



Inorganic Becomings

Situating the Anthropocene in Puchuncaví

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Abstract In this choral essay we, an assorted group of academics interested in inorganic life and matter, explore a mode of thinking and feeling with our objects of inquiry—chemicals, waste, cement, gas, and the “project” as a particular form of circulation and enactment of materials and things. To experiment with alternative modes of knowing, we went to Puchuncaví, the largest, oldest, and most polluting industrial compound in Chile, to encounter the inorganic through and with its inorganicness and to attend to the situated, historicized, and political composition of both our materials and our experiences. Thinking of this as a collective provocation, we do not rehearse a conventional argument. Its parts are connected but only partially. There is no dramatic arc but rather an attempt at composing an atmosphere through which our thought and feelings are invoked. We have made visible the authorship behind each of the stories recounted here to celebrate the multivocality of our collaboration and to rehearse a nonabstracted mode of attention to Puchuncaví and the inorganic forces and entities we encountered there. We connect our irritations and speculations with the Anthropocene precisely as a way of summoning the multiple violences, many of them of planetary reach, that have to be denounced when situating our knowledge practices in Puchuncaví. Thinking about the ethico-political challenges of research in territories that have been, and are being, transformed under the weighty history of contamination and that are lived in and lived with by generations of beings (human and otherwise), we call in our concluding remarks for an enhanced pedagogy of care born of our inherited pasts and of engagement, interest, and becoming as response-ability.

Keywords inorganic life, Anthropocene, slow violence, response-ability, Puchuncaví

Introduction: A Collective Experiment for Mattering the Anthropocene

Not far from Santiago, Puchuncaví holds the largest, oldest, and most polluting industrial compound in Chile—the Ventanas Industrial Complex, or VIC for short. For the last five decades the lives of Puchuncaví's inhabitants have been altered by a variety of industrially produced toxicants, from ultrafine particulate matter to BTEX, arsenic, and nitrogen dioxide. This inorganic matter has silently and systematically disrupted bodies (human and otherwise), landscapes, and politics in several ways and at different scales in Puchuncaví.

Insofar as VIC is part of the modernist epic of industrial development, inorganic disruptions and harms are inseparable from the infrastructural and institutional webs through which extractive futures and their toxic residues are imagined, produced, and circulated in late liberal Chile. Until not long ago Puchuncaví, 150 kilometers from Santiago in central Chile, was an isolated rural area whose population lived mainly from artisan fishery and peasant agriculture. In September 1964 the ENAMI copper smelting plant was launched, with the expectation of igniting a new industrial phase in twentieth-century Chile.¹ Nobody predicted an ecological catastrophe. In fact, the smelting complex was celebrated as a milestone for the progressive advancement of both Puchuncaví and Chile. In 1957, when the smelting plant was approved, *El Mercurio de Valparaíso*, the most influential newspaper of the region, had explained that the plant would “translate into wealth and jobs” for Puchuncaví.² Today Puchuncaví is the poorest municipality in the region. And the most contaminated. In addition to the smelting plant and various petrochemical industries, VIC holds a carbon and petcoke port and four thermoelectric plants.

The industrially produced inorganic matter harming lives and ecosystems in Puchuncaví is inseparable from this story of stateness, projectness, and progress. But at the same time, in Puchuncaví the inorganicness of inorganic life intersects politics and everyday life in queer and adamant ways.³ Inorganic materials and forces enveloping Puchuncaví—coating deteriorated rural lands, sedimenting on lungs, interfering in the chemistry of sea ecosystems—strive to exist as powers that are *not only*:⁴ not only elements within social arrangements and circulations but also things that demand their own regimes of engagement. In Puchuncaví, metalloids, carburants, and gases, intervening in unexpected ways in unexpected places, exert their recalcitrant and inhuman condition, their inherent capacity—executed daily in all aspects of collective life—of behaving in uncanny ways.

1. The smelting plant was operated by the Empresa Nacional de Minería (National Mining Company), the company in charge of copper processing. In 2005 the plant was transferred to the Corporación Nacional del Cobre (National Copper Corporation), or Codelco. Codelco is in charge of copper extraction and production and is the largest state company in Chile and the largest state mining company in the world.

2. *El Mercurio de Valparaíso*, “El progreso de Chile.”

3. Chen, *Animacías*.

4. de la Cadena, “Runa.”

How to be fair with the *not-onlyness* of the inorganic in social research? Recent engagements with the inorganic in the context of the “geological turn”⁵ have center-staged the capacity of the inorganic to disrupt assumptions about life, nonlife, and other-than-life.⁶ Yet the humanities and the social sciences still need to invent modes of relating with the inorganic that are able to respond to its phenomenological ambivalence, particularly in situations of industrial toxicity. Chemically damaging inorganic entities are produced by and interact with the precarities and power geometries of Western industrialism, while they are also withdrawn from human subjectivity and animated beyond anthropocentric action.⁷ How can we invoke inorganic beings in our research, recognizing their entanglement with multiple inequalities but without reducing them to language, cognition, discourse, or the symbolic?

In this essay we tackle this question. We do not claim to be the first to pose it; rather, we rehearse a *tactic* to answer it. A tactic, not a method or strategy, because our gesture is tentative, hesitant, and lacking any expectation of consolidation. And it is highly situated: it begins in, is dependent on, and perhaps ends with a place, an event, a collaboration. As part of the workshop *Governing the Inorganic*, held in Santiago in September 2015, we, part of a group of eight researchers, made a daylong field visit to Puchuncaví. The workshop aimed at discussing the liveliness of the inorganic and the injunctions between nonlife and the politics, infrastructures, and discourses rendering it visible/invisible, present/absent, intervenable/incommensurable, productive/harming. The discussion is hardly new, but our trip to Puchuncaví explored the possibility of posing the question and crafting the answers “in the presence of” our objects, to borrow from Isabelle Stengers: right there, *in media res*, dwelling with and feeling alongside them.⁸ Needless to say, the things we were interested in were quite different, and each one of these things reclaimed its own mode of engagement. We went to Puchuncaví to get a sense of how we could approach our inorganic materials, paying close—and humble—attention to their energies, capacities, infrastructures, and textures. And to their situatedness: to the fact that the liveliness of our materials was both a product and a condition of possibility of a specific instantiation of modern industrialism: Puchuncaví’s VIC.

During our field visit we met with local activists, municipal officials, and industry representatives. We walked around brownfields, illegal dumping sites, and engineered beachfronts; we had coffee in the municipal building and visited the natural gas port and processing plant. We wanted to know what it meant to live enveloped by chemical toxicants; how time and politics were imagined in a sacrifice zone; by which processes the VIC was (un)governed; and what the role of infrastructures was in shaping both the VIC and its harming effects.

