Focus Article

Climate change 'science' on the London stage

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This article considers climate change as a contested cultural idea, which is mediated to the public through varying forms of cultural narrative whose conventions and rhetorics impact significantly on how the 'story' is told. Specifically, it examines four recent British stage plays, each of which depict climate change scientists as central characters. These are Steve Waters' *The Contingency Plan* (Bush Theatre, 2009), Mike Bartlett's *Earthquakes in London* (National Theatre, 2010), Richard Bean's *The Heretic* (Royal Court Theatre, 2011), and the multiauthored *Greenland* (National Theatre, 2011). The essay argues that these plays represent an evolutionary step forward from the rather crude, apocalyptic narratives apparent in mainstream film treatments of the subject, insofar that they attempt to grapple—in various ways—with the necessary uncertainty around scientific findings and future projections. They also attempt to dramatize the 'new cultural politics of climate change' (Smith) by examining the relationships between, and contrasting responsibilities of, scientists, politicians, and the lay public. This article considers various critical questions arising from the plays' varying treatments of these interactions. Waters' play sees a pragmatic, technocratic role for scientific advisers in government; Bean's argues for empirical purism (and satirises the UEA Climategate 'scandal' of 2009); Bartlett's presents a Lovelockian scientist figure as the tortured villain in a kaleidoscopic theatrical treatment of cultural despair (following the failure of 2009's Copenhagen Summit); *Greenland* presents scientists old and young as ethically engaged witnesses to environmental change.

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INTRODUCTION

'The story of climate change', Mike Hulme has proposed, 'is a story about the meeting of Nature and Culture, [and] about how humans are central actors in both of these realms.'[1] Yet professional story tellers in the arts have only recently begun to ask the complex questions about what exactly this story is and how it should best be told in the cultural realm. The initial, dominant cultural narrative of climate change has been that of impending apocalypse—the generation of thrilling fear around nightmarish future scenarios.[2] Whether seeking to entertain (as in the near-future disaster movie *The Day After Tomorrow* (2004)) or to agitate for action (as in documentary films such as Al Gore's *An Inconvenient Truth* (2006) or the semi-fictionalized *The Age of Stupid* (2009)), these scary narratives tend to take climate change science and its conclusions as a given: 'the science is settled', Gore famously pronounced.[3] The campaigning logic in foreclosing the scientific debate is clear enough: as the heroine of Richard Bean's 2011 climate change comedy *The Heretic* drolly notes, 'Nothing changes unless everyone is shit scared.'[4] Yet research suggests that attempts to generate public interest in an issue through fear of future disaster deliver diminishing returns over time.[5] A more nuanced cultural debate—a better told story?—may need to be developed if waning attention is to be reengaged.

This article focuses on a recent flurry of British stage plays about climate change, which all premiered at leading London theatres: Steve Waters' *The Contingency Plan* (2009), Mike Bartlett's *Earthquakes in*

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London (2010), Bean's *The Heretic*, and the multi-authored *Greenland* (also 2011).[a] At first glance, the stage might seem an odd context in which to address environmental questions: theatres are controlled, artificial environments designed for the presentation of human behaviors. Site-specific performances, responding to the geographic and historical characteristics of particular places, may prove a more appropriate creative mode for apprehending environmental change itself.[6] Yet the particular aptitude of stage drama as a medium for dialogue and debate (by contrast with, say, the restless visual vocabulary of film) perhaps makes it strangely suitable as a vehicle for exploring what Joe Smith has called 'the new cultural politics of climate change'.[7] Building on a long, British tradition of politically engaged drama, these plays seek to dramatize the often-difficult relationships between research scientists, politicians, activists, and the lay public. Along with recent examples in other media such as Ian McEwan's novel *Solar* (2010), they provide evidence that the cultural 'story' around climate change is moving on from crude apocalyptics. Indeed, in striking contrast to the films cited above, these plays all depict scientists as 'central actors' in the drama, rather than pushing them off into the wings. In each case, moreover, it is the necessary uncertainty around scientific findings, rather than their 'settled' nature as evidence, which animates the plays' key conflicts. Although each is significantly flawed, these dramas are worthy of critical examination for what they tell us about the recent status of climate change science as a set of ideas and reference points circulating in cultural discourse (or, more specifically, in the cultural discourse of a major world city—London being one of the key engines of the global economy[8]).

