



MONASH University

AFFECTIVE ENTANGLEMENTS:
LEARNING TO LIVE-WITH CLIMATE CHANGE

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Bachelor of Science (Botany)

Master of Social Science (International Urban and Environmental Management)

A thesis submitted for the degree of Doctor of Philosophy,

Faculty of Education, Monash University

January 2019

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Chapter 3 of this thesis includes sections from the Accepted Manuscripts of the following two articles published by Taylor and Francis:

Verlie, B. (2017). Rethinking climate education: Climate as entanglement. *Educational Studies*, 53(6), 560-572. doi:10.1080/00131946.2017.1357555

Verlie, B., & CCR15. (2018). From action to intra-action? Agency, identity and 'goals' in a relational approach to climate change education. *Environmental Education Research*, *Online first*, 1-15. doi:10.1080/13504622.2018.1497147

ABSTRACT

This thesis is an effort to *climate otherwise*. Beginning from a concern about the scientific anthropocentrism that underpins the ontologies and epistemologies of many climate change pedagogies, this thesis develops a posthuman climate change pedagogy which can resituate humans ecologically and the more-than-human world ethically (Plumwood, 2002). It explores how to conceptualise knowledge, agency, emotions and affect, and human-climate relationships in non-anthropocentric ways, as well as the subsequent issue of the goals of climate change education. It proposes that we consider climate as an entanglement composed of intra-actions (Barad, 2007). Intra-actions are argued to involve the reconfiguration of identities, to emerge through acting-with more-than-human others, and to produce and emerge from difference. It is through our intra-actions with climate that our climate responsibilities are articulated.

The thesis develops this posthuman climate pedagogy by exploring the emotional and affective experiences that emerged in a semester long undergraduate course on climate change. Identifying climate change to manifest in our climate controlled classroom as an affective atmosphere (B. Anderson, 2009), the research explores how the students and I (their tutor) intra-actively encountered, witnessed and storied this affective atmosphere, and thus how we both emerged from and co-produced it. These practices of climating led to intense fears, worries and hopes for the future, as well as enigmatic embodied experiences that exceeded easy explanation. The thesis discusses how throughout the course we witnessed multiple, conflicting and disturbing climate realities, and through these encounters our sense of ourselves as capable individuals entitled to a better future was decomposed. Exploring the recomposed collective identities that emerged in response to this, the thesis argues that we

became affectively entangled with climate change and with each other. We were becoming-(with-)climate.

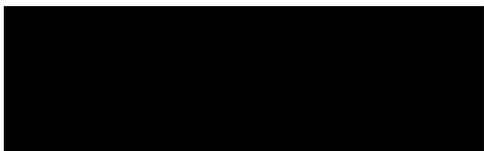
Through this exploration, the thesis proposes that in our course, we learned to live-with climate change. We became increasingly attuned to the complex interconnections between climate and humans, and through doing so, realised that many relations valuable to us were under threat. Collectively, with climate change, we learned to stay with the trouble (Haraway, 2016) of our climate complicity and vulnerability, continuing to engage with these distressing realities. Through this work, the thesis develops a pedagogical framework that takes humanity's ecological entanglement seriously and which can enable educators to assist communities to develop the emotional and ecological capacities needed to respond to/with/as climate change.

PLAIN LANGUAGE SUMMARY

This PhD develops a way to think about climate change education which considers humans to be part of climate, rather than separate from it. It explores this through a case study of an undergraduate climate change course. The thesis investigates students' experiences of anxiety, frustration, overwhelm, guilt, grief and hope, as well as their sensations of living a double reality and the collective identity that emerged in the course. These examples demonstrate some of the ways that humans are and can become entangled with climate change, and the emotional and intellectual challenges of living in a climate changing world.

DECLARATION

I declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.



Blanche Verlie

10/01/2019

ETHICS APPROVAL

The research for this project received a Human Ethics Certificate of Approval from the Monash University Human Research Ethics Committee. Project Number: CF15/2635 – 2015001083

ACKNOWLEDGEMENTS

This thesis was written on stolen and unceded Wurundjeri, Boon Wurrung and Dja Dja Wurrung Country. The colonisation of Australia's lands and peoples by the British, along with the systemic globalisation of such extractivist practices, is one of the major factors contributing to global climate change. Further, such colonial-capitalist systems play a major role in creating locally experienced climate change vulnerabilities and in limiting the adaptive capacities of Indigenous peoples. I would like to acknowledge that my very existence as an Australian citizen and PhD student has depended on the systemic genocide, displacement and disempowerment of Indigenous Australians and the parallel destruction of their homelands. I acknowledge that I have benefitted from this in so many ways. I take this opportunity to say sorry for all the ongoing hurt that settler Australia has caused, and continues to cause, your ancient, living, wise and sustainable cultures and peoples. I pay respect to Wurundjeri, Dja Dja Wurrung and Boon Wurrung elders past and present. Your passionate and tireless work caring for Country over millennia has co-facilitated all the nurturing and awe-inspiring experiences with the more-than-human world that I have been privileged to experience both before and during this PhD, and thus underpins all of the ideas and arguments I am able to make in this thesis. And I pay respects to emerging and future elders, and look forward to working with you to continue to care for Country and climate for generations to come.

This thesis would not have been possible without Peter Phipps at RMIT University and Phillip Payne at Monash University who assisted me in putting together PhD applications. Thanks to their help, I was fortunate enough to receive an Australian Postgraduate Award (APA) Scholarship. Cynthia Joseph and Kate Rigby at Monash provided

early co-supervision with invaluable insights. Alan Reid, Sylvia Almeida, Gloria Quiñones, Sue Greishaber and Deana Leahy provided constructive feedback on my work at annual milestone panel reviews.

Iris Duhn, my supervisor, provided provoking, challenging, and inspiring readings and discussion throughout this entire process, never directing but always opening conceptual and ethical pathways for consideration. Iris, more than anyone else, continually affirmed to me the importance of thinking and doing climate change differently. Iris, this PhD would be unrecognisable without your stimulating and energising guidance across the best part of the last five years. Thank you for encouraging me to push disciplinary, philosophical and methodological boundaries and established practices. Your passion for rigour, as well as your impressive ability to balance the encouragement of creativity and effective project management, have ensured this thesis got written, and written as well as it could. Your belief in your students' abilities and commitment to supporting them is appreciated immensely, and I know I speak for many of us on this.

Lauren Rickards joined my supervisory team in late 2015. Lauren, working with you is a constant source of inspiration at your passion and awe at your drive to address climate change and climate injustice specifically. Your relentless commitment in the face of the personal, institutional, and ideological barriers to climate action inspire me to work harder and keep believing. You have been a phenomenal role model. Your affective and ethical alliance has kept me sane, or at least kept me thinking I might still be sane, and that is no small feat. Your conceptual feedback and affirmative comments throughout have been much appreciated. I feel very privileged to continue working with you as a colleague.

My students from Climate Change Responses in 2015 all signed my consent forms without fuss, and immediately got on with the task at hand: being emotionally, mentally and

physically present for our discussions about how to respond to one of the most conceptually, ethically and practically overwhelming problems that the world has faced. You all brought different approaches and insights, of course. But collectively, your courage and curiosity for learning about climate change inspired me—and continues to do so—and I appreciate your enthusiasm for learning with me, and your tolerance for my own bafflement and confusion at times during the semester. I genuinely consider this thesis to consist of insights developed with you, rather than about you. Without your rigorous discussion, ethical interrogation, mature approach to study and willingness to openly discuss your experiences with me, this thesis would not be what it is.

My students since 2015, and indeed those before then, have also inspired my efforts in this thesis. While you are not directly mentioned—due to formal ethical considerations—you have also inspired, challenged, motivated and supported me. Thank you.

Numerous academic networks have contributed positively to this thesis.

Editors—Johnny Lupinacci, Elizabeth de Freitas, Alexandre Pais, David Clarke and Jamie Mcphie—and anonymous reviewers of the two special issues that my journal articles were published in provided nuanced and specialist feedback on my work, which has ensured a higher level of accuracy, relevance and clarity in the thesis. Delegates at the conferences which I have attended during my candidature have provided insightful commentary and thoughtful questions which have improved my ability to make these ideas relevant to real people in the real world. Reading groups around Melbourne, such as the Anthropocene reading group and EcoFeminist Fridays at the University of Melbourne, chaired by Jeremy Baskin and Hayley Singer respectively, and the New Ecological Discourses reading group convened by Freya Mathews, have provided scope for exploring new ideas, and dwelling with them. My kin from #aaeeer provided both intellectual stimulation as well as seriously

life changing support. Navigating the compounding stresses of ecological crises and postgraduate research has been that much easier knowing others sharing that journey find it hard sometimes too. Claudio, thanks for kicking us off; Leah, Ian, Matt, Jeremy and Farshad: thanks for the pizza and pub sessions, writing retreats and feedback on my writing. Maia, Sherridan, Kim, Bianca, Jen, Kevin: thanks also for decomposing, recomposing, and refuging with me. At RMIT: Arley, Anne-Lise, Laurel, Gabby, Cathryn and Dan. Thank you for inspiring my passion for education over the years, and for all the skills and insight you taught me which formed the foundational stepping stones for beginning this thesis. From Monash: Kerry, Misol, Yoshi, Louise, Mark, and Hanif. Thanks for the reading group discussions, the feedback on my work, and the support at my panel presentations. A special thanks to Sarita Galvez for being my buddy on the commute to Frankston, for counselling me through my white guilt, for indulging my resentment of new materialist hypocrisy and for tolerating my probably simplistic rantings about settler-colonial-capitalist-hetero-patriarchy. Your joie de vivre and capacity for staying with the trouble are admirable! It has been an absolute pleasure and total privilege to share the PhD journey with you. Alicia, my co-labourer in posthuman environmental ed from the University of Melbourne: thank you for making me laugh and for the affirmational discussions the past few years.

A really vast network of friends has helped me think harder, relax, have fun, get out of the city, learn more, and keep at it across these last few years. Thank you Jessie, Jace, Gary, Tom, Dhivia, Ivan, Leonie, Em and Sufie. Many of these friends have also been co-labourers in voluntary efforts to respond to climate change. Climate for Change provided a welcome opportunity to explore and road-test some of the ideas, skills and knowledge arising from this PhD in a community setting. Kat, I have always felt so lucky to live in Melbourne and to be part of C4C. Spending four years reading climate change education literature means I know that C4C's vision, theory of change, and innovative approach are incredibly effective,

and it is so wonderful to be able to be part of C4C. To all the C4C facilitators, especially Oli, Zey, Nathan, Nicole, Gabby, Anna, Jimmy, Deb and Sue, thanks for your hard work, good spirits, and practical insights into how to help people engage with climate change, and for all the friendship along the way. To Climates: Jarrod, Malcolm, Jeremy, Sanch, Gemma, Jacynta, Em and Oli (again): thanks for the opportunity to contribute to Pacific climate resilience while I was in Fiji, and more generally in Melbourne. It is wonderful to be able to have so much fun while doing important work, and your model of climate adaptation through friendship informs this thesis in an under-acknowledged, though significant way. Kudos. Going beyond the demands of friendship, Anna Dunn and Mandy Pritchard offered incredible levels of informed encouragement, and Mandy even proof-read the entire thesis—no small feat, and one which helped immensely. Thank you! Gabby, Oli and Zey also read and made time to discuss the thesis with me, and Sugata, Helena, Heidi, Cam, Sarah, Ella, Simon, and Meg all came to my presentation in May 2018. Thank you all.

Josh Blau’s yoga classes helped me at a crucial time when I needed some solace. Annie Belcher helped me use such experiences to develop this thesis through our co-facilitated “climate change and yoga” class. VicBeach volleyball helped distract me from the thesis like nothing else could. Thanks to Big Al for organising such inclusive, easy going and fun ways of getting active, for an excuse to watch the sunsets over the bay each week, and for getting us to the beach in the cold, the wind, the sun, the fog and sometimes even the rain, improving my attention to embodied, enplaced and affective entanglements with weather.