5. Bennett, “Earthling, Now and Forever?”; Bonneuil, “Geological Turn”; Yusoff, “Geologic Life.”

6. J. Cohen, *Stone*; Wills, *Inanimation*; Woodard, *On an Ungrounded Earth*.

7. De Landa, *Thousand Years*.

8. Stengers, “Cosmopolitical Proposal.”

Trying to make sense of what we were witnessing and joining the dots—connecting what was happening in Puchuncaví to other sites across the globe, locating Chile in the larger history of colonialism and neoliberalism, understanding the VIC within the larger diagram of extractivism—we came to realize that an inquiry into the inorganic in Puchuncaví was an exploration into the formation and manifestation of what has come to be known as the Anthropocene, or the recognition of human activity as a planetary force profoundly and permanently altering Earth systems and the conditions of possibility of human life. The configuration of Puchuncaví as a sacrifice zone, we realized, was entangled with sociopolitical processes, including colonialism, developmentalism, and extractivism, that have exerted their power globally. But in Puchuncaví, we also felt uncomfortable with the story of the Anthropocene as tale about *generality*. As suggested by Bruce Braun and his colleagues, the equalization between the planetary and the general “can lead to a fixation on the global scale and space of geophysical epochal change at the expense of what we see as the Anthropocene’s groundedness in specific contexts.”⁹ Spending time in Puchuncaví we realized the phenomenological ambivalence at work in what we were sensing, watching, and hearing. On one hand, we were witnessing a nexus between neoliberalism, toxicity, and violence that was specific to Puchuncaví and thus demanded a grounded mode of attention; on the other, the political and ecological intensity of what we were witnessing pushed us to recognize the messiness of its temporal and spatial scales. Puchuncaví’s transformations were linked to geographies far beyond (and not exclusive of) central Chile and connected with temporalities that exceeded the “present” as the arc of action and change. The VIC and the industrially produced inorganic exuberance harming life in Puchuncaví demanded that we hold the planetary and the particular in the same frame.

In this essay, we engage with the Anthropocene as a concept to help us think about the Puchuncaví’s inorganic powers and harms but only insofar as we approach the concept with the same *not-onlyness* guiding our engagement with the inorganic: the Anthropocene not only as planetary transformation but also as historically situated and locally entrenched configuration. Instead of assuming the Anthropocene as an abstract geologic inevitability, ignoring its gendered, classed, and anthropocentric assumptions and consequences,¹⁰ we take the Anthropocene as a way of grounding politically and materially the stakes at play in Puchuncaví: a way of entangling our exploration into inorganic and more-than-human worlds with the trajectories and effects of human intervention on ecologies and livelihoods. Our aim that day was to follow our inorganic materials as they labored through bodies, politics, and infrastructures in Puchuncaví—a specific territory in which specific solidarities and relations have flourished. The suffering and possibilities of Puchuncaví are irreducible yet connected to the larger histories of earthly transformation. Or put differently, this is a story about intractable inorganic

9. Braun et al., *Grounding the Anthropocene*, n.p.

10. E.g. T. Cohen et al., *Twilight of the Anthropocene Idols*; Haraway, *Staying with the Trouble*; Moore, *Anthropocene or Capitalocene?*; and Parikka, *Anthrobscene*.

things, and thus we do not want to think about the Anthropocene—but we do not want to think without it either.

What stories do our inorganic materials tell us about the Anthropocene in Puchuncaví? This was the question guiding our visit. In this experimental essay, we assemble our reactions, speculations, and feelings around the question and its tentative answers. And here is our tactical move: to slow down the exercise of wholeness to see if, in the indeterminate space between writing about *something* and about *some things*, a mode of rendering Puchuncaví's inorganic complex congeals. Our tactic is choral, not only because the essay is written by several authors but also because we think about it more as a patchwork than as a coherent document. We do not try to elaborate an argument. There is no dramatic arc. Its parts are connected but only partially. Because we want to think about the Anthropocene and the inorganic in Puchuncaví by celebrating the specificity of each material invoked in this essay, we have made visible the authorship behind each of the stories recounted here. We believe that in a choreography of mutual prehensions, to borrow Alfred North Whitehead's concept, the object of inquiry becomes-with the author and vice versa. Inorganic becomings—the title of this essay—refers to the more-than-discursive entanglement through which affections and materials, attentions and textures, somatizations and physicalities working together made possible the narrations we present here. Each of these narrations is about very specific things (chemicals, waste, cement, gas) and also about the specific ways each of these things—irritating also in specific ways the author engaging with them—tells a story about the Anthropocene. In the concluding remarks we stitch together the reactions and sensibilities that Puchuncaví provoked in our thoughts and bodies in order to think about the ethico-political imperatives of the Anthropocene.

Quintero, GNL, and the Time-Space of Projects

Nathaniel Freiburger

Our driver pulls into the security checkpoint at the entrance of the GNL Quintero facilities.¹¹ We have come to see one of the newest of the dozens of industries lining the beachfront of the industrial port of Quintero and comprising the industrial zone of Puchuncaví. We are late—quite late, actually. Likely this adds a bit to the chaos we brought with us: eight researchers from three different continents, all with distinct interests in visiting this liquefied natural gas facility.

Security asks for identification. Passports and IDs are shuffled among us. Caught in the middle of our desire to get to know the operations, infrastructure, and headquarters of the GNL facility, our driver is forced to become the broker and arbiter in a dispute between us and the security guard over the identification requirements.

After a bit of waiting, we are given the go-ahead. Our driver takes us to a small lot on the south side of a single-story building. It is one of those mostly steel and glass sorts of buildings. A kind of industrial chic of the neomodernist variety.

11. GNL Quintero is Chile's largest complex for liquefied natural gas processing and distribution.

As we pour into the lower level of the building, we spread out like spilled water into a small conference room that has an adjacent room filled with dioramas: the entire GNL facility, we find, is housed in a Plexiglas box, neatly contained and foregrounding the most visible infrastructure of the GNL operation: the two-kilometer bright red jetty extending into Quintero Bay.

As we fan out and examine the different dioramas—a GNL storage tank, the freighter loading facility, and the enormous ships that bring the liquefied natural gas from other, distant continents—we begin peppering our host, the public relations official for the firm, with questions. There is a question about the jetty: can it withstand earthquakes? Another question: when did the firm arrive here? A number of other questions follow. Our host answers by fits and starts; he patiently declares that he is more than happy to answer any and all questions, but he either withholds answers or gives truncated versions of them, all the while repeating, “You’ll see, you’ll see in the presentation!” Confronted with a motley of questions and interests, the public relations official very energetically directs our attention to the screen, projector, and computer in the conference room, as a promise of both answers and order: “Yes, yes, don’t worry, I’ll get to this in the presentation!”

Yes, our questions will be answered in the presentation, but what—exactly—is being presented? We are here to get to know this facility, its operations, and the context of its operations. Certainly at this point what we know about GNL Quintero is that an enormously long jetty receives equally enormous tankers full of liquefied natural gas; the facilities are separated from their surroundings by a security apparatus; and these two things can be scaled down to fit in a display case for our inspection. But of course, GNL Quintero is more than what these dioramas can contain. If there is anything that science and technology studies, as well as organization studies, have taught us over the years it is that for any organization there is always much more to it than what is given by a formal organizational chart and the formal description of the facilities and operations. And of course, organizational agents are quite aware of this, hence the urgent desire on the part of our guide to present to us GNL Quintero and its link(s) to its environment/context/setting. It is precisely the questions of the composition of the material relations of gas, organization, and setting that keep returning during the tour. Of course, the obvious answer is one made available by the flat geometry of everyday intuition: gas, GNL Quintero, and the context/setting/environment—the relations of point, line, and plane. A more or less discrete set of objects punctuated by the designation GNL Quintero and located in a particular context. The diorama is an excellent performance of this. It is literally all points and lines: gas held between two points (ship and onshore storage tank) connected by pipes. The diorama of the facilities performs this relationship of pure points and lines, abstracted from a plane (context/setting/environment). The single most important job of our public relations official is to present to us—to make present—the relation of point, line, and plane: gas, GNL Quintero, and the bay. Even though we are at the GNL Quintero facility to get a tour of its operations and its

infrastructure, we are constantly reminded that the presence of GNL Quintero goes far beyond fences bounding the facilities, beyond the two-kilometer jetty, beyond—even—the industrial alcove of Quintero Bay. We were instructed of this presence beyond the facilities on our return to the conference room, where GNL Quintero presence was made known to us in another way: through the presentation of GNL Quintero’s “projects.”

