

Islands and the rise of correlational epistemology in the Anthropocene: Rethinking the trope of the ‘canary in the coalmine’

David Chandler

Politics and International Relations, University of Westminster, UK

D.Chandler@westminster.ac.uk

Jonathan Pugh

Geography, Newcastle University, UK

jonathan.pugh@newcastle.ac.uk (corresponding author)

Abstract: Once on the periphery of international debate, today small islands are seen by many as key to unlocking new ways of thinking about climate change and developing new practices of adaptation in the epoch of the Anthropocene. These approaches differ starkly from modernist, linear, causal frameworks that construct islands as vulnerable objects that require ‘saving’ or ‘protecting’. Instead, islands become instruments of productive knowledge, laboratories for investigation and learning, fundamental to an alternative, correlational, epistemology. In analysing these approaches, we take the prolific trope of islands as the ‘canaries in the coalmine’ in order to draw out the ontological implications of instrumentalising islands as ‘correlational machines’ in the Anthropocene. We raise fundamental problems with this literal instrumentalisation of islands and islanders, drawing out how these logics reduce island life to merely sensing and attuning to the co-relational entanglements of the Anthropocene, rather than offering higher normative aspirations for political change.

Keywords: Anthropocene, canary in the coalmine, climate change, correlation, islands, laboratories

This paper is published as part of the Anthropocene Islands periodic section of Island Studies Journal.

<https://doi.org/10.24043/isj.119> • Received October 2019, accepted January 2020

© 2020—Institute of Island Studies, University of Prince Edward Island, Canada.

Islands as exemplars of the Anthropocene

This paper is part of a wider project which we are in the process of developing called ‘Anthropocene islands: A critical agenda for island studies in the Anthropocene’ (Pugh & Chandler, in progress). This seeks to examine the various ways in which the figure of the island has become particularly generative for the development of non-modern, relational ontologies and epistemologies in wider Anthropocene thinking. Our own approach is heuristic, or analytical, where we seek to draw out the underlying logics which are today driving how a great deal of contemporary Anthropocene thinking works with islands. In this paper we focus upon the logic of what we call ‘Correlation’, but elsewhere (Pugh & Chandler,

in progress) we will be drawing out other analytics, such as what we call the relational ontologies of ‘Resilience’ and ‘Patchworks’, and the relational epistemology of ‘Storiation’, which are related but different ways of thinking through how islands are widely engaged in the development of contemporary Anthropocene thinking.

Islands are often seen as ‘canaries in the coalmine’ in debates about the Anthropocene because they are widely understood as small and extremely vulnerable to catastrophic climate change, and such factors as atmospheric pollution, rising sea levels and plastic pollutants. Islands have therefore attracted a significant number of scientists, social theorists and scholars from the arts and humanities keen to understand the forces of the Anthropocene more widely (Baldacchino, 2017; 2018; Chandler & Pugh, 2020; Grydehøj & Kelman, 2017; Pugh, 2018; Watts, 2018; DeLoughrey, 2019; Sheller, 2020). Indeed, the figure of the island has emerged as *the* emblematic canary in the coalmine in such debates: i.e. a way of registering, sensing or revealing processes of anthropogenic influence which often otherwise would go unseen. As Elizabeth DeLoughrey (2019, p. 15) notes, islands have become vital ‘interpretants’ in the Anthropocene for mapping and modelling indirectly, through the registration of effects, the impact of complex transformations in planetary conditions (see also Chandler & Pugh, 2020; Hayward 2012; Pugh, 2018). This is illustrated in an extremely wide range of island practices today: from the prolific use of big data which intensively maps changing island coastlines and rising sea levels (United Nations Climate Change, 2019), to the remote sensing of coral bleaching as a bio-sensor of environmental change (Foo & Asner, 2019), the growing interest in algorithmic correlation with social media feeds to see emerging island disasters, and Indigenous island peoples’ own capacities for sensing climate changes (Chandler & Pugh, 2020; Percival, 2008; Pugh, 2018). The recent success of such books as Robert MacFarland’s (2019) *Underland*, Gleb Raygorodetsky’s (2017) *Archipelago of Hope*, and Laura Watt’s (2018) *Energy at the End of the World: An Orkney Islands Saga* reflects how islands and islanders are widely seen as key detectors or sensors of climactic variations in the Anthropocene. They are widely understood as “important models for future sustainability and as corollaries for the survival of the human species generally” (Fitzpatrick and Erlandson, 2018, p. 283).

Today, islands and islanders are held to exemplify the importance of correlating, sensing, attuning to and responding to processes of emergence and disturbance in the Anthropocene. As Watts (2018, p. 149) says:

Islands are often on the planetary frontline of environmental change. Their long shore-lines and specialized ecosystems are finely tuned and sensitive places, barometers for the Earth. They are “advance indicators or extreme reproductions of what is future elsewhere”, as Godfrey Baldacchino, island studies scholar, has said. Islands are “the harbingers, the pioneers, the miner’s canary.” What happens at the island edge is often the litmus test for the urban future.

However, for us in this paper (as, indeed, for Baldacchino, personal communication, 2019), the crucial point, which is often obscured in discussions about islands being ‘barometers’, ‘canaries’ and a ‘litmus test’ for the future, is that the figure of the island has come to exemplify a much broader range of impoverished logics—from resilience, to romanticised frameworks of indigeneity, correlational epistemologies and co-relational ontologies—which increasingly underpin shifting approaches to the possibilities of political change in debates about the

Anthropocene (Chandler, 2014a; Pugh, 2014; 2017). Once on the periphery, it should not be underestimated how much the figure of the island has been centred in a wide range of international debates.

Back in 1999, at a special session of the UN General Assembly, Kofi Annan (1999) said “islands are microcosms for our world. We are all inhabitants of the global island, surrounded by the limitless ocean of space. If we can find solutions to the special vulnerabilities of islands, it will help us address more global problems.” Yet today islands are not only framed as passive victims but increasingly understood as generative and active agents which the rest of the world can and should now learn from (Tsing, 2015; Watts, 2018). Islands have become powerful symbols of ‘hope’ (Mission Blue, Sylvia Earle Alliance, 2019) where much “recent academic research has increasingly been moving beyond ‘doom and gloom’ headlines to instead frame islands as sites of livelihood resilience to the impacts of climate change and disaster risk” (De Souza, Henly-Shepard, McNamara, & Fernando, 2015). The near-ubiquitous argument is that islands and islanders are “inspiring champions” (De Souza, Henly-Shepard, McNamara, & Fernando, 2015) and that we should be learning from how they sense, attune and adapt in the Anthropocene (Hall & Sanders, 2015; Intergovernmental Panel on Climate Change, 2007; Kueffer & Kaiser-Bunbury, 2014; Nwanze & Sinon, 2013; Parry, 2007; Pugh, 2018).

As Grydehøj and Kelman (2017, p. 107) have noted, “just as the boundedness of small islands makes their beauty more graspable, it also sets their disasters in relief, transforming islands into symbolic carriers for mainland fears.” We seek to take this observation as a starting point to develop the ‘canary in the coalmine’ analogy much further and delve into its central and powerful organising logic, and why this makes islands so key for wider contemporary debates about the Anthropocene. We argue that the powerful analogy of the canary in the coalmine points to how islands are increasingly reinterpellated not merely as a “living laboratory” (Watts, 2018, p. 105), in the sense of being small and confined sites for investigative research, which the rest of the world finds appealing to learn from (Grydehøj & Kelman, 2017), but as also enabling the proliferation of correlational epistemologies as a challenge to modernity in wider debates about the Anthropocene more generally.

