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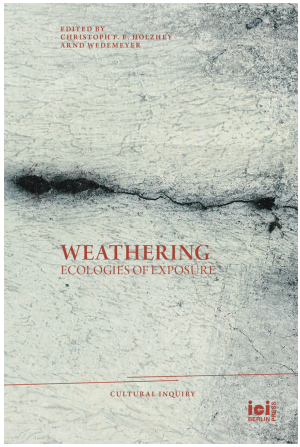

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Weathering Weather

Atmospheric Geographies of the Guiana Shield

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ABSTRACT: This chapter argues that paying attention to the weather and its associated processes of geological, biological, and social weathering can destabilize knowledge traditions that insist on dichotomies. Looking to specific histories and current conditions in Guyana and Suriname, this chapter shows how notions of weathering can accommodate a wide range of referents, ranging from the weathering of rock to socio-political and historical afterlives of violent colonial displacements.

Weathering Weather

Atmospheric Geographies of the Guiana Shield

YOLANDA ARIADNE COLLINS

INTRODUCTION

As the climate changes, so too must our ways of grappling with the interconnectivities that it lays bare. Increasingly, artistic and academic renderings of climate change are demonstrating the need for human beings to rethink, restate, and reshape their connections to their environments.[1] A subset of these renderings has turned towards the weather to identify the shared atmospheric and lived experiences it orients and engenders.[2] Weather, along with its associated processes of weathering

1 Yolanda Ariadne Collins, 'How REDD+ Governs: Multiple Forest Environmentalities in Guyana and Suriname', *Environment and Planning E: Nature and Space*, 3.2 (2020), pp. 323–45 <https://doi.org/10.1177/2514848619860748>; Robert Fletcher, 'Environmentality Unbound: Multiple Governmentalities in Environmental Politics', *Geoforum*, 85, Supplement C (2017), pp. 311–15 <https://doi.org/10.1016/j.geoforum.2017.06.009>; Malcolm Miles, 'Representing Nature: Art and Climate Change', *Cultural Geographies*, 17.1 (2010), pp. 19–35 <https://doi.org/10.1177/1474474009349997>.

2 Tim Ingold, *The Life of Lines* (Abingdon: Routledge, 2015); Astrida Neimanis and Jennifer Mae Hamilton, 'Open Space Weathering', *Feminist Review*, 118.1 (2018), pp. 80–84; Astrida Neimanis and Rachel Loewen Walker, 'Weathering: Climate Change and the "Thick Time" of Transcorporeality', *Hypatia*, 29.3 (2014), pp. 558–75; Christina Sharpe, *In the Wake: On Blackness and Being* (Durham, NC: Duke University Press, 2016); Eliza de Vet and Lesley Head, 'Everyday Weather-Ways: Negotiating the Temporalities of Home and Work in Melbourne, Australia', *Geoforum*, 108 (2020), pp. 267–74 <https://doi.org/10.1016/j.geoforum.2019.08.022>.

and being weathered, which I will explore in its various aspects, is largely taken for granted within scholarship that is most concerned with analysing the spatially differentiated social, cultural, and historical relationship of human beings with their natural environments. The air and the ever-changing atmospheric constellations referred to as weather exist as spaces between physical objects and the human and non-human beings that form the focus of academic analyses within the social sciences.[3] A focus on weather, however, may provide a useful window into how these spaces, along with relationships between human and non-human beings and their natural environments, can be examined.

In line with scholarship that connected the adoption of fossil fuels in the United Kingdom centuries ago to current rising temperatures and melting ice at the earth's South Pole, I suggest that efforts to rethink human-environment relationships must recognize that 'climate change is a messy mix-up of time scales'.[4] The human-environment relationship is simultaneously immediate and futural, grounded and atmospheric, fluid and embedded. This instability acts as an oppositional counterpart to the dominant depiction of climate change and climate policy as a singular, coherent force being rolled out and differentially manifested in spaces and places around the world, managed through coherent logics and top-down governing approaches.[5] Attention to weather, air, and atmosphere in analyses of climate change can challenge these entrenched ways of seeing the world, such as those that bifurcate human beings and nature, while troubling assumptions that enable the dominance of one over the other. This destabilization resonates, for example, with the challenge presented to any 'culture' that is resistant to the incorporation of technological objects by its recognition of some more useful and welcome aspects of said objects.[6]

3 Stephen Graham, 'Life Support: The Political Ecology of Urban Air', *City*, 19.2–3 (2015), pp. 192–215; see also Ingold, *The Life of Lines*.

4 Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London: Verso, 2016).

5 Karin Bäckstrand and Eva Lövbrand, 'Planting Trees to Mitigate Climate Change: Contested Discourses of Ecological Modernization, Green Governmentality and Civic Environmentalism', *Global Environmental Politics*, 6.1 (2006), pp. 50–75.

6 Gilbert Simondon, *On the Mode of Existence of Technological Objects*, trans. by Cécile Malaspina and John Rogove (Minneapolis: Univocal, 2017).