To mum, Morgs, Trev, Katie and Deb. Thanks for all the support, for looking after my dogs so I could get out of the city sometimes, for cooking me dinners, for checking in with me, and for general familial love. Couldn’t do anything without you. Mum, I am sure that your undying faith that I could achieve anything I wanted—except sing—has helped me

always believe that I could see the PhD to completion. Morgs, thank you for your unwavering encouragement and confidence in me, even though our passions and directions diverge so much sometimes. That is a special kind of support and I appreciate it immensely.

Rob: thank you for providing nourishing food and other general life-support services throughout. Thank you for the stability offered throughout the ups and downs of postgraduate study on climate change. Thank you for always offering a perspective grounded in the present and for making the most of life. Your insatiable energy for getting outdoors, moving and being active, and for eating yummy healthy food have contributed beyond measure to my overall wellbeing. I am sorry for going on about entanglement all the time, although I can't promise it will stop.

To my canine companions, Jessie and Bella. Thank you for reminding me every morning on our walks to the park that it is the journey, and not the destination, that matters. Your intense interest in smelling things I cannot see and the hedonistic pleasure you take from rolling in dirty, dead and decaying matter remind me to pay attention to the easily overlooked and the everyday moments of joy that are possible even in messy situations. If I could muster these qualities in the coming climate-changing decades, I would do well! Thank you for the hugs, excuses to get out of the house, and laugh out loud moments you have provided me. Bella, you sat by my feet as I typed nearly every word of this thesis, and Jessie, your selective indifference to me keeps my multi-species ego in check. Thanks for being with me throughout this process, I only wish I could have spent more time writing in the park with you.

To the other more-than-human organisms and elements in my life world: the currawongs, honeyeaters, wattlebirds, blackbirds, cockatoos, kangaroos, sheep, alpacas, gum trees, bottlebrushes, grevilleas, butterflies, ants, wildflowers, worms, soil, rocks and various

bodies of water: the bay, the beach, our dam, the river. Thanks for just being, but thanks also for recycling some of my waste—and sorry about those bits you can't—and thanks for providing me with food, clean air, place based solace, refreshment, intrigue, and all manner of life sustaining and enriching experiences. To climate, and Naarm/Melbourne's climate more specifically: thanks for providing conditions in which life is possible, and even abundant and joyful. For too long, this has been taken for granted by many. This thesis is dedicated towards increasing appreciation for how intimately enmeshed climate and life are, and to acting in ways appropriate to such recognition.

AFFECTIVE ENTANGLEMENTS: LEARNING TO LIVE- WITH CLIMATE CHANGE

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1. INTRODUCTION

WHY WRITE THIS THESIS?

“I just tell my students, if they don’t believe in climate change, they don’t believe in science.”

This comment arose from a discussion about how to navigate the significant and frustrating issue of climate denial in the undergraduate social science course Sustainability: Society and Environment that my friends and I were tutoring in 2012 at RMIT University in Melbourne. In this course, we had one week to cover climate change, which effectively meant just one hour in our tutorials to engage students with this unprecedented, global, “super wicked problem” (Lazarus, 2008, p. 1153). But in Australia, we have some of the world’s worst levels of climate scepticism (Tranter & Booth, 2015), and this course was mandatory for the students we taught. It was quite possible that some of them may have been sceptical of climate change. I was frustrated by the issue of denial, and did not want to have to “waste” class time trying to convince students that climate change was real and human induced, when there were more exciting and interesting things we could do. At the time, telling students if they did not believe in climate change, they did not believe in science seemed a brilliant idea. I thought, great, if I say that, people will have to be convinced—everyone believes in science! We can move on!

In September 2013 Tony Abbott was elected Prime Minister of Australia on the back of his “Axe the Tax” campaign, which as he promised, wiped back the carbon price Julia Gillard had implemented as the previous Prime Minister. Tony Abbott has stated over the years that “coal is good for humanity” (Massola, Ker, & Cox, 2014, n.p.), that “climate change is absolute crap” (K. O’Brien, 2010, n.p.), and that even if climate change was real, it

would probably be beneficial (Bourke, 2017). His policies, and the policies of those like him, such as our current coal-cuddling Prime Minister who argues that “coal can’t hurt you” (Kenny, 2017, n.p.), explicitly deny the facts of climate science, and thus contribute to Australia continuing to have some of the highest per capita greenhouse gas emissions in the world (F. Perry, Henry, Perry, & MacArthur, 2015; Remeikis, 2018). Following Abbott’s repeal of the carbon tax, Australia’s greenhouse gas emissions began to rise again, and they have continued to do so (Cox, 2018). The influence of climate denial in Australia is what led me in 2014 to start a PhD in climate change education.

Since then, the world has witnessed a seemingly limitless series of horrific climatic events: an unfathomable hurricane season in the Atlantic in 2017; famines affecting millions of people in East Africa, barely reported in the West; wildfires burning in the Arctic Circle; Cape Town counting down to “Day Zero” when they would run out of water; bushfires blazing throughout winter in Australia; the Great Barrier Reef bleaching summer after summer, after summer. These events show what is at stake in questions of knowledge, reality, and truth when it comes to climate change: as one of my students put it in 2015, “our knowledges and ignorances of climate change will determine who will live and who will die.” No wonder Al Gore’s international non-government organisation, the Climate Reality Project, offers the following pledge to those who want stronger action on climate change, emphasising the importance of believing the truth of climate science and therefore the reality of climate change:

In reality, 97% of climate scientists agree climate change is real and caused by humans.

It’s time to stand up for what matters.

Alternative facts won’t halt rising temperatures. Fake news won’t make polluted air safe to breathe. And burning more fossil fuels sure won’t protect our planet.

But clean energy and science will.

With renewable technologies like wind and solar in our hands today, we can solve the climate crisis. But only if our leaders insist on truth, accept reality, and listen to science.

Together, we'll make them.

Join us at Climate Reality and take the pledge:

I Stand with Truth. I Stand with Reality. (Climate Reality Project, n.d.)

The approach shared by us tutors in Sustainability: Society and Environment and the Climate Reality Project—that science provides the truth about climate change and should (must!) be believed—are foundational to most efforts to engage people in reducing carbon emissions. Climate science has therefore come to occupy quite a radical place in Australian society, being positioned alongside social and environmental justice projects, and as antithetical to climate denial. Climate science has become protest and donation worthy, demonstrated by the global March for Science (Davidson & Milman, 2017; “March for Science Australia,” 2017) and by Australia’s biggest ever crowdfunding campaign which re-established the Climate Council following its dismantling and de-funding by the Federal Government (Climate Council, 2017). If it is so valuable, then what does science tell us about climate change?

Climate is understood by science as a system of inter-connecting or inter-acting sub-systems: the atmosphere, hydrosphere (water), cryosphere (frozen water), lithosphere (soil, rocks), and the biosphere. This system is “influenced by various external forcing mechanisms, the most important of which is the Sun. Also the direct effect of human activities on the climate system is considered an external forcing” (IPCC, 2001, p. 87). Climate is thus the outcome that results from these interactions and its properties can be measured statistically. When understood statistically, climate is known as “the average

weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities... most often surface variables such as temperature, precipitation and wind” (IPCC, 2013, p. 126). This average is usually calculated over a period of 30 years. Weather “describes the conditions of the atmosphere at a certain place and time with reference to temperature, pressure, humidity, wind, and other key parameters” such as “the presence of clouds, precipitation... thunderstorms, dust storms, tornados and others” (IPCC, 2013, pp. 123–124). Climate change therefore “refers to a change in the state of the climate that can be identified ... by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer” (IPCC, 2013, p. 126). That is, climate change is a statistically measurable change in the average weather.

The Intergovernmental Panel on Climate Change (IPCC) produces and publishes reviews of peer reviewed climate science. These are some of the most comprehensive scientific publications ever produced in the world. Its most recent Assessment Report, published in 2014 at the start of my PhD, affirms what scientists have been telling us for decades: that climate change is real, is bad, and is caused by fossil fuelled industrial practices (IPCC, 2014a). Echoing decades old calls to mitigate climate change before it is “too late,” scientists have also informed us that time is rapidly running out if we are to avoid the worst impacts of climate change (Figueres et al., 2017). If we are to keep global warming to the 1.5°C agreed at the Paris Climate Summit in 2015 then according to the IPCC’s 2018 Special Report we have until 2030 to *halve* greenhouse gas emissions, which will require nothing less than *rapid* and *unprecedented* transformations of the global economy (IPCC, 2018).

Science gives us essential and vital knowledge when it comes to climate change. However, as I was starting my PhD and thinking about this, I was becoming unsettled with the reliance on and almost religious worshipping of climate science within the climate

activism and education circles I was part of. In other areas, both myself and my friends would critique science—for being colonial, patriarchal, militaristic and anthropocentric (human centred) (see e.g. Haraway, 1988; Harding, 2008; Loomba, 2005; Plumwood, 2002; Young, 2001). Yet when it came to climate change, science got a free pass.

These ethical problems, such as anthropocentrism, are often argued to be due to science's default practices which treat their study material as objects that are separate from the subjects who are conducting the science (Harding, 2008). Influential eco-philosopher Val Plumwood describes this approach as one that enacts a dualism—a false but institutionalised binary embedded in cultural relationships of power, domination, oppression and exclusion (Plumwood, 1993). In Western culture, including and especially Western science, the dualisms of man/woman, white/coloured, human/nature, and mind/body are still frequently enacted (Plumwood, 2002). These dualisms mutually reinforce each other such that one side of the pairings is “systematically and pervasively constructed and depicted as inferior” (Plumwood, 1993, p. 47). The more valued side is understood to be knowledgeable and have agency, and to gain these through exerting power over the ignorant, passive other.

Underpinning dualistic culture is a deeper metaphysics of individualism, a belief that the world is composed of discrete, individual entities with distinct and solid boundaries (Barad, 2007). Anthropocentrism then, is the belief that humans are distinct and separate from, and more intelligent and valuable than, non-humans and nature (Braidotti, 2013).

Anthropocentrism intersects with other hierarchies like racism, hetero-sexism and ableism to normalise and value a particular kind of human, i.e. a white, male, heterosexual, able bodied, middle/upper class human. Plumwood (1993) argues that these dualisms, especially the separation of humans and nature in Western culture, are the root of our ecological crises.

Climate science is not immune from these dualistic practices (P. Edwards, 2010;

Israel & Sachs, 2013; MacGregor, 2010; Tuana, 2013; Tuana & Cuomo, 2014; Uggla, 2010). Contemporary climate science has arisen through complex entanglements with militarism, desires to control the weather, and other industrial processes which themselves cause climate change (Bader & Laberge, 2014; P. Edwards, 2010), and while it now operates with dramatically different objectives, values, structures, governance and funding, its anthropocentric inheritance may still pervade it in subtle but significant ways. For example, perhaps the most widely cited finding from climate science is that current climate change is anthropogenic, that is, it is caused by humans and is therefore not natural (e.g. IPCC, 2014a). While providing a mechanism for attributing responsibility is necessary for climate change mitigation strategies, if that mechanism depends on situating humans as inherently separate from and more powerful than nature it is unlikely to engender the recognition that climate change matters because we are part of the climate that is changing (Nolt, 2011; Uggla, 2010). Further, while climate science may be “in the midst of a radical turn towards” describing climate according to “Gaia-like principles” of “processes and relations” (Rickards, 2015, p. 339), its methods of gaining this knowledge are supposedly achieved through being separate from the climate (Tuana, 2013). To clarify, science provides absolutely integral knowledge about how the climate of our only possible home is changing rapidly and becoming literally uninhabitable; but its means of doing so can potentially make us feel separate from that world, and they thus risk reinforcing, rather than overcoming, apathy in the face of climate change. Becoming uncomfortable with this tension, I realised that the approach I had first embraced—science will solve our inaction—was problematic, and potentially reproduced the anthropocentric ways of being that I was trying to change. So, what were the alternatives?

