategy to neutralize acidity and remove salts. A state-owned entity, the Trans-Caledon Tunnel Authority (TCTA), was issued a directive to undertake the pumping, neutralisation, and discharge of the water into the Tweelopies Stream and to dispose of its residual heavy metal sludge into an existing deep surface excavation, the West Wits Pit. Given that the water would still have elevated levels of sulphate, manganese, iron, and uranium—some of these up to 1000% of the South African operational limits (Oelofse et. al n.d.)—and that these heavy metals would continue to leach into aquifers, scientists, farmers, and environmental activists viewed the steps as far from adequate. Voices of dissent were heard at the public meetings conducted as part of an environmental-impact assessment scoping exercise in July 2012. Attendees protested that solutions should be deferred until all entities impacted by the water were gathered into a coherent whole (Personal attendance at a public meeting, July 2012).

The government's subsequent proposal to address the environmental and political problems raised by the acid mine water did not attempt to hold its many entities and propositions together in an all-encompassing spatio-temporal envelope. Instead, it curtailed and rearticulated the water's trajectories and rearticulated by "amicable agreement" (cf. Adler et al. 2007: 34) between just three players—central government departments, select scientists, and state-owned companies. The water's multiplicity of clamorous attendants and associations were silenced and its propositions were translated into technical processes of partial treatment, piping, and discharge, to be conducted in private by certain government officials, engineers, scientists, and company employees. This shedding of its wider gamut of collaborators and associations divested the water of its politics and made it less real (Latour 1999). What it had brought to the surface was channelled into treatment plants, engineering works, and pipes and made to disappear.

CONCLUSION

The dissent of rising acid mine water between 2002 and 2010 in Johannesburg, South Africa, transgressed the institutions, practices, and discourses that had assigned it to its place. It became a "scandal at the heart of an assembly that carried on a discussion requiring a judgment brought in common" (Latour 2004: 54), making visible what apparently had no business being seen, and revealing a discourse where once there was only place for noise (Ranciere 1999: 30). In redistributing geology across the surface of the earth, into the air, and into the metabolism of plants, animals, and humans, the water made what had been invisible (except to those who daily came into contact with it) clearly visible and knowable—not as hidden abstractions or scientific facts, but as forms of above-ground experience and matters of concern. It reorganised surface and depth into a fluid, contested continuum and made it impossible to pretend that what had formerly been distinct realms—geology and city, science and politics, humans and nonhumans, the visible and the invisible—did not belong to the same sphere—an assemblage of associations between heterogeneous actants, events, matters of concern, and points of view. The water revealed that mining displaces geology not only in terms of the matter it extracts and commodifies, but also in what it discards and leaves behind. Much of this is polluted, toxic, and unstable. It metabolises into groundwater, air, and flesh. Geology becomes biology, and toxicity becomes a condition of daily life. Engaging with these conditions through documenting, visualising, and mapping reveals new ways of seeing and understanding them, exposes new ethical and aesthetic challenges, and suggests new sites for political, practical, spatial, and aesthetic intervention.

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