In what follows, I take natural geographic formations for granted instead of human-imposed borders. I recognize the messy time scales of climate change while challenging the 'false opposition between the local as immobile or grounded and the global as mobile and ubiquitous'.[7] I focus on the term weather(ing), which I define later, in both its geophysical and linguistic registers in the English language. I suggest that one of the possible relationships between weather(ing) and climate change is its operation in, above, through, and on the geological formation called the Guiana Shield, located in the north of the South American continent. In so doing, I tease out its peculiar atmospheric and place-specific qualities. I recognize the interconnectivity of temporalities pointed to by Andreas Malm in *Fossil Capital* but refrain from advocating for a 'collapse (of) any notion of distinct space and time'[8] as do Astrida Neimanis and Rachel Loewen Walker in their programmatic essay on 'Weathering'. My arguments do not represent an attempt to retell the stories told about the earth through the natural sciences. On the contrary, I pursue an answer to the question of how paying attention to the English word 'weather', in both its noun and verb forms, can make the relationship between geological, biological, and social activities perceptible outside of ongoing global efforts by the social to exploit the resources of the biological and geological. I construct an image of a circular atmosphere, which is locally accessible yet locally unbounded, while pushing back on atmosphere's traditional limitation of referring to above-ground relations.[9] Like Neel Ahuja in her essay on 'Intimate Atmospheres', I recognize the atmosphere's 'contradictory figuration as a space of geology and life, and a background that forges exchange between social and physical processes'.[10] Finally, I limit my reflections on the socio-political aspects of weathering to the two independent countries situated within the Guiana Shield, those of Guyana and Suriname.

7 Ash Amin, 'Placing Globalization', *Theory, Culture & Society*, 14.2 (1997), pp. 123–37 (p. 131).

8 Neimanis and Loewen Walker, 'Weathering', p. 569.

9 Neel Ahuja, 'Intimate Atmospheres: Queer Theory in a Time of Extinctions', *GLQ: A Journal of Lesbian and Gay Studies*, 21.2–3 (2015), pp. 365–85.

10 Ibid., p. 370.

A POLITICAL ECOLOGY OF ATMOSPHERES

Investigations into the relationship between the international political economy and the environment take place within the tradition of political ecology, which explores the detrimental environmental and social effects of the dominant economic system. It does so by integrating methods from ecological anthropology to examine the role culture plays in these dynamics and interactions.[11] The discipline of political ecology pays significant attention to the relationship between both current and historical international political economy on one hand, and the environment on the other. It focuses especially on the relationship between capitalist and neoliberal endeavours and the societies supporting them.

Political ecology has been strongly critiqued for focusing too much on 'politics' to the detriment of the 'ecology'.[12] In developing this critique, Andrew P. Vayda and Bradley B. Walters argued in *Against Political Ecology* that the tendency of self-styled political ecologists to focus on politics in distant view of the environment assumes a direct connection between politics and environmental change that is not always there. Instead, they suggest that connections between politics and environmental change be sought out and proven rather than determined from the outset as a determining factor in that change.[13] While the now well-established connection between politics and climate change, as an example of environmental change, already challenges the openness to non-political factors advocated for by Vayda and Walters, I suggest that attention to weather(ing) may form a useful addition to the political ecology framework due to the weather(ing)'s simultaneous reference to the earth's natural and physical processes of resilience and change, and to atmospheric constellations of nature and climate change. After all, as noted by political ecologist Raymond Bryant (1998), 'unequal power relations are as likely to be "inscribed" in the air or the water as they are to be "embedded" in the land.'[14]

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11 Raymond L. Bryant, 'Power, Knowledge and Political Ecology in the Third World: A Review', *Progress in Physical Geography*, 22.1 (1998), pp. 79–94.

12 Andrew P. Vayda and Bradley B. Walters, 'Against Political Ecology', *Human Ecology*, 27.1 (1999), pp. 167–79.

13 Ibid.

14 Bryant, 'Power, Knowledge and Political Ecology in the Third World', p. 89.

'Weather' in its noun form is defined by the Merriam-Webster dictionary as 'the state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness; state or vicissitude of life or fortune; and/or disagreeable atmospheric conditions'.[15] The verb 'weather', on the other hand, is defined as 'expos[ing] to the open air: subject to the action of the elements; to bear up against and come safely through; weather a storm or crisis; to undergo or endure the action of the elements; and of or relating to the side facing the wind'.[16] Naturally, these definitions of the weather and the process of weathering have been operationalized in the academic literature in a variety of ways.

Christina Sharpe, writing from the perspective of critical race theory, has conceived of the weather in terms of social climates. For her, the weather is 'the totality of our environments; the weather is the total climate; and that climate is antiblack'.[17] Anthropologist Tim Ingold, in arguing for greater recognition of how the world is shaped by weather, challenged the overreliance of some disciplines, among them anthropology, on 'the hard physicality of the world' as it is described by archaeologist Bjørnar Olsen quoted by Ingold, for understanding environments.[18] He calls into question the manner in which the environment is interpreted and envisaged as a 'clutter of solid objects' ignoring the 'aerial dimension of bodily movement and experience'.[19] He asserts that within the efforts to understand how people engage with the things of the world through analyses — by taking into account the agency of people, the agency of objects, or even hybrid people–object agencies — little attention has been paid to air. In a critique fully extendable to the interdisciplinary framework of political ecology,[20] Ingold states that this is simply because 'within the terms of accepted discourse, air is unthinkable'.[21]

15 'Weather', in *Merriam-Webster Dictionary.com* (Springfield, MA: Merriam-Webster, 2020) <https://www.merriam-webster.com/dictionary/weather> [accessed 20 February 2020].