Pre-empting my dissatisfaction with the worldview science offered our approaches to climate change, climate scientist Mike Hulme turned to the social sciences and has spent more than a decade exploring the notion that climate is best understood as a culturally

constructed idea (2009; 2015b; 2017). As an example, Hulme contends that scientific definitions of climate

do not do justice to the deep material and symbolic interactions which occur between weather and cultures in places, interactions which, I believe, are central to the idea of climate. They too easily maintain a false separation between a physical world (to be understood through scientific inquiry) and an imaginative one (to be understood through meaningful narratives or human practices). Such a distinction maps easily onto the nature-culture dualism which has engrained itself in much western thought and practice and which has been extensively challenged over recent decades. (2015c, pp. 175–176)

Hulme rejects “such a dualist position” (2017, p. 3) and for this reason, when starting my PhD, I found his work promising. According to Hulme, climate is “an idea that can be approached using either physical or cultural pathways, but it is best understood as an idea that binds together the physical world and our cultural imagination. ... climates have both physical reality and cultural meaning” (2009, p. 32). His repertoire contributes valuable insights to our understanding of climate change and human social and cultural relations to it. Across all these works, Hulme maintains that climate “needs to be understood, first and foremost, culturally” rather than scientifically (2015a, p. 2). This does offer important developments in how we understand climate.

However, this approach is based in social constructionism, which like science is deeply anthropocentric and dualistic, being based in a metaphysics of individualism (Barad, 2007). Both social constructionism and scientific realism are epistemologies (theories of how knowledge works) based on ontologies (beliefs about what exists in the world) that see the human mind as separate from material nature. A term for this specific form of anthropocentrism is representationalism. Representationalism assumes there is a “primary, originary reality out there” (St. Pierre, 2013b p. 649) and presupposes a gap between this world, the human knowers that can know it, and the knowledge—representations—that

apparently mediate between them (Barad, 2007, p. 46). Scientific realism and social constructionism both assume this gap between knowers and the world, they differ only in their belief about whether our representations can tell us how the world really is (scientific realism), or whether we can only know social and cultural representations of it (social constructionism) (Alaimo & Hekman, 2008). This leaves us with an unsatisfactory choice between relativism (where the knower can know their subjective representations but the representations cannot be trusted to truly match reality), and detached universalism (scientific knowledge is a perfect image of a singular reality which is known through *not being part of the reality* that is being represented) (Barad, 2007).

This representationalism and anthropocentrism is evident in Hulme's work: he argues that climate "is therefore an idea of the human mind" (2017, p. 2). This means "there can be no unmediated access to climate" (2017, p. 9) and that "climate cannot be experienced directly through the senses" (Hulme, 2009, p. 3). That is, following Hulme, *climate is always represented by humans*. In a desire to reject the dualistic approach of science, Hulme moves from understanding climate primarily as a scientific phenomenon knowable through human science, to understanding it primarily as an idea knowable through human culture—an equally, though differently, anthropocentric position. This leaves no scope for human bodies or non-humans to know climate, nor for the climate to exert its own agency by influencing, affecting, or exceeding our knowledges of it.

I was just as dissatisfied with social constructionist approaches to climate, such as Hulme's, as I was with scientific approaches. As another student of mine stated in 2015, "I don't believe climate can be a purely constructed idea because ... because *feel it*, we can feel it, not just with our senses but with our emotions and in our subconscious" (student's emphasis). Social constructionist approaches err uncomfortably close to enabling climate

denial, as evidenced in Hulme's claim that it "is as irrelevant as it is impossible to find the invisible fault line between natural and artificial climate" (2010, p. 270) and his questioning of whether there even is a climate crisis (2010). While both science and social constructionism do offer important contributions to understanding climate change, both conceive of climate knowledge being possessed by human minds and they therefore reinforce representationalism and anthropocentrism (Haraway, 1988; Israel & Sachs, 2013).

I came to realise that our climate change discourse was troubled, and troubling. I doubted myself. I was lost. Science is not neutral nor a silver bullet—but questioning climate science seems a risky move in a political landscape such as Australia's, because interrogating how climate science works can be used to, or be seen to, legitimate scepticism (Demeritt, 2006; Iyengar & Massey, 2018). Belief in human separateness from nature is the source of our environmentally destructive culture; yet we rely on the distinction between "natural" and "human induced" climate change in order to respond to climate change. As climate change education has largely mirrored dominant social climate discourses (Kagawa & Selby, 2010), it is possible climate educators are using the same ideology—disembedded ontologies of human exceptionalism—to try to address a problem caused by that ideology. If we cannot solve a problem using the thinking that created it, we have a very tricky situation on our hands. I believe that climate change education needs to interrogate climate science, and that it needs to do so by transgressing the belief that humans are separate from nature, not reasserting it through a different formula. Turning to feminist science studies helped me begin to do this. As Karen Barad (2007) articulates, science can be a profoundly social practice while still delivering empirical adequacy. And as Israel and Sachs (2013) and Tuana (2013) argue, we must take the risk of examining and rethinking climate science if we are to develop the knowledges and pedagogies we need for climate justice and responsibility.

THESIS AIMS AND OUTLINE

This thesis aims to contribute to a form of climate change education that, following Val Plumwood (2002), can resituate humans ecologically and the more-than-human world ethically. That is, it aims to contribute to non-anthropocentric climate change pedagogy. I understand pedagogy to mean a theory about how knowledge emerges and how it can be cultivated, which by extension involves a theory about what exists in the world (an ontology) and who is capable of knowing about it (an epistemology) (Carstens, 2016; Kuby & Christ, 2018). Pedagogy is therefore a philosophical framework that can be used to understand and practice education (Lenz Taguchi, 2010; A. Taylor, 2017b). Pedagogy is related to, but distinct from, curriculum. Whereas pedagogy is more about the processes of learning, curriculum is more about the topic or content of learning. For example, a lecture enacts a different pedagogy to an excursion; whether the topic should be energy policy or climate justice is more a matter of curriculum. Although this thesis does not exclude discussions of curriculum it focuses on pedagogy, and as such it involves the exploration and development of climate change ontologies and epistemologies.

To clarify the scope and need for this thesis, Chapter 2 provides a literature review. It explores how anthropocentrism and representationalism are pervasive in climate change education. Both the dominant approaches to climate change pedagogy—“science deficit” and social constructionist pedagogies—understand human minds to be separate from human bodies and from climate, and they thus consider climate knowledge, concern and action to be distinct dimensions of engagement. Exploring avenues towards a non-anthropocentric climate change pedagogy, I then review posthuman and feminist materialist approaches to climate change, to education, and to climate change education. Posthumanism, as I use the term in this thesis, is an effort to uncover, problematise and counteract the assumptions that humans

are more valuable or intelligent than, or clearly distinguishable from, nature (Barad, 2007; Braidotti, 2013). Feminist materialism seeks to pay careful attention to, and advocate for, the agency of the non-human world and of human bodies (Alaimo & Hekman, 2008; Bennett, 2010). Both challenge the heterosexism, racism and ableism that often accompany anthropocentrism (Clare, 2016; Neimanis, 2017). Through this review, I find useful starting points for developing a posthuman (i.e. non-anthropocentric) climate pedagogy, which include an attention to non-human agency as well as how humans are enmeshed and become-with the weather. A related and important move is towards performative, rather than representational, climate ontologies. Performativity understands realities, knowledge of them and knowers themselves to be brought into being through socio-ecological practices: patterned collective actions that are context specific, and which rehearse established ways of being while also diverging and reconfiguring them (Barad, 2007; Haraway, 1988; Law, 2004). Thus, rather than knowing through being outside the world, we know because we are of the world (Barad, 2007), and our knowledge practices thus co-compose and change that world. While these are promising directions towards a posthuman climate change pedagogy, Chapter 2 finds that there are significant theoretical gaps that this thesis can contribute to:

- a posthuman understanding of *human-climate relationships*;
- a relational yet functional theorisation of humans' *agency* in changing climate that neither centres humans nor absolves us of responsibility;
- an account of climate *knowledge* that is neither anthropocentric nor representational, yet that accounts for how climate science works;
- a more-than-human understanding of *affect/emotions* and their relation to climate change, and
- a consideration of what the *goals* of a posthuman climate change education might or could be.

Grosz argues that “without concepts, without theory, practice has no *hope*, its goal is only reversal and redistribution, not transformation” (2011, p. 83, italics in original). As she

elaborates:

We need concepts in order to think our way in a world of forces that we do not control. Concepts are not means of control but ... ways of addressing the future, and in this sense are the conditions under which a future different from the present—the goal of every radical politics—becomes possible. (2011, p. 80)

Thus, in order to contribute to a more hopeful and transformational climate pedagogy, I offer conceptual developments throughout the thesis that respond to the gaps identified above. This is achieved through a range of means, including through engagement with the empirical case study of Climate Change Responses, an undergraduate social science course I tutored in at RMIT University in 2015, and with my own lived experience as a climate educator and activist situated in Melbourne in the 2010s. I also draw on literature from a diverse range of disciplines and topics, including: climate change adaptation, mitigation, communication and education literature; affect, Anthropocene, multispecies and science and technology studies; climate science; the environmental humanities; ecopsychology; human geography; postqualitative and more-than-human methodologies; and intersectional feminist, poststructural, queer, anti-colonial, Indigenous and environmental philosophy. My contributions are developed across the thesis through various modes of weaving theory and empirical experience together and through each other. Through this work, the thesis addresses the “climate change gap” in feminist materialism (Pearse, 2017), feminist science studies (Israel & Sachs, 2013; Tuana, 2013) and posthuman education.

In Chapter 3, I develop a climate change pedagogy which responds to the need for posthuman understandings of human-climate relationships, climate changing agency, climate knowledge and the goals of climate change education, as identified above. Karen Barad’s (2007) work is my main theoretical guide in this chapter. I use Barad’s notion of entanglement—developed through her reading of quantum physics—to demonstrate that we

can understand climate not as an object that we can know about through spatial separation, but as an entanglement that we can know about through being part of it. In this account, climate science achieves objectivity by enacting certain human/climate boundaries that enable meaningful, functional and useful knowledge to be produced; the crucial insight is that these boundaries are not a “natural” or fixed separation, but are performed for a specific purpose. While valuable for producing knowledge that works and can counter scepticism, exclusive, dogmatic or uncritical use of climate science or pedagogies inspired by its methodologies can therefore reinforce the belief that humans are separate from nature and climate, rather than inspiring concern about climate change. My approach of climate-as-entanglement is scientifically grounded and thus “constructs the ballast” against climate denial, insuring us against claims of epistemological relativism (Hekman, 2008, p. 85). This posthuman performative reading also enables us to understand climate not as an object, but as a set of relationships in which we participate, and thus, as a verb, something we all *do*. It therefore avoids anthropocentrism and representationalism.

Elaborating on this philosophy of science, the posthuman climate pedagogy I develop retains climate change education’s desire for doing, but reconceptualises knowledge, concern and action as entangled and enacted through relationships with climate. The educational aim is therefore not to cultivate climate action—understood as predetermined behaviours conducted by rational individual humans—so much as climate response-ability: a process where subjects and responses co-enact each other through relations with the more-than-human world. Climate response-ability is outlined as occurring through what Barad terms intra-actions. Intra-action is similar to interaction, referring to instances where different parts of the world come into relation with each other and affect each other. However, Barad’s notion of intra-action reworks this, arguing that rather than entities entering into relations, relations create entities. Thus, in intra-actions, entities continuously emerge according to the

different relations that are composing them. I therefore argue that a posthuman climate pedagogy is composed of climate intra-actions.

