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The politics of anticipation: On knowing and governing environmental futures

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Abstract

In this article we describe how the historical emergence and rise of future studies, since the founding issue of *Futures* in 1968, has been intricately connected to the emergence and development of environmental anticipation as discourse and practice. We trace a dialectical and inter-twined relationship between technologies of environmental anticipation and forecasting, and technologies of anti-environmentalist anticipation and counter-intervention, one which we argue shapes not only the contemporary politics of anticipation, but in a very material sense, the future conditions of biological and social life on Earth. In so doing we want to address the possible contributions that the field of futures studies can make to reimagining collective agency and ways of being on Earth, whilst reflecting critically upon its genealogical relations to the political reason and strategic horizons of powerful fossil fuel interests, from the crisis of the 1970s to the present. The article also offers a more in-depth contextualization to the other articles in this special issue of *Futures* on "The Politics of Environmental Anticipation". The aim to bring to the fore the role that social scientists play in environmental anticipation - ie. drawing attention to the fact that the future could always have been otherwise.

Keywords: anticipation; global environmental change; future studies

Introduction

"Hell is truth seen too late."

Attributed by some to the political philosopher Thomas Hobbes and by others to the philosopher of history Georg W. Hegel, this apocryphal aphorism might be said to define the existential rationale of the cross-discipline of future studies. A relatively young social science arising from modern forms of political, scientific, technological and economic organisation, the arts and sciences of anticipation are engaged with a wide array of knowledge traditions and practices which seek to answer with *foresight* the danger of seeing the way things are only with hindsight - when it is too late.

Ideas of the future inform action in the present, and ways of knowing, forecasting, and actively anticipating future events are crucial elements of social organisation. Yet systematic attention to the future (and the social production of fore-knowledge) has often been limited to the margins and interstices of the human and social sciences, which have tended to concentrate on the immediate present as an outworking of historical patterns past. In this article we argue that if anything has truly revolutionised the anticipatory human and social sciences it is the emergence of the political horizon of anthropogenic ecological risks on a planetary scale. The historical emergence and rise of future studies has been intricately connected to the emergence and development of a dialectical and inter-twined relationship: between technologies of environmental forecasting, and techniques of anti-environmentalist anticipation and political intervention. This dialectical movement is still shaping the contemporary politics of anticipation, and indeed the conditions of social and biological life on Earth.

The co-emergence of future studies and environmental anticipation

As we race through the threshold of an 'urban climacteric' (Davis, 2006, p.1) the majority of the world's human populations now live and act in urban spaces. In this context practices of bringing the future into the present and shaping the present to anticipated futures take socio-material form in the complex architectures and infrastructures of everyday life. This includes the communication networks carrying flows of finance, information, and entertainment; in energy grids and the hydro-social spaces of water and sewage; in transport conduits that connect agro-industries with mines, factories and sweatshops with markets. For most people, the immediate 'environment' is an infrastructured life-world integrated into the planetary expansion and intensification of global "industrial technomass": a "dissipative structure" in thermodynamic terms (Hornborg, 2001, p.87), which maintains its order, motion and growth through a systematic conversion of 'natural resources' into myriad novel artefacts and waste flows, a process thus far largely driven by the energy released in the irreversible combustion of eons of fossilised photosynthesis.

Few could disagree that the horizon of future studies has expanded in significant ways since the rise of the 'ecology movement' in the late 1960's, when 'the environment' first

coalesced as an object of politics counterposed to 'the economy'. Chemical, radiological, plastic and nutrient pollution; abrupt climate change, runaway global warming of the atmosphere and land surfaces; melting of polar ice shelves and sea level rise; ocean acidification, mass biodiversity extinction, and health threats from zoonotic, food-borne and emerging infectious diseases all mean the end of the idea of nature as an inert, unchanging backdrop to the drama of human affairs. In other words, the concern with environmental futures and the politics of anticipation of future environments and socio-ecological relations is critically different from the release of the *The Limits to Growth* report and the first United Nations Conference on the Human Environment in 1972, when arguably environmental futures first became an official matter of global concern.