16 Ibid.

17 Sharpe, *In the Wake*, p. 96.

18 Ingold, *The Life of Lines*, p. 69.

19 Ibid.

20 See Graham's 'Life Support' for an exception.

21 Ingold, *The Life of Lines*, p. 69.

Gender and cultural studies theorists Astrida Neimanis and her co-authors, Jennifer Hamilton and Rachel Loewen Walker, see weathering as useful for conveying how climate change is being felt by people within 'the fleshy, damp immediacy of our own embodied existences'.[22] For them, weathering is 'a particular way of understanding how bodies, places, and the weather are all inter-implicated in our climate-changing world'.[23] The authors argue that weathering 'describes socially, culturally, politically and materially differentiated bodies in relation to the materiality of place, across a thickness of historical, geological and climatological time'.[24] Particularly useful here for political ecology is their recognition that 'not all bodies weather the same; weathering is a situated phenomenon embedded in social and political worlds'.[25]

In a radically different use of the term, architectural theorists Mohsen Mostafavi and David Leatherbarrow focus on the weathering of architecture to explain that weathering is not only a subtraction, insofar it destroys that which was constructed, but that it also has to be recognized as adding certain qualities to the weathered artefact. Weathering, in this productive sense, is a process of 'unending deterioration', 'the continuous metamorphosis of the building itself'.[26]

Hence, while furthering engagement with how bodies, places, and the weather are implicated in the climate changing world described by Neimanis and Hamilton and racialized by Sharpe, I join Ingold by looking past the 'hard physicality' of world to follow Mostafavi and Leatherbarrow's recognition of weathering as that which produces and transforms. I interrogate weathering in the Guiana Shield by seeing weathering as:

- Exposing to the open air and subjecting to the action of the elements.
- Becoming deteriorated by excessive exposure to bad weather.

22 Neimanis and Loewen Walker, 'Weathering', p. 559.
23 Neimanis and Hamilton, 'Open Space Weathering', p. 80.
24 Ibid., pp. 80–81.
25 Ibid., p. 81.
26 Mohsen Mostafavi and David Leatherbarrow, *On Weathering: The Life of Buildings in Time* (Cambridge, MA: MIT Press, 1993), p. 16.

- To become prominent or isolated by the decay or disintegration of the surrounding rock.
- The breaking down of rocks, soil, and minerals as well as wood and artificial materials through contact with the Earth's atmosphere, water, and biological organisms. Weathering occurs in situ, that is, in the same place, with little or no movement, and thus should not be confused with erosion, which involves the movement of rocks and minerals by agents such as water, ice, snow, wind, waves, and gravity and then being transported and deposited in other locations. [27]

And, as I propose in the sections that follow: 'to influence and generate weather patterns'.

ATMOSPHERE

The weather is an insufficient signifier of the climate. It is overly mutable and short-lived. The significance of the weather in relation to the climate at any given time needs to be determined by situating its occurrence into averages qualified according to a linear timeline. Neimanis and Loewen Walker look to overcome the different temporalities of longer-term climate and shorter-term weather by collapsing them into a conception of 'thick time', seen as 'a transcorporeal stretching between present, future, and past, that foregrounds a non-chronological durationality'.[28] In my analysis of how the Guiana Shield weathers, however, I will retain temporal distinctions and adhere to what might appear to them a rather conventional linear conception of time. I do this because my effort to facilitate dialogue between the social scientific discipline of political ecology and the interdisciplinary concept of weathering requires that the potential for the attribution of responsibility be maintained. Hence, in order for connections to be made cross-temporally and for the responsibility of these actions to be attributed to specific actors operating in particular times and places, the maintenance of the distinctions embedded in linear time

27 Vladimir A. Obruchev, *Fundamentals of Geology: Popular Outline* (Moscow: Foreign Languages Publishing House, 1959), p. 75.

28 Neimanis and Loewen Walker, 'Weathering', p. 561.

is paramount. Overall then, I suggest that focusing on the weather and processes of weathering has the potential to bring particular places like the Guiana Shield into view, situating them in the geographic coordinate system of linear latitudinal and longitudinal spatial geographies, much like observations of the weather within climate models, through the ordinary linearity of time that retains its capacity for representing connections between the past and the present. It is through these interactions that atmospheres emerge.

HOW THE GUIANA SHIELD WAS WEATHERED

> From sufficient altitude, the Shield resembles an old weathered island surrounded by flat Tertiary and Quaternary sediments.[29]

Politically, the region known as the Guiana Shield is governed by six states including Colombia, Venezuela, Guyana, Suriname, French Guiana, and Brazil.[30] Geologically, however, the Guiana Shield is known to be a formation that has been stable in geological terms, unaffected by mountain building activity for a thousand million years. A massif of hard Proterozoic rocks, the Shield can mostly be found between the Orinoco and Amazon river basins. Its parental rocks are low in mineral content but are susceptible to high rates of weathering, resulting in poor to very poor nutrient content.[31] This, in turn, results in low nutrient soil since '[s]oil is the layer of weathered material overlying bedrock' that then goes on to support plant life.[32]

The gradual weathering undergone by the Guiana Shield is captured in contemporary art theorist Amelia Groom's evocative description of the process of fragmentation:

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29 Allan K. Gibbs and Christopher Norman Barron, *The Geology of the Guiana Shield*, Oxford Monographs on Geology and Geophysics, 22 (Oxford: Oxford University Press Oxford, 1993), p. 3.

30 Philippa Haden, 'Forestry Issues in the Guiana Shield Region: A Perspective on Guyana and Suriname', 1999 <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/5700.pdf> [accessed 1 July 2020].

31 Ibid.

32 Graham R. Thompson and Jonathan Turk, *Introduction to Physical Geology* (Fort Worth, TX: Saunders College Publishing, 1998).

> Pieces of rock keep multiplying through further breakage, with their insides becoming new outsides. They gradually leave more of themselves behind, acquiring the edges that suggest autonomy and self-containment while moving always into pluralized partiality, via loss, until the undecidable moment where they become sand, the granular representation of time itself.[33]

Through the slow process of loss, multiplication, and transformation, the Guiana Shield has been weathered over millions of years, as it continuously has been shaped by interactions with the elements. Yet the Guiana Shield is representative of weathering not only in terms of the destruction of rock. It also weathers in ways not captured in the literary meaning of the term. The Shield influences weather, as I will show later.

