



Climate Change in a Chromium World: Estrangement and Denial in Ted Chiang’s “Exhalation”

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Abstract: This article discusses Ted Chiang’s “Exhalation” as a story of climate change with the potential to resist polarisation of attitude and different forms of denial. Through the lenses of naturalisation and world reduction the story can be seen to recontextualise climate change. As the mechanical inhabitants of the chromium world of the story contemplate their role as agents of their own demise, the story addresses the material and psychological impact of climate change. The process of naturalisation and the resultant estrangement disentangle climate change from real-world politics and polarised attitudes, while at the same time drawing attention to them. World reduction simplifies the science and politics of climate change, and thereby undermines the reasoning behind different levels of denial.

Keywords: Ted Chiang, climate fiction, estrangement, world reduction, climate change, denial, responsibility

Climate change is susceptible to ideological polarisation. The attitudes affirming and denying climate change seem to align with party politics, with both liberals and conservatives holding antagonistic and prejudiced views of the other side. According to Dan Kahan, people rely more on group allegiances than on their knowledge of what is known to science as they assess whether to “believe” in climate change (8–12). Thus, for climate-change sceptics, both the acknowledgement of climate change and action to combat it can threaten their cultural identity and membership in their cultural group (Kahan 14; Cohen 24). Others argue that the polarisation between warmists and sceptics must be challenged for democratic debate about climate change to be possible (Garrard et al 17). Kahan suggests disentangling the discussion of climate change from political identity, which would allow people to hold on to their cultural identity and rely on science in policymaking (28–29). His focus on science and effective science

communication does not account for the coexistence of concern for the climate and inaction.

Climate change is susceptible to different levels of denial. In terms of anthropogenic climate change, we can see denial at work, especially as a disconnect “between scientific knowledge and public opinion” and “opinion and behaviour” (Hoggett 56–57). In other words, in addition to climate sceptics’ literal denial of climate change, even “those who express concern about climate change may do little about it” (57). This implicatory denial does not dismiss the facts, but deflects the blame and/or call for action they imply. As Kari Norgaard notes, while climate scepticism may be “flashy and attention grabbing”, the majority of people know the threat climate change poses, but do not think about it in or let it affect their everyday lives (3–4). She also argues that this inattention to climate change is socially organised (11–12). Denial has a protective psychological function, as an “unconscious defence mechanism for coping with guilt, anxiety and other disturbing emotions aroused by reality” (Cohen 5), but it also obstructs taking action that would mitigate the effects of the real-world threat that triggers denial (Cohen 5–6, 23–24; Milburn and Conrad 3). Therefore, tackling climate change, also requires overcoming different forms of denial on different sides of the debate.

Ted Chiang’s short story “Exhalation” (2008) can be read in the context of climate change in a way that decouples it from cultural identity and resists different forms of denial. The story presents an enclosed chromium world inhabited by argon-breathing mechanical beings who discover that their atmosphere is slowly changing in a way that will eventually lead to their death. “Exhalation” invites the reader to consider how the mere act of living and breathing makes a world inhospitable for its inhabitants and how they react to the knowledge that they are the cause of their own demise. The relocation to a world completely unlike ours creates subtle parallels to climate change that avoid entanglement in real-world politics while at the same time drawing attention to them. Still, estrangement appears to be a double-edged sword: while some distance allows the familiar to be recontextualised (Spiegel 375), too much distance can leave the recontextualisation unnoticed. Striking a balance between being subtle enough to be “really effective” (Mendlesohn 5) and not so subtle as to obscure the estrangement that shifts perspective in acknowledging climate change and denial can go amiss if the reader is not already environmentally oriented. In other words, rather than the story affording a fresh perspective to unlike minds, the parallels between the climatic changes in the story and in the real world may become apparent only to those who are already concerned by climate change.¹