Back at the conference room, we are dispatched to places far beyond the boundaries of the processing facility. These are places that are far beyond the present moment, places that mix, hybridize, and transpose past, present, and future in Quintero Bay. Through a series of short videos utilizing computer graphics imposed on short clips of footage of people in different settings in Quintero, along with a two-hundred-page text we have been given, the landscape, the GNL operations, and the temporal scale of Quintero Bay are presented in the form of a project called Quintero Vive (Quintero Lives).

In Quintero, life and death are folded into each other in complex ways. “This place has cancer,” the driver will tell us when we leave. “It is dying of cancer,” the public relations official tells us. A cancerous landscape, made present in the layering of materials—virtual, actual, textual, and visual, among others—that the public relations official deploys to establish the context of the project: in epidemiological terms, Quintero Vive establishes a relation between the GNL operations and a diseased landscape. The temporal and spatial dimensions of gas, GNL Quintero, and Quintero Bay take on a form other than the Euclidean geometrical form of point, line, and plane performed by the dioramas of the GNL Quintero facilities. The diorama seeks to establish the anatomy of GNL Quintero, but the official public relations presentation—together with the text *Quintero Vive*—establishes another topology, one that “doesn’t localize objects in terms of a given set of coordinates” and that establishes “different rules for localizing in a variety of coordinate systems.”¹² There is another space-time made present in the project Quintero Vive, one that sets out to establish an equilibrium between “dream and reality” and localizes the GNL facilities differently than the anatomy performed by the dioramas.¹³ The text enacts this spatiotemporal form of dream-reality, as a prominent feature of the text is a series of photographs of the “actual situation” in the city of Quintero and the “proposed situation.” This proposed situation consists of stylized sketches superimposed onto realist representations of photographic images: a material figuration of the equilibrium between dream and reality that establishes affective relations to a cancerous landscape.¹⁴

I want to think through this a bit, about the spatial and temporal consequences of this sort of presentation of the project Quintero Vive because I think that it has some

12. Mol and Law, “Regions, Networks, and Fluids,” 643.

13. GNL Quintero SA, *Quintero Vive*, 20.

14. *Ibid.*

distinct political effects. Those political effects are generated precisely in the framework of governance that the presentation articulates—a framework of governance that articulates an affective time-space dimension of what has been called the Anthropocene.

First, the biological metaphor and epidemiological framing of the relation between gas, GNL Quintero, and the Quintero Bay region performed by the dream-reality of Quintero Vive produces an effect of “palliative care” practices. The suggestion is that while there is no cure for the cancer affecting the landscape, its residents, and its other non-human beings, at the very least what can be done is to “gather and translate the aspirations of the community into concrete proposals that are doable in the near future” and to therefore provide at the very least a bit of respite from the everyday experience of existing with cancer.¹⁵ This is to take the hard reality of disease and palliate it by the dream-reality that re-centers temporal experience on the near future of making it through the next day rather than on a bleak long-term prognosis.

Second, in the presentation, the project Quintero Vive—a palliative relation between a cancerous landscape, GNL Quintero, and the gas it handles—dissolves the landscape, making actors (copper refinery, coal-fueled power plants) into a background of potential factors contributing to the cancerous state of the bay region. Those other actors become just that: background—one other region of a diseased body rather than significant actors who contribute to the production of that very body.

For these two reasons, the Quintero Vive “project” is a way of making present, visible, and knowable the relations among gas, GNL Quintero, and Quintero Bay that can produce profound spatiotemporal effects that bound or frame the possibilities of governance. The palliative care framework seeks to establish the affective relations between humans and nonhumans as well as the relations between the organic and inorganic in the dream-reality of the “doable.”

The Frost on the Pipe

Peter Forman

There are no fish in Quintero Bay. According to David Insunza of the Consejo Ecológico de Puchuncaví (Ecological Council of Puchuncaví),¹⁶ in addition to high concentrations of toxins such as mercury and copper tailings, the water in this part of the Pacific Ocean exhibits a dramatic and life-extinguishing thermocline, caused by industrial processes that deposit both heated and chilled seawater back into the ocean within only a few hundred meters of each other. The result has been the formation of a stretch of coastline that is exceptionally inhospitable to organic life, a phenomenon that constitutes just one part of the wider environmental crisis affecting the Puchuncaví area.

It is the role of natural gas in this ecology that interests me here. Following Michel Serres’s provocation—“What language do the things of the world speak, that we might

15. *Ibid.*

16. Insunza is a member and founder of the council, the first activist collective in the area.

come to an understanding with them, contractually?”¹⁷—I consider how we might regard natural gas to “speak” in and through this crisis and how these kinds of gaseous expressions may help us to understand the broader human-material entanglements that construct the Anthropocene.

At GNL Quintero, liquefied natural gas (LNG) is received from container ships, stored in holders, and converted back into gaseous form, ready for pipeline transmission. In this latter process of conversion, the materialities of gas and seawater collide, resulting in the ecologically significant jettisoning of chilled seawater. Seawater stores thermal energy from the sun, and this energy is harnessed by the gas company to raise the temperature of the LNG to above -161°C , the point at which it begins to convert back into a gaseous state. Yet as the water exerts its heat on the LNG, so the gas expresses itself on the water, and the water dramatically decreases in temperature. In what follows, I propose that this might be one way in which we can understand the gas in Quintero Bay to perceptibly “talk.”

Gas is unlike many of the materials that have formed the focus of vital materialist inquiries. It is, for example, distinct from Jane Bennett’s black plastic glove, her discarded bottle top, or her dead rat.¹⁸ Indeed, it is different from many of the materials described in the rest of this essay—water, concrete, industrial waste (it does, however, share similarities with certain forms of carbon). Unlike these materials, gas refuses to present itself readily for human somatic or sensorial experience. During our visit to Quintero Bay, we did not see gas, nor did we smell, touch, or taste it. We were not moved, seduced into contemplation, or motivated to write simply by observing it glinting in the sunlight, by being alarmed by its odor, or by feeling it brush against our skin. Gas, from our position as humans situated within this ecological assemblage, was completely invisible, intangible, and odorless.¹⁹ It was immune to our human sensorial perception; it exceeded our senses and refused to grant us a direct audience.

But it still spoke. While beyond our physical sensation, it does not belong to a world entirely inaccessible to human experience. Instead, it exerts itself on other things that are sensible to our bodies, and it is in these indirect expressions that we can understand it, in one particular way, to speak. During our visit, it exerted itself through the chill in the water, the absence of fish, the audible vibrations in pipeline components, and the formation of frost on the outside of pipes; and through these relations, gas spoke and made itself heard.

Such “once-removed” presses on human senses, however, are just one way in which we might understand gas to have been vocal. As we arrived, we rapidly became aware of the gas’s presence without ever touching the sea, without hearing any

17. Serres, *Natural Contract*, 39.

18. Bennett, *Vibrant Matter*.

19. The smell often associated with natural gas comes from an artificial additive; natural gas typically has no odor. The gas in this section of the system was not odorized.

vibrations, and without seeing the frost. Instead, the gas made itself known through the presence of a vast complex of pipes; through gas company plaques on gates and fences; through guarded barriers to entry. It declared its existence through yellow signs warning us of its dangers; through personnel in red jumpsuits and plastic hard hats; and through the giant concrete gasholders that dominate this section of the bay. Gas spoke in the way it gathered around itself a complex and contingent collection of heterogeneous parts. As noted by Lorraine Daston, this “capacity to call . . . a society of things into existence is as much a part of a thing’s thingness, of its reverberations in the world, as its material properties like weight and chemical composition.”²⁰ The ability of gas to rally people, materials, technologies, ideas, and things together is as much an expression of materiality as the visual allure of a glove or the observable formation of frost on a pipe.