The hard rocks of the Guiana Shield weather as they are subjected to the natural forces they encounter daily, such as heat, rain, water, and wind. The rocks are weathered by weather in combination with plants and minute organisms. On a daily basis, rocks are exposed to sunlight, which heats them intensely. They then cool down over the course of the night. These daily fluctuations in temperature ensure that, during the day, rocks expand and, during the night, they contract. Despite the fact that these expansions and contractions are hardly noticeable to human observers, their repeated occurrence over hundreds and thousands of years take their toll, as rock particles weaken over time.[34]

Water also helps in the work of weathering since porous, multi-cracked rock absorbs more moisture, while solid rocks absorb less. The repeated action of wetting and drying rock also wears down the internal adhesion of the rocks. Water, in particular, contributes to the weathering of rocks because it carries with itself gases from the atmosphere, such as carbon dioxide, which may have been produced by the burning of fuel or the oxidation of various substances. Through water, these gases are put into direct contact with the rocks. The water carrying these gases has a more significant impact on the weathering of rocks than in the case of water in which these gases are not present.

33 Amelia Groom, *Beverly Buchanan: Marsh Ruins* (London: Afterall Books, forthcoming in 2021).

34 Obruchev, *Fundamentals of Geology*.

Plant and fungi species also weather rocks as lichens colonize even the smoothest of rocks. Wind carries spores of lichens into microscopic cracks, and/or the rain carries them as they stick together on the surface of rocks. As they germinate, they become firmly lodged in the rocks. Drawing on the moisture they are able to absorb from the rocks, they eventually corrode the rock's surface and widen the cracks that develop there. Grains of sand and dust brought by the wind or water more easily adhere to rock that had been corroded, filling the cracks. Tree roots also cause rock particles to break down, and eventually dust accumulates to such an extent that soil appears, necessary for the growth of further vegetation. The seeds of these plants also fall, through wind and rain, into the cracks and dust in spaces between lichen colonies that are situated on the rocks, eventually germinating.[35]

Vegetation eventually smothers the lichens working their way down into the cracks of the rock, corroding the surface of the rock further. As cracks widen and more dust gathers, along with the remains of dead grass and their roots, a place emerges where shrubs and trees and larger types of vegetation can take root. As they grow, their roots act as wedges, further widening the cracks in the rock. The natural forces of heat, frost, dew, and water affect the internal cohesion of the rock. But further, they help other forces of nature to interact with the rock.[36] As Vladimir A. Obruchev notes, 'from a rock subjected to weathering, the rain washes away liberated grains.'[37] He continues, 'The rain, as it collects in grooves, slowly wears away nicks in the rock. The wind, on the other hand, acts to disperse liberated sand and dust particles and carries them away.'[38] Yet, it is as a result of this process through which the Shield is physically weathered that the Shield is, in turn, able to generate weather itself, as I describe in what follows.

HOW THE GUIANA SHIELD WEATHERS

The Guiana Shield generates and influences the formation of weather patterns through its hydrological function, a role that impacts the well-

35 Ibid.
36 Ibid.
37 Ibid., p. 80.
38 Ibid., p. 79.

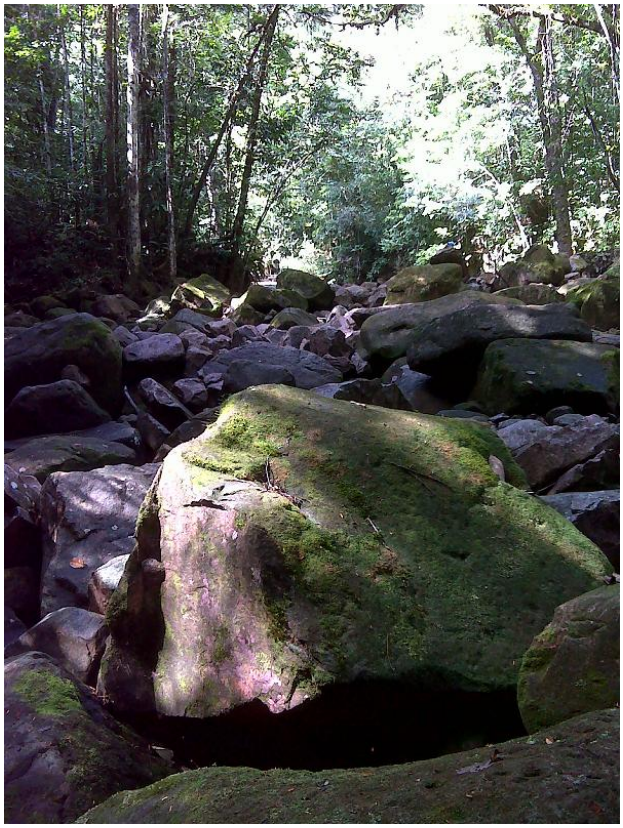

Figure 1. Weathered Rock and Emerging Vegetation in Kaieteur National Park, Guyana, 2010. Photo credit: Oronde Drakes.

being of the wider Amazon basin, one of the few relatively intact forest ecosystems on Earth.[39] The weathering of rock over millennia generated the soil of the Guiana Shield as 'granular representations of time'[40] within which tropical rainforest was able to take root. The rainforest that emerged is remarkable in abundance, diversity, and rate of botanical endemism.[41]

39 Haden, 'Forestry Issues in the Guiana Shield Region'.

40 Groom, *Beverly Buchanan*.

41 Haden, 'Forestry Issues in the Guiana Shield Region'.

Focusing on the weather understood as exposure to air and the elements calls to mind a hierarchy between the weather and that being weathered, between that which is above ground and that which is grounded. This hierarchical, layered approach to weathering is downward facing yet expansive. Hence, although the Shield was formed, in part, through this downward facing weathering relationship, its vegetation also produces weather in a manner that signals a reverse upward approach to influencing weather. Their combination is, hence, a circular relationship of different manifestations of weather(ing).