In this article I discuss the reframing of polarisation and denial of climate change in “Exhalation” through naturalisation, or the process of making the strange elements of an SF story familiar and thus allowing them to cast the familiar in a new light (Spiegel 372–76), and world reduction, an “operation of radical abstraction and simplification” (Jameson 223), in which the complexity of the real world is deliberately reduced in order to show that reality from a fresh perspective. Both processes aim to

¹ In fact, most early reviews make no mention of climate change at all, and address “Exhalation” only as a story about the second law of thermodynamics and entropy. According to Ted Chiang, his intention was indeed to fictionalise entropy (342–43). Despite the author’s stated intention, the story still affords a perspective on climate change, and since the publication of the short-story collection *Exhalation* (2019), more reviews have also addressed “Exhalation” in terms of climate change. In the eleven years between the publication of the short story and the collection, climate change discourse has intensified, which might in part explain the difference in receptions.

recontextualise the reader's reality by producing a difference between the real and fictive worlds: one by adding features that do not exist and the other by cutting out features that do.

Naturalisation and Estrangement

SF draws from estrangement its power to show an aspect of the reader's accustomed, lived existence from a fresh perspective, to reframe a political or social question of the real world in a way that provides potential for new insights. It uses the novum to create differences between the real world and the world of SF, casting the familiar world in a new light. However, as Simon Spiegel points out, in SF the strange elements of the fictional world must first be made familiar before the familiar can be made strange (372, 375): the novum of the story must first be naturalised and accepted as normal, and only then will the estranging effect be able to recontextualise something in the real world.

However, the world in "Exhalation" is not a normal world with a twist of the strange, but a rather strange one with a twist of normalcy, and yet this very strange world seems familiar. The exterior of the chromium world and its mechanical inhabitants are completely alien, but the lives and social conventions of the beings are familiar and cosy. Instead of naturalising a strange aspect in an otherwise familiar reality, "Exhalation" naturalises the entire world with the help of familiar features and customs within this strange reality.

Spiegel formulates naturalisation as the "basic formal process noticeable in sf" that can be achieved, for example through focalisation (376–77). This is also the case in "Exhalation", which naturalises its world by focalising it through a first-person narrator, presenting the world through someone indigenous to it. Thus, the reader is invited to identify with the narrator and to see the world through his² eyes. In addition, the narrator addresses the narratee, explaining that he engraves these "words to describe how I came to understand the true source of life and, as a corollary, the means by which life will one day end" (37), which suggests that his implied reader is not familiar with the world, but is expected to become so over the course of the narrative. In the end, the narrator not only invites the narratee to visualise his world, but even claims that "through the act of reading my words, the patterns that form your thoughts become an imitation of the patterns that once formed mine" (56). This underlines the identification expected to occur between the narrator and his implied reader, and presumably an actual one also. Suggested here is not just becoming familiar with another's reality, but also being changed by it when even thought patterns adapt in the process of reading. This is what estrangement in SF also strives for – a shift in thought patterns through recontextualisation. It is thus conceivable that this shift could translate into changed individuals who change the world.

Although the narrator is a mechanical being and, therefore, fundamentally different from the reader, he is presented in many ways as very humanlike and familiar through his manners and behaviour. He has a friendly storyteller's voice, and a frank, unassuming manner as he tells the events of his world. This and the direct address invite readers to trust the narrator and his account of his world and the true source of life. The fact that the world is presented through a trustworthy, straightforward narrator encourages the reader to accept the world, one that is realistically impossible

² "Exhalation" only uses male pronouns, and so the narrator is also addressed thus here.

but nonetheless plausible within its own framework. The narrator also draws on universal truths of his world: “It has long been said that air (which others call argon) is the source of life For most of history, the proposition that we drew life from air was so obvious that there was no need to assert it” (37). Even though he then goes on to disprove this very truth, the acknowledgment of the beliefs of his people suggests objectivity. His detailed demonstration to the contrary seeks its credibility from the scientific process, which is further supported by the narrator’s profession as a scientist.