I outline climate intra-action to be comprised of three key elements: intrasectionality, which refers to how the boundaries, qualities and identities of entities (such as humans or climate) are reconfigured through intra-actions; acting-with, which refers to how all capacities to affect the world are always enacted in partnership with many other forces and beings; and diffractions, which are unanticipated, novel actions that emerge from and produce difference in the world. This account moves from seeing individual humans as the location of climate change knowledge and action, to seeing such phenomena as the effects of ever changing relationships between climate and humans (and potentially, between climate and non-humans—climate intra-action does not require human participants, but my study does focus on human-climate intra-actions).

Chapter 4 introduces Climate Change Responses 2015 (CCR15), the empirical case study I worked with in order to develop, explore and elaborate on the posthuman climate pedagogy offered in the thesis. Chapter 4 provides the context as well as an overview of the content of the course. Chapter 4 also discusses the practical issues of research design and data creation that I enacted as a researcher, in order to lead into Chapter 5 which outlines the research methodology.

Chapter 5 is in fact a bit of a “mess” (Law, 2004) or a “mangle” (Pickering, 1995) of research findings, methodology, and conceptual contributions. If that sounds confusing, it is because this is not a traditional methodology where the object of study (CCR15) is separate from the means of knowing (auto/ethnography) or the knower (me). Taking the “onto-epistemology” (Barad, 2007, p. 185) of entanglement seriously means that just like other forms of climate knowledge, my research methodology, findings and my own subjectivity

emerge through being entangled with that which I seek to know. Therefore, my methodology was not fully predesigned before participating in CCR15, rather, it emerged as an unfolding response-ability. The chapter introduces three specific modes of intra-action: encountering (Haraway, 2008), witnessing (Haraway, 1988, 1997) and storying (Haraway, 2016), and then discusses how climate change manifested in our climate controlled classroom as an affective atmosphere (B. Anderson, 2009). Affective atmosphere is a term from cultural geography that uses the physical form of meteorological atmospheres as a metaphor to explain the emergence and circulation of affects, which are embodied forces or intensities that are both produced by and produce bodies. I refine this concept to explicitly articulate the entanglement of climatic atmospheres with affective forces. Chapter 5 thus begins the thesis' work of contributing to posthuman understandings of the role of emotions and affect in climate change pedagogy. I explain how in CCR15 the course learning resources, the semester's weather and Melbourne's climate, the national political discourse and the classroom materialities contributed to the affective atmosphere of CCR15. As learners, we pedagogically encountered, witnessed and storied this affective atmosphere, and in so doing, contributed to the ongoing (re)manifestation of climate change as an affective atmosphere. Encountering, witnessing and storying climate change's affective atmospheres therefore becomes my understanding of the mechanism through which students and climate were intra-acting in CCR15. The specific details of these pedagogical intra-actions are explored across the remaining chapters (6–9). The final section of Chapter 5 discusses encountering, witnessing and storying climate change's affective atmospheres as my methodological practices. That is, it explores how as a researcher I methodologically encountered, witnessed and storied the pedagogical encounterings, witnessings and storyings occurring in CCR15. This includes discussion of how the research experience affected me, my own influence on the research project, the challenge of working with my memory, and an explanation of how

an entangled voice stories the empirical chapters that follow.

Chapter 6 is an affective entangled narrative of CCR15. It provides a theoretically informed story of students' and my experience of the course, and is narrated by multiple entangled voices. It is an experimental effort to textually perform affective atmospheres and to enrol the reader in the intra-actions of encountering, witnessing and storying climate change. This story forms the "data" for the analysis and discussion advanced in the following three chapters. Chapters 7–9 each focus on one specific pedagogical intra-action (i.e. either encountering, witnessing or storying) to explore the kinds of climate-human entanglements and response-abilities which emerged and/or were reconfigured in CCR15. In so doing, Chapters 7–9 attend to "our" experiences, although such first person collective pronouns are not used to suggest uniformity of experiences across individuals, but rather, to refer to collectively produced experiences, many of which were common, but none of which were universal. The ephemerality and porosity of the "we" of CCR15 is discussed explicitly in the section *A cloudy collective* in Chapter 9.

Chapter 7 looks specifically at encountering. Encountering is where two entities or forces meet unexpectedly and counter each other's existing ways of being. In the chapter, I firstly explore some of the affective encounters with climate change in CCR15 which exceeded easy explanation, and then discuss how our encounters with climate change produced six characteristic emotional responses. I demonstrate that the emotional performances of anxiety, guilt, grief, frustration, and being overwhelmed disabled our sense of individual agency, sunk our sense of self and enabled us to identify ailing relationships and articulate climate responsibility. Finally, I demonstrate that our experiences of hope enabled us to bear worlds, that is, to endure current painful worlds in order to generate new, better ones, and I thus argue that painful emotional and affective responses are an important and

constitutive part of hoping. Through this work, the chapter therefore explores how modern/neoliberal climate response-abilities were somewhat decomposed through our encounters with climate change's affective atmospheres. In so doing, the chapter demonstrates the intra-active nature of the practice of encountering: climate change changed us and because we are part of climate, we changed climate.

Chapter 8 focuses on the pedagogical intra-action of witnessing. Witnessing is a practice that validates stories of encounters, and in so doing it realises some worlds and not others. Witnessing climate change is often understood to occur visually. Chapter 8 interrogates normalised understandings of vision as a pre-given ability and explores how in CCR15, through various collaborative practices of witnessing, we articulated novel visual apparatuses and learned to see climate change in differing ways. With this approach to visually knowing climate change, I explore experiences of witnessing “double” and “unreal” climate realities in CCR15, where the grotesque reality of climate change became affectively “seen” in mundane business as usual experiences. I discuss how the stories of these encounters were witnessed in CCR15, and I also explore other ways they could be witnessed. Finally, I examine how this affective interpersonal witnessing led some students to consider climate science as its own kind of climate denial, one that denies (as in, hides, overlooks, or devalues) emotional and affective engagements with climate change. Chapter 8 therefore demonstrates how the intra-action of witnessing contributes to the realisation of climate worlds, which in our case included both the increased sensation of the affective realities of climate change, and an awareness that multiple ways of knowing climate change are valid.

Chapter 9 focuses on the pedagogical intra-action of storying. Storying is the production of socially comprehensible narratives about occurrences. I discuss how students storied their experiences in CCR15 as involving the formation of a kind of “group” and as

being like “therapy.” I demonstrate that this storying emerged from entangled intra-actions, but also, that the stories affected us, producing novel possibilities for climate response-abilities. I then posthumanise these stories by arguing that in CCR15, our practices of encountering, witnessing and storying climate change produced an affective-atmospheric refuge from climate denial where we were able to maintain engagement with climate complicity and vulnerability. The collective engagement in these practices cultivated what I term a cloudy subjectivity, an ephemeral, affective, more-than-human collective that engaged with the murky ethical challenges of responding to climate change. This storying of the cloudy collective discusses how the “we” of CCR15 was not a homogenised and united collective, but one which was engaged in reiterative inclusions and exclusions, and which thus encompassed diversity, difference and discord. Through this work, Chapter 9 complements Chapter 7 and Chapter 8 by attending to the recomposed climate response-abilities that emerged in CCR15 through witnessing each other’s affective climate encounters. Thus, Chapters 7–9 collectively illuminate how our climate response-abilities emerged through the specific pedagogical intra-actions of encountering, witnessing and storying the affective atmospheres of climate change.

In the conclusion to the thesis (Chapter 10), I discuss some of the implications of my research by exploring the notion of learning to live-with climate change. I argue that learning to live-with climate change is a key task for the twenty-first century, especially for those in high-emission societies. Beginning from a posthuman climate ontology, learning to live-with climate change recognises that living is always living-with climate and climate change. Learning to live-with climate change also involves the emotional/affective labour that CCR15 taught me is required to engage in recognising such entanglements, as this relational approach to the world forces us to acknowledge that future life will be radically different to what we have evolved with and come to love. Learning to live-with climate change thus

involves becoming climate response-able, and key to such response-ability is being able to bear worlds, to hope-and-mourn. Through such affective, intra-active labours we will become different to ourselves—we will become-human otherwise—which, while disconcerting, is important if we are to climate otherwise. Chapter 10 also reiterates the performative potential of the intra-actions of encountering, witnessing and storying climate change, by exploring how my methodological practices of researching what happened in CCR15 have affected my pedagogical response-abilities as a teacher in subsequent iterations of Climate Change Responses and other courses. I discuss efforts at trying to connect students to networks or collectives, increasingly encouraging students to engage with their emotional and affective means of knowing climate change, and how things never turn out the way I intend. As such, Chapter 10 synthesises the discussions of affect, goals, knowing, agency and human-climate relations advanced in the thesis, and argues that the conceptual developments offered in the thesis may enable us to take a “quantum leap” in our ways of climating (K.L. O’Brien, 2016).

As a whole, the thesis therefore contributes to the development of posthuman climate change pedagogy by demonstrating that climate change knowledge, concern and agency are not the attributes of autonomous individual humans, but phenomena that emerge in between human-climate relations. It troubles the neat categories of head/heart/hands of science deficit and social constructionist pedagogies and offers the emphasis on continuously emerging, dynamic and contingent response-ability in place of this. It decentres humans by attending to how climate affects us in ways we cannot control, nor predict, nor even fully understand. Through rejecting anthropocentric desires and models of control, it also destabilises the belief in human educators’ abilities to effectively or consistently direct students towards predetermined goals. Learning to live-with climate change is thus an alternative approach to climate change pedagogy which is more honestly attuned to the messy, distressing, uncomfortable and non-linear processes through which humans and climate mutually affect

each other, which still strives to contribute to more positive climate futures for all. And at heart, this is an effort to climate otherwise: to engage in, as and with climate in more ethical ways. These philosophical, practical and intellectual contributions therefore have relevance beyond what might generally be considered the realm of education, and I hope that they inspire others to reconsider and/or reconfigure their relations with climate.

2. BEYOND ANTHROPOCENTRISM AND REPRESENTATIONALISM IN CLIMATE CHANGE PEDAGOGY

INTRODUCTION

As discussed in Chapter 1, climate change is most commonly known in the West through climate science. Climate science forms an important counter to climate denial, and is crucial if effective climate change mitigation and adaptation responses are to be implemented. However, science treats climate as a geo-physical object that human subjects can measure, represent, know and act on from a position of relative separation (Israel & Sachs, 2013; Tuana, 2013). Thus, climate science enacts troubling dualisms and engages in anthropocentrism and representationalism. Further, in climate science, the human subject is implicitly assumed to be white, male, heterosexual, able-bodied and middle-class (Israel & Sachs, 2013; MacGregor, 2010; Tuana, 2013), and this is argued by social justice advocates to be at the heart of legitimating and perpetuating the suffering and oppression of women, people of colour, poor people, disabled and LGBTIQ+ people (Kaijser & Kronsell, 2014). Many of these issues of anthropocentrism and representationalism are similarly risked by social constructionist approaches to climate change.

In this chapter, I enquire into whether and to what extent this anthropocentrism and representationalism is perpetuated in climate change education literature, and what—if any—posthuman approaches exist. Climate change education generally aims to get humans to engage in climate action, usually by increasing their climate knowledge and/or their concern about climate change. This literature review thus investigates how climate change education literature conceptualises humans, climate, action/agency, knowledge and emotions,

and how it understands them to be related. To clarify, my interest is less in the content that is (advocated to be) explicitly discussed in classes, but in the pedagogies in this literature: the epistemological and ontological beliefs underpinning the theories and approaches to teaching and learning. I firstly review and critically analyse “science deficit” and social constructionist approaches to climate change education, and then review posthuman approaches to climate change, education, and climate change education. I then enact a diffractive methodology (Barad, 2007, 2014) taking the insights and provocations of each approach and exploring the tensions and gaps that arise when they interfere with each other. Through doing so, I find that there is important work to be done developing posthuman approaches to human-climate relations, knowledge, agency, affect/emotions and goals in climate change education.