Allan K. Gibbs and Christopher Norman Barron, authors of one of the few academic texts on the geology of the Guiana Shield, refer unwittingly to the unidirectional nature of the forests as they quote an anonymous geologist:

> The close-pressing trees, large and small, instinctively draw one's gaze upward, looking for light. But the crown of the forest, 30–40m above, forms a dense canopy. Only where a forest giant has finally given up the struggle and fallen, dragging down its neighbours in a long roar of sound, only then is there a chance of seeing clear sky, and a place for the geologist to read his [sic] instruments without much difficulty, or to eat his sandwiches beside one of the clear streams that he may be fortunate enough to find.[42]

Forests, by and large, stand upright. As the above-quoted geologist looking for a place to read his instrument finds in the forests of the Guiana Shield, trees grow upward, standing so densely together that the search for cracks of light coming through their overlapping canopies may prove futile. For the single human standing in these forests, the forests are giants, forcing her to gaze upward to see the sky beyond their canopies. While rooted in the soil, forests continually mediate with air, negotiating between the creation and absorption of oxygen and carbon dioxide. Forests are fuelled and nurtured within the vertical space between air and land, remaining horizontally stationary but vertically unconstrained, except perhaps by other trees competing with each other and with the human within them for access to the sun's light.

42 Gibbs and Barron, *Geology of the Guiana Shield*.

Figure 2. Cracks of Light in the Forests of Brownsberg Nature Park, Suriname, 2014. Photo by author.

The verticality of the forests as they move from soil to atmosphere is more than just visible. Emerging vertically from weathered rock, the forests of the Guiana Shield also *influences* weather. The forests of the Guiana Shield are guardians of the water cycle of the South American continent.[43] As hydrologist Isabella Bovolo described:

43 C. Isabella Bovolo, Thomas Wagner, Geoff Parkin, David Hein-Griggs, Ryan Pereira, and Richard Jones, 'The Guiana Shield Rainforests — Overlooked Guardians of South

Figure 3. A View of Dense Canopy from a Mountain, Mahdia, Guyana, 2014. Photo by author.

> [D]eforesting less than a third of the Guiana Shield, in areas currently under threat from mining, logging, and agricultural activities, could result in significant changes in the water cycle across the continent. This includes large variations in temperature and precipitation affecting areas 4000 km away, impacting ecosystems and economies, with consequences for society.[44]

Land-use change in the Guiana Shield, 'even if small in spatial scale, but occurring in particularly sensitive hot-spots, can alter the flow of atmospheric rivers, with large consequences'.[45] A focus on the cycles of weather shows that because the Guiana Shield is vulnerable to immense pressure from extractive activity on and within it, its ability to prevent and magnify further climatic changes is reduced.

With the unidirectional connections of geology and atmospheres now outlined, I now turn towards situating these interactions in relation to the actions of the states, people, and colonial histories that magnify and are magnified by these dynamics.

American Climate', *Environmental Research Letters*, 13.7 (2018) <https://doi.org/10.1088/1748-9326/aacf60>.

44 Ibid., p. 1.

45 Ibid.

ABOVE AND BELOW GROUND

Political geographers Adam Bobbette and Amy Donovan point out that the classical conception of geopolitics saw the concept of the state as a spatial configuration on the surface of the earth, with the political dramas of sovereign territories playing out across these territorial surfaces. Bobbette and Donovan highlight that critical geopolitics have since challenged this framework. Political geographers, they explain, such as Bruce Braun, Stuart Elden, and Gavin Bridge, have since thickened the horizontal and classical spatial understanding of the state by demonstrating how territory claimed by the state is constituted vertically, showing how 'the depth of political processes extend into and through the geos'.[46] I take this further, however, by considering also how the state and its territorialization also has effects that go from the surface to the atmosphere.

Claims made by states on subsoil and biological life point to the need for a vertical, perhaps layered, approach to understanding territory. Similarly, I argue, these claims should be recognized as continuing upward past the canopies of trees to include the unrelentingly spatially unbounded atmosphere, especially within the effort to rethink the human-environment relation in view of climate change. States and their claims on land, life, and atmospheres also have a key role in discussions of the geological and linguistic registers of weathering. This is because the process of creating the states that now support the authority with which the governments of Guyana and Suriname are able to manage sections of the Guiana Shield (including those 'particularly sensitive hotspots' outlined by Bovolo)[47] was made possible through approximately five hundred years of colonialism.[48] This colonial experience went hand in hand with the development and expansion of geology as a science. I describe this experience in the following section.

46 Adam Bobbette and Amy Donovan, 'Political Geology: An Introduction', in *Political Geology: Active Stratigraphies and the Making of Life*, ed. by Adam Bobbette and Amy Donovan (Berlin: Springer, 2019), pp. 1–34 (p. 1).

47 Bovolo and others, 'The Guiana Shield Rainforests'.

48 Sidney Wilfred Mintz, *Sweetness and Power* (New York: Viking New York, 1985).

COLONIAL GEOLOGY

Since the discovery of the land that became Guyana and Suriname, in the late fifteenth century to the early sixteenth century, the people residing on the Guiana Shield have weathered colonial histories and continue, despite the granting of independence in 1966 and 1975, respectively, to endure postcolonial injustices. It is through this colonial experience that the population of Guyana and Suriname came to include non-indigenous groups. The people now residing on the Guiana Shield and within its forests interact with, magnify, and live with the natural and social weathering processes of the Shield.