The world is also made familiar through the narrator’s description of daily life and community. The narrative naturalisation, where the “narration accepts the novum as well as takes its point of view” (Spiegel 377) happens on the level of the story. The strange customs have an air of normality because they are presented as normal within the story world and because of their similarity to corresponding customs in the real world. The collision or dissonance between the fictive and the reader’s worlds, familiar from Darko Suvin’s cognitive estrangement, happens here not with bringing a strange element to an otherwise normal world, but with bringing normal customs into a strange one (see Spiegel 375; Mendlesohn 5). For example, the daily changing of lungs (cylinders filled with argon) is entirely strange, but at the same time the activity is framed as a coming together, much like unhurried family suppers, from which the beings “draw emotional sustenance as well as physical” and which entail a social code of polite behaviour:

If one is exceedingly busy, or feeling unsociable, one might simply pick up a pair of lungs, install them, and leave one’s emptied lungs on the other side of the room. If one has a few minutes to spare, it’s simple courtesy to connect the empty lungs to an air dispenser and refill them for the next person. But by far the most common practice is to linger and enjoy the company of others, to discuss the news of the day with friends and acquaintances and, in passing, offer newly filled lungs to one’s interlocutor. While this perhaps does not constitute air sharing in the strictest sense, there is a camaraderie derived from the awareness that all our air comes from the same source.... (38)

Thus, from the very beginning the mechanical creatures are framed as social and emotional beings living in close community, where social codes of behaviour, such as politeness and courtesy, are very similar to customs in the reader’s world. The activity of installing and filling lungs seems to perform the same social function as family dinners, which are as much about upholding social bonds as about nourishment. The filling stations are a place where the beings come together and show consideration for each other through simple gestures like filling and offering lungs to each other, much as food might be brought to a dinner or passed around the table. This relaxed coming together is both familiar and nostalgic, harking back to a time before microwave dinners and the hectic pace of modern existence.

This apparent nostalgia makes both the society and the mechanical beings themselves seem old-fashioned. Their bodies are not made of plastic and circuits, but rather have a steampunk aesthetic of rods, pistons, hoses, switches – their brains a “microcosm of auric machinery, a landscape of tiny spinning rotors and miniature reciprocating cylinders” (46). This indicates a retrofuturist view of robots that looks back in time rather than forwards. In addition, this sense of the past is reinforced by the apparent lack of advanced technology. The narrator engraves his story on copperplates, and news from other districts are passed on by word of mouth. The narrator’s study of anatomy – with his rudimentary understanding of reflexes and

discovery of the brain's basic operations – is reminiscent of discoveries that took place in our world in the eighteenth century. In other words, the world is presented as more nostalgic than futuristic, and framed as cosy and familiar. In this world progress seems so slow as to give the impression of a world in stasis, until the revelation of the atmospheric changes proves otherwise.

This combination of strangeness and familiarity enables a recontextualised perspective on climate change. On the one hand, naturalisation makes the world relatable despite its drastic difference to the world of the reader. On the other, the world is strange enough so that it does not so easily trigger the denial that is often entangled with discussions about climate change, whether in the form of scepticism or of the disconnect between concern and action. This is further reinforced by the fact that the story never mentions climate change, and it is up to the reader to draw the parallel between the atmospheric changes in the story and anthropogenic climate change. Naturalisation also makes the atmospheric changes a matter of undeniable fact, leaving little room for disbelief. “Exhalation” takes its time to naturalise the world before mentioning atmospheric changes. Only towards the end of the story is it revealed how air and the narrator's study of anatomy are connected to the true source of life, which then makes it possible to see the parallel to climate change. As the story gradually naturalises the argon-breathing creatures with their detachable lungs and their cylindrical, enclosed chromium world, it also naturalises the atmospheric changes in this world. All are presented as factual elements of the world; if one change is accepted, there is no reason not to accept the others. Furthermore, as the story is one of discovery, the narrator takes the reader step by step through the evidence to the conclusions that appear even to him as an unexpected “cascade of insights” (48). The slow build-up of clues leading to the discovery of the “true source of life” runs parallel to the gradual naturalisation that leads to an estranging effect and the “cascade of insights” expected to occur for the reader as perception is de-automised and the familiar can be seen anew (see Spiegel 376).