We think this pivotal shift to correlational epistemologies is of vital importance in de-centring modernist or subject-centred approaches. This is because correlational thought always involves speculation beyond the appearance of entities as ‘given’ for us. Correlational epistemologies always highlight *relationality* as key to seeing the world as a process of becoming rather than one of stable entities in a fixed grid of time and space. Correlational thought is necessarily ‘more-than-human’ as it involves seeing or sensing something through the affordances or sensing capacities of another subject-object. Thus, what Timothy Morton (2013) calls ‘hyperobjects’, such as global warming, which cannot be seen directly in their vast multi-dimensionality, can be seen indirectly, through the registration of their effects by islands and islanders. In the same way that the affordances of the canary enable us to see or sense indirectly toxic gases in a mineshaft, the island and islanders therefore become the canary in the coalmine for registering the effects of the Anthropocene.

The registration of effects—the capacity to see processes of becoming beyond those ‘given’ in appearance to a human subject—is a product of the specific affordances of the particular subject-objects, or ‘actants’ (in the terminology of Actor Network Theory; Latour, 2005) enrolled in the process. Correlational epistemologies are not new *per se*; rather, in the Anthropocene the limits of the modern episteme and the importance of process ontologies is

increasingly coming to the fore. Whilst in this paper we focus upon islands and islanders as key ‘correlational machines’ in the Anthropocene, everyday examples of correlational machines would also include such mundane, epistemological instruments as thermometers, registering air temperature based on the affordances of mercury or other liquids, which expand or contract at a constant rate as temperatures change. Compasses are also correlational machines, registering magnetic fields based on the affordances of magnetic materials or ‘lodestones’ in relation to the magnetic north (Chandler, 2018a). Thus, correlational machines—thermometers, compasses, or islands in the Anthropocene—bring unseen or unrecognised forces into a wider awareness, thereby expanding our ‘world’ by revealing agential forces to us indirectly via their effects. Human, non-human and technological aids have long histories of enabling responsivity via the sensing or registration of effects, through the power of co-relation or correlation. But today these have become increasingly central in the quest to reveal and attune to transforming planetary conditions.

It is important to illustrate how the ‘canary in the coalmine’ trope shifts the focus to correlation rather than a modernist ontology of causation, as this is key to the importance of islands as instruments for new and non-modern ways of thinking and new practices of adaptation in the Anthropocene. Correlation relies on causal laws or regularities, but the key aspect is that these are secondary to correlation rather than primary. As Bruno Latour argues, correlational epistemologies are not so much about entities or essences but relations: the causal becomes background to the relational effects which are foregrounded (Latour, Harman, & Erdélyi, 2011, p. 84). In the classic trope of the canary in the mineshaft, the precondition for the canary signalling the existence of carbon monoxide is the causal regularity of poisonous gas killing the canary before mine workers are aware of its existence and prone to its effects. However, the problem of carbon monoxide is not addressed at the level of causation (predicting it or preventing it from appearing or solving the problem afterwards) but through developing a method of *signalling* the existence of poisonous fumes and of increasing human *sense-ability* through the power of correlation. Without this registration of effects, carbon monoxide is understood to either exist or to not exist in a mineshaft, and by the time it exists, it is too late, and the coalminers die.

The addition of the canary into the situational context reveals the coming into existence of other actants, the poisonous gases, which would have previously operated unseen, beneath the level of human cognition. The affordances of the canary enable poisonous gases (variations in intensities) to become quantified or measured through extension via the material body of the canary. In the same way, the fact that mercury expands when heated is a specific capacity or affordance that enables enrolment in a technical more-than-human assemblage—a thermometer—or ‘correlation machine’. As Scott Schwartz (2017) writes, these affordances enable the translation of an intensity, like heat, to be read or made legible through extension, in the form of measurement; thus enabling something that cannot be seen directly to be datafied indirectly. In short, correlation translates quality into quantity, enabling its registration through effect. Intensities such as air temperature or densities thereby come into existence as meaningful or legible objects.

Thus, via the power of correlation, the fact that island ecologies are sensitive to fluctuations in temperature patterns enables islands to be enrolled as ‘correlational machines’. To follow this logic to the ontological conclusion, islands—and increasingly islanders themselves—become constructed as the ‘canaries in the coalmine’ of the Anthropocene as

they enable us to see the unseen or unrecognised (the catastrophic effects of global warming, sea level rises, pollution, nuclear fallout, and other forces associated with the Anthropocene) precisely through their correlational powers. These ‘correlational powers’ are often understood to be the particular affordances of islands and islanders, which have long been assumed to have a very high level of ecological sensitivity, and which today are intensive laboratories for understanding and learning about the Anthropocene (Russell & Kueffer, 2019). Like the canary in the coalmine, the sensitivities of islands and islanders are said to enable a greater understanding of transforming planetary conditions. In fact, for leading Anthropocene theorists, such as Morton (2013; 2016), understanding global warming as a hyperobject (a process of emergent becoming, withdrawn from human awareness) necessarily requires these ‘more-than-human’ sensing capacities, provided by other forms of being, such as island ecologies.

For many critical commentators on the Anthropocene, the purpose of this shift, which positively embraces the logic of correlation, is not to achieve some sort of “happy ending” (Tsing, 2015, p. 21; Watts, 2018), but rather to learn how to “stay with the trouble” (Haraway, 2015; 2016; Watts, 2018, p. 121); to correlate, attune and adapt in the ‘ruins’ of the Anthropocene (Tsing, 2015). It is the affordances and sensitivities of island life in particular which reposition islands as so often central in these debates, not merely in modernist ways – needing to be protected and saved – but as spaces in which new understandings and new approaches to climate change and governance can and need to be developed. Just as the Anthropocene at one and the same time puts humans at the centre of the problems of climate change but also weakens and undermines claims to human superiority, so islands are seen as undermined and threatened in the Anthropocene; but, importantly, also become key to grappling with the new problems faced. In fact, as modernist scientific knowledge seems to reach its limits in debates about the Anthropocene, island life, and islander ways of knowing, through the correlational registration or sensing of effects, appear to provide a non-modern alternative (Tsing, 2015; De Souza, Henly-Shepard, McNamara, & Fernando, 2015). In this epistemological framing, islands become increasingly recast as instruments of knowledge: as ‘correlational machines’, analogous to the thermometer or the compass discussed above. Thus, today’s ‘smart’ and ‘innovative’ islands pragmatically ‘stay with the trouble’, correlating, sensing and attuning better to transforming planetary conditions (Smart Island World Congress, 2018).