As '(in)human geographer' Kathryn Yusoff explains, geology is part and parcel of processes of racialization, by no means innocent with respect to the histories of colonialism, slavery, and environmental devastation that rely upon it.[49] This was also partly demonstrated in Gibbs and Barron's *The Geology of the Guiana Shield* cited earlier.[50] Now, almost three decades past its publication date, a re-reading of this book brings into view the way geology, lauded as a noble but unrewarding calling, sweeps aside or even propagates the colonial encounter.

Gibbs and Barron traced geology, recognized as a science in the beginning of the nineteenth century, back to the demand for finding mineral deposits in pre-historic times. Gibbs and Barron note that Alexander von Humboldt ascended the Orinoco in 1800 and discovered the Cassiquiare Canal, 'linking it with the Negro and hence with the Amazon'.[51] The authors describe him as 'truly an example for his present-day successors, and also an example of the many European and North American geologists who gave up the comforts of homes and universities to demonstrate by example the internationality of geology'.[52] In recognizing the geological contributions of Venezuelan nationals in mapping the Venezuelan Amazon, they further describe early gold exploration in Guyana by Dutch mining engineers and John

49 Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018).

50 Gibbs and Barron, *Geology of the Guiana Shield*.

51 Ibid., p. 99.

52 Ibid., p. 10.

Harrison, who discovered Guyana's bauxite deposits. They continued by describing how geological mapping of the then 'colony' of Guyana was tied to the search for base metals. According to Gibbs and Barron, Harrison published 'many papers on the geology of the country, the weathering of its rocks, and finally the miner's bible, "The Geology of the Goldfields of British Guyana", in 1908'.[53]

Notably, Gibbs and Barron draw attention to the fact that, as they put it, the 'Guyanaization of the survey of Guyana's mineral deposits started in 1959, and the first Guyanese director, Dr. S. Singh, was appointed in 1966', the year of Guyana's independence. They continue by explicitly tying geological knowledge to mining, stating that 'Guyana's principal gold deposits was published as "Bulletin 38" by Ronald McDonald', who they describe as an experienced Canadian economic geologist. This Bulletin was instrumental for summarizing the significant data on dozens of old gold mines and workings. It still represents, according to Gibbs and Barron, the '"sourcebook" of prospective mining companies'. On the Surinamese side, which receives substantially less attention in this part of their elaboration, the authors write that 'the "grand old man" of Surinamese geology was undoubtedly IJzerman'. In addition, they recognize that aid in mapping Suriname was provided by Dr. Prem and his team in the Netherlands, Suriname's colonial masters. Gibbs and Barron then tie the development of geological maps and surveys to the large bauxite industry that subsequently developed in Suriname, along with its hydroelectric scheme and 'helpful' petroleum industry.[54]

These developments of geology as a science operationalized, in part, within colonial Guyana and Suriname went hand in hand with the exploitative practices that defined slavery, indentureship, and colonialism in these two countries. These exploitative practices were enacted upon populations who simultaneously weathered them and came to influence the weather in turn, as I will detail next.

53 Ibid.
54 Ibid.

THE PEOPLE WHO WEATHER(ED)

The circumstances of forest-dwelling communities in Guyana and Suriname are particularly reflective of the circular nature of weathering, as in withstanding oppressive conditions, and in influencing and generating weather patterns. The indigenous inhabitants of the forests of the Guiana Shield were diverse, spread over at least nine different tribes in Guyana alone. They lived in ways that were considerate of the natural environment but that did not conform to utopian ideas of a harmonious and conflict-free life. Over time, however, as these communities were confronted by European colonizers, they were forced to move away from the Shield's coastal areas. They took up residence deeper in the forests as conflicts with the newcomers arose and escalated. Over the following centuries, the colonizers relocated comparatively vast numbers of people from Africa, Asia, and Europe to work on the plantations they had developed on the coasts.

Those brought to these lands to work forcibly or under exploitative conditions also found ways of rebelling. The maroon communities of Suriname exemplify this rebellion.[55] Maroon communities were established within the rainforests of the Guiana Shield. They are the descendants of formerly enslaved Africans who were brought to labour on the coastal plantations and managed to escape. They fled to the forests and learned how to survive in them partly from the indigenous communities already living there. This escape was by no means peaceful. Wars were frequently waged against the emerging maroon communities whose members made it their mission to attack plantations and to liberate other enslaved people. In the 1760s, peace treaties were signed between the colonizers and the maroon communities, allowing the latter to live autonomously in the forests, prohibiting future

55 I opted not to capitalize the words 'indigenous' or 'maroon' because I use these words primarily as adjectives. Maroon and indigenous groups in Guyana and Suriname have their own names and titles that they have used for centuries, for example, the Saramaka in Suriname, now classed as maroon, and the Wapishana in Guyana, now classed as indigenous. In this paper, I pay careful attention to how people brought to and found in the Guiana Shield were labelled by external powers according to the demands of capital accumulation and in the interest of racial hierarchies. I therefore resist the urge to act in a manner similar to that which I critique by cementing the identities of these groups of communities through capitalization according to externally imposed groupings and identities.

settlers from molesting them, and compelling them to respect the customary laws they had established.[56] Maroon communities in Suriname can be said to have weathered forced relocation to unfamiliar lands, attempts to subjugate them to horrific slave systems, and the challenges that came with establishing new, cohesive communities within the forests.