World Reduction and Climate Change

The narrator, through his study of the brain, discovers that the source of life is not air after all, but the difference between the air pressure in their lungs and that of the air around them. As they breathe, this difference gradually equalises, which makes them become slower and slower until at last their lives simply come to a stop. In other words, with every exhalation they exacerbate an atmospheric change that is detrimental to them. This connects the atmospheric changes in the story to anthropogenic climate change: the mechanical beings are the source of the adverse changes to their own ecosystem, just as humans are responsible for the damage to our climate and ecosystems. The story skips past the likelihood of these climatic changes and debates over what the actual climate impacts will be. It simplifies the ecosystem, which also makes the science simpler and leaves no uncertainty as to these beings' ability to affect their atmosphere, albeit unwittingly. Instead, it focuses on the scientific process of discovering the atmospheric changes and their impact on the mechanical beings. It also addresses the psychological implications of the discovery, focusing on how the mechanical creatures become aware of their role as the agents of their own demise and how they cope with this new awareness.

This simplified view of climate change and the range of reactions to it is akin to Fredric Jameson's concept of world reduction, where the world is simplified to the bare minimum to show "some new glimpse as to the ultimate nature of human reality" (222–23). While Jameson sees this abstraction mainly as escapism, he does admit that it may "amount to a political stance as well" (229). Gib Prettyman sees world reduction more clearly as a political stance, where it "can be seen to serve a cognitive and material purpose...to reframe familiar assumptions of egoism and anthropocentrism" (57). Thus, world reduction can be seen to be working towards a similar goal as estrangement in reframing an element of the reader's world. While world reduction does not represent its object in its full real-world complexity, with all its historical, political, and material contingencies, the abstraction can by omission provide a fresh angle or highlight what is missing. The simplification may seem especially problematic for promoting ecological values, Prettyman notes, since ecology as a "positive framework emphasizes qualities such as diversity, complexity, and systemic balance, whereas world reduction seems to ignore those factors, or actively to fantasize them away" (62). However, he goes on to argue that world reduction can also be seen as "a strategic response to the worldview of capitalism" that involves "unlearning the egoistic and anthropocentric illusions that underlie the psychic ecosystem of capitalism, and learning the real limits that characterize the material ecosystem and circumscribe human culture" (62–63). Therefore, world reduction can perform an ecological purpose even when it does not emphasise diversity and complexity.

"Exhalation" can be seen to perform world reduction to highlight climate change. The story does not present how society is organised in terms of government or economy, and therefore capitalism's role in causing climate change is also missing. Even the ecosystem is reduced: the story mentions no other living entities, only the mechanical beings, their built environment and the air they breathe. The ecosystem is becoming inhospitable to the mechanical beings, but poses no harm to anything else. Thus, there is a simple causal relationship between the act of breathing and the harm it causes to those doing the breathing. In contrast, anthropogenic climate change harms not just humans but also multitudes of other species and ecosystems, which in turn contributes to making the world inhospitable to human life. In both cases, the whole world is not about to be destroyed, but the result for the dominant species is the same, although "Exhalation" eliminates intermediaries and questions of justice towards other species. In so doing, it omits an important ethical question that challenges anthropocentrism but also eliminates uncertainties associated with complex systems and processes. This allows a self-serving interpretation: harm is only meaningful when it is directed to oneself.