When the first issue of *Futures* appeared in 1968, an interest in disciplined foresight was becoming apparent across a range of fields, particularly in economics, political science, business management and the geophysical sciences. The first years of *Futures* coincided with a plethora of work that brought together social ecology, political economy and futures and which gave shape to the notion of sustainability as a public issue. These include pioneering work such as Rachel Carson's *Silent Spring* (1962); R. Buckminster Fuller's *Operating Manual for Spaceship Earth* (1969); Barry Commoner's *The Closing Circle: Nature, Man and Technology* (1971); and Barbara Ward and René DuBois' *Only One Earth: The Care and Maintenance of a Small Planet* (1972).

These works were all concerned with anticipating 'postnatural' environmental futures and stood in contrast to other significant works that came to crystallise the field of futures studies around the formation of the World Futures Studies Federation (WFSF) in 1967. Some of these works as Bertrand de Jouvenel *The Art of Conjecture* (1967), Alvin Toffler's *Future Shock* (1970) among many others - too numerous to name here - were debating in one way or another the accelerating change that for liberal-conservative scholars such as Daniel Bell, augured *The Coming of Postindustrial Society* (1976). For Bell, the postindustrial future would arise from the mastery of nature manifest in the harnessing of vast atomic energies and the rapid development of digital computers and communication technologies. He took dismissive note of the nascent environmental movement:

"[...] ecological reformers like Rachel Carson and Barry Commoner, [...] invoke the institutional charisma of science in making moral or political judgments. What we have here is the resumption of the prophetic claims of science in setting forth truth as against self-interest. [...] Paradoxically, the vision of Utopia - a fully automated production economy with an endless capacity to turn out goods - was suddenly replaced by the spectre of Doomsday. In place of the early-sixties theme of endless plenty, the picture by the end of the decade was one of a fragile planet of limited resources whose finite stocks were rapidly being depleted, and whose wastes from soaring industrial production were polluting the air and waters. Now the only way of saving the world was zero growth. What was striking in this change is the shift in attention from machinery to resources, from man's mastery of nature to his dependence on its bounty, from Harrod-Domar-Solow growth economics to

Malthusian-Ricardian scarcity economics. And the principle of diminishing returns, rather than increasing returns to scale, becomes the analytical motif." (Bell, 1976, p. 404)

It's probably not reasonable, nor possible, to undertake a comparison between the state of affairs in 1967 and 2017. The world - and the future for that matter - has changed quite significantly in the past 50 years. In fact, the future seems to have changed dramatically in 2016 as this special issue of *Futures* was being put together. On April 22 (Earth Day) 2016, the Paris Agreement (accorded at COP 23 in December 2015) opened for signature at a ceremony in New York. By December 2016 it had been signed by 194 UNFCCC members. One month later Donald Trump was inaugurated as President of the United States, who in his first month in office warned of pulling out of Paris agreement, whilst appointing Rex Tillerson, CEO of ExxonMobil, as Secretary of State. The new administration has signalled intentions to radically transform and constrain the US Environmental Protection Agency, marking something of an historical watershed.

The EPA was established in 1970 by President Richard Nixon to administer a raft of new environmental and consumer-protection statutes, at a time when many nations were institutionalising recognition of environmental degradation within the regulatory apparatus of the state. Nixon's move catalysed a profound sense of betrayal amongst US business elites. In 1971, the corporate lawyer Lewis Powell, a board member of Phillip Morris tobacco soon to be appointed to the Supreme Court by Nixon, prepared a secret memorandum for the United States Chamber of Commerce, a call to arms to big business. The memo included a message from the Chicago School economist Milton Friedman, the ablest public protagonist of the neoliberal doctrines developed in the private and privately-financed Mont Pelerin Society.

"It its crystal clear that the foundations of our free society are under wide ranging and powerful attack - not by Communists or any conspiracy but by misguided individuals parroting one another and unwittingly serving ends they would never intentionally promote." (Friedman in Powell, 1971).