It is important to note here that we understand the contemporary reoriented focus around correlational logics as part of a much broader turn in critical Anthropocene scholarship and practice away from modernist frameworks of reasoning. Contemporary critical debates seek to operate without the handrails of modernist ideas of rationality and progress, instead reorienting governance, analysis and critique toward the power of what today we understand to be a new key conceptual framework or concern: *relational affordances and feedback effects*. Whether in actor-network or assemblage theory, second-order cybernetics or posthumanism, speculative realism or object-oriented ontologies, much dominant critical Anthropocene scholarship and practice is bound together by this new reorienting focus. The turn away from modernity and the disciplinary concerns of ‘biopolitics’ towards, what we call the ‘ontopolitics’ (Chandler, 2018) of relational and feedback effects, is also, we believe, the key important reason why the figure of the island features so prominently in wider contemporary debates about the Anthropocene. As noted, the figure of the island is not only a material

geographical form which is symbolic of rising sea levels, global warming, nuclear fallout, intensified hurricanes, and other forces associated with transforming planetary conditions. Rather, we believe, the island has risen to such prominence because thinking *with* islands' relational affordances and feedback effects is understood by so many to be generative and productive for Anthropocene scholarship and practice more generally. To be absolutely clear, we do not see this reoriented focus towards the ontopolitics of relational affordances and feedbacks in positive terms, and later in this paper we highlight its discursive effect of limiting politics to the reactive modulation of the status quo. However, in this paper we are not primarily concerned with critiques and limitations, but the prior political tasks of analysis and explanation: of the ontopolitical shift which is taking place; and, importantly, understanding how and why the figure of the island has become so central within this.

Throughout our analysis in this paper we draw upon paradigm island case studies and examples to illustrate how islands and islanders have become exemplary of the convergence around the particular ontopolitical logics of correlation. Our problematic, following Adam Grydehøj's (2020) salient call, is to engage with what is at stake in this increasingly prevalent generalisation of islands as the canary in the coalmine; as we seek to flag up some of the limitations of instrumentalising islands and island peoples as the correlational machines of the Anthropocene.

The rest of the paper is organised in three sections. The next section explains in greater detail what we mean by the rise of *correlational epistemologies* and the shift taking place in the underlying logics of Anthropocene scholarship away from causation to correlation. It thereby establishes the overarching problematic of correlation, where contemporary debate focuses upon islands and islanders positively correlating and attuning to emergent effects in the Anthropocene, rather than those of causal depth, or questioning hierarchical systems of power and control as in the struggles and scholarship of island writers including Franz Fanon (1967), C.L.R. James (2001) and Édouard Glissant (1981). Here Indigenous islanders in particular are being enrolled in international policymaking and academic literature more broadly as correlational machines in the Anthropocene. The section which follows extends this examination of correlational epistemologies to the rise of digital island governance as another prominent illustration of the turn towards correlation as an underlying logic for the Anthropocene. In the concluding two sections, we end with a cautionary note about the stakes of resistance, and impoverished political horizons and aspirations for change, when engagement with the world is reduced to correlation as the increasingly dominant horizon for political action.

The enrolling of Indigenous islanders into correlational epistemologies

The key argument of this paper is that island governance is increasingly being developed through correlational epistemologies which construct the world through processes of emergence and the registration of effects. Contemporary island governance is characterised by the proliferation of these new post-epistemological approaches that view correlation as a more useful 'empirical' method than the extrapolations and predictions of causal analysis (Chandler, 2018a; Chandler & Pugh, 2020). Here eco-technologies for island governance increasingly accept that little can be done to prevent or hold back the Anthropocene, or to address deeply entrenched power relations and fundamental political inequalities. Indeed, the correlational epistemologies we examine below accept that the unpredictable and complex

world of relational entanglements of the Anthropocene means that widescale aspirations for transformation are much more likely to exacerbate problems than solve them. Following this changing underlying logic, rather than attempt to stand outside of and ‘solve’ the Anthropocene, new approaches to eco-technology and island governance—widely supported by international policy-making (European Union, 2019) and in the popular press (McKie, 2019)—are shifting the perspective of debate towards how the specific affordances of islands and islanders enable them to “innovate to thrive in a high-stress world” in ways which are impossible for those on the mainland, lacking in these sensitivities (Rowling, 2018). Thus, in this paper we examine how the strongly converging logics of correlation and post-epistemological understandings—where islands and islanders are seen as exemplars—are adopted to offer normative ways forward in the Anthropocene, but which also proffer low horizons for political change.

Indeed, contemporary Anthropocene scholarship is fundamentally marked by the proliferation of new approaches which seek to affirm the enabling powers of more-than-human relations in the Anthropocene (Clark & Yusoff, 2017; Danowski & Viveiros de Castro, 2016; Haraway, 2016; Latour, 2017; Morton, 2013; Stengers, 2015). For such authors, the power of the Anthropocene (Danowski & Viveiros de Castro, 2016), ‘Gaia’ (Latour, 2017; Stengers, 2015), the lithosphere (Clark & Yusoff, 2017), or ‘hyperobjects’ (Morton, 2013), like global warming, while too great for the human intellect to grasp in modernist forms of ‘command-and-control’, enable new forms of thinking and responsiveness to emerge. Although ‘anthropos’ may have forged the road to the Anthropocene, for many such commentators the tables are turned; our transforming planet is now setting the pace, revealing to us the overwhelming power and forces of more-than-human relations. Humans are now tasked with following and responding to these forces, having a more humble, adaptive and responsive role: to learn better how to sense, attune to, and become aware of what the transforming planet is telling us (Chandler, 2018b; Chandler & Pugh, 2020; Chandler & Reid, 2018). The problematic then becomes that of: ‘how to listen?’; ‘how to become aware?’; ‘how to pay attention to the unseen side-effects or externalities of modernity?’ The answer is that of seeing or sensing through and with these relations. The sciences of correlation rather than causation, and the development of new instruments of (post)epistemology—correlational machines—have therefore proliferated.

Key here is how islands and islanders are not only seen as useful and productive for the development of new ways of governing and thinking in the Anthropocene, but also how they become assimilated into a new dominant ontopolitical logic which privileges, above all else, ongoing sensing and attuning to relational affordances and feedback effects. Perhaps the most high-profile illustration of this today is the widespread celebration of Indigenous peoples’ correlational practices in international policy making and academic literature, because it is said that:

Indigenous science and knowledge are based largely on bioindicators, or natural signs. For instance, the timing of the onset of rains in Bolivia can be predicted by how high a certain species of bird builds its nests. Many animals can sense earthquakes and other natural disasters before humans can, and watching their behavior can give us time to get to safety if such an event occurs. Learning from nature in this way is an integral part of

the Indigenous worldview that all things are connected, and that nature, when respected, can be a benevolent part of the whole community (First People's Worldwide, n.d.).

Indigenous islanders are regularly characterised in these ways:

On these small atolls the ocean and its rhythms, the endless sound of the waves breaking on the reef, and the tides, constantly contracting and expanding around the islands like a heartbeat, feature in most aspects of daily life. Navigational skills have allowed a handful of people from these islands to align themselves in this ocean world and to predict sailing and weather conditions. Navigators have interpreted the formation and colour of clouds to identify islands over the horizon. Birds and certain species of fish would give an indication of the distance to land. Star paths were followed when travelling greater distances. Most impressively, ocean swells, reflected from far away islands and reefs, would echo through the canoe and its navigator, and would be recognised like the face of an old friend. (Robertson, 2018, pp. 50-51).