CLIMATE CHANGE PEDAGOGY

Climate change education finds its purpose in cultivating “climate action” (Henderson, Long, Berger, Russell, & Drewes, 2017; Monroe, Plate, Oxarart, Bowers, & Chaves, 2017; Moser, 2016). Generally in the overdeveloped world—the context in which this study is situated—this is implicitly assumed to be mitigative action, that is, actions, behaviours or practices which reduce the amount of greenhouse gas emissions that enter Earth’s atmosphere. However, this can also include adaptive action (R. Stevenson, Nicholls, & Whitehouse, 2017). Efforts to stimulate both adaptive and mitigative action are enacted by teachers, scientists, journalists, governments, businesses, activists, individuals, community groups, intergovernmental and non-government organisations. That is, climate change education is not limited to the domain of schools and universities. Rather, a broad range of actors engage in climate change education, and as such, a broad range of efforts exist. However, underpinning these efforts are theories about what humans, climate, climate knowledge, climate action and climate concern are, and how they are related. These

theories—whether explicitly articulated or assumed—influence the strategies that the actors try to design and implement. Together, I take the theories and strategies enacted in climate change education to constitute climate change pedagogy. Within the West, there are generally two broad climate pedagogy camps: the science deficit and the social constructionist approaches. Most climate change education practice probably engages both to more or less an extent, however they are quite distinct theoretical approaches.

In much climate change education, science is often taken to be the best or most accurate form of climate knowledge (Rousell, Cutter-Mackenzie, & Foster, 2017), reflecting the dominance of science in broader social efforts to know climate change (Kagawa & Selby, 2010; P. Edwards, 2010). The “science deficit” pedagogy, as it is often called by its critics, assumes that scientific literacy—including knowing that climate change is real, is caused by humans and is therefore not natural—leads to concern, which in turn leads to action (Geiger, Swim, Fraser, & Flinner, 2017; Hulme, 2009; Kagawa & Selby, 2010; Kavanagh, Waldron, Ruane, & Oberman, 2012; Moser & Dilling, 2007). In other words, inaction can apparently be remedied by the provision of (more) scientific information about climate change. Such science deficit pedagogies have been the default approaches to climate change education, communication and engagement efforts for some time (Moser, 2010; Monroe et al., 2017; Rousell et al., 2017).

Science deficit approaches enact representational pedagogies which replicate the scientific methodology of knowledge-via-spatial-separation. For example, in science deficit pedagogies, mental models is a construct often used to explain learners’ climate knowledge (Huxster, Uribe-Zarain, & Kempton, 2015; Niebert & Gropengiesser, 2013; Reynolds, Bostrom, Read, & Morgan, 2010; Shepardson, Niyogi, Roychoudhury, & Hirsch, 2012; Wibeck, 2014). Huxster et al. explain that mental models is a theory which posits that

individual people amalgamate information they learn about the world into small scale models of reality that they “carry around in their heads” (2015, p. 152). According to Huxster et al. (2015) people’s mental models are thought to be linked to their motivation and behaviour. Science deficit climate pedagogy—in education practice and research—therefore tries to identify and reconstruct these mental models. It is thought that by doing so, people’s climate knowledge can therefore be measured, calculated and compared to scientific models of climate (Huxster et al., 2015).

Climate change education research from this school of thought finds that people—whether they be children or adult students, teachers themselves, or the public more generally—do not understand climate science to the extent that, or in the way that, climate scientists do (Deryugina & Shurchkov, 2016; Huxster et al., 2015; Niebert & Gropengiesser, 2013; Plutzer et al., 2016; Reynolds et al., 2010; Shepardson et al., 2012; Wibeck, 2014; Wodika & Schoof, 2017). Common deviations from the general scientific consensus include confusing climate change and the hole in the ozone layer; a misunderstanding about the role of carbon dioxide; a lack of clarity about how the greenhouse effect works or the role that fossil fuels play in climate change; and the obvious issues such as not being convinced that climate change is real or is caused by humans (Geiger et al., 2017; Huxster et al., 2015; Monroe et al., 2017; Niebert & Gropengiesser, 2013; Reynolds et al., 2010; Shepardson et al., 2012; Wibeck, 2014). The inherent complexity of the climate system, for example feedback loops, is also very challenging for learners (Shepardson et al., 2012; Wibeck, 2014). These cognitive issues are argued to be responsible for “the adoption of ineffective mitigation actions, as well as possibly weakened support for governmental initiative on the issue” (Huxster et al., 2015, p. 151; see also Geiger et al., 2017). Science deficit teaching practices therefore aim to correct misconceptions or gaps in these mental models, often through direct instruction (Geiger et al., 2017; Huxster et al., 2015; Monroe et al., 2017; Shepardson et al.,

2012). In science deficit approaches pedagogy is understood to be the responsibility of “superintendents, principals, science teachers, science educators, and scientists” (Shepardson et al., 2012, p. 337), with—implicitly—a passive, information absorption role for students.

But there is now extensive research that shows that comprehension of climate science is not clearly connected with concern about climate change, and neither knowledge nor concern are clear causes of climate mitigating actions (Deryugina & Shurchkov, 2016; Fernandez, Thi, & Shaw, 2014; Gaillard, 2012; Kagawa & Selby, 2010; Skamp, Boyes, & Stanisstreet, 2013; Wachholz, Artz, & Chene, 2014; Wibeck, 2014; Wilson, 2012). In some studies, increasing scientific literacy is actually correlated with decreasing levels of concern about climate change (Kahan et al., 2012; Wibeck, 2014). At the end of the day, such science deficit approaches—which have been implemented not just in schools but across society more broadly—just have not led to the scale of action that is needed to halt or even significantly slow climate change. Some have argued that perhaps the issue is that by providing climate science as the answer, we assume that the problem is a scientific one (Szerszynski, 2010), rather than a political, cultural, emotional or psychological one.

In response to the inefficacy of science deficit pedagogies to cultivate climate concern and/or action, participatory student-centred pedagogies informed by social constructionism have emerged (Moser, 2016). These pedagogies recognise that human knowers actively construct their own subjective meanings and representations about climate change (Hulme, 2009; Monroe et al., 2017; Wibeck, 2014). Learners are understood as unique individuals who are socially situated, and therefore a host of (human) social factors are seen to influence their knowledge construction, such as framings, identities, interpersonal relationships, emotions, economic structures, ideologies, religion, and more (Adlong & Dietsch, 2014; A. Anderson, 2012; Gaillard, 2012; Hu, Jia, Zhang, Zheng, & Zhu, 2017; Jaspal, Nerlich, &

Cinnirella, 2014; McCright, 2010; Moser & Dilling, 2007; O'Neill & Nicholson-Cole, 2009; Sachdeva, 2016; K. Stevenson, Peterson, Bondell, Moore, & Carrier, 2014; Valdez, Peterson, & Stevenson, 2017; Wachholz et al., 2014; Weber, 2010; Whitmarsh, 2011; Wibeck, 2014; Zamasiya, Nyikahadzoi, & Mukamuri, 2017).

As these approaches believe that learners are not completely rational or autonomous, they therefore do not assume a linear pathway from knowledge to concern and then action (A. Anderson, 2012; Fernandez et al., 2014; Gaillard, 2012; Kagawa & Selby, 2010; Moser, 2016; Wilson, 2012). In place of the primary focus on scientific cognition, these approaches focus on cognitive, affective and behavioural engagement, which involves directly activating students' "head, heart and hands" (Gaillard, 2012; Geiger et al., 2017; Monroe et al., 2017; Wibeck, 2014). Such pedagogies thus seek to take account of and work with learners' individual personal and social contexts, and a range of pedagogical strategies are advocated, such as ones that foster open questioning and discussion, critical thinking, engagement with ethics, personal reflection, the use of art, metaphor and imagery, interpersonal communication, experiential learning, role plays, games, problem solving and negotiated curricula (A. Anderson, 2012; Chapman, Corner, Webster, & Markowitz, 2016; Gaillard, 2012; Hawkins & Kanngieser, 2017; Karpudewan & Mohd Ali Khan, 2017; Kavanagh et al., 2012; Meadows, Sweeney, & Mehers, 2016; Monroe et al., 2017; Moser, 2016; Murphy, 2010; Rumore, Schenk, & Susskind, 2016; Wilson, 2012; Wu & Lee, 2015). Actively cultivating behavioural and affective engagement is an important improvement to the science deficit approaches which assume such engagement will inevitably arise following the comprehension of facts.

Due to the failure of increased knowledge to create sufficient action, the affective dimension has recently been considered to have an "essential role" (Salama & Aboukoura,

2018, p. 141) and emotions to be the “missing link” (Burke, Ockwell, & Whitmarsh, 2018, p. 95) in engaging people with climate change. Given the influence of the knowledge-attitudes-behaviour approach in environmental and sustainability education (Russell & Oakley, 2016), emotions are thus understood to be means through which to achieve the real end of climate change education: action (Chapman, Lickel, & Markowitz, 2017; Hufnagel, 2017; Salama & Aboukoura, 2018). Sidestepping knowledge for a moment, the general belief is, as discussed above, that inspiring concern in people will motivate them to take action (Hornsey & Fielding, 2016). But research into people’s emotional experiences of climate change show that many people fail to respond to climate change not because of a lack of concern, but *because of their concern* (Kristin & Dilshani, 2018; Norgaard, 2011b). This denial, apathy or disengagement can arise because when people do engage with climate change—whether through choice or by being confronted with it—they experience a wide range of intense emotions (Clayton & Manning, 2018; Davenport, 2017; Hayes, Blashki, Wiseman, Burke, & Reifels, 2018). This is true not just of students (Kelly, 2017), but also of climate scientists (Head & Harada, 2017), activists (Kleres & Wettergren, 2017), teachers (Kelsey, 2017; Lombardi & Sinatra, 2013), farmers (Roelvink & Zolkos, 2011), Indigenous people (Cunsolo Willox et al., 2012), and those who have experienced climatic changes like hurricanes, drought, sea level rise and fires (Albrecht et al., 2007; Bray, Wutich, Larson, White, & Brewis, 2018; Dodd et al., 2018; Manning & Clayton, 2018; Tschakert, Tutu, & Alcaro, 2013). Denial or apathy can therefore function as a coping mechanism (Kristin & Dilshani, 2018).

While climate change education has often ignored or simplified the role of emotions (Alsop & Dillon, 2018; Hufnagel, 2017), when emotions are considered in either science deficit or social constructionist pedagogies they are often understood to be something educators or communicators can or should manipulate (e.g. Burke et al., 2018; Carmi, Arnon,

& Orion, 2015; K. Stevenson & Peterson, 2016; R. Stevenson et al., 2017). As such, many studies seek to measure individual people's emotions regarding climate change (Feldman & Hart, 2017; Li & Monroe, 2017), and suggest preferred emotional states that educators should try to make people feel as well as strategies for achieving that (Kelsey, 2017). Recently this has moved from aiming just to inspire concern to promoting the cultivation of hope, so that people will feel that it is both important and possible to make change (Kelsey, 2017; Ojala, 2012, 2016). Others argue against promoting certain emotions because this is both practically and ethically questionable (Chapman et al., 2017) and contend that emotions should be acknowledged, honoured and interrogated, not promoted or manipulated (Chapman et al., 2017; Hufnagel, 2017; Ojala, 2016).

The provision of scientific information, the engagement of socially situated learners and the increasing attention to the role of emotions are fundamental to effective climate change education. However, my contention is that both science deficit and social constructionist climate pedagogies—including the emotionally attuned ones—reiterate anthropocentrism and representationalism, potentially limiting their capacity to contribute to genuinely engaged ecological responsiveness.