The Powell memorandum outlined a pervasive long term strategy, calling upon US corporations "at all levels and at every opportunity, to be far more aggressive than in the past," to organise and generously fund a para-academic network of pro-business scholars, lawyers, advertisers and public communications professionals to capture the commanding heights of public opinion through the popular media, and to exert "muscle" to shape state policy formation. In 1972, business responded to the threat with the formation of the Business Roundtable, a powerful federal lobby group of the CEOs of the 200 largest transnational corporations. In 1973, wealthy donors and corporate interests established the Heritage Foundation to promote bold social and environmental deregulation, but one of the contemporay galaxy of neoliberal thinktanks among whose abiding aims, as one contributor to the Heritage Foundation house journal put it, is to "strangle the

environmental movement" (Andrews et al, 1990).¹ At the time of writing this article, Republican representatives had introduced a single paragraph Bill (H.R. 861) to the US Congress, 'to terminate the Environmental Protection Agency'.

Even without the threats posed in 2017 by the Trump administration to the future of the Paris Agreement, the problem remains, as Rockström et al have bluntly put it: the "scale of the decarbonisation challenge to meet the Paris Agreement is underplayed in the public arena" (2016, p.465). It's the world's biggest gamble, one which may foreclose on the time allowed for recognisable life on Earth, as Rockström et al contend:

It will require precipitous emissions reductions within 40 years and a new carbon sink on the scale of the ocean sink. Even then, the world is extremely likely to overshoot. A catastrophic failure of policy, for example, waiting another decade for transformative policy and full commitments to fossil-free economies, will have irreversible and deleterious repercussions for humanity's remaining time on Earth (2016, p.465).

Living in a state of anticipation: historical and new challenges for the social sciences

In a 1932 BBC radio broadcast, the science/fiction writer H.G. Wells lamented that there were no 'Professors of Foresight' devoted to the anticipation of technology-driven social change (Slaughter 1989, p.3-4). Tellingly, the petrol-powered automobile was Wells' example. This is of course no longer the case. Within and without the academy, many 'thought leaders' now make their living as business strategists offering entrepreneurial and strategic foresight. Consider the contemporary fascination with 'innovation' and allied concepts such as disruption, agility and resilience. Disequilibrium, turbulence and instability, once seen as potentially catastrophic threats to orderly social reproduction, are now celebrated as generative principles of social organization (Walker & Cooper, 2011). Increasingly, natural scientists are called to research in the anticipatory mode, projecting trends from facts (which are by definition historical) into imminent future states of the local or planetary environment, in projections which call into question the creativity of Schumpeterian 'creative destruction'. For the marine ecologist Roger Bradbury (2012), the Earth's coral reefs are already "zombie ecosystems, neither dead nor truly alive in any functional sense, on a trajectory to collapse within a human generation". Others report that by century's end it will be too hot for the human body to survive summer heat waves in the Middle East (Lieleveld et al., 2016), a region considered the 'cradle of civilisation' in

¹ For the most comprehensive mapping of the think tank network, see the global directory of the Atlas Network. Founded as the Atlas Foundation in 1981 by Antony Fisher, a disciple of Friedrich Hayek who became wealthy through pioneering intensive battery-farming methods in the poultry industry, the Atlas Network coordinates policy, personnel and funding across 465 think tanks in 95 countries. <https://www.atlasnetwork.org/partners/global-directory>

Eurocentric universal histories, indeed the source of Creation in the Edenic origin myths of the Abrahmic religions. Surely, the stakes of political contest over anticipatory visions and interventions could not be higher.