SCIENTIST AS PRAGMATIST

For the purposes of this analysis, I propose to look at these four plays as two, opposed pairings. Waters' *The Contingency Plan* and Bean's *The Heretic* are very different in tone and implication, but are strikingly similar in their adherence to principles of debate-based drama that date back over a century to the work of George Bernard Shaw.[9] In these plays, set in fixed, 'realistic' physical locations (the only set changes occur during intervals), the central characters represent dialectically opposed positions in debates which become personalized through the entanglement of inter-generational family dynamics. Binarized dramatic structures of this sort have traditionally been used to explore the political spaces between left and right, or between moderate and radical, so what happens when they are adapted to dramatize science?

The debate-play format is demonstrated by Waters not once but twice in *The Contingency Plan,* which actually consists of two, sequentially linked plays. In the first part, *On the Beach*, we meet Will Paxton, a young glaciologist who claims to have alarming new evidence that the rate of Antarctic ice melt is faster than previously estimated. The key source here appears to be Chris Rapley's 2006 British Antarctic Survey (BAS) Report to the UK government.[10] (Waters consulted three BAS scientists while researching the play.[b]) Will is literally being courted by a senior civil servant—his girlfriend Sarika—who sees him as 'the man who's proved [. . .] that in fact the Western Antarctic Ice Sheet is on the verge of collapse; that in fact sea-level rises of minimum five metres are imminent'.[11] (Research suggests that the collapse of the WAIS could lead to a global sea level rise of 4.8 m.)[12] Sarika needs Will's expertise, she believes, to help convince government that drastic action is needed to shield Britain's coastal communities from catastrophe. Yet Will is appropriately cautious about his findings, insisting that Sarika's reference to 'facts' is misguided: 'there's no way I can offer the kind of certainty you seem to be asking for' (Ref 11, p. 20). His father Robin, himself a retired glaciologist, warns Will away from involvement with politicians: 'They want authoritative statements and [. . .] you are compelled to give these closed answers, do you discuss probability, no, risk, no and then you end up looking a fool. Abusing your position' (Ref 11, p. 74). Thus, the initial moral dilemma for Will is a variation on the classic dramatic conflict between purism (be faithful only to the data) and pragmatism (do what you have to, to see that action is taken). Should he risk his father's displeasure by 'compromising' scientific objectivity, in view of the urgency of the situation? Toward the end of *On the Beach,* Will's hesitancy is brought to an abrupt end by news of a fatal tidal flooding event in Bristol: the seas are out of control and pragmatic action must be taken.

In the second play of Waters' diptych, *Resilience,* the scene switches from Will's parents' home on the Norfolk coast to a Whitehall policy bunker, where Will finds himself at odds with the government's Chief Scientific Advisor, Colin Jenks. 'Following a Shavian pattern', noted the *Guardian* reviewer Michael Billington, 'Waters presents us with a passionate dialectic between [these] two men'.[13] This time, however, the purism/pragmatism argument is replaced by a mitigation versus adaptation debate. Jenks insists on the case for steady transition to a low-carbon

economy: 'the message we need to keep rolling out with dogged consistency is about changing habits, mitigation' (Ref 11, p. 93). Will, however, believes that more drastic, adaptive measures are needed: 'Compulsory purchase of inland areas. Demolish all houses that are not carbon neutral. Convert all of East Anglia to a wetland as a protective sump [etc.]' (Ref 11, p. 142). This proposal, which would require government to adopt the kind of emergency powers associated with wartime, appears to be inspired by the radical vision of James Lovelock's popular science book *The Revenge of Gaia* (2006): 'We in the UK are as we were in 1939 and may soon be, to a considerable extent, alone; our future food and energy supplies can no longer be taken as secure. [. . .] Our cause will be the defence of our civilization to ward off the chaos that might otherwise overtake us'.[14]