Firstly, such pedagogies see individuated human minds as the centre of agency and meaning making. Apparently, neither human nor non-human matter plays an active role in knowing climate in either approach (Potter, 2009), and climate knowledge is possessed by individual humans. That is, while the climate may be represented to be ontologically dynamic (Rickards, 2015), in these pedagogies the climate is understood to be epistemologically passive, pre-existing and independent of our knowledge of it. In science deficit approaches, students mentally attempt to match their model (representation) of climate to the objectively accurate ones of scientists. In “participatory” accounts, what participates is the student's

mind and their social context, not their body nor the climate itself. In this way, these approaches can also be seen to enact not just the human/nature dualism, but also the mind/body dualism, understanding knowing as separate from doing. One can apparently know climate, independent of one's actions with/in it—and it is *one* that knows and acts: an atomistic individual (K. L. O'Brien, 2016).

Further, both accounts believe that we can only know scientific or social representations of climate, rather than knowing climate itself through our inextricable embodied enmeshment in/as/with it. Science deficit pedagogies advocate conformity with scientific representations which apparently reflect climate as it really is, while contending that this objective reality is somehow knowable by humans due to their externality from climate. Participatory climate pedagogies blend an ambiguous mixture of scientific realism and social constructionism: full social constructionism would risk epistemological relativism and therefore climate scepticism, so they defer to science for the right answer or at least the foundational knowledge, allowing students to construct what climate change means for them on top of this.

Ultimately, the scientists are right: *climate change is human induced, it is not natural*. That is, these climate pedagogies share the assumption that “the human” and “the climate” are independent, individual entities with fixed identities which pre-exist their relationship. Knowing climate does not change the learner's identity, nor does it change the climate—given that climate knowledge is separate from climate action. Both approaches believe in the separation of mind from body, knowing from doing, and human from climate. My concern is that by enacting pedagogies that hyper-separate (Plumwood, 1993) humans and climate it is possible that we unwittingly enrol students into the disembodied, disembedded, universalist, anthropocentric subjectivity of Western modernist science that has

so frequently been critiqued by feminists, eco-philosophers and post-colonialists (e.g. Haraway, 1988; Harding, 2008; Mathews, 2006; Plumwood, 1993; Prasad, 2008; Schnabel, 2014; Seth, 2009). Perhaps by replicating the scientific method's epistemology of knowledge-via-separation as a pedagogy, we are reifying the very distinctions we are seeking to transgress. I believe we need alternative pedagogies that may be more capable of situating humans ecologically and the more-than-human world ethically.

TOWARDS POSTHUMAN CLIMATE PEDAGOGY

Efforts to get beyond anthropocentrism can take many forms. Many non-Western cultures have never been anthropocentric and the world's diverse Indigenous and other animist peoples' philosophies and ways of life are important leaders and teachers in such efforts. However, because of my concern with climate denial, I wanted to be able to theorise human-climate relations in ways that were not anthropocentric or representational, but that could also account rigorously for the fact that Western climate science provides integral and functional knowledge. For these reasons, I have worked across the thesis mainly with the philosophies of science studies scholars Karen Barad and Donna Haraway. Their work, and that of related scholars, is often termed "posthuman," although this term is contested and Haraway rejects that as a label for her work (2008, 2016). Some align the term posthuman with transhumanism—the desire to transcend the material limitations of human ecological embodiment, such as mortality, through technology (Braidotti, 2013)—which is not how I use the term. For me, posthumanism refers to a desire and an effort to get away from, rather than to advance, damaging ideas of humans as separate from or better than the non-human world. Others have added qualifiers to distinguish this form of posthumanism from transhumanism, such as "feminist posthumanism" (Alaimo, 2016) or "critical posthumanism" (Neimanis, Åsberg, & Hedrén, 2015). Other terms for similar approaches include "hybrid" or

“more-than-human” (Whatmore, 2002, 2006) philosophies, feminist/vital/new or relational materialism (Alaimo & Hekman, 2008; Bennett, 2010), “agential realism” (Barad, 2007), or as Haraway (2015) prefers, “compostist.” I align my use of the term posthuman with these approaches. That is, I use the term posthuman because it encapsulates both the desire to trouble binaries established within Western-hetero-patriarchal-capitalist notions of “humanity,” as well as the human/nature dualism (Braidotti, 2013). To do such work requires interrogating and reconfiguring understandings of self, other, boundaries, agency and knowledge (Barad, 2007). There is currently little literature that is explicitly about posthuman climate change pedagogy, however, there are promising leads emerging from fields slightly tangential to this specific focus area.

Within climate change research, a range of scholars are trying to account not just for the *connectedness*, but for the *inseparability* of humans and nature (J. Cameron, Manhood, & Pomfrett, 2011; Chakrabarty, 2009; Head, 2008; Head & Gibson, 2012; Leyshon, 2014; Roelvink & Zolkos, 2011; Uggla, 2010). In such work, climate change is understood as an embodied, transcorporeal, relational, living global socio-natural process and experience (Cassidy, 2012; Cunsolo Willox et al., 2012; Sasser, 2016). As Knox puts it, “climate is not primarily a thing but a set of relationships” (2015, p. 103). For Blok (2010) and Burnham, Ma and Zhang (2015), climate change is best understood as a “hybrid” of human and non-human assemblages and their entanglements. As such, they argue that “we ought to pay attention to [climate’s] processual becoming” (Blok, 2010, p. 898). Considering Hurricane Katrina, Tuana argues that climate change is an issue that “reveals that the social and the natural, nature and culture, the real and the constructed, are not dualisms we can responsibly embrace” (2008, p. 209) and which renders apparent “the urgency of embracing an ontology that *rematerializes the social and takes seriously the agency of the natural*” (2008, p.188, italics in original). Of course, as climate changes, humans become-with it (Haraway, 2008)

and scholars are also attending to this. Tuana (2008) argues that we can understand the boundaries between climate and humans to be characterised by a “viscous porosity”:

Viscosity is neither fluid nor solid, but intermediate between them. Attention to the porosity of interaction helps to undermine the notion that distinctions, as important as they might be in particular contexts, signify a natural or unchanging boundary, a natural kind. At the same time, ‘viscosity’ retains an emphasis on resistance to changing form, thereby a more helpful image than ‘fluidity’, which is too likely to promote a notion of open possibilities. (pp. 193-194)

Viscous porosity enables us to attend to how we are not the same as climate, but how we are part of climate and how climate transcorporeally (Alaimo, 2008) flows through us in various ways and contributes to our ongoing becoming. To elaborate, Roelvink and Zolkos (2011) understand climate change to be experienced affectively and thus as a subject changing force. Head (2016) adds that this is not just ontologically true, but a necessary and desirable process. Ryan’s empirical study (2016) demonstrates that such personal and interpersonal transformations unfolded through an embodied, affective community flood adaptation workshop. Such work can enable us to understand climate and humans to be dynamic processes which co-compose each other, rather than static entities that are largely separate from one another.

Perhaps the most explicit and rigorous effort towards a posthuman understanding of climate is Neimanis and Walker’s (2013) conceptualisation of “weathering”. Developed with feminist materialist philosophy, weathering refers to processes where bodies (human and not) both contribute to and experience weather and climate. Weathering articulates how “the ebb and flow of meteorological life transits through us, just as the actions, matters and meanings of our own bodies return to the climate in myriad ways” (Neimanis & Walker, 2013, p. 560). Unlike representational climate ontologies, this transcorporeal account enables recognition that we can directly experience and sense climate with our bodies, through noticing how

particular weather events contrast to the climatic patterns that are archived in our body-memories. This attendance to how we “are all implicated in one another’s spacetimes as weathermakers” demands “more humble, generous and self-reflexive” (2013, p. 562) approaches to our relations and engagements with climate and the wider world. Neimanis and Walker (2013) suggest that taking our co-becoming with weather and climate seriously will require alternative considerations of future climate possibilities, ones which are more nuanced than the “stop climate change” approaches.

As Neimanis and Walker (2013) argue, understanding climate and climate change through relational or posthuman approaches also raises important questions regarding agency. In Western philosophy, agency—the capacity to influence the world—has traditionally been a quality possessed by (some privileged) individual humans (Barad, 2007). Climate change challenges this belief that only humans effect change in the world (Chakrabarty, 2009). However, much climate change discourse in the West still takes a relatively atomistic approach to agency, believing that humans and climate are distinct entities which affect each other in discrete and identifiable processes (K. L. O’Brien, 2016; Sasser, 2016). By contrast, posthumanism understands agency to emerge through messy, more-than-human assemblages (Barad, 2007; Bennett, 2010). Thus posthuman approaches to climate change efforts contend that perhaps the metaphor of “human impacts” is no longer useful for us (Head, 2008). This is because “climate change is not an object” (Leyshon, 2014, p. 360) that externally situated humans simply impact upon in a linear flow of agency which is separate to the impacts climate exerts on us (Sasser, 2016). In sum, a posthuman approach to climate change requires a (re)consideration of how agency operates relationally.

Another step towards rejecting the human/nature dualism involves moving from representational to more performative accounts of climate knowledge. Performative

epistemologies argue that knowledge is not out there awaiting discovery, but is cultivated through the enacted relations between people and the more-than-human world (Barad, 2007; Pickering, 1995). As one example of a performative account of climate, Taddie argues that weather forecasting is a performative practice:

An elementary feature of forecasts is that, in the act of addressing the future, they change the present—even if only minimally, by creating in the actor a disposition toward mitigating the unfavorable predicted event or, on the other hand, taking advantage of predicted opportunities. (2013, p. 245)

With a similarly performative epistemology, Webber's (2013) study of climate adaptation in Kiribati shows how climate data, material-ecological conditions and historical global power structures contribute to the assemblage that produces and performs "vulnerability." Webber thus argues that climate vulnerability is not a quality that inheres in people, places, or objects (such as Kiribati or the i-Kiribati peoples), but that climate vulnerability is constantly made and remade through particular political-ecological contexts. J. Cameron et al. (2011) contend that their research practice of "learning to be affected" (drawing on Latour, 2004) by climate change moves from (just) considering whether their climate change research is accurate, to considering what kinds of climate worlds it contributes to. Knox (2015) explains that climate scientists themselves are beginning to implement performative ontologies of climate, although the scientists might not describe them as such. As the scientists see their own carbon footprints embedded in the climate data they read or the models they create, the belief that they are external to the climate they study is undermined. Thus, some climate scientists now engage in political activism which has traditionally been considered to contaminate the objectivity of science. Such performative accounts of climate change epistemology provide an important contribution towards developing a non-representational climate pedagogy.

Similarly to such scholars I am yearning for an understanding of climate that can

enable us to understand “humans and nonhuman climate and weather phenomena [as] co-constitutive ... mutually emergent, coextensive” (Neimanis & Walker, 2013, p. 564). With a specific focus on education, I see more potential for feminist materialist, relational and posthuman approaches than either science deficit or social constructionist approaches to develop “practical pedagogies” that can “destabilize dominant, humanist imaginaries of weather and climate” and replace them with “a deep attunement to our human bodies’ implication in the weatherworld” (Neimanis, 2015, pp. 141, 145).