Yet what is it about gas that demands the formation of such a complex assemblage, and how can these utterances inform our understandings of the ecological politics of the Anthropocene? With regard to the first question, one significant aspect of gas’s communicativeness lies in its destructive vitality. Gas’s expressiveness through its capacities to expand, ignite, and explode is a key motivator in the calling together of this community: people, pipes, gates, and gasholders are drawn into a performance that is predicated on the imperative of securely containing it and preventing it from realizing its destructive capacities. Such performances take considerable effort, particularly in the face of the geologic instability that characterizes this region of Chile. Indeed, during our visit I was struck by just how much work goes into ensuring that these pipes retain their integrity in the face of unpredictable ground movements. The subterranean, far from being a space of protection (as is often the case for other buried infrastructures), is here a site of vulnerability that threatens to tear steel apart. Pipes are not buried; they are suspended in cradles, and this entire infrastructure is cushioned by shock absorbers. As such, what initially appeared to be a rigid and stable infrastructure turned out to be a flexible assemblage that spoke of the extreme efforts required to prevent the gas from realizing its explosive capacities.

Rather than understand this assemblage as predicated on the silencing of gas’s explosive vocality, however, we should instead reflect on how gas speaks about its destructive potential *through* these signs, restricted areas, and shock absorbers and how it thereby communicates another aspect of its role within Puchuncaví’s fraught environment. For in spite of the work done to contain it, its mere presence in this region poses significant risks to the humans, animals, materials, and things that populate and constitute this troubled ecosystem.

It is also interesting to consider why such a community has formed around this particular aspect of gas’s environmentally threatening vitality and not around its

20. Daston, “Glass Flowers,” 228.

thermal impacts on maritime environments. Indeed, the question of how objects come to acquire certain “powers of engagement” through which they inspire the formation of publics is currently a source of academic debate,²¹ and it has significant ramifications for how we come to terms with the sociomaterial politics of the Anthropocene. It inspires questions such as, “Is it possible to curate the formation of publics?” and “Can certain material utterances and their implications for human-material relations be amplified?” Additionally, paraphrasing Bruno Latour, “How might we tip certain socio-material phenomena beyond their framings as mere ecological crises, to the point at which they are instead regarded as profound mutations of our relations with the world?”²²

In this instance, silencing of a particular kind *did* seem to be taking place. For when pressed about the environmental impacts of gas within Quintero Bay, our guide (a spokesperson from the gas company), claimed there was no negative ecological impacts from gas’s commercial exploitation whatsoever. Indeed, by his account, his company was one of the most environmentally sensitive organizations in the area. While in relative terms this might be the case (it seems hard, for example, to equate the discharge of cold seawater with the illicit dumping of radioactive materials), gas’s chilling exertions on seawater received no mention, despite the contrasting claims made by David Insunza, members of the public, and the distinct absence of fish. Admittedly, within this complex assemblage where copper, mercury, gas, water, and organic bodies collide, it may be difficult to attribute singular blame for the ecological crisis that currently grips Puchuncaví’s maritime environment. Yet through the water, the people, and the absent fish, gas coolly speaks of its role in this ecosystem, and its utterances have not been completely stifled. At the very least, it has drawn me into conversation with it, and in that it has spoken.

Concrete and Steel

Cristián Simonetti

A flash coming from a cable hanging from energy poles aligned on the side of the road wakes us up from our daydreams after our rather unsettling visit to Quintero Bay. Tuning in to a local radio station, we learn that an earthquake—8.4 on the Richter scale—has just gone unnoticed by us, probably because of the continuous movements of the bus driving us back to Santiago. Technoscience serving the needs of wealthier people (in this case, us) had silenced momentarily the telluric forces encountered by those standing on the ground. Yet a disturbing thought immediately entertains our minds. Only half an hour earlier, while still in the bay, we were literally underneath a gigantic barrel of steel and concrete containing 160 thousand liters of liquefied natural gas. Designed to endure earthquakes, the barrel lies on 260 seismic insulators, and our tour of

21. Cf. Marres, *Material Participation*; and Marres and Lezaun, “Materials and Devices of the Public.”

22. Latour, *Facing Gaia*, 11.

the GNL Quintero plant included a stop to inspect the advanced engineering behind this sophisticated suspension system. At nearly three meters, the distance between the insulators allows a person to walk underneath the barrel from end to end.

The unusual situation was a clear reminder of the apparently unlimited powers of concrete and steel. Their combined malleability and strength in the form of reinforced concrete allowed modernity to expand quickly during the past two centuries and to consolidate its global agenda.²³ Icons of modern architecture, concrete and steel are not only the most widely used construction materials in the world today but the most extensively manufactured in human history, to the point at which our contemporary world is somehow unthinkable without them.²⁴

In this fast expansion, steel and concrete seem to have accomplished the unimaginable. Roads and transoceanic channels have contributed to the globalization of the world by shortening travel distances. Dumps and water defenses allowed the containment of rivers, seas, and storms. Skyscrapers defied gravity and the telluric forces of nature. In the GNL Quintero complex, all those miracles somehow were held together. According to a local newspaper released the following morning, the earthquake that evening had been the most intense in the world that year. Reinforced concrete had allowed liquid gas traveling from around the world to be contained in suspension, despite the Earth's unpredictable telluric force.

However, concrete and steel are responsible for yet another powerful illusion, according to which modernity is meant to stand solidly above tradition. Production and consumption of cement alone—the agglutinating substance in reinforced concrete—is in almost perfect correlation with the World Bank's development indicators. More than ten billion tons of cement are produced annually in the world, mostly by leading economies in the northern hemisphere. Originally dominated by Europe and the United States, which at the turn of the twentieth century concentrated more than 90 percent of the world's production, the industry enlarged significantly after the Second World War, particularly through the expansion of growing economies. A significant example in recent years is China, currently the biggest consumer and producer of reinforced concrete in the world. With nearly half the population now living in urban environments, this global trend to measure growth in terms of a national capacity to *concretize environments* leaves entire continents—such as Africa, the smallest manufacturer and consumer of cement—at the bottom of the developmental ladder.²⁵

In this historical process, modern values have not simply sat upon concrete's hard physicality. To the contrary, they seemed to have flown and solidified with it, as engineers, architects, and builders engage on a daily basis with the properties of the

23. Harvey, "Cementing Relations."

24. Cathcart, "Anthropic Rock."

25. See Rodrigues and Joekes, "Cement Industry."

material in ways that are responsive to movement and gesture, which signals once again the condition of inseparability that exists between building and thinking.²⁶ A crucial aspect in contemporary uses of concrete is a tendency to craft smooth surfaces touching at straight angles. Such tendency to flatten concrete surfaces into squared blocks would coincide with a complementary impulse in Western science to narrate history stratigraphically, as a vertical superposition of flat horizontal platforms.²⁷ Accordingly, the daily gestures that engineers, architects, and workers perform to smooth, actually or virtually, the surfaces of mega cities such as Dubai or New York would be part of a baptismal effort to craft modernity's place in history as a period in the present, standing solidly above tradition. The suffocating properties of concrete have allowed control of the spontaneous growth of organic life while affording a leveled, solid, and impermeable ground for the building of modern lifestyles.

This triumphalist view of history is precisely what we encountered on our visit to Quintero Bay. The surfaces of roads inside the GNL Quintero grounds, recently paved, contrasted significantly with most roads in the vicinities, all made of concrete, as is common practice in Chile. The contrast included the roads of wealthy neighboring companies, which our host at GNL Quintero would often use as points of comparison to stress the company's commitment to improve infrastructure in the area in compensation for the environmental catastrophe. Quintero Bay was often described during our conversations as a *sacrifice zone*, in that it holds the largest concentration of polluting companies in the country, including a copper smelting plant, cement industries, and coal-fueled power plants, among others, all in a semicircular bay just ten kilometers wide. Around it gather the poorest municipalities in the region.