Waters attempts to maintain some balance in this debate. Lovelock's arguments are described by one character as 'certifiably crazy' (Ref 11, p. 104), and the cautious Jenks is portrayed as likeably frank, and personally committed to a low-carbon lifestyle (he arrives onstage in cycling gear). Nevertheless, Jenks' position is significantly undermined by revelations about his past. It transpires that he and Will's father Robin were research partners in the 1970s, whose work on Antarctic glaciers had seemingly confirmed the existing 'stability hypothesis' (the fictionality of which is by no means clear to the lay spectator): 'Basically it claims the West Antarctic is impregnable', the ice stable enough to withstand significant temperature fluctuations (Ref 11, p. 19). Yet some of the duo's melt-rate data, we learn, was inconsistent with this hypothesis: unable to explain these variations, Jenks had buried the inconvenient figures. When Robin, the data purist, tried to draw wider attention to the inconsistencies, he was silenced by political hostility: 'they spat in my face' (Ref 11, p. 64). Hence his retreat to monastic isolation, even as Jenks went on to become 'the most respected climatologist *[sic]* in the UK, ranked third globally,' and chair of three IPCC panels (Ref 11, p. 96). Will's upstart challenge to Jenks's power position in *Resilience* is thus, on one level, an opportunity 'to . . . atone' for Robin's past humiliation (Ref 11, p. 100). This Oedipal twist is given added resonance by the fact that, in Waters' scheme for the doubling of actors across the two plays, Robin and Jenks are played by the same person (actor-playwright Robin Soans, in the original Bush Theatre production).

Waters' scenario, then, is consistent with the inter-generational dynamics of classic realist drama. In the context of a play about climate change, however, the implication is that bellweather data should have been acted upon a generation ago. Back then, Robin maintains, we 'had no conception about CO_2' as a cause of atmospheric warming (Ref 11, p. 59), but had the data been properly investigated, vital discoveries might have been made earlier. In point of fact, climatalogical understanding of CO_2 as a potential 'greenhouse gas' was already sufficiently advanced, in 1974, for the administration of President Gerald Ford to have established a Subcommittee on Climate Change.[15] Yet a glaciologist, like Robin, might well have been ignorant of such ideas, since it was not until the 1980s that an interdisciplinary community of 'Earth system science' researchers began to evolve.[16] Jenks's burying of inconsistent figures was, Waters suggests, less a case of cover-up than a convenient elision, since he did not have the knowledge at that stage to appreciate their true significance. The play's scenario is thus strikingly consistent with Lovelock's insistence that scientific specialization impeded the development of a broader, systemic understanding of climate change impacts: 'if the middle management of science had been somewhat less reactionary about Gaia, we might have had twenty more years in which to resolve the much more difficult human and political decisions about our future' (Ref 14, p. 33).

It might be argued, however, that Lovelock here foregrounds professional resentment over political reality: it seems unlikely that faster movement toward an earth-systems consensus would have made any difference to the willingness, or otherwise, of governments and corporations to jeopardize economic growth in the name of scientific hypotheses. Nevertheless, both Lovelock and Waters place the weight of responsibility for moral failure squarely on the shoulders of mainstream science (as embodied by Jenks), thereby implicitly exempting other players from the equation. Indeed, in *Resilience*, the shallowness and self-interest of politicians is depicted as a given: the government ministers are little more than cartoons, peripheral to the central confrontation between scientists. That conflict is resolved by the arrival of news about a massive tidal surge bringing watery disaster down the East coast of England toward London (the same premise as in the 2007 disaster movie *Flood*[17]): Will's dire warnings about sea-level rise seem vindicated, while Jenks's cautious mitigation policy now appears as dangerously complacent as his actions a generation ago. He has to stand aside as Will gravitates to the role not just of scientific advisor but of technocratic guru, single-handedly orchestrating the national crisis response. Thus, for example, we

find this glaciologist altering Met Office wave height predictions according to his own calculations: 'It's an adjustment up, it's not enormously significant. But if it's right, Skegness is going under [in] ten minutes' (Ref 11, p. 165).

The apocalyptic climax of *Resilience,* although perhaps justifiably 'overheated' given the subject, nonetheless seems a long way from the careful reflections on scientific uncertainty with which *On the Beach* begins. Waters reverts, in effect, to what Hulme calls 'a classic view of discoverable and objective scientific 'facts', which are socially and politically neutral,' and which need to be applied in government policy via the wisdom of 'a skilled and compliant technocracy offering their impartial scientific knowledge to policy makers'. The essence of this naïve but nonetheless popular 'science-policy model', Hulme concludes, is captured in the aphorism 'truth shall speak to power' (Ref 1, p. 103). This is precisely the role adopted by Will in *The Contingency Plan*, and dramatic logic therefore demands that he supplants Jenks, for whom (as Will damningly asserts) 'the time is never right to tell the truth' (Ref 11, p. 138). Waters does introduce a note of caution around Will's radical new action plans: his proposals endear him rather too much to hard right-wing minister Tessa Fortnum, who relishes the climate emergency as an opportunity to assert authoritarian control over the nation. Nevertheless, any potential threat to democracy presented by this resort to technocracy ultimately reads as a secondary consideration in the drama. The scientist-protagonist is doing what needs to be done *now*, after too little action in the past.