The set of questions that social scientists and futures scholars today address increasingly engage the modalities through which environmental futures - as contingent sets of probabilities and possibilities - are made present and decided upon, problematizing the ways in which emergent threatening futures are known, anticipated, fostered, pre-empted, and prepared for. The geographer Ben Anderson has been influential in framing an approach to explain how futures are “disclosed and related to through statements about the future (styles); rendered present through materialities, epistemic objects and affects (practices); and acted on through specific policies and programmes (logics)” (Anderson, 2010, p. 779). He outlines three types of anticipatory practices: calculating, imagining and performing futures. Each produce different pre-emptive and precautionary logics mutual adjustment between future expectations and contingent present dynamics - as a process through which the present is transformed, intervened in and ultimately governed in the name of the future. Anticipation, as a lived condition or orientation always demands a response in the present; it is about “enacting a future that (hopefully) makes a present that (hopefully) shapes the future” (Wilkie and Michael, 2009, p. 504; see also Alvial-Palavicino 2016). Equally important though, are the ways in which foresight is *ignored*, and precautionary responses routinely deferred. Here, scholars since Ulrich Beck (1995) have analysed the phenomena of ‘organised irresponsibility’, with the history of climate policy bearing exemplary witness to the sophisticated amplification of public uncertainty, confusion and ignorance accomplished by the ‘merchants of doubt’ (Oreskes & Conway, 2011), practitioners of an anti-epistemic science dubbed ‘agnotology’ by Proctor and Schiebinger (2008).

Novel concerns with the predicaments posed by a pervasive “subjunctive mood” of the present urban condition are indicative of a more profound engagement with futures. In this vein, Vincanne Adams, Michelle Murphy and Adele Clarke have argued that “one defining quality of our current moment is its characteristic state of anticipation, of thinking and living toward the future” (2009, p. 246). Adrian Mackenzie contends that we seem increasingly to be living in a “regime of anticipation” (2013, p. 391). Yet characterisation of contemporary modes of future-orientation as unprecedented may risk overstatement if not considered in the longer *durée* of historical consciousness, in all the ontological diversity of ways of being in time (Granjou & Salazar, 2016). As the anthropologists Linda Connor and Jon Marshall (2015, p.1) have observed:

A paradox of cultural, social and ethical life in all societies is that is directed towards a future that can never be observed, and never directly acted upon, and yet is always interacting with that social life. As a result, actions depend both on imagination and on a political ontology or sense of being in the world and of the nature of that world.

For Barbara Adam, “the future poses major challenges [to social sciences inquiry] because it lacks the tangible materiality needed for empirical study” (Adam, 2009 p.1). On the other hand, the reason why futures have long eluded social science inquiry and theory is not only methodological but also more deeply epistemological: with their constructivist focus on understanding how human subjects make sense of the world by building intersubjective meanings and institutions, social sciences historically contributed to reinforcing the modern vision of a human-authored future. Researching environmental futures requires us instead to destabilize the disciplinary patterns of the social construction of reality in order to confront the autonomous and outside reality of the future (Granjou, 2016, p. 13), to become more attuned to the fact that humans and societies do not own and shape “their” future alone. Environmental futures are definitively “more than human” futures, channelling the complex and non-linear future-making capacities of non-human lives and ecological communities, machines and artefacts whether integrated or disintegrating, and the inhuman planetary forces of the Earth.

These predicaments demand we rethink the methods that social and cultural research have at their disposal to undertake future-oriented research.² Contemporary methods of anticipatory social sciences are routinely traced to the 1940’s, when military strategists, government planning agencies and large corporations began devoting substantial resources to future-oriented research. The co-emergence of atomic weapons, digital computers, game theory and cybernetic systems-modelling within the US military industrial complex and early ‘think-tanks’ such as the Rand Corporation - a hybrid organisation emerging in the interface between the US Air Force and its avionics contractors - would raise the stakes of geopolitical anticipation to apocalyptic heights. The Cold War strategy of ‘maintaining the balance of terror’ through MAD (mutually assured destruction) could only be interpreted as the hardest form of anticipatory rationality within an intellectual atmosphere “sleek with dread and heavy with doom” (Mirowski, 2002, p.45).