A regular point of comparison was an old concrete road running on the south end of GNL Quintero owned by the Compañía de Petróleos de Chile (COPEC), which, according to our host, preferred to avoid unnecessary investments on infrastructure, despite its contribution to the environmental disaster. Unlike COPEC, roads at GNL Quintero were "new" and well preserved, which aligned well with the modern image our host portrayed of the company. According to him, GNL Quintero is the least polluting industry in the bay and the most committed to improving local infrastructure. Yet the word *compensation* in this context often rang in our ears as yet another attempt to provide a lasting sense of control over nature. More precisely, it held the strange illusion that science and engineering, powered by capital, will eventually clean and bury their own mess beneath concrete infrastructures. Around the word *compensation*, industrial practices in the bay turned for us into yet another expression of the Anthro-obsene.

Perhaps the most significant performance of this illusory *sense of control* over the slow sacrifice of the bay and its people through concrete use was a video our host

26. Heidegger, *Poetry, Language, Thoughts*.

27. Simonetti, *Sentient Conceptualisations*.

saved for the end of our visit. It included a virtual tour through a three-dimensional model of the infrastructure the company had recently promised to build along the coast. Dominated by squared angles and smooth surfaces, the walk along the beach offered to appease all doubts that someday the suffering of local communities would be buried beneath solid concrete.

Yet in modern history, reinforced concrete has hardly kept its promises. Despite the efforts the industry has invested in portraying concrete as a modern material—patented in Victorian times—its aura of artificiality is constantly defied by its earth-bound origins in Roman volcanic activity and by the craft of its making.²⁸ Likewise, concrete's claim on the present is challenged by the fact that no concrete has ever remained still, impervious to decay. A gathering of materials—sand, gravel, and cement—concrete is never meant to last as stone does.²⁹ Furthermore, concrete is a significant contributor to global warming, a fact practically unknown to most citizens of industrial societies. Cement production alone is responsible for between 5 and 10 percent of global carbon emissions, which turns concrete into the most iconic *familiar stranger* of modern life in the Anthropocene.³⁰

These hidden histories of concrete clearly were not invisible to local activists from Puchuncaví, who earlier that morning offered us a trip to inspect the disaster, including a visit to a neighboring illegal dumping site for industrial waste. According to them, highly contaminating traces of industrial activity, including those of cement production, were regularly discovered in the vicinities. In such context, cement turned not into a carrier of modern hopes and values through the solidity of finished surfaces but into a highly polluting chemical product, a gathering of material transformations. The burning of lime, a calcium carbonate, along with vast amounts of fossil fuels, all coming from the unfathomable depths of time, were not imperceptible to the activists but visible in the landscape in the form of ash and smoke. Moreover, although at times they wished for a solid infrastructure on which to build up their fragile communities, all around them concrete surfaces have turned into solid witnesses to the recurrent technological failures of modern science and engineering.³¹ The following image, taken in the illegal dump site, is an example (fig. 1). Contrasting with the smooth surfaces we found at GNL Quintero later in the afternoon, the dump site included a spill of discarded mixed concrete running down a slope right next to a concentration of ash. The pour reminded activists of La Greda, a school built on discarded ash that in 2011 slowly poisoned

28. Forty, *Concrete and Culture*.

29. Harkness, Simonetti, and Winter, "Liquid Rock."

30. Indeed, the obsolescence of GNL Quintero can be estimated already, considering that this type of infrastructural project tends to be abandoned after twenty-five years of operation and that the company holds a twenty-one-year contract. After concrete surfaces and reinforcements start to, respectively, fracture and rust, the GNL Quintero site will probably be abandoned, yet another monument to humanity's carbon footprint.

31. Hird, "Knowing Waste."



Figure 1. Concrete pour in Puchuncaví. Photograph by the author

students and teachers. It reminded us also of artist Robert Smithson's famous concrete pours, unsettling the illusion of containment in modern construction.³² We saw the trace of a warmer fluid running through the concrete, calling for forensic experts to identify it, making our disaster-filled imaginations run wildly. Unlike at GNL Quintero, the concrete landscape of these activists told us a truly sad story.

A Feel for the Speck

Manuel Tironi

It was a cloudy morning. Fumes, fog, dust. In Puchuncaví it is really hard to discern where the atmospheric boundaries are between them. An eerie envelopment. Weird air. It was not my first time in Puchuncaví. I have been doing fieldwork there for the last five years. My respiratory and immuno-endocrine systems have been attuning to

32. Harkness, Simonetti, and Winter, "Liquid Rock."



Figure 2. Gloria and the cloud in Los Maquis. Photograph by the author

Puchuncaví's atmosphere. But still. Sometimes I cannot help feeling, as on that gloomy morning, suspended in Puchuncaví—suspended in time, in action, and in airborne toxicants. Suspended as a somatic and a political condition.³³ And it is not just me. I remember one of my last visits. We were in Los Maquis, up in Puchuncaví's valley, where the plume from the smelting plant concentrates. I was outside with Gloria, looking at her lemon and avocado trees, when she suddenly looked up to the hills and said, half worried, half excited, "Look! That's the cloud—the one we were talking about before, the one coming from the smelting plant. Can you see it has a blueish hue? That's toxic." And yes, there it was, haunting us, the cloud that accompanies life in Puchuncaví. In Puchuncaví, bodies are air-conditioned (fig. 2).

But back to our field trip. We picked up David Insunza in Ventanas and drove south. David is a longtime neighbor and activist in Puchuncaví. He had a special "tour" prepared for us. He guided us through lateral roads, most of them carved for (and by) truck use. As we drove, we passed immense industrial complexes, barren wastelands, and barbed-wired fences—a lot of barbed-wired fences protecting something invisible to our eyes and imaginations. We finally got to the sea: to a strange point right in

33. Choy and Zee, "Condition—Suspension."

the middle of Quintero Bay shoreline amid pipelines, warehouses, and large-scale machineries for petrochemical production. The sensation, standing there, was moving: equidistant from Ventanas to the north and the town of Quintero to the south, we not only got to see the scale of the Ventanas Industrial Complex (VIC) but also to *feel* how it is to be surrounded by it. It is suffocating. The immensity of the Pacific Ocean stood in front of us, and the fresh sea breeze fluttered around our hair and nostrils, but I could not help a feeling of enclosure. I felt, again, suspended—enveloped by the strange forces of chemicals, corrosion, industrial violence, abandonment, all of them meshed with one another. “This was a beautiful beach,” said David, looking at the long sandy coastline intersected by massive pipelines. The past tense, the reference to an irremediably gone past that brutally clashes with the alienation of the actual, reinforced a feeling of being immersed in a creepy *mise-en-scène*, confined in a movie about ghosts, ruins, and arsenic, trapped in a Chernobyl-esque version of *The Truman Show*. Being suspended as being strangled.