SCIENTIST AS EMPIRICIST

Richard Bean's *The Heretic* presents a kind of mirror image to the anxious urgency of Waters' play. This play too centers around a debate between scientists over the appropriate ethical and political response to climate change data. Here, though, the action is presented not as family tragedy but as situation comedy, staged within the mundane, quotidian surroundings of university office (Act One) and private home (Act Two). In these contexts, scientific arguments are rendered as the source for barbed, witty squabbling between Diane Cassell (the eponymous heretic), her work colleagues, and her family. Diane's adolescent, anorexic daughter Phoebe accuses her of 'a catastrophic failure of the imagination' for failing to appreciate the scale of future dangers (Ref 4, p. 105). Yet Diane doggedly insists that the task of science is to collate empirically verifiable data, not to 'imagine' apocalyptic futures. Climate change projections are therefore inherently suspect because 'computer models are not evidence, they're just another hypothesis'; as a chaotic system, climate 'almost by definition cannot be modeled' (Ref 4, p. 57). Diane is a specialist on sea level in the Maldives, and her data tells her that 'it's not rising!' (Ref 4, p. 46). This claim is apparently based on the contested findings of the Swedish paleogeophysicist Nils-Axel Mörner.[18,19]

In another variation on the purism/pragmatism dialectic explored in *On the Beach*, Diane's stubborn empiricism brings her into conflict with her senior colleague, Kevin Maloney. Lead author on a chapter for the latest assessment report by the Intergovernmental Panel on Climate Change (IPCC), and reportedly a former student of James Lovelock's, Kevin believes the computer models robust enough to necessitate urgent, direct engagement with policy makers. Like Jenks in *The Contingency Plan*, Kevin is presented as a grumpily likeable figure, and his disagreements with Diane are written with some attempt at even-handedness on Bean's part. When, for example, he challenges Diane to state exactly which tenets of climate change orthodoxy she disagrees with, he eventually establishes that there are in fact very few. Nonetheless, his credibility (and by extension the mainstream science position he represents) is repeatedly undermined, throughout the play, by the suggestion that he is more interested in professional kudos and departmental research income than in any unalloyed search for scientific truth. Kevin privately admits to scepticism about the famous 'hockey stick' temperature curve popularized by the IPCC's Third Assessment Report of 2001,[20] but insists on its political value to his discipline: 'every good thing that's happened in Paleo in the last ten years is because of the Hockey Stick' (Ref 4, p. 44). In a competitive university context, he reminds Diane, climate change has made Earth Sciences 'the kings of the castle. Let's not fuck it up, eh?' (Ref 4, p. 35).

As in *The Contingency Plan*, the play's animating tensions are accentuated by memories of the 1970s. Here, though, the past is recalled as a time not of ethical failure but of youthful innocence—*before* the mania over climate change led to such compromised careerism. Diane reminisces about a graduate field trip to the Arctic in which she and Kevin shared both idealism and intimacies: 'not cost effective, obviously. But inspirational. What happened to you?' (Ref 4, p. 66). As a manager, Kevin now proves himself willing to have Diane suspended from her post, simply for expressing professional opinions inconsistent with the official stance of their department. He

also eventually admits to the willful misrepresentation of data. The 'typo' that Diane has spotted in proof reading 'his' draft IPCC chapter 'wasn't a typo. I put it in deliberately' (Ref 4, p. 74). A reference to the Himalayan glaciers melting 'by 2035' was, he admits, sourced from a WWF document rather than a peer reviewed journal. Bean thus has the fictional Kevin take responsibility for a notorious factual inaccuracy in the IPCC's Fourth Assessment Report (2007),[21] for which Dr. Murari Lal was the actual culprit. 'It related to several countries in this region and their water sources,' Lal told the *Daily Mail*: 'We thought that if we can highlight it, it will impact [on] politicians and encourage them to take some concrete action.'[22]