In such widespread and commonplace statements, island life is understood as a correlational or sensing machine for the rest of the world to learn from. In particular, it is often said that Indigenous islanders attune to the world better than Moderns because they “don't see nature as separate from people” (Lakpa Nuri Sherpa, qtd. in Forest Peoples Programme, 2019). Indigenous islanders are frequently said to offer “a worldview that privileges not just the perspective of other men, but of other living beings—of trees, animals, oceans and stars” (His Highness Tui Atua Tupua Tamasese Ta'isi Efi, 2018, p. x). Contemporary work is replete with such examples which foreground how Indigenous islanders are both immersed within, adaptively sense and correlate to complex relationalities:

Climate has always been important for Māori. It affects the winds, waves, and ocean currents, influences which plants, trees, and birds are found in various parts of the country, and impacts the social, economic and cultural well being of individuals and communities. Through the generations Māori have built up extensive knowledge of local climate, from the character of local winds and rain to the forecasting of drier and warmer summers. These forms of knowledge have traditionally helped to make important decisions about the best time to farm, fish and navigate, among other activities. However, despite this local knowledge and the resilience that it brings, some Māori communities face obstacles related to climate change which increase their vulnerability and heighten their socio-economic risks. (National Institute of Water & Atmospheric Research, qtd. in Percival, 2008, p. 13).

By contrast:

In the developed world, loss of traditional cultures and perspectives has led to a disconnect between people and nature. Indigenous peoples have often been found to have intimate familiarity with the natural rhythms and processes of their ecosystem. (Salick & Ross, 2009, p. 138)

It is of course no coincidence that in many of these debates today Indigenous islanders' frameworks of reasoning and correlational practices are seen to align coherently with the kinds of Western Anthropocene scholarship and correlational thought advocated by leading scholars such as Latour discussed earlier. Leading Western critical theorists and Indigenous islanders are often brought together and assimilated in the literature as sharing the same logics of reasoning; advocating correlation and sensing over causation and 'top-down' understandings of political power and control. Indigenous islanders are enrolled in these debates as ostensibly advocates of approaches which seek to more pragmatically correlate, adapt and attune to the forces of the Anthropocene. Thus, for Rubow (2018, p. 38), exploring how cyclones are sensed and experienced on islands involves:

partaking in the natural lifeworld by resonating and listening to its cycles and rhythms [...] There, on the ground, when sea and atmosphere evolve into a grand air and water pump, winds whip the waves white and force them into powerful cyclical movements that can reach 20 meters or more in the open ocean. Sea spray batters vegetation, rips foliage off trunks and branches and deposits them like a thick brown plaster on windward walls. In the low pressure on the ground, cars, roofs, stones, sand, windows, trees, doors and people enter an extreme, shaking state of cultural-natural hybridity in the Latourian sense in which humans and things are inextricably connected [...] It may be possible to hold a 'modern' or 'global' perspective on things on a fine clear day, and at a distance to see a cyclone as a discrete weather-object. But when the loud howling noises, the invading waters and crushing boulders enter one's house, the hybrid mess of things and humans is impossible to overlook.

The limits to top-down and modernist forms of reason, the ascribed sensing abilities of Indigenous islanders, and the correlational thought advocated by leading Western critical theory today, are all central to contemporary discourses in international policymaking, the general media and academia. These profoundly reposition the figure of the island and islander vis-à-vis the hegemony of continental mainland thinking. Thus, once reviled as backward, and even at times as subhuman or savages under oppressive colonial frameworks of reasoning (Gillis, 2004), in contemporary debates about the Anthropocene what is meant by 'exemplary' is being reversed across critical Anthropocene scholarship—that is, *once islanders have been appropriately aligned with the switch to correlational thinking more generally in debates about the Anthropocene.*

As a result, today it is increasingly Indigenous islanders who are heralded as the exemplars for revealing and teaching the rest of the world how to sense and correlate better to transforming planetary conditions. For Gleb Raygorodetsky (2017, p. 264), in the *Archipelago of Hope*, focusing upon Indigenous peoples' and islanders' own stories gives us "our best chance to remember—or learn—how to care for Earth in a way that keeps it healthy for our descendants" (Raygorodetsky, 2017, p. xix). As Robin Wall Kimmerer (2013, p. 199) argues, Moderns have isolated themselves from feedback relations, creating a "Potemkin village of an ecosystem where we perpetrate the illusion that the things we consume have just fallen off the back of Santa's sleigh, not been ripped from the earth." In such debates about islanders in the Anthropocene the focus on correlational analysis to facilitate real-time responsiveness is held to enable adaptive capacities which are not available to those in the West, isolated from seeing feedback effects. It is in *this* way, we argue, that islanders have become the 'canaries'

of the coalmine, because of their highly attuned correlational practices. The islander is assimilated into a new dominant mode of ontopolitics in the Anthropocene which is reductively about the ongoing attuning and adaptation to relational affordances and feedback effects.

In the next section we turn to explore the development of other new mechanisms and techniques which also work of the basis of being sensitised and responsive to the world in its emergence. We explain how the post-epistemological implications of frameworks of correlation also seem to underlie the fascination with Big Data approaches as a way of generating increasingly sensitive real-time responses to emergent effects.

Digital island correlational machines

How do you turn these islands into a living IoT [Internet of Things] lab? Just add 500,000 sensors (Solana, 2017).

In Spain's Balearic Islands, referred to in the quote above, the movements of island life, island intensities, can become seen or datafied through their translation into digital sequences, via the registration of sensory equipment, now so cheap as to become increasingly ubiquitous. Perhaps the most obvious example of this is Singapore, where, as the *Smart Island* (n.d.) journal says:

Making technology all pervasive, permeating every sphere of activity, Singapore became an Intelligent Island by year 2000. But technology does not cease to evolve, so Singapore has a constant focus on it and now has a 10-year plan to become the world's first Smart Nation by 2025! Sensors will be rolled out across the country to further improve the quality of life for its citizens.

Such digital governance operates through the correlational ontology of the canary in the coalmine—enabling the unseen to be seen through the registration of effects, in these cases, upon the material body of the sensor. These correlational logics are widespread and extensively deployed in the Anthropocene, with island governance in particular taking on an increasingly important role: from the call for new smart cities to better sense emergent effects and enable “real-time decisions” in the Caribbean after Hurricane Irma (Whyte, 2017), to the real-time detection of changes in air and water quality on islands (Smart Island World Congress, 2018), to tracking the fluctuating levels of food available in retail shops after island disasters (Cavallo, 2017). Again, here islands are the *canary* in the coalmine, but not only because islands are ostensibly spatially confined sites for intensive investigation and learning. More fundamental than this, islands can be precisely linked to the role of the canary because the argument proliferating today is that island governance should switch to correlational practices and epistemologies, which enable islanders to better sensitise, attune and become resilient to emergent effects and disturbances. Islands and islanders are understood as canaries in that they contain capacities or affordances which can signal or register climate change as a hyperobject (Morton, 2016), which would otherwise reach catastrophic tipping points without becoming visible to the modernist gaze, restricted to distinct entities and linear causality. Like the canary, islands do not predict climate change but instead register it in its processual emergence. Thus, today we often see both islands and islanders themselves regularly characterised in these particular ways.

In the archipelago of Indonesia, the capital city Jakarta has sought to turn its citizenry into citizen-sensors, capable of early detection and adaptive responsiveness to wide-scale flooding. One such correlation and sensing project, *PetaJakarta*, sees the population of the major city as a resource still in need of mobilisation: they are already extensively networked through social media and could make great citizen sensors, especially once flood information offered can be verified through geo-spatial tagging of the precise time and location (this enables others to check and compare the information from multiple sources and makes verification much easier). Social media can be reconfigured with humanitarian apps to activate these civic citizenship elements. Different problems can then be used to construct engaged and active communities able to play a role in addressing them as a form of “civic co-management” (Author interview with PetaJakarta coordinator, Jakarta, 17 February 2016). The development of civic communication technologies is understood as enabling a more dynamic reality to unfold, amplifying the collective networked social intelligence of the city, where the citizens and the river flooding work together to reveal the river’s importance and to develop syncopated rhythms of adaptation, rather than seeking to control or ‘normalise’ the river system (Chandler, 2017). At present, new civic technologies are being bankrolled and tested in relation to disasters and emergencies, but the hope is that this could be the beginning of new forms of geo-social networked systems enabling much more distributed and democratic forms of real-time island governance.