Building on the work of philosophers such as Rosi Braidotti (2013), Jane Bennet (2010), Karen Barad (2007) and Donna Haraway (2008), feminist materialist and posthuman education explicitly seek to decentre the human from pedagogy (Snaza, Sonu, Truman, & Zaliwska, 2016). Key to this is the deconstruction of the universalised subject of educational humanism—a disembodied, unitary, autonomous, and fixed subject who possesses knowledge which is independent of the material world (Bozalek & Zembylas, 2016a). Posthuman pedagogues contend that mainstream modern education often functions to establish “compulsory humanity” (McKay, cited in Pedersen, 2010, p. 237) or “anthroponormativity” (A. Taylor & Blaise, 2014, p. 377) which “continually reinscribes and ‘closes’ categories of ‘human’” (Pedersen, 2010, pp. 241–242). That is, humanist pedagogies reproduce individuated subjectivities where “all nonhuman objects [become] potential ‘resources’ to be extracted, refined, exchanged, and used” (Snaza, 2015, p. 26) by the detached “I” (Pedersen & Pini, 2017). These are the very subjectivities that need to be challenged if we want to create more sustainable worlds (Pedersen, 2010). Snaza argues that this occurs through the negation and taming of “the animality of the human that enters into the educational apparatus” as well as a “suppression of embodiment ... bodily desire and passion” (Snaza, 2015, p. 22), as these are replaced with a rational subject disinterested and disembodied from the world. Snaza concludes that “until education is decoupled from this

[and until] we reject the idea that the human is separate (and separable) from everything else on the planet, we have no traction to move toward different futures” (2015, pp. 27–28). In response, posthuman education literature articulates that neither the subject nor the object of education precede or exist independently of, but co-emerge with each other and the more-than-human world (Lenz Taguchi, 2010; Radomska, 2013; C. Taylor, 2013). In this way, feminist materialist and posthuman pedagogy attend to the perpetual reconfiguration of always-porous and ever-shifting boundaries (Leibowitz & Naidoo, 2017).

Pedersen echoes this, arguing that pedagogy needs to pay more attention to “cross-species intersubjectivities, agencies, and entanglements” (Pedersen, 2010, p. 244). Feminist materialism and posthuman approaches to education respond to this provocation by accounting for the agency of the more-than-human world in pedagogy (Sjögren, 2014; Snaza et al., 2016; Somerville, 2017; A. Taylor, 2017a). For example, C. Taylor (2013) attends to the ways in which mundane classroom materialities such as whiteboards co-enact gendered power, and A. Taylor and Pacini-Ketchabaw (2015) explore how ants, worms, boots, rain, mud, sticks and children affect each other, leading to surprising occurrences. Such approaches are also committed to getting students actively participating and responding to the worlds that they are entangled with. R. Edwards’ call demonstrates this:

Students in education learn much about the world through representation, but what would a curriculum of responsible entangling within the world, of experimentation and responding look like? In an era when there are major concerns about climate change ... [perhaps] the purpose of education could be to enact experimentation and responding to others rather than ... the subject centring practices of learning about objects and facts. (2012, p. 533)

Such calls for pedagogy to facilitate students’ capacity to learn how to intra-act responsibly are echoed by the Common Worlds Research Collective who seek to teach students “how to ‘world’” (Taylor & Giugni, 2010, p. 177) and Fenwick and Edwards (2014) who argue that

education should teach students how to enact and intervene.

According to posthuman education literature, knowledge and reality are also effects of relationships that are enacted, generated or performed through worldly engagements (Carstens, 2016; Fenwick & Edwards, 2014; Postma, 2012). Thus learning simultaneously, continuously and reiteratively produces worlds, subjectivities, and relationships (Goodley, 2007; Lenz Taguchi, 2010; M. Perry & Medina, 2011; Snaza et al., 2016; A. Taylor & Giugni, 2012; A. Taylor & Pacini-Ketchabaw, 2015). Knowledge, the world, and the subject are in a continuous process of co-transformation: of becoming-with (Blaise, Hamm, & Iorio, 2017; Bozalek & Zembylas, 2016a; Jeong et al., 2017; Radomska, 2013; Somerville, 2010). Concepts themselves are material and lively, actively participating in learning networks (de Freitas & Palmer, 2015). In place of (or perhaps in addition to) the didactic and participatory pedagogical strategies advocated by the science deficit and social constructionist pedagogies, posthuman pedagogy advocates teaching strategies that are creative, dynamic, non-linear, transdisciplinary, multi-modal, disruptive, unchartered, transcorporeal, interwoven, and that trouble established categories (Hickey-Moody, Palmer, & Sayers, 2016; Lenz Taguchi, 2010; Postma, 2012; Spector, 2015).

These pedagogies where knowing, doing and be(com)ing are inseparable from each other are an alternative to representationalism which understands the world, knowledge, and knowers to be disconnected and independent of each other (Taylor & Blaise, 2014; Taylor & Pacini-Ketchabaw, 2015). St. Pierre articulates the scale of these challenges to anthropocentric pedagogy as “insisting we rethink the nature of being.” She continues:

Importantly, this is an ethical charge. In this ontology, thinking and living are simultaneities, and we have to think possible worlds in which we might live. As long as we think the nature of being as subject/object, materiality does not matter, and we live in the world accordingly. Deeply embedded in [posthumanism] are ethical concerns that acknowledge the destruction of the world

humanism and its science projects encourage with their man/nature, human/nonhuman binaries. Refusing that binary logic ... is a priority, because if we see ourselves as always already entangled with, not separate from or superior to matter, our responsibility to being becomes urgent and constant. (2013b, p. 654)

Feminist material and posthuman philosophies in this way are deeply ecologically attuned, situating knowers directly in or of the world rather than outside, acknowledging that not all knowers are human, and that knowers are never atomistic individuals.

Climate change pedagogy that engages with such approaches is beginning to emerge in the literature. Within this, a few scholars advocate attending to direct (human) bodily encounters and engagements with air/the atmosphere/the weather. Neimanis (2015, p. 141) promotes “weather writing,” an exercise designed to get students to attune more closely to their unique, different and always transcorporeal bodies’ under-explored capacities as sensitive interfaces that make knowledge as part of the “weatherworld.” Hamilton and Neimanis (2018) describe a further range of embodied, sensory, critical, speculative and imaginary activities that can be undertaken in and as part of the weather in order to “cultivate an expanded meteorological imaginary, where we become more sensitive to how we (human and nonhuman natures) ‘weather’ the world together” (Neimanis, 2015, p. 146). Rooney (2018a), building on Neimanis’ (2015) and Neimanis and Walker’s (2013) concept of weathering, suggests that educators should provide opportunities for (young) children to directly experience their bodies intermingling with rain, wind and sunshine (i.e. by going outside). According to Rooney, moving away from an artificial separation of humans and weather is possible by attuning to how children (and humans more generally) are “becoming-weather” through “the ways the weather moves in, with or through us and where we move in, with or through a flux of elemental forces” (Rooney, 2018a, p. 8). This is argued to bring the seemingly distant phenomenon of climate change into our local, embodied realms of experience, making it more tangible and relevant (Neimanis, 2017; Rooney, 2018b). Rooney

argues that “learning *with* the weather” (2018a, p. 8, italics in original) can thus enable a more generative, open ended responsiveness to climate change, one that still seeks mutual ongoingness without centring humans as the sole source of agency. Along similar lines, Banerjee and Blaise (2013) demonstrated that conditioned and polluted air (which is a direct cause and effect of climate change) agentially participated in the learning and identities that emerged in a Hong Kong education exercise, which included air-human relationships that occurred *inside* classroom walls. This close attunement to body-weather intra-actions and affective relations offer very promising directions and openings for climate change education. Of course, we also need to consider climate change education more broadly than this, given the large temporal and spatial scales across which climate change operates, the ways in which it does and may affect others, and the complex political, economic, social, cultural and ecological causes and impacts of climate change.

As such, other scholars are encouraging the participation of multiple forms of more-than-human matter and advocating for more varied pedagogies that include futures, fictions, difference and democracy. Godfrey (2015, p. 4) engaged democratic, embodied, connective pedagogies in order to cultivate what she termed an “earth community” in her tertiary Society and Climate Change course. Godfrey argued that her pedagogy was founded in “radical trust in the universe” (Fisher, cited in Godfrey, 2015, p. 14) which enabled both her and her students to move beyond the distressing fear of ecological collapse with which they were engaging. Weaving Indigenous and posthuman epistemologies together, Cole contends that fully including all the diverse human and more-than-human voices, agencies and epistemologies of what he also terms the “Earth community,” “education might be able to say something very different” and thus respond more effectively to climate challenges (Cole, 2016, p. 10). As one small example, Alaimo (2017) discusses one moment in her undergraduate environmental literature class where a story about the endangered Great

Crested Newt inspired the students to turn their classroom's lights off for the whole semester. While a potentially mundane pedagogical moment, Alaimo takes this opportunity to emphasise the newt's affective agency in this phenomenon, referring to this occurrence as "when the newt turned off the lights" (2017, p. 45). Also exploring alternative conceptualisations of climate change, Rousell et al.'s (2017, p. 655) engagement with speculative fiction as an "ontological tool" enabled students to respond to climate change through speculatively envisioning, inhabiting and creating alternative possible futures.

TENSIONS AND GAPS FOR POSTHUMAN CLIMATE PEDAGOGY

The literature reviewed so far brings to light important tensions, challenges and gaps that need to be addressed in order to develop a posthuman climate pedagogy. One of the main areas that I believe needs further attention is how we conceptualise the relationship between humans and climate. As I have demonstrated, most climate change education assumes that its subject is a stable individual human who acquires knowledge, becomes concerned and exerts agency over a separate and objectified climate while they remain essentially the same throughout the process. This is an ontology of separation which understands the human/climate relationship, at best, as one of connection. To be connected in fact implies separateness which then can be overcome by a connection, and it always retains the possibility of disconnection. At the other end of the scale is the risk of completely dissolving the boundaries between humans and climate, which as Plumwood argues is "characteristic of the colonising self which denies the other through the attempt to incorporate it into the empire of the self" (1993, p. 174). Rather than simply promoting the blurring of climate-human boundaries, we need an approach that can help us attend to *how* human-climate boundaries are produced and reconfigured, *what the effects* of such articulations are, and *who benefits* from them (Barad, 2007; van Dooren, Kirksey & Münster, 2016). However, the most

promising posthuman climate pedagogy that currently exists focuses largely on human-weather relationships. While ground-breaking and foundational entry points, conceptual work such as “weathering” (Neimanis & Hamilton, 2018; Neimanis & Walker, 2013), “becoming-weather” (Rooney, 2018a) and “learning with the weather” (Rooney, 2018b) needs to be furthered, expanded upon by explicit engagement with the temporally, spatially and politically complex issue of climate change.

Secondly, there is a need for a performative, posthuman account of climate knowledge. Climate science can be reductive, yet it has also been one of, if not the, most significant driver of climate action, even if so far this has been insufficient. Climate pedagogy cannot risk an ambivalent stance when it comes to climate science. However, so far, climate science has been admired, accepted, aligned with or disparaged in climate change education, with little scholarship actively *reconsidering* what climate science is or how it works. As Nancy Tuana argues, what we need is “[climate] science that cultivates a sentiment of responsibility and care instead of objective detachment” (2013, p. 24). A posthuman climate change pedagogy would take seriously the need “to have *simultaneously* an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice for recognizing our own ‘semiotic technologies’ for making meanings, *and* a no-nonsense commitment to faithful accounts of a ‘real’ world” (Haraway, 1988, p. 579).

A third area requiring attention is how to conceptualise human agency in climate change. Climate change education typically sees climate action as the somewhat rational outcome of a linear process of knowledge accumulation which leads to individuals being empowered to act on the world. In contrast, posthuman accounts emphasise that agency emerges through unpredictable, non-linear, more-than-human collaborative intra-actions (Leibowitz & Naidoo, 2017). A posthuman approach therefore implies that it is not just

humans who produce climate change, and this can err very close to political relativism. As Head and Gibson (2012) argue, acknowledging interconnectedness between humans and climate, while perhaps theoretically less anthropocentric, often offers precious little guidance on how to proceed practically at cultivating conditions in which others—human and more-than-human—can flourish (see also Duhn, 2017; Ruddick, 2017; Sharp, 2017). But as Walker argues, a “climate change imaginary” does not need to be “a push–pull between human exceptionalism and absolute paralysis” (2013, p. 36). However, there is little work in climate change education working towards such posthuman climate responsibility.