World reduction also eliminates the question of choice: breathing is what keeps the mechanical beings alive and will also slowly kill them. They cannot choose not to breathe, whereas in the real world it is possible to curtail harmful human impacts on the environment. However, choosing not to participate in capitalism – a driving force of climate change – is more difficult; but even so, capitalism is not an immutable part of the world (see Haraway 50). The definite causal relationship between breathing and the harm that results from it presents a fatalist view of anthropogenic climate change: it suggests that humans are either as unable to curtail their actions as the mechanical beings are unable to stop breathing, or that humans are as unable to fix the harm they cause. On the other hand, the lack of choice makes the mechanical beings inextricably part of their environment. Their physiology interacts with the atmosphere in a way

that is ultimately fatal to them, but there is no standing apart from the materiality of their existence or from the world and its systems.

Even though the mechanical beings are unable to stop harming their atmosphere, there are those among them who devote themselves to reversing the effects on their climate, but all their efforts ultimately use more air than they conserve (52–53). Even if their efforts are futile, there is a great drive to mitigate the harm, unlike in our world, where both prevention and mitigation are possible. Perhaps the impossibility of both in the story world can be seen as underlining their possibility in the real world, or the fact that change should happen at the source rather than as a technofix after unwanted consequences materialise. Donna Haraway sees “a comic faith in technofixes” as endearingly silly and easy to dismiss (3). Alternatively, the futility of these efforts reveals the material limits of the world and what is possible within it, drawing attention to “the real limits that characterize the material ecosystem” (Prettyman 62). The very concrete limits are the chromium walls that surround the world on all sides. There is no place where the excess air can expand or escape to mitigate the effects on the mechanical beings. As air is the source of not only life but also the energy of all their technology, there is no way of using technology to mitigate effects without at the same time exacerbating the effects. This also links the problems in their atmosphere with consumer capitalism and its impact on the climate in the real world where energy and technology have been driving forces in climate change.

“Exhalation” also presents a world seemingly without capitalism or money – neither are mentioned in the short story – and thereby removes capitalism’s role in both creating climate change and slowing down responses to it. The narrator does have a profession as an academic, but his leisurely existence and freedom to carry out an extensive experiment suggest either an idealistic view of academia or an old-fashioned one where one’s livelihood and academic interests remain separate. The exclusion of capitalism can be seen as omitting a central feature inextricably linked with anthropogenic climate change, but it can also be seen to challenge taken-for-granted perceptions, to suggest that capitalism is not as inevitable as it seems and to allow an ethical consideration of responsibility and the harm caused without resorting to cost-benefit analyses.

The emotional reactions and the process of coming to terms with the knowledge of being responsible for one’s own eventual extinction resembles the five stages of grief as theorised by Elizabeth Kübler-Ross and David Kessler and others. Although stage theory has been discredited by empirical research, it still claims a powerful influence on cultural understandings of grief. The first stage is denial, exemplified in “Exhalation” by the unwillingness of other anatomists to believe the results and implications of the narrator’s discovery. However, their reaction seems to be more akin to simple disbelief than to denial as a psychological self-defence against threatening information. The disbelief is soon dissipated as more evidence is gathered, which results in “more and more of them [becoming] convinced” (51). The fact that disbelief within the story world is easily dissipated with information suggests an uncomplicated faith in science not influenced by other factors such as emotions or cultural identity. The next stage is anger, which manifests itself in the form of panic as “people contemplated for the first time the idea that death was inevitable” (51). The situation deteriorates as “accusations of wasted air escalated into furious brawls and, in some districts, deaths” (51). The realisation of the inevitable is so shocking that it causes a strong emotional reaction against those who are imagined to be making the situation

worse. The “shame of having caused these deaths” (51–52) quickly sobers the community and they move to a more practical response to the threat. Their attempts to mitigate and/or reverse the equalising effect can be seen as a form of bargaining, but all their attempts are in vain as all methods of compressing air from the atmosphere use more air than they can extract, thereby exacerbating the problem. Stage four, depression, takes the form of disillusionment when these mitigation efforts fail.