The key point about these sensing systems, based upon correlation rather than causation, is that the spatial and temporal separations of modernist approaches are disrupted. In the case of *PetaJakarta*, it is not the case that flooding is predicted or prevented, but that flooding and non-flooding become placed in superposition: both happen at the same time, and systems of citizen sensing enable citizens to modulate their modes of being in relation to changes and shifts in the river systems (Chandler, 2018b). The ability to see or sense the actual effects of relational interactions is understood to become more enabling the more connections can be established or imagined across greater distances and across more varied forms of interactive life. While this can be seen as ‘empowering’, the ontopolitical framing normalises or naturalises the problem of flooding, redistributing governing responsibility to a more aware, responsive and adaptive citizenship. The citizenry then are imagined to be living ‘attuned’ to the river and sharing in a syncopated rhythm with its flows. This foregrounding of the river, its inclusion into the quotidian lifestyle choices of the residents—their paths home or to work, for example—may sound romantically ‘close to nature’ but evades tackling the major infrastructural problems of a city that is literally drowning under the weight its own ‘success’.

Latour’s approach, noted above, is illustrated well in the *PetaJakarta* project which sees the ability to sense effects as crucial to revealing the unseen and unknown interconnections of the Anthropocene; involving the technology and regulatory mechanisms necessary to “trace and ceaselessly re-trace again the lines made by all those loops” with a “strong injunction: keep the loop traceable and publicly visible,” so that “whatever is reacting to your actions, loop after loop [...] weighs on you as a force to be taken into account” (Latour, 2013, p. 135). These new sensorial forms of digital governance are given a material political form in such examples as *PetaJakarta* as a new set of political competencies and responsibilities are established: “such an accumulation of *responses* requires a responsible agency to which you, yourself, have to become in turn *responsible*” (Latour, 2013, p. 135).

Thus, unlike earlier modes of governance, digital governance does not seek to make causal claims. Instead, the focus is upon how the emergence of effects can be traced to reveal new relations of interaction and new agencies or actants to be taken into account. There is no assumption that effects can be understood and manipulated or governed through the imposition of external or subject-centred policy goals. Real-time responsive forms of management through digital sensing, such as the *PetaJakarta* project, switch the focus to the ‘what is’ (Latour, 2013, p. 126) of the world in its complex and plural emergence. As stated earlier, Latour (2013, p. 26) argues that such machinic or more-than-human methods of ‘post-epistemological’ knowing are absolutely necessary today, because modernist forms of representation, reduction, abstraction and exclusion cannot know a world that is plural, lively and interactive. This logic strongly characterises the work of *PetaJakarta* and illustrates how islands in particular have become exemplary sites for the adoption of correlational modes of governance in the Anthropocene.

In the dominant mode of digital governance which today characterises debates about island governance in the Anthropocene, the focus of empirical analysis to facilitate real-time responsiveness enables emergent effects to discursively frame engagement without an external subject or government setting its own policy goals. The new political horizon is now to be set by the world itself; accessed through the development of new mechanisms and techniques sensitised and responsive to the world in its emergence. Human-non-human assemblages of sensors, like those just discussed, enable new forms of responsivity. This advance is not concerned with causal knowledge or with the associated problematics of seizing sovereign control and power as in the previous works of C.L.R. James (2001), Fanon (1967) and the early Glissant (1981), but with the capacities to see through the breaking down of processes via the development of ‘correlational machines’.

In this paper we have been using the term ‘correlational machines’ to distinguish this mode of governance as a very distinct paradigm in contrast to causal ontologies of depth and immanence. As noted earlier, the development of correlational machines is not new to the Anthropocene but is part-and-parcel of the extension of human agency through the use of artificial prostheses to enable sensing of the environment. While these ‘more-than-human’ machinic assemblages are constructed on the basis of causal laws and regularities, their purpose is a correlational one: seeing what exists in the present, in the actual, but is unknown or unseen.

To take another example of this coalescence around correlational epistemologies, Elizabeth Johnson (2017) has done insightful work on more-than-human forms of governance in her analysis of the work of commercial biosensing and the use of organic life to monitor fresh and marine water sources for pollution. Here an array of animal species, including small fish, worms, molluscs, crustaceans and micro-organisms are monitored intensively to discover their norms of functionality and to develop ways of measuring changes in these indicators. They are then ready for use as ‘correlational machines’:

[The company] monitors a suite of ‘behavioral fingerprints’ as these organisms are exposed to different systems. Locomotor activity, reproductive rates, and embryonic developments are measured together to indicate the severity of hazardous anthropogenic chemicals as well as biologically produced toxins, such as blue-green algae. In this way the company boasts, it can make ‘pollution measurable’ (Johnson, 2017, p. 284).

As Johnson (2017, p. 284) notes, this mode of digital governance is less about causation than seeing indirectly via effects: “making imperceptible harms perceptible.” The approach sees through correlation, which enables new problems and possibilities to be detected. Changes in the bodily indicators of the animal organs can alert human agents to potential problems, even if the sources of those problems are unknown. Thus, the company concerned argues that problems can be detected “in due time before pollution irreversibly spreads in the environment or even harms human health” (Johnson, 2017, p. 284). In a technological extension of the non-human prosthesis of the canary down a coalmine, “biosensing enables a way of seeing with non-human life” (Johnson, 2017, p. 286). Intensities of pollutants or toxins are given extension or appearance through the affectivities of the bodies of small marine creatures. Once again, such governance works on the basis of developing new forms of correlational sight; enabling a fundamental shift from governance on the basis of ‘problem-solving’ and analysis of ‘root causes’ to the adaptive governance of responsiveness to changes in effects. The ontopolitics informing governance is not concerned directly with entities or with causation but with indirect relational effects, enabling ‘more-than-human’ assemblages of responsivity to become the new governmental norm. New actors or agencies are brought into being through the affordances of ecological sensitivities—whether that be through redesigning sensing technologies on islands, giving increased importance to Indigenous islanders’ sensitivities, or using oysters as biosensors—enabling the appearance of ‘effects’, and thus enabling insight into processes of emergence through these ‘co-relations’.

Drawing out the reductive political horizons

To repeat what we said earlier, we are not advocating correlational epistemologies in this paper. Instead, we want to draw out for the reader the generic ontopolitical logic of this increasingly prolific approach for island and Anthropocene scholarship. Whilst this remains the central focus of this paper, in this section, we want to start to get into some of the limitations of the shift towards correlational logics which we have observed.