In the 1960s the Rand Corporation developed the Delphi method, an iterative process of aggregating, refining and statistically analysing expert opinion for long range forecasting and planning purposes (Dalkley, 1967). However it was the work of Rand’s civil defence strategist Herman Kahn which would challenge the US military establishment to systematically ‘think the unthinkable’ - for example, that wishful thinking, complacent groupthink and miscalculation amongst US military elites might be the cause of total thermonuclear war. Kahn’s anticipatory methods of strategic transition to the future would be further developed when he left the military to found the conservative think-tank the Hudson Institute, which drew wide publicity from his book *The Year 2000*, co-authored with Anthony Wiener (1967). Kahn would later be commissioned by the Heritage Foundation and the incoming Reagan administration to fortify the doctrine of infinite

² See for instance (Salazar, Pink, Irving & Sjøberg, 2017) for a discussion of methods and techniques for future oriented anthropological research.

growth, and refute the Carter administrations pro-renewables, pro-conservation, energy efficiency and family planning policies (Simon & Kahn, 1984).

In 1967, the Shell oil company initiated its 'Year 2000', a project to study the future 'business environment'. The study anticipated turbulent futures for the oil industry, concluding that: "the historical trajectory of year-on-year expansion of the industry could not continue to 1985, let alone 2000" (Bradfield et al., 2005). In the 1970s, a result of internal dissatisfaction with the corporate planning and strategy arising from its Universal Planning Model, the Shell oil company developed the method of scenario planning, in which multiple possible future scenarios - "anticipated retrospectives" - were creatively imagined, then role-played and ranked by executives in terms of degrees of belief, rather than in terms of mathematical probability. Scholars attribute to this method Shell's relatively agile navigation of the 1970s energy crisis, when Arab oil exporting nations embargoed US markets. The method of scenario analysis would be taken up not only in conservative military and business circles devoted to securing a future of economic growth, but was also by the Club of Rome. Deploying several scenarios, the *Limits to Growth* report attempted to model the biophysical interaction between industrial technomass and the Earth 'system' for the century to come (Meadows et al, 1972). Anticipatory scenario-modelling became the format organising the reports of the Inter-governmental Panel on Climate Change, and the Millenium Ecosystem Assessment (2005), to say nothing of the mathematical techniques deployed in the financial heights of global power, where the unknowable future values of financial capital, energy, resources, political violence and weather are speculatively traded and benchmarked through futures markets, derivative contracts, parametric insurance, and catastrophe bonds (Cooper, 2010).

The central role of powerful oil companies in organising effective political and counter-epistemic resistance to climate policy in recent decades is well known; less so is that this strategy emerged after an earlier investment in climate research. Shell Oil's research division sponsored the atmospheric chemist James Lovelock to develop the seminal papers that introduced 'Gaia theory' to the scientific and public imagination, which foregrounds the transformative role of global biological processes in maintaining the thermal and geochemical conditions conducive to life on Earth (Margulis & Lovelock, 1974; Lovelock & Margulis 1974). As the 'Exxon papers' gathered by the divestment committee of the Rockefeller Family Fund reveal, Exxon sponsored extensive global climate change research from the 1970s. In something of an historical irony given the origins of both Exxon and the Rockefeller fortune in John D. Rockefeller's Standard Oil monopoly, the Fund targeted ExxonMobil for immediate divestment because of its "morally reprehensible conduct": a 25-year-long campaign to deceive policymakers and the public about the realities of fossil fuel combustion and climate change, "protecting its profits at the cost of immense damage to life on this planet" (Kaiser & Wasserman, 2016).

In full knowledge of the abiding scientific consensus linking fossil fire to global heat accumulation, which their own researchers suggested could result in a rise of the Earth's average temperature by 6°C this century's end, Exxon decided to pursue a political

strategy that could be termed 'anticipatory agnotology'. "We should determine", wrote one executive in 1982,

"how Exxon can best [...] influence possible legislation on environmental controls. It is important to begin to anticipate the strong intervention of environmental groups and be prepared to respond with reliable and credible data." (in Kaiser & Wasserman, 2016).

Science generates anticipation, but remains subject to political and economic anticipation. Command over futures, imaginary, political and geophysical, appears more closely aligned to command over pyrotechnical capital than we might wish. As a consequence we would suggest a distinction not made often enough in contemporary research on anticipation: one between *anticipatory action* (namely: actions performed so as to alter materially the course of events and thus the possible future) and *activities which anticipate* (research which merely produces data and more accurate means of projecting trends into possible futures). All too clearly, scientific knowledge is *not* in itself power. Quite the contrary, the politics of environmental anticipation might be said to resolve to the political technologies by which scientific knowledge is prevented from having political effects, neutralising attempts at collective anticipatory action to prevent further degradation of ecological order, and naturalizing life on the edge of irreversible chaos as the normal state of things.