Lal's sleight of hand was discovered retrospectively by investigative journalists, in the wake of the 2009 'Climategate' furore—when emails between researchers at the University of East Anglia (UEA) were hacked into by climate change sceptics seeking to find evidence of distortion or cover-up. *The Heretic*, which can be read as a dramatic response to these events, uses a fictionalized variant on the UEA case as a key narrative thread. Diane, it seems, has been attempting to establish, via requests under the Freedom of Information Act, the source data for claims made by scientists at 'Hampshire University', about which she is sceptical. Their suggestion is that the Hockey Stick graph has been corroborated by new dendrochronological evidence (tree ring data), but when Diane's wayward student Ben succeeds in hacking Hampshire's mainframe, he finds that the suspect claims are based on a statistically insignificant tree sample: 'How the hell do you get a hockey stick from this cohort?!' Diane asks triumphantly (Ref 4, p. 88).[23] Bean is surely alluding here to one of the most widely attacked of the Climategate emails, in which UEA Professor Phil Jones referred to 'Mike [Mann]'s *Nature* trick'—a presentation of statistical evidence so as to 'hide the decline' in tree ring data post-1950.[24] In 2010, Jones and his colleagues were cleared of any wrongdoing by a UK Parliamentary Committee, which found that these phrases were colloquialisms for respectable data handling procedures.[25] In his dramatic variation, however, Bean explicitly recasts the scenario as a case of limited facts being willfully misrepresented by careerist scientists.

The Heretic's treatment of these events is again underpinned by Bean's insistence on the idea that scientists should be disinterested arbiters of fact, untainted by external interests. This position has an obvious appeal to lay audiences, but it is also, at best, naïve: 'most scientific research', contend Sarewitz and Pielke, 'whether funded by public or private moneys, is intended to support, advance or achieve a goal that is extrinsic to science itself'.[26] Ignoring such contextual considerations, Bean renders the climate change argument as one in which scientific claims are verifiably either true or false (as opposed to contingent and uncertain), and thereby sidesteps more complex and challenging arguments around—most obviously—the management of future risk. In its blithe, comedic way, *The Heretic* suggests instead that there is really nothing to worry about. The play's closing monologue, delivered straight to the audience on the pretext that Diane is 'rehearsing' a speech, argues that human creativity is the greatest wonder of the universe, eclipsing all the stars and planets: 'Stars are thick. Which star came up with the idea of using the energy stored in a lump of fossilized swamp to power the internet? Which star invented air travel, the internal combustion engine?' (Ref 4, p. 115). The burning of fossil fuels is creative, inspiring, and intrinsically human—so why stop? This specious argument is given rhetorical weight by its climactic placement, and by its delivery—in the Royal Court Theatre's premiere production—by the respected Shakespearean actress Juliet Stevenson. 'Would [Bean] extend the same charity', Michael Billington wondered in his *Guardian* review, 'to a flat-earth advocate?'[27]

SCIENTIST AS SCAPEGOAT?

Waters' *The Contingency Plan*, then, presents a scenario in which mainstream science is guilty of playing down the threat of climate change, whereas Bean's *The Heretic* implies that the evidence has been played up, in order to grab headlines and funding. Either way, it would seem, scientists are at fault—and either way, the lay spectator is largely exempted from personal responsibility in the climate change drama (either because it is already too late to avert the crisis, or because no such crisis really exists). This exemption is particularly striking in the context of a British theatre culture which has recently shown particular interest in extending the ways in which spectators are involved and implicated in theatre events.[28] Tellingly, however, reviews for these climate change plays often display an aversion to the idea that they might 'preach' about personal responsibility: 'The worst thing about the climate change debate', opines *Daily Telegraph* critic Charles Spencer, 'is that it creates a feeling of low-level guilt and depression and gives the self-righteous a terrific excuse to nag and bully us'.[29] It may be wariness of such accusations that has prompted these playwrights

to focus so insistently on scientists, and to depict as a source of humor members of the public who try to involve themselves in the debate directly. In *The Contingency Plan*, Robin's ineffectual wife Jenny is a member of North Norfolk Association for Climate Change Action, apparently a kind of earnest knitting circle whose acronym—NNACCA—renders it plainly ridiculous.[c] In *The Heretic*, Diane's student Ben and anorexic daughter Phoebe, both would-be eco-activists, are portrayed as naïve adolescents in need of firm parental guidance. Her scepticism also results in Diane's life being threatened by a buffoonish group calling themselves the Sacred Earth Militia.