Here the link between conceptual discussions of governance and epistemic questions of knowledge is highlighted particularly well by developing Giorgio Agamben’s (2014) understanding of the change in focus from causation to effects; which he sees as a depoliticising move. For Agamben, debates about addressing causation involve socio-political analysis and policy choices, putting decision-making and the question of sovereign power and political accountability at the forefront. Causal relations assume that power operates in a hierarchy, with policy outcomes understood to be products of conscious choices, powers and capacities. This is of course similar to how many island writers and activists themselves—like C.L.R. James (2001), Franz Fanon (1967) and the early Édouard Glissant (1981)—previously understood the stakes of resistance: in terms of the causal effect of seizing sovereign power and control over island independence (see also Meeks & Lindahl, 2001). But as Agamben argues, whilst the governance of causes and the focus upon sovereign power is the essence of politics, the governance of effects and disturbances reverses the political process:

We should not neglect the philosophical implications of this reversal. It means an *epoch-making transformation in the very idea of government*, which overturns the traditional hierarchical relation between causes and effects. Since governing the

causes is difficult and expensive, it is more safe and useful to try to govern the effects. (Agamben, 2014; our emphasis)

The rise of correlational epistemologies—the shift to governance on the basis of the registration and adaptation to effects—can therefore be seen not only as a retreat from modernist or causal assumptions of governance but also from traditional political logics, which sought to seize the apparatus of governmental control. As Agamben states, this involves an important transformation in the conceptualisation of governance itself: one that is at the heart of this paper, and, more generally, at the heart of what we call the rise of ontopolitics. The management of and adaptation to effects in emblematic examples, like PetaJakarta, and the celebration of Indigenous islanders as sensors via their more-than-human entanglements, involve a much wider and ‘flatter’ redistribution of agency; now understood as a correlational, adaptive, resilient and responsive capacity. Thus, there is little concern about locating responsibility or accountability for problems, or any need to pose questions relating to government as a form of political decision-making (see also Chandler 2014a; 2014b; 2014c; 2018b; Chandler & Pugh, 2020). Problems in their emergence are instead seen as the ontological product of complex feedback loops and systemic interactions that often cannot be predicted or foreseen. The surprising effects and disturbances, unexpected shocks and unseen threats, associated with the complex relational entanglements of the Anthropocene, seem to call for these new ways of thinking and governing; ways that go beyond modernist linear cause-and-effect assumptions and the seizing of governmental apparatus and sovereign control.

In making this critical point, we are certainly not advocating a return to the past, but rather calling for a more serious and in-depth interrogation of what is widely on offer in the present. Here the ontopolitical focus upon relational effects and feedbacks—illustrated in this paper by the prominent rise of correlational logics—is perhaps more prevalent than many want to admit in the dominant approaches of critical Anthropocene scholarship today, which variously advocate how to live life better ‘in the ruins’ of modernity and how to ‘stay with the trouble’. The key question here, we believe, is not only the often-raised point that White Western academics are speaking on behalf of islanders and others, and reductively assimilating them into their own ontopolitical frameworks—from Haraway’s (2016) ‘Chthulucene’, to Latour’s (2005) ‘actor network theory’, to Morton’s (2013) ‘object-oriented ontology’, and de la Cadena and Blaser’s (2018) ‘pluriverse’ world of many worlds. As the Indigenous scholar Zoe Todd (2020) says, there is a long genealogical history at work, so that a discipline like “Anthropology, in its dominant configurations, is really really bad at reflecting upon itself and its actions. Even with the whole dang reflexive turn.” Whilst we agree with Todd’s invocation to break away, it is a related but different concern which we have in mind. We are concerned with the increasingly powerful forces and projects of ontopolitics; which seem to be particularly inspired by, and draw very heavily upon, thinking with islands as emblematic sites of relational affordances and feedback effects. We want to break away from these because we believe that the ontopolitical horizons of merely correlating to, telling stories about relational feedbacks, adapting to, and being resilient are simply an impoverished way of dealing with the enormity of the stakes of the times.

Going forward, in our own work, we are therefore beginning to become interested in how it might be possible to not only map out and reveal the depths of the ontopolitical shift in which islands are playing such a pivotal role, but to also detour and break away from it.

Here, perhaps revisiting scholarly traditions concerned with the island as ‘opaque’ to the external grasping hand (Glissant, 1997), and therefore as negating and *nonrelational*, may prove a fruitful delinking move. Thus, going in the opposite direction of understanding islands as celebrated sites of relational and feedback effects, and laboratories for new modes of ontopolitical governance; and instead, as in the traditions of Glissant (1997), *The Undercommons* and “the maroon community” (Harney & Moten, 2013, p. 38), islands as non-relational sites of resistance and negation—working and agitating against the reductive ontopolitical horizons of dominant critical Anthropocene scholarship and practice today. As we develop our thinking in this area, we can be sure that islands will remain central—because *thinking with islands* is key for the dominant ontopolitical logics of the times, and it is therefore with islands in particular that we must address the stakes directly.

Conclusion

In this paper we have sought to draw out the ontological import of the most emblematic way in which the figure of the island has come to be characterised in the Anthropocene: *the canary in the coalmine*. For us, islands have not only become the ‘canary in the coal mine’ because islands have ostensibly confined spaces which enable us to watch the unfolding of transforming planetary conditions on a smaller scale, *but also because islands and islanders’ practices themselves have come to exemplify the shift in logic from causation to correlation*. This shift is fundamental in terms of governance in the Anthropocene and should not be underestimated in its significance.

As analysed in this paper, correlational logics no longer need to assume a normative political project or normative goals external to the actuality of the world. As Agamben (2014) has highlighted, the governance of effects can thereby be seen to be depoliticised, as the tasks of governance are discursively derived ‘empirically’ from the world, rather than from human actors as subjects. There is no longer a ‘line’ of causality, but a ‘plane’ of entangled relationality to be constantly sensed, attuned and adapted to (Deleuze, 1992). Thus, whilst in recent years there has been much interest in challenging stereotypical tropes of island insularity and isolation, especially in the Anthropocene (reflective of a broader ‘relational turn’ in islands scholarship (Chandler & Pugh, 2020; DeLoughrey, 2007; 2019; Grydehøj, 2017; 2020; Hayward, 2012; Pugh, 2013; 2016; 2018; Stratford, Baldacchino, McMahon, Farbotko, & Harwood, 2011; Steinberg, 2005; Stephens & Roberts, 2017; as just some of many examples), what we want to stress in this paper is that normative political horizons should not be reduced to merely understanding, sensing and attuning to island relational entanglements in themselves.

It is, of course, indisputable that islands and islanders are part of complex networks of relations. It is also indisputable that many islanders are well attuned to the elements, pragmatic, hardy and resilient. But to say that these should be the normative aspirations for island political life is an impoverished aspiration indeed.

References

- Agamben, G. (2014). For a theory of destituent power. *Chronos* 10, February. <http://www.chronosmag.eu/index.php/g-agamben-for-a-theory-of-destituent-power.html>