Politics of environmental anticipation: A Special Issue of *Futures*.

The task before us consists in comprehending the temporalities of social-ecological change at a moment when crossing certain biophysical thresholds will most likely have disastrous consequences for life on Earth, if interlinked planetary boundaries continue to be irreversibly overstepped (Rockstrom et al., 2009). This points to a different way of conceiving futures research. For centuries - as we have argued elsewhere (Walker, 2007; Granjou & Salazar, 2016) - the future was largely viewed in terms of modernity's human-centred categories of innovation, emancipation, progress and civilization, while nature was irremediably shoved to the realm of the a-historical, understood as a fixed background for the development of society. In other words we argue that the future cannot be fully addressed without acknowledging those shared *futures* of nature-culture entanglements (Granjou & Salazar, 2016). Present and impending radical environmental changes re-orient humanism, revealing how non-human beings share our paths. Non-humans (animals, plants, things and physical forces) themselves react to and instigate change, triggering unprecedented and partly unpredictable futures. Hence, the emerging concern with researching human and more-than human futures has also opened up new platforms for a range of anticipatory modes of inquiry ranging, for instance, from accounts of how futures are predicted and projected by algorithms, to how futures are envisioned, imagined, promised and performed according to different affective and sensory coordinates.

As editors of this special issue on the politics of anticipation we are most interested in questions of knowing and governing environmental futures. From the outset we were captivated by how, as an affective state, anticipation becomes a performative way of actively orienting oneself temporally. As Adams, Murphy and Clarke suggest, anticipation works as a regime of being in time, in which one “inhabits time out of place as the future” (Adams, Murphy and Clarke, 2009, p. 247). This signals the ways in which, at least to a point, anticipation has become a common, lived affect-state of daily life, shaping regimes of self, health, spirituality, but also our relations and technological entanglements with non-human nature. In other words, anticipation takes on epistemic and normative value as a politics of temporality and affect; “a virtue emerging through actuarial saturation as sciences of the actual are displaced by speculative forecast” (Adams, Murphy and Clarke, 2009, p. 247).

Anticipatory practices of risk calculation have been essential techniques of modern financial, commercial and state power, inherent in capitalist subjectivities. Yet the pyrotechnical, chemical, atomic, and genetic technologies disclose the incalculability of ecological risk, which verges on the infinite whether we focus down to the nano-scale or up to the evolutionary future of the sunlit biosphere (cf. Ewald, 1991). The process of assembling together these eight contributions has shown us that the analyses of social organisation can no longer proceed as if it were unnecessary to understand the future-making capacities and forces of the geosphere which, whilst they operate in the fullness of geological and evolutionary time, we are indelibly, inescapably, and forcefully part of. We concur with Nigel Clark when he observes the need to “begin to think through and not only about nature sciences – but in registers that embellish and exceed what scientists themselves would comfortably articulate” (Clark, 2011, p. 28). Clark’s exhortation to take the results of the Earth sciences as ground for the critical analysis of material culture and practices, of our collective prospects given the limits of geological agency, represents a challenge to theories of “science in action” which approach “facts”, “moderns” and “modernist politics” with a hermeneutics of suspicion. Here, STS scholars risk alignment with a post-environmentalist political quietism that strays uncomfortably close to the anti-environmentalism of the neoliberal think-tank network (Mirowski, 2015). Still, Clark’s call for paying attention to inhuman nature can also become a truism that, as Erik Swyngedouw notes, can quickly lead to a disempowering effect in contemporary attempts to refound a progressive politics “on the shaky grounding of an unpredictable, unnerving and indifferent nature” (Swyngedouw, 2012, p.682).