The final stage, acceptance, is explored most thoroughly in the narrator’s deliberations on their eventual demise and on their legacy as he writes the story of his people to anyone who might come across the remains of their civilisation. He acknowledges and accepts his own eventual demise – “I do not delude myself into thinking this would be a way for me to live again” (55) – but, nevertheless, hopes that the memory of his civilisation might survive. He does not look for a saviour, but for a witness to their lives. The narrator can be seen as defeatist, which is an understandable but an unhelpful response to climate change, or, in contrast, as someone willing to “stay with the trouble” until life ends (see Haraway 3). The narrator does not attempt to safeguard the future, but instead marvels that he exists and that his civilisation has produced such variety of life. Rather than mourning his death, he celebrates the fact that his thoughts will continue until the end. He acknowledges that life will no doubt change in ways that he cannot fully imagine yet, and seems curious to live through these changes. Thus, he seems willing to “stay with the trouble”, “to be truly present”, and not to “succumb to despair or hope” (Haraway 1–4).

The simplification of the atmospheric changes in “Exhalation”, therefore, does not attempt to represent climate change in all its complexity, in terms of either its science or the social, political and economic debates around it, but instead enables a focused perspective on its material, ethical, and psychological dimensions. The world reduction clears away the distractions of uncertainty about whether the atmospheric changes are real, who is responsible for them, and how they will affect the mechanical beings. It also draws attention to the possibilities of action to prevent or mitigate anthropogenic climate change. These abstractions separate climate change from cultural identity and resist denial strategies.

Overcoming Polarisation

By relocating climate change into a strange world, ignoring the polarised views on it in the real world and presenting the atmospheric changes of the chromium world simply as fact, “Exhalation” disentangles climate change from partisan politics and cultural identities. Dan Kahan argues that people engage with information for two purposes: “to gain access to the collective knowledge furnished by science and to enjoy the sense of identity enabled by membership in a community defined by particular cultural commitments” (1). People are equipped to do both, but according to Kahan, when individuals “engage with information as citizens, in the political realm, they evaluate it from the standpoint of their identity-protective selves” (29). This offers a partial explanation to the polarisation around climate change, suggesting correlations between political outlook and “belief” in climate change without ruling out other possible factors. He suggests that “*antagonistic cultural meanings*” that both sides attach to climate change create the conflict of choosing between an understanding of what scientists know and the accepted stance taken among peers (29, emphasis

original). In fact, while overall public opinion on issues has not become significantly more polarised since the 1970s, “affective and behavioural polarization” has increased significantly: political opponents view each other with more hostility and are more willing to discriminate based on political outlooks (Garrard et al. 12–13). Garrard et al. view overcoming this polarisation as central to having a proper democratic discussion (15–17). Kahan believes citizens need to be engaged in a way that does not threaten their identity, as no amount of additional information will bridge the divide between the two sides (26).

The relocation to another reality allows “Exhalation” to recontextualise climate change and the cultural identities entangled with it. Estrangement is not there in the Shklovskian sense to make the reader vividly aware of something that has become automatised in their accustomed reality, “to make a stone stony” (Shklovsky 162), but to break it out of the frames in which it has been confined. Climate change has not become so invisible in our day-to-day life that we need to be woken to “*truly see*” it and to “overcome our ‘blind’ perception” (Spiegel 369, emphasis original). Rather, polarisation and the accompanying attitudes towards both climate change and those with different political outlooks have become automatised, not climate change itself. Instead of needing renewed attention, climate change needs reframing so that it can be considered from a perspective that separates it from cultural identities.

The mechanical creatures in “Exhalation” are not part of the cultural and political reality of the reader, and therefore, while they are framed as familiar and easy for people of any political outlook to identify with, it is not obvious how they should be categorised. The problems in the atmosphere are analogous to those occurring in our world, but a dislocation into another world destabilises and reframes debate. Therefore, the reader is unable to navigate the story with the help of accustomed oppositions and using the same toolkit and shortcuts as they would in the real world. Instead, they must find other ways of digesting the narrative, which means processing the ethical and psychological implications of the atmospheric changes step by step.