However, Suriname's independence in 1975 did not see maroon and indigenous rights included in the constitution of the new Surinamese state. Indigenous communities had also gained autonomy through peace treaties with the Dutch colonizers. As a result of Suriname's independence, the new Surinamese state claimed and continues to claim the land on which maroon and indigenous communities reside, along with the resources above and beneath that land. Some of the maroon communities were further disadvantaged when a few years prior to the state's independence, a hydropower dam was built by the colonial government. The dam, intended to provide cheap electricity for the industry that intentionally weathered rock by 'multiplying its insides'[57] in the successful search for bauxite, forced the relocation of some maroon communities to land near a modern-day nature conservation park. Again, in unfamiliar environments, those maroon community members turned towards the industry that had magnified their disadvantage, joining the effort to 'multiply the insides of rock'[58] but this time in search of gold. Now, gold mining, known to be the largest driver of deforestation in both Guyana and Suriname, and the related issue of land rights, demonstrate the manner in which these communities both weather (rock) and are weathered (by political climates) cumulatively throughout their lives in the forests of the Guiana Shield. Even Suriname's independent government has recognized the legacy of previous injustices carried out against these maroon communities in granting miners from the communities the right to continue mining for gold within the nearby conservation park. The state government, too, recognizes that these communities also face the challenge of finding

56 Marieke Heemskerk, *Rights to Land and Resources for Indigenous Peoples and Maroons in Suriname* (Paramaribo: Amazon Conservation Team, 2005) <http://www.act-suriname.org/wp-content/uploads/2015/02/ACT_land-rights-report-2005.pdf> [accessed 2 August 2017].

57 Groom, *Beverly Buchanan*.

58 Ibid.

Figure 4. Gold Mining Operations taking place near Brownsweg, Suriname, 2014. Photo by author.

land for gold mining due to the fact that they are often expelled from lands when large-scale mining concessions are granted by the state government.[59]

In Guyana, the development of maroon communities was limited because some indigenous communities worked with the colonizers to stop enslaved Africans from seeking refuge in the forests. Nonetheless, complications around access to the land remain. While indigenous communities in Guyana benefit from the Amerindian Act, which serves as the legal basis on which the right to the land of Amerindian communities is established, the efficacy of the act is challenged by an organization that represents indigenous people in Guyana. An analysis carried out by this organization, called the Amerindian Peoples Association, stated that the discriminatory norms rooted in Guyana's colonial period continue to be manifested in the Guyana's national legal framework. These norms support the idea that all the land not

59 Interviewee, 2014.

privately titled land in the country, and hence the sub- and above- soil, is solely the domain of the state.[60]

In reference to circumstances similar to those earlier described for the case of Suriname, the report described that once the British colonial power seized control of the country from the Dutch in the nineteenth century, the rights to the lands of indigenous people were annulled. The power to determine the use of the land, and to pass the previously mentioned Amerindian Act, passed to the state government, which now grants forestry and mining concessions in the areas considered customary lands by the Amerindians. In their efforts to weather the vicissitudes of their lives in the forests, communities based there use the materials in the forests around them in ways that contribute to the problem of climate change.

In 2014, I conducted fieldwork in Guyana and Suriname on forest conservation initiatives taking place there. Eddy, a community member of a relocated maroon community in Suriname, explained how the communities use the above- and below-ground resources to which they have access to survive.[61] In these and other ways, people residing on the Guiana Shield engage in racialized economic relations that cause the Shield to be weathered and to influence weather. They are important elements in any effort to rethink the situated and layered human-environment relationship within the larger framework of global climate change. The circumstances of forest communities demonstrate how actions that took place in the colonial past continue to impact the climate-changing present and future, multiplying vulnerabilities they faced for centuries through the atmosphere to the rest of the earth. The communities exemplify particularly well the recognition

60 *Indigenous Peoples' Rights, Forests and Climate Policies in Guyana: A Special Report*, ed. by Kate Dooley and Tom Griffiths (Georgetown, Guyana: Amerindian Peoples Association, 2014).

61 Eddy explained that 'We are not waiting for money from the government. We want to decide for ourselves on what we are going to do and make our own decisions. We were moved fifty-five years ago. You have to see what kind of house they gave us. We had to live in it with a husband, wife, three to four children. It is too small. We want to have our own rights, make our own decisions, build our own houses, and do everything by ourselves without the government telling us what to do. How is it even possible to live in this house for a whole family? We try to make our own houses so we use the rainforests. We use wood, gravel, we use everything that we can find in the rainforests, we use to build our own house' (Interviewee, 2014).

by Neimanis and Hamilton that not all bodies weather the same.[62] Moreover, the differentiated weathering of bodies in the Guiana Shield go on to influence social weather patterns in other parts of the globe, as I detail next.

SOCIALLY DIFFERENTIATED WEATHERING

Just as continental weather patterns are influenced by the forests of the Guiana Shield, so are social weather patterns influenced by the events taking place there. This is demonstrated in how the system of socially differentiated and racialized weathering of the bodies populating the Shield went on to influence social climates around the world. This influence becomes visible once it is situated within the spatial and social geographies of the dominant capitalist system.

The coloniality of power, as defined by sociologist Anibal Quijano in *Coloniality of Power and Eurocentrism in Latin America*, connects these colonial histories with the creation and institutionalization of race and global capitalism. Quijano traces how capital became the organizing principle or axis around which all other social relations took shape in the Americas, of which the Guiana Shield is a part.[63] Hence, as capitalism expanded and deepened, so did constructions of race as fundamental to the structuring of social and economic relations. The exclusive control of the circulation of resources produced in the Americas by people categorized as 'Whites', went hand in hand with the concentration of the commodification of the labour force for 'White' workers. This constellation meant that capital:

> [A]s a specific social relation, could be concentrated in the geographic region that then received the name of Europe. So Europe or, more specifically, Western Europe emerged as a new historical entity and identity and as the central place of the new pattern of world-Eurocentered colonial/modern capitalist power.[64]

62 Neimanis and Hamilton, 'Weathering'.

63 Anibal Quijano, 'Coloniality of Power and Eurocentrism in Latin America', *International Sociology*, 15.2 (2000), pp. 215–32.