When I think about our field visit to Puchuncaví that cloudy day—actually, when I look back at every visit I have made to Puchuncaví—I cannot help asking myself one question: what does my body *exactly* feel here? I undoubtedly feel something. As does Gloria. And David. It is a feeling, I have come to realize, that is not just invoked by my Santiaguino, middle-class body. But what is it? For lack of a better description, I am tempted to say that it is the general although inexpressible feeling that in Puchuncaví there is *something in the air*—in every sense of the expression. There is literally something in Puchuncaví’s air: metalloids, gases, specks, poisonous things that harm physiological systems and that are palpable through minuscule irritations, tiny itches, and subtle fuzziness. But it is not just airborne toxicants. What can be sensed in Puchuncaví’s air is also a mood, a bad mood, something wrong, an ill energy. Maybe fatality and uncaring can also be corporeally felt in the air. It is, perhaps, that in places like Puchuncaví you can attune to both the effects and the causes. Or in places like Puchuncaví—sacrifice zones subjected to decades of all kinds of violences—it is impossible to separate between the chemicals polluting the atmosphere and the intricate web of state negligence, industrial triumphalism, and social injustice producing them. The substance and its source, the pathogen and its vector fold into each other to create one toxic sensation that is at the same time chemical and political, somatic and cultural.

What can be sensed in Puchuncaví is an atmospheric texture produced by intractable toxicants *and* long-term disempowerment. What is in the air is a chemosphere *and* a psychosphere, at unison, inseparable, meshed into one pulse, one feeling pressing on skin, tissue, and affect. An incredible achievement of industrial capitalism: the creation of a vibration, an aura, an energetic field. Maybe it is the vibration of the Anthropocene. Maybe the end result of the profound and irreparable damage inflicted by the “anthropos” to the Earth is not just the beginning of our extinction; maybe it is also the formation of a toxic aura, a malignant envelopment. Maybe in places like Puchuncaví

we can feel the sensation not only of the atmospheric emissions of carbon-burning, soil-damaging, resource-dependent industries that are deemed responsible for the Anthropocene but also of the violence of the processes that spread them across—and in spite of—the land. Maybe the Anthropocene is not just a geologic condition; maybe it is also a sensibility, or a geo-feeling. Whitehead claimed that “different modes of natural existence shade off into each other,” converting life into a process of folding into each other the micro and the macro, the bacteriological and the cosmological:

There is the animal life with its central direction of a society of cells, there is the vegetable life with its organized republic of cells, there is the cell life with its organized republic of molecules, there is the large-scale inorganic society of molecules with its passive acceptance of necessities derived from spatial relations, there is the infra-molecular activity which has lost all trace of the passivity of inorganic nature on a larger scale.³⁴

If chemicals, molecules, rocks, bodies, and ideas vibrate within one another, then maybe Puchuncaví’s atmospherics are the feeling of the many modes of existence folded into each other and provoking the Anthropocene.

After our visit to Quintero Bay, we headed to Puchuncaví’s municipal building. The director of the municipal Oficina del Medio Ambiente (Environmental Office) and his team had prepared a presentation for us: a historic explanation of how Puchuncaví transitioned from a rural and isolated area to the largest industrial complex in the country. The presentation was rich in political and toxicological details, an account of fifty years of state (de)regulations and interventions that have turned Puchuncaví into a toxic territory. A former activist, the director introduced us to every scientific report, research finding, and policy briefing attesting to the environmental collapse of Puchuncaví: the construction of the smelting plant in the 1960s; pictures of people in the 1970s vacationing on the fume-coated beach of Ventanas; the first toxicological study in the late 1980s confirming the alarming concentration of arsenic on human bodies; the string of reports commissioned by the Ministry of Health in the 1990s identifying unusual levels of toxicants in mussels, oysters, and sea urchins; the perplexing expansion of the VIC in the early 2000s; the approval of a large thermoelectric plant after an obscure last-minute intervention of the Chilean president in 2009; and the peak of NO₂ in 2011 that led to a massive intoxication of twenty students and seven teachers in a municipal elementary school.

Maps, graphs, and photographs illustrated what seemed like the chronicle of a sinking ship, an account of things getting inextricably worse and worse. We were supposed to have some question-and-answer time after the presentation, but an uncomfortable silence ensued. I looked at my colleagues. Something, again, was in the air.

34. Whitehead, *Modes of Thought*, 157.

They were frozen. I could not blame them. Who can ask anything in the face of such intractable disaster? What could a question add to the legibility (or repair) of what was being invoked that morning? How could any question *not* crystalize the abyssal distance between our privileged lives and the toxic existences of those trapped in the horrifying story recounted by the municipal clerk? It was like: if we wanted to stay with the trouble³⁵—an attempt at avoiding the objectification of the problem in front of us—what was required was a gesture of solidarity, or even a moment of silence. Anything but questions. The situation seemed to demand acting against, feeling with, or healing for—in any case, modes of engagement beyond *knowing*.

A question was asked about the mandate of the Oficina del Medio Ambiente and its regulatory capacities to stop, or at least mitigate, environmental contamination in the area. “Nothing” was the answer. In the highly centralized and top-down Chilean system, it was explained, local governments have little if any influence on environmental assessments and regulations. Moreover, the VIC is a special industrial district whose planning codes have to be amended at the state level and hence after approval from the congress. In principle, municipal governments can petition and lobby for specific planning adjustments. But Chilean municipalities are in such an extreme state of material and professional deprivation, with hardly any resources for anything beyond basic maintenance of municipal services, that policy prospecting is way outside the range of the possible.

An uncanny atmosphere filled the room. If the presentation instantiated the same sensation of omnipresent abandonment invoked in our visit to Quintero Bay, the questions and answers were intensifying it. Being trapped, being estranged, nowhere to go. That was, again, my feeling in that room, and I am sure it was the director’s as well. I have known him since 2012. A marine biologist from Valparaíso, he was among the first university-educated activists in Puchuncaví. He was introduced to Puchuncaví’s catastrophe when he was hired by a catholic nongovernmental organization in the early 1990s to work with the fishing community after fish disappeared from the bay. He then founded Consejo Ecológico de Puchuncaví, the first activist collective to gain political traction. Several years ago he joined the environmental office, tempted by the possibility of making changes from within and by the prospect of a monthly salary after coping for too long with the precariousness of activism.

I particularly remember one conversation the director and I had in Ventanas. A colleague from Barcelona came with me. It was already dark, and we met in the home of another activist (absent that evening). We had a bag of peanuts, and the director had brought an extra-large bottle of Coke. He chain-smoked the entire evening. I still remember his skepticism and disenchantment. He was already working for the municipality, but (or hence) not a bit of hope could be extracted from his words. For much of the conversation, my colleague and I could even sense in his answers a subtle irony

35. Harraway, *Staying with the Trouble*.

mixed with distrust and anger, as if waiting for the deceit, for the revelatory moment in which we would unveil our real intentions and ideologies—academics in our ivory tower, too naive, too protected, and with too many vested and classed interests to fully recognize the skeletons in the closet of liberal democracy and the Chilean industrial elite. It was a great conversation, though. After a while mistrust eased off, and we realized he had seen too many abhorrent things as an activist to chat nonchalantly about Puchuncaví's slow disaster. "Puchuncaví is doomed," he said, and the spell he was invoking seemed to breathe on us: a more-than-political curse that I could feel in my skin and gut. It was not just the gloomy atmosphere provoked by his dystopic words; rather, it was as if the suffering of his account had collided with the metalloids in the air to congeal a dense energy that not even the evening sea breeze could wash away. An energy that was a state of mind *and* an itchiness in my throat, an energy that irritated my imagination *and* my lungs.

That evening I felt Puchuncaví's psychochemical cloud. It was the same energy that descended on us in the municipal building the morning of our visit. The energy I came to associate with Puchuncaví's toxic atmosphere. The energy, maybe, of the Anthropocene.

Putting It All Together: A Day in Puchuncaví and Reflections on Inorganic Becomings and Care

Myra Hird

What does it mean to visit a landscape that has been, and is being, transformed under the weighty history of contamination? What does it mean for this landscape to be lived in, lived *with* by generations of families and rather more transient industry workers and government officials? And what does it mean for researchers, in even more transient fashion, to visit, poke around, take photos and tours?