- Annan, K.A. (1999). At a glance: Small islands developing states. A message from Kofi A. Annan (Secretary-General of the United Nations). https://web.archive.org/web/20160912151839/http://www.ourplanet.com/imgversn/103/08_small.htm
- Baldacchino, G. (2019). Personal communication via e-mail, “Island governments are cashing in (literally) on this new-found interest in islands as laboratories and microcosms, suggesting answers to big/ planetary issues. But they don’t really. Islands are inherently non-self-sufficient and open capsules of life; they present themselves as isolates in order to suggest that they can make themselves the attractive beacons which draw in money from donors, plus gain the eventual recognition that could in turn lure investment, tourism, more money, etc. This is the 21st century version of the ‘plantation economy’ – sustainability and climate proofing is the new cash crop. The island has become again the ‘miner’s canary’ in the mine.”
- Baldacchino, G. (2018). Seizing history: Development and non-climate change in small island developing states. *International Journal of Climate Change Strategies and Management*, 10(2), 217-228. <https://doi.org/10.1108/ijccsm-02-2017-0037>
- Baldacchino, G. (2017). Islands as novelty sites. *Geographical Review*, 97(2), 165-174. <https://doi.org/10.1111/j.1931-0846.2007.tb00396.x>
- Cavallo, E. (2017). Big data and the pursuit of better disaster relief. *Ideas Matter*. <https://blogs.iadb.org/ideas-matter/en/big-data-pursuit-better-disaster-relief/>
- Clark, N., & Yusoff, K. (2017). Geosocial formations and the Anthropocene. *Theory, Culture & Society*, 34(2-3), 3-23. <https://doi.org/10.1177/0263276416688946>
- Chandler, D. (2018a). Digital governance in the Anthropocene: The rise of the correlational machine. In D. Chandler & C. Fuchs (Eds.), *Digital objects, digital subjects: Interdisciplinary perspectives on capitalism, labour and politics in the age of big data* (pp. 23-42). London: University of Westminster Press. <https://doi.org/10.16997/book29.b>
- Chandler, D. (2018b). *Ontopolitics in the Anthropocene: An introduction to mapping, sensing and hacking*. Abingdon: Routledge. <https://doi.org/10.4324/9780203703434>
- Chandler, D. (2017). Securing the Anthropocene? International policy experiments in digital hacktivism: a case study of Jakarta. *Security Dialogue*, 48(2), 113-130. <https://doi.org/10.1177/0967010616677714>
- Chandler, D. (2014a). *Resilience: The governance of complexity*. Abingdon: Routledge.
- Chandler, D. (2014b). Beyond good and evil: Ethics in a world of complexity. *International Politics*, 51(4), 441-57.
- Chandler, D. (2014c). Beyond neoliberalism: Resilience, the new art of governing complexity. *Resilience*, 2(1), 47-63. <https://doi.org/10.1080/21693293.2013.878544>
- Chandler, D., & Pugh, J (2020). Islands of relationality and resilience: The shifting stakes of the Anthropocene. *Area*, 52(1), 65-72. <https://doi.org/10.1111/area.12459>
- Chander, D., & Reid, J. (2018). ‘Being in being’: Contesting the ontopolitics of indigeneity today. *European Legacy*, 23(1), 1-18. <https://doi.org/10.1080/10848770.2017.1420284>
- Danowski, D., & de Castro, E.B.V. (2016). *The ends of the world*. Cambridge: Polity.
- de la Cadena, M., & Blaser, M. (Eds.) (2018). *A world of many worlds*. Durham: Duke University Press.
- Deleuze, G. (1992). Postscript on the societies of control. *October*, 59, 3-7.

- De Souza, R.M., Henly-Shepard, S., McNamara, K., & Fernando, N. (2015). Re-framing island nations as champions of resilience in the face of climate change and disaster risk. *UNU-EHS Working Paper Series*, No. 17. Bonn: United Nations University Institute of Environment and Human Security. http://collections.unu.edu/eserv/UNU:2856/Reframing_island_nations_WP_No_17.pdf
- DeLoughrey, E.M. (2019). *Allegories of the Anthropocene*. Durham: Duke University Press.
- DeLoughrey, E.M. (2007). *Routes and roots: Navigating Caribbean and Pacific island literatures*. Hawaii: University of Hawaii Press. <https://doi.org/10.1515/9780824864187>
- European Union (2019). *3rd clean energy EU islands forum*. <https://www.euislands.eu/clean-energy-islands-start>
- Fanon, F. (1967). *The wretched of the Earth*. London: Penguin.
- First People's Worldwide (n.d.). 'Who are indigenous peoples: how our societies work', *First People's Worldwide*. <http://www.firstpeoples.org/how-our-societies-work.htm>
- Fitzpatrick, S.M., & Erlandson, J.M. (2018). Island archaeology, model systems, the Anthropocene, and how the past informs the future. *The Journal of Island and Coastal Archaeology*, 13(2), 283-299. <https://doi.org/10.1080/15564894.2018.1447051>
- Foo, S.A., & Asner, G.P. (2019). Scaling up coral reef restoration using remote sensing technology. *Frontiers in Marine Science*, 13 March. <https://doi.org/10.3389/fmars.2019.00079>
- Forest Peoples Programme (2019). Islands of nature in a sea of decline – indigenous and local knowledge, action and contributions key to saving the world's nature. *Forest Peoples*, 6 May. <https://www.forestpeoples.org/en/international-processes-convention-biological-diversity-cbd/press-release/2019/media-release>
- Gillis, J. (2004). *Islands of the mind: How the human imagination created the Atlantic world*. New York: Palgrave Macmillan.
- Glissant, É. (1981). *Le discours antillais*. Paris: Seuil.
- Grydehøj, A. (2020). Critical approaches to island geography. *Area*, 52(1), 2-5.
- Grydehøj, A. (2017). A future of island studies. *Island Studies Journal*, 12(1), 3-16. <https://doi.org/10.24043/isj.1>
- Grydehøj, A., & Kelman, I. (2017). The eco-island trap: Climate change mitigation and conspicuous sustainability. *Area*, 49(1), 106-113. <https://doi.org/10.1111/area.12300>
- Grydehøj, A., & Kelman, I. (2016). Island smart eco-cities: innovation, secessionary enclaves, and the selling of sustainability. *Urban Island Studies*, 2, 1-24. <https://doi.org/10.20958/uis.2016.1>
- Hall, E.F., & Sanders, T. (2015). Accountability and the academy: Producing knowledge about the human dimensions of climate change. *Journal of the Royal Anthropological Institute*, 21(2), 438-461. <https://doi.org/10.1111/1467-9655.12162>
- Haraway, D.J. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Durham: Duke University Press. <https://doi.org/10.12775/rf.2017.017>
- Haraway, D.J. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, 14(3), 575-599. <https://doi.org/10.2307/3178066>
- Haraway, D.J. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making kin. *Environmental Humanities*, 6, 159-165. <https://doi.org/10.1215/22011919-3615934>