Instead of displaying scepticism rooted in cultural identity, after initial disbelief of the protagonist’s discovery, the mechanical beings universally accept the predicted change as more

examinations of people’s brains were performed, more measurements of atmospheric pressure were taken, and the results were all found to confirm my claims. The background air pressure of our universe was indeed increasing, and slowing our thoughts as a result.

There was widespread panic in the days after the truth first became widely known, as people contemplated for the first time the idea that death was inevitable. (51)

The abrupt shift from the confirmation of scientific theory in one paragraph to emotional reactions to this “truth” in the next suggests that public opinion easily follows scientific consensus. Differences in attitude can be observed between the Reversalists, who believe they can stop the atmospheric changes through some invention, and those who believe there is nothing to be done except accept their fate, but there seems to be no rift between them. There is only uncomplicated, and de-politicised, faith in science and different levels of optimism as to their ability to intentionally produce positive changes in their atmosphere.

“Exhalation” is centred on the idea of an individual who relies on science, which results in a simplified view of an individual and their social and emotional

entanglements – one that can only exist in fiction. Once the knowledge of their impending extinction emerges, emotional reactions do not affect the interpretation or assessment of information or create polarisation. The facts of the atmospheric changes and their interpretation and implications are free from the influence of both cultural identity and emotional influence, which simplifies the issue as compared to the real world, but also makes denial more difficult, as it hinges on questioning one of these three elements.

Denial

The estrangement and world reduction in “Exhalation” eliminate opportunities for denial. The scale and timeframe of climate change, as well as its potentially catastrophic consequences, make it an issue that is difficult for human brains to grasp, and also makes climate change susceptible to denial. Denial as a psychological defence refers to shielding oneself from potentially traumatic information. Literal denial refuses to accept the truth value of the threatening information (it is not real), interpretative denial questions the interpretation of the facts (the facts suggest something different), and implicatory denial challenges the implications of the threatening information (it has nothing to do with me) (Cohen 5–9). In “Exhalation” there is little denial at the level of the story; there is only the short-lived disbelief when the narrator reveals his discovery. What is more interesting is that the story denies the use of denial strategies for readers if they make the connection to climate change. By simplifying climate change and separating it from cultural identity, “Exhalation” makes climate change and its impact easier to grasp, but also by treating the atmospheric changes as fact without opposition, it strips away uncertainties and probabilities, and thereby removes opportunities for denial.

By presenting the atmospheric changes as a certainty with a definite causal relationship between breathing and the deteriorating conditions for life, the story reduces possibilities for different forms of denial. The naturalisation of the atmospheric changes with all the other marvels of the world makes it impossible to deny that the atmosphere is indeed changing for the worse for the mechanical beings, thus eliminating literal denial. Second, there is no other way of interpreting the cause and detrimental consequences of the atmospheric changes to the mechanical beings, thus eliminating interpretative denial. Third, blame cannot be shifted onto anyone else due to the simple and definite causal relationship between breathing and the equalising air pressure, thus eliminating implicatory denial. Because the mechanical beings are only harming themselves, there is no opportunity to suggest that the harm does not warrant action because it only affects someone else; for example, another species undeserving of the right to survival. In contrast, the story does allow for acknowledgement of impending disaster without a sense of duty to do something about it. While this is still an uncomplicated analysis of denial, it goes beyond simple dualism of acknowledgement or rejection of climate change. Such simple binary categories do not do justice to the diversity of denial in the real world among sceptics or those who acknowledge climate change (Garrard et al. 7; Hoggett 57).

The story does not address collective denial, partly due to the first-person narration and lack of description of the social and political structures. However, there is collective responsibility when all the mechanical beings are placed on equal footing as to the harm they cause and the harm they can expect to experience. Their breathing

has equal impact and they will all come to a stop in the end. This is, of course, another simplification, as in the real world there are great differences in the impact people have on the environment, their ability to prevent or mitigate harm, and the kinds of consequences they will suffer. Nevertheless, the equalisation is significant in denying the possibility to shift blame onto others even if this does not represent the complexity of impact different kinds of people have.