This ridiculing of direct action is taken to another level in the multiauthored play *Greenland*, which premiered at the National Theatre in February 2011 (just as *The Heretic* opened at the Royal Court). In this play, another confused, anxious young woman, Lisa, rebels against her traditionalist parents and joins a group of environmental activists seeking to protest against big oil lobbyists. This narrative thread represents the most sustained treatment of activism in any of the plays considered here, but the tone is cartoonish and condescending throughout ('we've got climate wankers', an oil executive calmly tells security, as they chain themselves to his desk[30]). There is no sense that the carefully researched work of activist groups both large (e.g., Greenpeace) and small (e.g., the London-based collective Platform themselves the authors of an interactive performance piece on climate change, *And While London Burns*[31,32]), might have a significant role to play in the new cultural politics.

Greenland's failure in this respect is particularly notable, because it seems to have been conceived as an attempt to open up a diversity of perspectives on climate change, by involving a range of different writers in its creation. Part of a recent London trend for multiauthored plays on 'big' themes (other examples include *The Bomb—a partial history*, by 9 authors, and *Decade,* for the anniversary of 9/11, by 20 authors[33]), *Greenland* consists of a collage of interwoven narrative threads commissioned from four, very different playwrights—Moira Buffini, Matt Charman, Penelope Skinner, and Jack Thorne. These stories eventually coalesce around the Copenhagen COP15 Summit, of December 2009. The idea appears to have been to generate a sense of mutual investment in, and responsibility for, the outcome of those talks, but the quality of writing is extremely uneven, and the production was widely derided by critics: 'the whole show feels as though the National thought it ought to do something serious about global warming, but couldn't find a decent play on the subject'.[29]

More successful in its attempt to create a multi-perspectival theatrical reflection on the cultural anxieties around climate change is Mike Bartlett's *Earthquakes in London*, which preceded *Greenland* at the National Theatre, opening in the summer of 2010. In contrast to the relatively sober, naturalistic staging of *The Contingency Plan* and *The Heretic, Earthquakes* was originally staged in the Cottesloe studio space, in an immersive design scheme dominated by a curling red runway that snaked around and about the audience. Within this unorthodox layout, director Rupert Goold orchestrated a seemingly chaotic collision of interwoven narratives and spectacular set pieces. The play's most obvious influence is Tony Kushner's dramatic 'fantasia' *Angels in America* (1992), which had portrayed the AIDS crisis as a focal point among pre-millennium tensions. Similarly, in *Earthquakes*, 'ash clouds, tsunamis, religious hatred, economic collapse' are presented alongside climate change as the ingredients for a cocktail of contemporary confusion.[34] Bartlett's opening stage directions specify that: 'The stage should overflow with scenery, sound, backdrops, lighting, projection, etc. Everything is represented. It is too much. The play is about excess, and we should feel that' (Ref 34, p. 5).

Written in the months following the COP15 summit, *Earthquakes* reflects an almost palpable sense of despair at the failure of global leaders to achieve any substantive agreement on mitigating the continuing growth of carbon emissions worldwide.[35] The dramatic tone is both nihilistic and hedonistic. 'It's Weimar time, it's Cabaret, across the world', one character remarks, pointing again to a parallel with the pre-World War II period: 'You feel it, we all do. We know there's nothing to be done, so we're dancing and drinking as fast as we can' (Ref 34, p. 105). That spirit is embodied by Jasmine, the play's youngest character—a student and part-time burlesque dancer, who exhibits a directionless urge to revel in rebellion, but is haunted by uncertainty and fear. So too is her sister, Freya, pregnant with her first child, who seems riddled by guilt at the thought that she might be bringing a baby into a world on the brink of catastrophe. Freya smokes and drinks with abandon, as if trying to kill off the new life in her womb, and experiences terrifying, hallucinogenic visions of death among the next generation. '*The women throw the babies up in the air*' reads one stage direction: '*They explode into black powder, that covers everyone, and is blown about by the wind*' (Ref 34, p. 67).