- Harney, S., & Moten, F. (2013). *The undercommons: Fugitive planning and black study*. New York: Minor Compositions.
- Hayward, P. (2012). Aquapelagos and aquapelagic assemblages. *Shima*, 6(1), 1-11.
- His Highness Tui Atua Tupua Tamasese Ta'isi Efi (2018). Climate change and the perspective of the fish, In T. Crook & P. Rudiak-Gould (Eds.) *Pacific climate cultures: Living climate change in Oceania* (prelude) (pp. IX-XIII). Warsaw & Berlin: De Gruyter Open.
- Pachauri, R.K., & Reisinger, A. (Eds.) (2007). *Contribution of working groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva: Intergovernmental Panel on Climate Change.
- James, C.L.R. (2001). *The black Jacobins: Toussaint L'Ouverture and the San Domingo revolution*. London: Penguin.
- Johnson, E.R. (2017). At the limits of species being: Sensing the Anthropocene. *South Atlantic Quarterly*, 116(2), 275-292. <https://doi.org/10.1215/00382876-3829401>
- Kimmerer, R.W. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge and the teachings of plants*. Minneapolis: Milkweed. <https://doi.org/10.5840/envirophil201613137>
- Kueffer, C., & Kaiser-Bunbury, C.N. (2014). Reconciling conflicting perspectives for biodiversity conservation in the Anthropocene. *Frontiers in Ecology and the Environment*, 12(2), 131-137. <https://doi.org/10.1890/120201>
- Latour, B. (2017). *Facing Gaia: Eight lectures on the new climatic regime*. Cambridge: Polity.
- Latour, B. (2013). *Facing Gaia, six lectures on the political theology of nature: being the Gifford Lectures on natural religion, Edinburgh, 18th-28th of February 2013* (draft version 1 March 2013).
- Latour, B. (2005). *Reassembling the social: an introduction to actor-network-theory*. Oxford: Oxford University Press. <https://doi.org/10.1108/eoi.2008.27.3.307.2>
- Latour, B., Harman, G., & Erdélyi, P. (2011). *The prince and the wolf: Latour and Harman at the LSE*. Winchester: Zero.
- Macfarlane, R. (2019). *Underland: A deep time journey*. London: Penguin.
- McKie, R. (2019). How Orkney leads the way for sustainable energy. *The Guardian*, 20 January. <https://www.theguardian.com/environment/2019/jan/20/orkney-northern-powerhouse-electricity-wind-waves-surplus-power-hydrogen-fuel-cell>
- Meeks, B., & Lindahl, F. (Eds.) (2001). *New Caribbean thought: a reader*. Mona, Jamaica: University of West Indies Press.
- Mission Blue. (2019). First ever hope spot in mainland United Kingdom declared along Scotland's Argyll coast and islands, 4 June. <https://mission-blue.org/2019/06/first-ever-hope-spot-in-mainland-united-kingdom-declared-along-scotlands-argyll-coast-and-islands/>
- Morton, T. (2016). Molten entities. In D. Daou & P. Pérez-Ramos (Eds.), *New geographies 08: Island* (pp. 72-76). Cambridge, MA: Universal Wilde.
- Morton, T. (2013). *Hyperobjects: Philosophy and ecology after the end of the world*. Minnesota: University of Minnesota Press.
- Nwanze, K.F., & Sinon, P. (2013). The self-sufficient Seychelles island that may hold the secret for small island states. *Skift*, 5 March. <https://skift.com/2013/03/05/the-self-sufficient-seychelles-island-that-may-hold-the-secret-for-small-island-states/>

- Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., & Hanson, C.E. (Eds) (2007). *Contribution of working group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- Percival, G.S. (2008). *An assessment of indigenous environmental knowledge (IEK) in the Pacific region to improve resilience to environmental change*. Kensington, Australia: Climate Change Research Centre, University of New South Wales.
- Pugh, J. (2018). Relationality and island studies in the Anthropocene. *Island Studies Journal*, 13(1), 93-110. <https://doi.org/10.24043/isj.48>
- Pugh, J. (2017). Postcolonial development, (non) sovereignty and affect: living on in the wake of Caribbean political independence. *Antipode*, 49(4), 867-882. <https://doi.org/10.1111/anti.12305>
- Pugh, J. (2016). The relational turn in island geographies: Bringing together island, sea and ship relations and the case of the Landship. *Social & Cultural Geography*, 17(8), 1040-1059. <https://doi.org/10.1080/14649365.2016.1147064>
- Pugh, J. (2014). Resilience, complexity and post-liberalism. *Area*, 46(3), 313-319. <https://doi.org/10.1111/area.12118>
- Pugh, J. (2013). Island movements: Thinking with the archipelago. *Island Studies Journal*, 8(1), 9-24.
- Pugh, J., & Chandler, D. (in progress). *Anthropocene islands: A critical agenda for island studies in the Anthropocene*. Rowman & Littlefield.
- Raygorodetsky, G. (2017). *The archipelago of hope: Wisdom and resilience from the edge of climate change*. New York: Pegasus.
- Roberts, B.R., & Stephens M.A. (Eds) (2017). *Archipelagic American studies*. Durham: Duke University Press.
- Robertson, M.L.B. (2018). Crafting certainty in liquid worlds: Encountering climate change in Kiribati. In T. Crook & P. Rudiak-Gould (Eds.) *Pacific climate cultures: living climate change in Oceania* (pp. 45-59). Warsaw & Berlin: De Gruyter Open. <https://doi.org/10.2478/9783110591415-005>
- Rowling, M. (2018). Reinventing islands: Sink or swim? Islands innovate to thrive in a high-stress world. *Zilient.org*, 23 July. <http://news.trust.org/shorthand/reinventingislands/>
- Russell, J.C., & Kueffer, C. (2019). Island biodiversity in the Anthropocene. *Annual Review of Environment and Resources*, 44, 31-60. <https://doi.org/10.1146/annurev-environ-101718-033245>
- Rubow, C. (2018). Woosh—Cyclones as cultural/natural whirls: the receptions of climate change in the Cook Islands, In T. Crook & P. Rudiak-Gould (Eds.) *Pacific climate cultures: living climate change in Oceania* (pp. 34-44). Warsaw & Berlin: De Gruyter Open. <https://doi.org/10.2478/9783110591415-004>
- Salick, J., & Ross, N. (2009). Traditional peoples and climate change. *Global Environmental Change*, 19(2), 137-190. <https://doi.org/10.1016/j.gloenvcha.2009.01.004>
- Schwartz, S.W. (2017). Temperature and capital: Measuring the future with quantified heat. *Environment and Society: Advances in Research*, 8, 180-197.
- Sheller, M. (2020) *Island futures: Caribbean survival in the Anthropocene*. Duke University Press.

- Steinberg, P.E. (2005). Insularity, sovereignty and statehood: The representation of islands on portolan charts and the construction of the territorial state. *Geografiska Annaler: Series B, Human Geography*, 87(4), 253-265. <https://doi.org/10.1111/j.0435-3684.2005.00197.x>
- Stengers, I. (2015). *In catastrophic times: Resisting the coming barbarism*. Lüneburg: Open Humanities Press.
- Smart Island Journal (n.d.). *Smart Singapore*. <http://smartisland.com/singapore-the-smart-island-smart-nation/>
- Smart Island World Congress (2018). Congress Program 2018. <http://www.smartislandcongress.com/en/agenda-2018>
- Solana, A. (2017). How do you turn these islands into a living IoT lab? Just add 500,000 sensors. *ZDNet*, 8 December. <https://www.zdnet.com/article/how-do-you-turn-these-islands-into-a-living-iot-lab-just-add-500000-sensors/>
- Stratford, E., Baldacchino, G., McMahon, E., Farbotko, C., & Harwood, A. (2011). Envisioning the archipelago. *Island Studies Journal*, 6(2), 113-130.
- Todd, Z. (2020). An answer. *Anthro(dendum)*, 27 January. <https://anthrodendum.org/2020/01/27/an-answer/>
- Tsing, A.L. (2015). *The mushroom at the end of the world: On the possibility of life in capitalist ruins*. Princeton: Princeton University Press. <https://doi.org/10.14237/ebl.6.1.2015.506>
- United Nations Climate Change (2019). Mapping exposure to sea level rise: Tonga, Samoa, Vanuatu and Papua New Guinea. <https://unfccc.int/climate-action/momentum-for-change/ict-solutions/mapping-exposure-to-sea-level-rise>
- Watts, L. (2018). *Energy at the end of the world: An Orkney Islands saga*. Cambridge, MA: MIT Press.
- Whyte, A.V. (2017). Preparing for the next Hurricane Irma, or Harvey: How analytics and smart cities will help. *Huffington Post*, 7 July. https://www.huffpost.com/entry/preparing-for-the-next-hurricane-irma-or-harvey-how_b_5a01cb19e4b085d72ae06d2b