These are the kinds of questions that spoke in increasing registers as we tried to sift through the sensations of our one-day visit to Puchuncaví. How could we (an eclectic assortment of academics) possibly make sense of, let alone contribute our voices and words to, the complex industrial and political past, the present lived experiences, and the future uncertainties of this small, almost forgotten region of the world?³⁶

As we approached Puchuncaví, we were all acutely, embarrassingly aware that we were foreigners, ecological tourists of a sort, and benefitting from a global economy and politics of injustice whose long arm had extended through the soil, drinking water, schools, churches, eating houses, and streets of this industrial sacrifice zone. Contamination was everywhere. In unsettling (if predictable) ways, all our familiar techniques and disciplines for encountering "the other" (manifested in Puchuncaví by a foreign

36. To be clear, certainly the Puchuncaví community has not forgotten, nor have the researchers and community groups who persist in advocating for change. What I mean here is that Puchuncaví takes its place beside increasing numbers of sacrifice zones littered around the globe.

country [for most of us], abject poverty, toxicity and contamination, corrupt politics, and so on, in an endless list of injustices) fell excruciatingly short of the mark, and we were all left speechless at various times throughout our visit. I noted that at some point in the long day each person in our group broke off for a short period, trying to quietly take stock of all of the sensations, thoughts, and feelings that confronted our abilities to process, organize, and rationalize.

But we came to see, smell, listen, taste, and move for a few hours in Puchuncaví in order to write about our experience, to use theories and approaches that we had at hand, however inadequate. The title of the conference that brought us to Chile was “Governing the Inorganic: Materials, Infrastructures, and Care.” Everyone seemed as eager as I was to share with other social sciences and humanities colleagues our intense interest in inorganic materials. Even so, as we moved through the Puchuncaví landscape, talked with some of its community, and were able through our research interests to make sense of what we saw, what soon eclipsed everything was the theme of caring. Peter C. van Wyck has described his research and writing on uranium mining by peoples of the Dené Nation in the Northwest Territories of Canada as an ethical journey: “a story about the aporias of responsibility . . . about the infinite character of responsibility”³⁷—an ethics that can only be understood, and experienced perhaps, from “having been somewhere.”³⁸ It is, after a fashion, what Donna Haraway—refracting Robert Boyle’s characterization—calls being a “modest witness.”³⁹ How might we bear modest witness to the inorganic becomings and their entanglements in Puchuncaví?

This theme of care is also manifest in the “big ticket item” of our generation, otherwise known as the Anthropocene. It is, in rather blunt terms, the sickening realization that while over the past century (give or take, depending on where you want to place the golden spike)⁴⁰ we have been busily organizing the planet according to a decidedly Western capitalist itinerary, the planet has—for billions of years—been organizing itself in ways that will ultimately obviate the human species. It is to come to terms with the nearly univocal chorus of the global scientific community that is detailing the role we are playing in this planetary remaking. To now look back in disbelief and anger at our hominid ancestors whose zealous commitment to industrialization and capitalism has bequeathed an increasingly inhospitable planet is to take sober stock of how the consequences of our own modernist addictions will be inherited by (more likely now) a limited number of future generations. And although we all knew that this planetary remaking knew no geographic boundaries, the overarching sensibility of being in Puchuncaví was that “the Anthropocene lives here.” The organic and inorganic in a multivocality of conversations are profoundly complex and indeterminate, beyond our

37. van Wyck, *Highway of the Atom*, 3.

38. *Ibid.*, 4.

39. Quoted in Hird, “On Preparations.”

40. Hird, “Burial and Resurrection.”

species' ability to control, and as uncaring concerning the clearly manifest differentiated impact of humanity's messing with the planet. We may forgive our ancestors for reasons of ignorance (a tall order), but we can harbor no illusions as to our responsibility in bequeathing the fallout of our planetary hubris.

Inorganic Anchorings

Manuel Tironi knew the territory best, having conducted fieldwork in Puchuncaví for several years. His body having acclimatized more than ours, in this collective writing experiment Manuel asks what his body has made, is making, and will make of the contamination that he intermittently ingests during his ongoing visits to Puchuncaví. We might say that it is all relative. David Insunza, a Puchuncaví activist and our tour guide, led us through some of the waste sites, including Quintero Bay, which opens into what we used to refer to, casually and reassuringly, as the Pacific Ocean. As though the ocean is so vast, so encompassing, that it can withstand the continuous excretion of toxic contaminants from the industries that line this bay and from the plethora of other industrial sites around the globe. The corroded signs that warn people not to swim, bathe, fish, or otherwise come into contact with the water makes the surfers and fishing people we see all the more alarming, if also predictable. People still need to eat; they still need to play.

While environmentalists catalogue the increasing number of sacrifice zones spreading throughout the Earth's waters, there is also an unpredictable flip side to all of this biodiversity loss and extinction:⁴¹ the unfathomable billions of bacteria that are busily metabolizing the heady mix of industrial materials we have discarded may well also be creatively transforming it as they increase their numbers and their diversity.⁴² As my gaze took in the beach and the oceanic horizon, I thought about the impossibility of imagining what mutated marine species might survive here and what differentiating bacterial colonies—superorganisms, if you will—might be getting a foothold and setting forth to explore newly emerging watery reaches.

The intangibility of the bacterial worlds that interest me intersects with Peter Forman's research on gas as an inorganic material that circulates largely beyond our human sensorium. Out of sight, smell, and touch, Peter points out that the gas pumping through the myriad industrial pipes in Quintero Bay may be usefully theorized as assembling around itself—literally—materials, infrastructures, forms of governance, workers, liability regulations, local communities, and so on. The gas “speaks about itself,” then, in particular ways—both when it is conforming to industrial will and when it leaks, explodes, or otherwise materially pushes the boundaries of its confinement and control. Cristián Simonetti's observations offer an equally cautionary tale regarding

41. Hird, “Proliferation-Extinction-Anxiety.”

42. Clark and Hird, “Deep Shit”; Hird, *Origins of Sociable Life*; Hird et al., “Making Waste Management Public”; Hird, “Burial and Resurrection.”

concrete and steel, these inorganic materials that both physically and symbolically signify the Western sensibility toward order, enterprise, and the reassurance of an (imagined) control over nature and its indefinite subservience to human will—what amounts to an “industrial chic” aesthetic, as Nathaniel Freiburger puts it.

Modest Witnessing

In his attempt to impress on us the social responsibility that his employer has willfully shouldered, the GNL Quintero representative we spoke with described the industrial complex as “raping” Puchuncaví. He went on to self-assuredly claim that liquid natural gas was not going to leave Puchuncaví post-rape (I am sure I heard a love-her-and-leave-her tone here, but my incredulity might have gotten the better of me at this point); his employer had plans to build a boardwalk for the people of Puchuncaví to enjoy. The image of a community and landscape raped in the name of industrial enterprise and then compensated with a boardwalk to better appreciate the bay as a dead sacrifice zone temporarily pushed me beyond my critical faculties. I was not the only one to fall silent at the audacious (mis)use of this metaphor.