These private crises are mirrored by the more public struggles of a third sister, Sarah, who is Minister for Climate Change in the UK's new, Coalition government. Sarah is faced with decisions over whether or not to recommend a halt to further expansion of UK airports (Bartlett is here riffing on the fact that David Cameron's government, as one of its first actions in office, scrapped plans for a third runway at Heathrow[36]). Unlike Waters, Bartlett paints his politician character as having principles and conscience: in yet another variation on the purism versus pragmatism dichotomy, Sarah must weigh up her environmentalist instincts against concern for her future political credibility, should she move too far, too fast. Far from assuming any straightforward deference to technocratic advice, Sarah is aware that her role is to take multiple factors into account: 'It's complicated because we have to consider everything. Transport means investment. Investment means greater employment. Greater employment means less poverty, which I assume you're in favour of?' (Ref 34, p. 54). This last remark is aimed at Tom, a climate activist of Eritrean descent, who speaks passionately of the deadly impact of climate change in Africa, and invokes the tipping point metaphor to reject moderate arguments: 'according to the best scientists, we've got about five years left before it's too late, so you'll forgive me if I don't wait for the next *election*, you'll understand if I'm *impatient*' (Ref 34, p. 130). In a microcosmic mirror of the stalemate in Copenhagen, Sarah finds herself torn between intolerable extremes: Tom demands a halt not just to airport expansion but to *all* air travel, whereas Carter (a mysterious airline representative) will stop at nothing, bribery and blackmail included, to ensure her compliance with his industry's expansionist goals. Meanwhile, under pressure, Sarah's marriage is falling apart. As *Guardian* critic Lyn Gardner notes, the play 'is at its best [...] in the quiet domestic exchanges between flawed human beings, blundering onwards'.[37]

Earthquakes, then, presents a richer and more varied range of characters and experiences than does *The Contingency Plan,* and acknowledges the difficult distribution of responsibility for acting on climate change. Yet the whirlwind of the play's action ultimately hinges, once again, around a scientist—Robert Crannock, father of the three sisters. Clearly inspired by James Lovelock, Robert is a former NASA scientist, a specialist in atmospheric composition, who has become an environmentalist icon: 'in green circles, he's a god' (Ref 34, p. 78). Lovelock's picture of the Earth, in *The Revenge of Gaia,* as a self-regulating organism shaking off an infection, is efficiently summarized in Robert's mini-lecture to Freya's husband, Steve: 'We were part of a system, a relationship, and we abused it. [...] The world will be fine in the end, and it knows what it wants. It wants to get rid of us' (Ref 34, p. 97). Like some old testament prophet of doom, Robert insists that it is simply too late to mitigate emissions or seek to limit global warming: 'I'm sure you have a bag for life, you travel by train and all that makes you feel better but it's a complete waste of time because the global climate has never been interested in two degree anything' (Ref 34, p. 95).

Robert's rhetoric is brutally frank, and perhaps not unrealistic (some recent studies suggest that it is already too late to keep warming in this century below the much-debated two degree threshold[38]). Yet in Bartlett's scenario, these bleak forecasts also seem to stem from bitterness and corrosive guilt. It transpires, through flashback scenes, that back in the 1970s Robert accepted bribes from the airline industry to suppress his own findings about the risks to the atmosphere from aviation emissions. The parallel with *The Contingency Plan* here is striking, except that where Jenks ignored inconvenient data through complacency, Robert was plainly corrupt. Not only that: in addition to having jeopardized the future of the planet, he is apparently the source of his three daughters' emotional difficulties, having refused contact with them for 20 years, since the death of their mother. Freya's terror of childbirth, Steve also establishes, is a direct consequence of recent contact with Robert, and his dire warnings about to the planet's inability to support an ever-expanding population: 'I told her that her child will regret she was ever born. Hate her mother for forcing her into a terrible world. I told her to do whatever it takes. I told her to kill it' (Ref 34, p. 104). Robert thus becomes the pantomime villain in Bartlett's theatrical extravaganza. Where Waters' play insists on maintaining faith in the scientist's role as truth-seeker, *Earthquakes* instead suggests an urge to 'shoot the messenger'—to render the scientist as scapegoat for the world's irresolvable ills.