In this sense several questions kept hovering over when putting this special issue together. First, how might the forms of environmental anticipation that have proliferated since the late 1960s lead to responsibility, and to what extent do we retain the ability to respond with prevention and precaution? Second, how do we resist an immobilising ‘regime of anticipation’ that preserves immunity for organized irresponsibility on an industrial scale? An evocative pessimism on this point is registered by Charles Thorpe, who suggests that “the trajectory of capitalist technology is toward artificial life on a dead planet” (2016, p. 54). If this is the case it is of utmost importance to find, to create – and

fight for - ways of 'imagining the about-to-be-present' (as Anna Tsing notes) in ways that avoid the 'shadow of inevitability' of neoliberal globalization and its attending 'states of emergence - and emergency ... [where] hope and despair huddle together' (2005, p. 269).

Conclusion

Wendell Bell (2005) has suggested that the study of the future represents for social researchers both a scheme for organizing and analysing the social realities that confront us, and a way of orienting and directing our efforts. We can't turn a blind eye to the fact that we are living through a momentous time - the Anthropocene as some would name it - in which academic scholarship cannot abstain from instigating change in the way we are in this world, or in the plurality of ways through which we make and unmake futures that impact on all life on this planet. In assembling this array of thinkers and scholars we wanted to insist on the urgent need for thinking more seriously about the political relevance and implications of futures studies work, including how to instigate and support more effective public processes to build awareness, capacity, and agency on global environmental change, in ways that better inform and support planning and decision-making. The eight articles in this Special Issue of *Futures* each exemplify Bell's observation, all illuminating the intricate, complicated and often obscure ways in which environmental futures are being told, traded, tamed, promised, transformed and traversed (Adam & Groves, 2007); or how they are calculated, imagined and performed varying and often contested modes of pre-emption, prefiguration, and preparedness (Anderson, 2010). In their own way they show how futures are made possible, probable and preferred as much as they are forged, negotiated, colonized and tamed (Felt, 2011, p. i).

Anticipation is explicitly a taking care of (preparing for) ahead of time (implicit in its etymology). Yet, as our review here of anticipatory environmental research within the wider context and deeper history of future studies suggests, there are times when time's up: when its no longer possible to shape and transform our lifeworlds in ways that we might prefer. It is hardly the case that the accumulation of environmental futures research leads to the progressive aversion of catastrophe. Knowing the future is one thing, but governing it is quite something else. The responsible translation of foresight into preparation, precaution and prevention cannot be presumed. Indeed, it may be that not knowing is crucial to the operation of power. After all, more than half a century has passed since US President Lyndon Johnson was presented with the first public study warning of the potentially devastating effects of the accumulation of carbon dioxide in the atmosphere (Revelle et al 1965). Our present - in which the oceans are already too hot for coral reefs to survive - is the now realized future that we have have known of for a long time.

Considering the profound problem of long-term expectations, John Maynard Keynes once wrote that "[t]he social object of skilled investment should be to defeat the dark forces of time and ignorance which envelope our future" ([1936] 2008, p. 129). As we

have shown, some of the most substantial early investments in futures methodology, and indeed in anticipatory environmental science, were made by transnational fossil-fuel corporations. Anticipating the rise of global warming up the international policy agenda, they responded with a concerted and decidedly anti-social investment in the arts of agnotology, harnessing 'the dark forces of time and ignorance' into the array of finely honed strategies of denial and deferral now deployed in the cause of maintaining fossil capital's imperium (Malm, 2016; Mitchell, 2011). To borrow from Walter Miller's (1959, Ch. 20) long-range post-apocalyptic science fiction, it appears that despite all our foresight, fore-knowledge and foreseeing; "Ignorance has been our king. Many would not profit by his abdication. ... they defraud and govern, enrich themselves and perpetuate their power." In light of our interpretation of the politics of anticipation, we would suggest a critical and ethical re-examination of the production of knowledge in futures studies past and present, an acknowledgement of its often silent proximity to the methods and performances of those that govern. Our environmental futures "as sojourners on a volatile planet", inextricably bound to the "wayward potentialities of [...] other-than-human presences" (McLean, 2016), may well depend on it.

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