64 Quijano, 'Coloniality of Power', pp. 217–18.

These racialized dynamics played an instrumental role in the emergence of modern Guyana and Suriname. As I previously wrote of the racialized distribution of labour in Guyana, colonial racial structuring meant that white planters headed the social order with the support of the colonial authorities, controlling most of the land and capital. Chinese and Portuguese groups in Guyana, after being freed from laws that prevented them from acquiring land, became smallholders who practiced market gardening that led to their eminence in trade and commerce. Villages established by formerly enslaved people worked as seasonal labour on the plantations while living on lands considered marginal to the colonial authorities. East Indian descendants laboured on the plantations year-round, while Amerindians continued to live in and to depend on the forests in the interior locations of the country. In the nineteenth century, a black, middle class developed and came to dominate the urban areas while East Indians populated some rural areas, farming rice on land that the colonial masters granted them. Some of the descendants of the formerly enslaved, as previously described, turned to gold mining in the forest areas.[65]

In the productive and generative sense in which I conceptualize weathering, the Guiana Shield can be seen to have had a similar atmospheric effect of structuring racialized capital relations within the emergent system of world capitalism. These racialized relations are situated in but not limited to the spatial geographies of the Guiana Shield.

As I also wrote of Suriname's racialized division of labour, Creoles, as the descendants of formerly enslaved people are called in Suriname, began to dominate Suriname's political scene. Maroon communities remained suspicious of Creole dominance, having been sceptical of the granting of Suriname's independence since they had by then developed an amicable relationship with the colonizers with whom their ancestors had signed peace agreements. While racialized economic separations in Suriname diminished somewhat on the coast where most of the population lives, they remain strong in the forests where some maroon communities have established dominance in gold mining and

65 Yolanda Ariadne Collins, 'Colonial Residue: REDD+, Territorialisation and the Racialized Subject in Guyana and Suriname', *Geoforum*, 106 (2019), pp. 38–47 <https://doi.org/10.1016/j.geoforum.2019.07.019>.

indigenous communities opt largely to work towards maintaining their subsistence practices.[66]

This racialized system of categorizing labour that became fundamental to the development of capitalism originated in the Americas, eventually becoming institutionalized in the dominant global capitalist system.[67] In his particular representation of a temporal schism, Quijano explained that '[t]he relations between European and non-Europeans suffered a temporal alteration: all non-Europe belonged to the past, and so it was possible to think about relations between them in an evolutionary perspective'.[68] This resulted in an evolutionary perspective according to which all-non Europeans could be situated along a historical chain in comparison to Europeans, ranging from, 'primitive' to 'civilized', from 'irrational' to 'rational', from 'traditional' to 'modern', from 'magic-mythic' to 'scientific', *en route* to eventual Europeanization and modernization.[69] Hence, these temporal alterations, cemented in part in Guyana and Suriname, continue to linger in the modes of production and exploitation characteristic of current capitalist orders.

ATMOSPHERIC GEOGRAPHIES

Man-made or not, weathering plays a fundamental role in the potential of the Guiana Shield to affect both physical and social weather patterns. The weathering and fragmentation of the Guiana Shield unearths gold, diamonds, and oil beneath the soil; and has the now familiar, double-edged effect of increasing carbon in the atmosphere through the burning of fossil fuels to sustain the mechanized aspects of these activities. The production of certain commodities, like gold and bauxite, is made possible through the intentional, human-induced weathering of rock and soil. Forests and other vegetation become the victims of economic activity that cause weathering as they are cleared to access these timeworn minerals beneath the soil. This weathering then goes on to affect the weather by reducing the capacity of forests

66 Ibid.
67 Quijano, 'Coloniality of Power'.
68 Ibid., p. 221.
69 Ibid.

in the area to maintain the Amazon's hydrological function. Oil, also produced in Guyana and Suriname, is especially notable in how it goes on to magnify these weathering dynamics, leading directly to increased carbon in the atmosphere that, completing the loop, increases the potential to rainfall infused with atmospheric gases to speed up the weathering of rock, as previously described, and to speed up the slow process of weathering rock.

Racialized social climates[70] are also bound up in biophysical process of weathering, as racialized, colonial, and capitalist relations established and schematized in the Guiana Shield went on to inform and support the dominance of capitalist relations on a global scale. I hope to have demonstrated that reimagining human-environment relations by focusing on weather and the process of weather(ing) can bring into view the circular manner through which activities and relations taking place across linear time and space affect each other and shape particular places. This attention to weather and weathering has shown that it is possible to bring different geological, biological, and social activities, as well as different disciplinary insights into sustained and critical dialogue with each other outside of attempts of one to exploit the other. This endeavour, undertaken by exploring how weather and processes of weathering culminate in the climate changing social and ecological atmosphere, arrives at the somewhat unsurprising conclusion: What goes up must come down.

Nevertheless, with 'weathering' representing form, function, and activity, I posit that attention to the weather might be a useful complementary addition to political ecology frameworks. Weathering represents a useful prompt for urging political ecologists to refocus on the iterative and ongoing interaction between the natural environment and the social, potentially balancing the framework's current social leaning to the detriment of the physical, a critique to which the discipline has found itself susceptible. Weathering can remind political ecologists that it is possible to interrogate human-environment relationships without overlooking or over-relying on the social or upon the capitalist, economic factors that are often the source of their ire.

70 Sharpe, *In the Wake*.

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