SCIENTIST AS WITNESS

It is ironic, but perhaps not merely coincidental, that the least dramatically satisfactory of the plays examined here—*Greenland*—also provides the most balanced view of the role of scientists, in relation to each other and the world. The two key scientist characters depicted are Ray, a young climate modeler, and Harry, an ageing biologist whom Ray has recently established contact with. Harry has been 'counting black

guillemots in Alaska [. . .] for thirty-five years. Sent us records stretching back to the seventies' (Ref 30, p. 22). Yet again, we are presented with a legacy of the past, and an inter-generational relationship, but this time there is complementarity, rather than dramatic tension, between purism and pragmatism. The value to Ray's future modeling of Harry's diligently gathered lifetime of bird data is made clear: 'Because guillemots are Arctic birds whose breeding is in response to snow melt', Harry explains, 'my statistics on their patterns shows what change in Arctic temperature is doing' (Ref 30, p. 64).[39]

Ray, like Will in *The Contingency Plan*, is wooed for his findings by a female civil servant, Phoebe, who believes he can make a difference in the run-up to the Copenhagen Summit. Unlike Will, though, Ray does not develop messianic zeal for his cause. His relationship with Phoebe is characterized by a recurring game in which he outlines 'Worst Case Scenarios': 'American and Russian nuclear submarines, on routine patrol in the North Sea, collide, causing the world's worst ever nuclear blast [. . .] Kim Jong-Il challenges Barack Obama to a fist fight. He accepts' (Ref 30, p. 29–30). Eventually the scenario outlined is an apocalypse of Lovelockian proportions: 'the sixth mass extinction of life on the planet [. . .] A global rise in temperature so acute the heatwaves buckle the ancient infrastructure of every city in Western Europe'. The game, he stresses, like his modeling, is intended to outline possibilities, not certainties: 'But after playing 'Worst Case Scenario', it doesn't feel quite so bad, right? To think about the unimaginable' (Ref 30, p. 51). Here playfulness and seriousness are deftly combined. When Ray's data is largely ignored at Copenhagen, he pointedly refuses to become angry or embittered: 'It's a model. It's just a model', he tells Phoebe, 'there'll never be a complete picture' (Ref 30, p. 67, 69). Ray seems well aware of the limits of his own responsibilities and capabilities and expects others to live up to theirs. He also wants to lead a normal life, worst case scenarios notwithstanding, and teases Phoebe with the prospect of starting a family: 'We shouldn't be the ones who don't have [kids]', he announces, as if contradicting Bartlett's Robert Crannock. 'Then who should?' Phoebe asks. Ray's three-word response resonates on many levels: 'I don't know' (Ref 30, p. 86).

Something of the same circumspection marks *Greenland*'s depiction of Harry, whose Arctic isolation is dramatized through a time-slipping conversation with his younger self, Harold. There is a wistful, elegiac quality to this thread of the play, as the older man describes the everyday threat presented to his encampment by polar bears and shows Harold a flock of guillemots wheeling in the sky (a scene assisted by some ingenious National Theatre staging effects). The dominant impression is of a likeable but lonely old man, wondering whether his lifetime's work has been worth the sacrifices. Yet, armed with this experience of the future, the young Harold timeslips back to his entrance interview at Cambridge University's Geography department and delivers a simple, striking vindication of his as-yet unlived life as a scientist: 'Geography—for me—is about habitat—how we fit in the world, how the world fits us. It's about seeing the world as it is, not how you want the world to be. That's exciting. Because the world is changing, sir. And I'm excited by watching that change' (Ref 30, p. 94).

The scientist's role in *Greenland*, then, is not that of technocrat, maverick, or false prophet, but of ethical witness. This is a difficult concept to present through dramatic action (normally predicated on argument and conflict), and that may be a contributory problem in *Greenland*'s failure to work as compelling theatre. The formal specifics of any cultural medium—from theatre to rolling news—necessarily have a crucial, shaping influence on the ways in which it tells the climate change 'story', and to judge from the evidence of these plays, dramatists are still wrestling with the challenge of finding appropriate theatrical forms by which to address these issues ('how we fit in the world, and how the world fits us'). 'So far', Robert Butler writes, 'we have only seen the first efforts by artists and writers to come to terms with the full meaning of the climate science that has emerged over the last 20 years. These are still early days'.[40] These plays collectively suggest, through their divergent perspectives, that the public debate around climate change is currently in a state of considerable flux: this changing situation is indeed exciting, as well as concerning.

NOTES

[a] These plays were performed, respectively, at the Bush Theatre, National Theatre, Royal Court Theatre, and National Theatre. The coauthors of *Greenland* are Moira Buffini, Matt Charman, Penelope Skinner, and Jack Thorne.

[b] These were Anna Jones, Eric Wolf, and John King.

[c] The British slang word 'knacker', originally referring to a person whose job was to slaughter elderly horses for glue (at 'the knacker's yard'), now functions as a colloquialism both for testicles ('knackers') and for exhaustion ('I'm knackered').

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