We cannot make sense of all of the violences of gender, race, poverty, geography, and nation that so profoundly mark Puchuncaví. We hope that our work with inorganic materials and their complex involvement with other inhuman forces will precipitate new ways of understanding our vulnerability to the geologic that subtends all life on Earth and is the stratigraphic marker of the Anthropocene. The imprescriptibility of both the capacities and the limits of the inorganic and organic to transform and be transformed comes into stark relief in Puchuncaví. “Valid witness,” writes Haraway, “depends not only on modesty but also on nurturing and acknowledging alliances with a lively array of others, who are like and unlike, human and not, inside and outside what have been the defended boundaries of hegemonic selves and powerful places.”⁴³ Which brings me, brings us all, eventually (given time), to the question van Wyck asked as he traveled the “highway of the atom”: “What kind of pedagogy does material engagement demand?”⁴⁴ A pedagogy of situated knowledges born of our (claimed or unclaimed) inherited pasts, of engagement, interest, and becoming as response-ability: of modest witnessing. It is to bear modest witness to differentially experienced lives and deaths carried along by the Anthropocene tide.

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43. Haraway, *Modest_Witness@Second_Millennium*, 269; see also Hird, *Origins of Sociable Life*.

44. van Wyck, *Highway of the Atom*, 4.

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References

- Bennett, Jane. "Earthling, Now and Forever?" Afterword to *Making the Geologic Now: Responses to Material Conditions of Contemporary Life*, edited by Elizabeth Ellsworth and Jamie Kruse, 244–46. New York: Punctum Books, 2015.
- . *Vibrant Matter: A Political Ecology of Things*. Durham, NC: Duke University Press, 2010.
- Bonneuil, Christophe. "The Geological Turn: Narratives of the Anthropocene." In *The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in a New Epoch*, edited by Clive Hamilton, Christophe Bonneuil, and François Gemenne, 17–31. London: Routledge, 2015.
- Braun, Bruce, Mat Coleman, Mary Thomas, and Kathryn Yusoff. *Grounding the Anthropocene: Sites, Subjects, Struggles in the Bakken Oil Fields*. Antipode Foundation International Workshop, 2015. antipodefoundation.org/2015/11/03/grounding-the-anthropocene.
- Cathcart, R. B. "Anthropic Rock: A Brief History." *History of Geological and Space Sciences*, no. 2 (2011): 57–74.
- Chen, Mel Y. *Animacies: Biopolitics, Racial Mattering, and Queer Affect*. Durham, NC: Duke University Press, 2012.
- Choy, Timothy, and Jerry Zee. "Condition—Suspension." *Cultural Anthropology* 30, no. 2 (2015): 210–23.
- Clark, Nigel, and Myra J. Hird. "Deep Shit." *O-Zone*, no. 1 (2014): 44–52.
- Cohen, Jeffrey Jerome. *Stone: An Ecology of the Inhuman*. Minneapolis: University of Minnesota Press, 2015.

- Cohen, Tom, Claire Colebrook, and J. Hillis Miller. *Twilight of the Anthropocene Idols*. London: Open Humanities, 2016.
- Daston, Lorraine. "The Glass Flowers." In *Things That Talk: Object Lessons from Art and Science*, edited by Lorraine Daston, 257–96. New York: Zone, 2004.
- de la Cadena, Marisol. "Runa: Human But Not Only." *HAU* 4, no. 2 (2014): 253–59.
- De Landa, Manuel. *A Thousand Years of Nonlinear History*. New York: Zone, 2000.
- "El progreso de Chile." *El Mercurio de Valparaíso*, August 25, 1957.
- Forty, Adrian. *Concrete and Culture: A Material History*. London: Reaktion, 2012.
- GNL Quintero SA. *Quintero Vive: V Región, Chile*. Quintero, Chile: GNL Quintero S. A., 2015.
- Haraway, Donna J. *Modest_Witness@Second_Millennium.FemaleMan[®]_Meets_OncoMouse[™]: Feminism and Technoscience*. New York: Routledge, 1997.
- . *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press, 2016.
- Harkness, Rachel, Cristián Simonetti, and Judith Winter. "Liquid Rock: Flattening, Gathering, Curing." *Parallax* 21, no. 3 (2015): 309–26.
- Harvey, Penelope. "Cementing Relations: The Materiality of Roads and Public Spaces in Provincial Peru." *Social Analysis* 54, no. 2 (2010): 28–46. Heidegger, Martin. *Poetry, Language, Thoughts*. New York: Harper and Row, 1971.
- Hird, M. J. "Burial and Resurrection in the Anthropocene: Infrastructures of Waste." In *Infrastructures and Social Complexity: A Companion*, edited by Penelope Harvey, Casper Bruun Jensen, and Atsuro Morita, 242–52. London: Routledge, 2017.
- . "Knowing Waste: Towards an Inhuman Epistemology." *Social Epistemology* 26, nos. 3–4 (2012): 453–69.
- . "On Preparations: Learning and Teaching Materiality." In *A Feminist Companion to the Posthumanities*, edited by Celia Åsberg and Rosi Braidotti. Forthcoming, 2018.
- . *The Origins of Sociable Life: Evolution after Science Studies*. Houndmills, Basingstoke, UK: Palgrave, 2009.
- . "Proliferation-Extinction-Anxiety and the Anthropocene Aesthetic." In *Posthumous Life: Theorizing beyond the Posthuman*, edited by Jami Weinstein and Claire Colebrook, 251–70. New York: Columbia University Press, 2017.
- Hird, M. J., Scott Loughheed, R. Kerry Rowe, and Cassandra Kuyvenhoven. "Making Waste Management Public (or Falling Back to Sleep)." *Social Studies of Science* 44, no. 3 (2014): 441–65.
- Latour, Bruno. *Facing Gaia: Eight Lectures on the New Climatic Regime*. Translated by Kathy Porter. Cambridge: Polity, 2017.
- Marres, Noortje. *Material Participation: Technology, the Environment, and Everyday Publics*. London: Palgrave Macmillan, 2012.
- Marres, Noortje, and Javier Lezaun. "Materials and Devices of the Public: An Introduction." *Economy and Society*, no. 40 (2011): 489–509.
- Mol, Annemarie, and John Law. "Regions, Networks, and Fluids: Anaemia and Social Topology." *Social Studies of Science* 24, no. 4 (1994): 641–71.
- Moore, Jason W., ed. *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*. Oakland, CA: PM, 2014.
- Parikka, Jussi. *The Anthrobscene*. Minneapolis: University of Minnesota Press, 2015.
- Rodrigues, F. A., and I. Joekes. "Cement Industry: Sustainability, Challenges, and Perspectives." *Environmental Chemistry Letters* 9 (2011): 151–66.
- Serres, Michel. *The Natural Contract*. Translated by Elizabeth MacArthur and William Paulson. Ann Arbor: University of Michigan Press, 1995.
- Simonetti, Cristián. *Sentient Conceptualisations: Feeling for Time in the Sciences of the Past*. Abingdon, UK: Routledge, 2018.
- Stengers, Isabelle. "The Cosmopolitical Proposal." In *Making Things Public: Atmospheres of Democracy*, edited by Bruno Latour and Peter Weibel, 994–1003. Cambridge, MA: MIT Press, 2005.
- van Wyck, Peter C. *The Highway of the Atom*. Montreal: McGill-Queen's University Press, 2010.

- Whitehead, Alfred North. *Modes of Thought*. 1938. New York: Macmillan, 1966.
- Wills, David. *Inanimation: Theories of Inorganic Life*. Minneapolis: University of Minnesota Press, 2016.
- Woodard, Ben. *On an Ungrounded Earth: Towards a New Geophilosophy*. New York: Punctum, 2013.
- Yusoff, Katherine. "Geologic Life: Prehistory, Climate, Futures in the Anthropocene." *Environment and Planning D: Society and Space* 31, no. 5 (2013): 779–95.
- . "Geologic Subjects: Nonhuman Origins, Geomorphic Aesthetics, and the Art of Becoming Inhuman." *Cultural Geographies* 22, no. 3 (2014): 383–407.