It remains unclear how the society is organised in terms of government or economy. Thus, no links can be drawn to official, government-level denial, but even this offers an interesting simplification. Although the population is spread out into several districts, they all seem to comprise one nation connected together through gossip and travel: “one can receive news from remote districts, even those at the very edge of the world, without needing to leave home” (38). There seems to be no political or economic competition. Such competition can lead to denial of possibilities of action in order to remain competitive with other entities. This can manifest itself as an unwillingness to discuss the ethical basis on which facts are assessed and decisions made. Jean-Pierre Dupuy recognises an aversion to even enter into a discussion about the ethical implications of technological development for fear of getting left behind in the technological race (238–39). He criticises nanoethics for reducing ethics to cost-benefit analyses (239–40). The lack of political and economic competition in “Exhalation” makes cost-benefit analyses pointless: if the mechanical beings were to find a way to reverse the atmospheric changes, the benefits of survival would always outweigh the costs, as arguably they should also in the real world.

As mentioned above, the lack of any monetary system in “Exhalation” obscures the connection between capitalism and climate change. Thus, the atmospheric changes become a natural phenomenon caused by the mechanical beings’ natural process of living. This opens possibilities for denial on the basis that climate change is a natural phenomenon, not the result of technological progress or capitalism’s demand for endless growth. The connection between apocalypse as an end point and an end of capitalism has often been made (for example, see Canavan and Robinson 12–14; Jameson, “Future City” 76), but here a slowly approaching apocalypse has no link to capitalism, neither as its cause nor as something that needs to be cleared away with (or by) the apocalypse. However, while some of the complexity of climate change and its entanglements in politics and economics are lost in “Exhalation”, the simplification still allows a perspective into climate change that shows the familiar anew because of this abstraction. The absence of capitalism allows the reader to consider climate change without having to choose between economic and environmental priorities in much the same way that the disentanglement of cultural identity from climate change allows people to consider climate change without choosing between what is known to science and whose side they are on.

Conclusion

The naturalisation in “Exhalation” estranges climate change in a way that has the potential to overcome polarisation, while world reduction resists denial strategies that discussions on climate change face in the real world. The unhurried process of naturalisation can catch the reader unawares with the connection to climate change and circumvent polarisation by omitting such oppositions in the story world. Instead it provides a view into seemingly objective science uncomplicated by politics or

cultural identities. Therefore, it does not mitigate polarisation by increasing mutual understanding, but by inviting the reader to consider the material and psychological impact of climate change. This places the focus on coming to terms with the certainty of impending death, the awareness that it is self-inflicted, and the material limits of the world. Rather than directly addressing real-world politics and antagonisms, it tackles the underlying emotions and unacknowledged limitations of modern life.

World reduction simplifies climate change and the polarised attitudes around it, and excludes politics, social and economic structures, and capitalism's demands for profit and growth. While such abstractions leave out many important features of the climate-change debate as well as causes and consequences in the real world, they enable the story to focus on the ethics of climate change and psychological responses. By omission the story also invites an assessment of these features and obstructs their use as excuses for inaction and denial even as it forgoes the opportunity to discuss them in more detail. The resulting focus is anthropocentric, but so is the problem of inaction that it addresses.

While "Exhalation" holds the potential to overcome polarisation and denial, there is no guarantee that it will do so with actual readers. As we have seen, even the parallels to climate change may go unnoticed. Furthermore, when these aspects are noticed, there is the possibility that pre-existing attitudes are simply reinforced. In terms of denial, for example, the story disarms some excuses for inaction, but can also be seen to validate others. This might be seen as undermining the "green agenda" analysed here, but it also demonstrates that the story is open for a multiplicity of interpretations.

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