I believe that such onto-epistemological work regarding our climate knowledge, agency and relations will require a subsequent reconsideration of the goals of climate pedagogy, including discussing whether having goals is itself desirable or feasible. As stated earlier, climate change pedagogy aims to cultivate climate action. This is problematic if the action of learners is understood through anthropocentrism, but it is also problematic when considering the agency of educators themselves. Teachers, just like students, are situated in complex eco-historical contexts, and exert agency through and with their dynamic and contingent relations. Thus the idea that teachers can exert agency over and effectively influence their students to perform the teacher’s desired pre-determined climate actions is just another variation of the anthropocentric delusion (Snaza, 2015; Sonu & Snaza, 2015). Yet climate change is not something we can simply study for interest’s sake: we will be forced to respond to climate change one way or another whether we like it or not, and so we need a nuanced consideration of what an ethical and feasible aim for posthuman climate pedagogy should be.

Finally, if we are reconsidering how we understand climate knowledge and agency, posthuman climate pedagogy will also require engagement with non-representational

approaches to affect and emotions. My experience teaching Climate Change Responses taught me that climate change is an intensely affective phenomenon. Yet, while sometimes referring to “the affective” dimension (Geiger et al., 2017), climate change education has largely engaged with psychological approaches which consider emotions to be relatively distinct to knowledge and agency (Russell & Oakley, 2016; Ryan, 2016). The psychological or humanist approach generally understands emotions to be internally generated and experienced by human individuals who can identify and name their feelings (Hufnagel, 2017; Salama & Aboukoura, 2018). This reinforces the boundaries between the internal human self and the external environment, as well as emphasising humans’ capacity to fully comprehend the world (M. Smith, 2013; Vermeulen, 2014). Climate change education has been fairly ignorant of non-representational, posthuman scholarship on affect (Ryan, 2016) which considers affect to be a relational field of not-fully-tangible, more-than-human forces and intensities which interpermeate bodies (Gregg & Seigworth, 2010). Engagement with this scholarship may broaden how we understand and approach climate change education.

In sum, climate change pedagogy as it is currently practised (or at least, documented in academic literature), in both science deficit and social constructionist approaches, is problematically representational and anthropocentric. Yet climate science clearly has a crucial role in enabling us to identify and quantify changes in the climate and the impacts of them, as well as attribute responsibility for them. And social constructionism provides important considerations about the limitations of science, the subjective nature of climate knowledge, and the influence of social forces on humans’ relationships with climate. A posthuman climate change pedagogy would work with the best features of both these approaches, while reworking the individualistic and anthropocentric elements. This thesis aims to contribute to rigorous, nuanced posthuman conceptualisations of climate agency, knowledge and affect, human-climate relationships, and the goals of climate change

education, in order to develop such a posthuman climate change pedagogy.

3. ENTANGLEMENT, INTRA-ACTION AND RESPONSE-ABILITY: A POSTHUMAN CLIMATE PEDAGOGY

INTRODUCTION

I am compelled by the need for more effective climate change education. Both science deficit and social constructionist pedagogies situate the climate knowing subject as an individual human who is independent and separate from the natural world, no matter how dynamic and/or agential that nature is represented to be. I am troubled by how both these efforts to counter inaction rely fundamentally on the human/nature dualism (Plumwood, 1993). This is a big dilemma: although scientific knowledge is crucial to knowing, caring about and responding to climate change, approaches that defer to science as the best, correct, or ultimate means of knowing climate risk cultivating apathy or a hero complex in place of ecological responsiveness (Bader & Laberge, 2014; Israel & Sachs, 2013). But rather than a turn away from science, perhaps what is needed is a different understanding of how climate science works.

In order to articulate a non-anthropocentric, non-representational climate pedagogy that is capable of accounting for human responsibility for climate change, this chapter works with Barad's (2007) concepts of entanglement, intra-action, and Barad's (2007) and Haraway's (2016) concept of response-ability. I begin with Barad's concept of entanglement which situates science and knowledge projects more generally as embodied, emplaced, material practices of entangling with the world. Following this, I provide a brief but indicative analysis that conceptualises climate science as an entanglement. Using atmospheric temperature—the de facto measure of global climate change—as an example I show that *we*

are part of that climate we seek to understand. I demonstrate that we can account for how climate science works without understanding the human and the climate as distinct individuated entities, or climate science as a disembodied neutral epistemology that represents a separate world.

I then use this rethinking of climate science to reconsider climate pedagogy more broadly. I contend that climate, subjects, knowledge and action emerge through intra-action. I argue that climate intra-action can be understood to be intrasectional, to involve acting-with, and to create and emerge from diffractions. Intrasectionality articulates how the subject of climate change education emerges through intra-acting with climate change. The emergent subject's capacities for climate action are achieved through acting-with; that is, agency is not an attribute of individualised subjects but of worldly entanglements. This applies equally to climate educators as it does to climate learners, meaning that climate educators themselves are always emerging and acting-with climate change and their students. Their ability to prescribe and achieve pre-given goals such as standardised climate actions are thus limited, and an attention to the different climate actions—the diffractions—that may emerge is also beneficial. Through these reconfigured and entangled agencies, actions and subjectivities, abilities to respond to climate change—climate response-abilities—are articulated, and novel worlds and knowledges are realised.

CLIMATE AS ENTANGLEMENT

ENTANGLEMENT

Karen Barad's book *Meeting the Universe Halfway* (2007) offers a conceptualisation of entanglement advanced by diffractively reading poststructural theory with Niels Bohr's quantum philosophy. Via an analysis of the enigmatic "two slit" experiments, Barad argues

that “we are part of that nature we seek to understand” (p. 184). Two slit experiments direct a beam of light at a barrier with two holes in it, and the behaviour of the light on the other side is observed. First performed in 1801 by Thomas Young, two slit experiments have puzzled physicists and been modified in various ways since then. This is because two slit experiments can demonstrate that light is a particle or a wave, depending on the experimental apparatus that scientists use. According to classical (i.e. non-quantum) physics, matter can be *either* a particle or a wave *but not both*, so these findings were ontologically paradoxical.

Barad’s (2007) interpretation is that light, and therefore matter more generally, is ontologically indeterminate (i.e. it exists in a range of states). It becomes determinate, that is, becomes a specific ontological form (e.g. wave or particle) through intra-actions with other elements of the material world such as (but not limited to) measurement apparatuses. In contrast to interaction which assumes that distinct entities pre-exist their relationship, intra-action understands the determination of boundaries, properties and meanings to emerge through relationships. This is Barad’s understanding of entanglement: entanglement is not just “any old kind of connection, interweaving, or enmeshment in a complicated situation” (2007, p. 160), rather, to be entangled is to “lack an independent, self-contained existence” (2007, p. ix).

Thus, in reference to the seemingly paradoxical two slit experiments, Bohr’s analysis, Barad tells us, indicates that the measuring apparatus is entangled with the object being measured. That is, the apparatus and the object are not distinct, pre-existing entities; they are an entanglement. The emergent “outcome”—wave or particle behaviour—is not a property that genuinely belongs to an entity (light), but rather, is a phenomenon enacted by the entanglement of light and apparatus. Or, more accurately, “light” and “the apparatus” do not pre-exist but are dynamically co-constituted through their intra-action. The articulation of

determinate entities and properties, which in this example enables the meaningful attribution of wave or particle behaviour to light, depends on what Barad calls agential cuts which generate agential separability. This refers to where the boundary between the agency of observation (or subject) and the observed object is configured within the entanglement through the specific material arrangement.

For example, the placement of a moveable diaphragm within a two slit experiment (which enables the determination of which slit the light passes through) will intra-act with the light, such that the light performs particle behaviour. This physical arrangement delineates the agency of observation (the diaphragm which will be moved by the light) from the object (the light) (Barad, 2007). In classical physics, spatial separability (i.e. distance and separateness) and an a priori, fixed boundary (a Cartesian cut) between an independent agency of observation and observed object facilitates objectivity. In contrast, in Barad's account objectivity is "premised on an agential (or enacted) ontological separability, an individuation-within-and-as-part-of-the-phenomenon enacted in the placement of the cut between 'observer' and 'observed', rather than an absolute notion of externality" (2007, p. 321).

Barad's account thus allows for objectivity by taking phenomena (entanglements) as the primary ontological units, rather than pre-individuated entities. That is, because a different material arrangement will enable different phenomena, Barad concludes that we cannot describe the object without also describing the whole experimental arrangement, because it is this material-discursive entirety through which different phenomena (say, wave behaviour or particle behaviour) are actualised. To reiterate, this means there are no such things as "determinate objects with determinate properties" (2007, p. 127).

If we recognise this ontological indeterminacy, we must also recognise that this has

epistemological implications: if there are no determinate objects with determinate properties, then, following Bohr, Barad argues, there are no “corresponding determinate concepts with determinate meanings independent of the necessary conditions needed to resolve the inherent indeterminacies” (2007, p. 127). Concepts are not ideas that represent the world, rather they are “specific physical arrangements” (2007, p. 109) of matter, of bodies. Thus, embodied concepts are those that “are defined by the circumstances required for their measurement” (2007, p. 109) and it is the use of embodied concepts that secures “the possibilities for objectivity in the absence of an inherent distinction between subject and object or knower and known” (2007, p. 330). The world can be quantum in nature yet we can use concepts from classical physics in many cases, because such concepts (and the entities they refer to) become determinate through the agential cut between the object and the agency of observation/subject which is embodied in the apparatus. And “it is in this sense that the measurement can be said to express particular facts about that which is measured” (2007, p. 140).

However, Barad is wary of the remnant anthropocentrism in Bohr’s account. She argues that “it is not merely the case that human concepts are embodied in apparatuses” (2007, p. 148) and that apparatuses are instruments selectively employed by neutral, independent, pre-existing scientists which thus produce reality. She is adamant that “we don’t obtain knowledge by standing outside the world; we know because we are *of* the world” (2007, p. 185, italics in original). Barad states that it is “necessary to understand humans as part of nature [and this] suggests a radical reconception of the notion of knowing” (2007, p. 341). She therefore revises and extends Bohr’s approach in the following way, and in so doing, challenges the scientific epistemology of knowing via separation.

According to Barad, apparatuses are material-discursive “boundary-drawing practices—specific material (re)configurings of the world” (2007, p. 140) through which

subjects, objects, bodies, and phenomena are differentially articulated or performed into being (becoming). That is, in this onto-epistemology, measurements themselves are understood as physical processes, “causal intra-actions” (2007, p. 337) which “create and further extend entanglements” (2007, p. 344). She argues that this approach to knowing does not require “a conscious self-aware self-contained independent rational agent that comes to a knowledge project fully formed” (2007, p. 341). Insofar as “humans” are involved, it is as a contingently co-emergent, intra-actively differentiated phenomenon—but if “humans” are involved, then the form of their participation does need to be accounted for. The apparatus thus includes the emergent knower, not just the instrument and the object. Concepts, then, are only objectively knowable if the material arrangement between knower and the object to be known is consistently enacted. The property measured (e.g. light behaving as a particle) does not refer to an inherent quality of the object studied (i.e. light) but to the whole experimental arrangement (i.e. a scientist seeking light behaving as a particle and setting up a specific experimental arrangement).

To summarise, entanglement references how knowledge making configurations can still be objective, but this is not about neutrality, universality, or disconnectedness. Rather it is about being accountable for which knowledge making practices have been performed. Crucially, this requires positioning knowing subjects and knowledge as part of the phenomenon to be known. Knowledge is the result of an agential cut—a distinction between subject (or agency of observation) and object which is enacted, not inherent, as knowers are not observers permanently separated from the object. Knowledge is not composed of representations that are ontologically separate from the world. Rather, knowing is doing: reality is generated through knowledge practices which are direct material engagements with the world. This is because the apparatuses we use to measure, understand, or know about the world are specific material-discursive arrangements which participate in the unfolding of the

world. Concepts are “particular material articulations of the world” (2007, p. 139), and are defined by reference to bodies and how they emerge through intra-action. Matter participates in the experimental arrangements through which reality, meaning and knowledge are iteratively co-generated. In this account, knowledge, learning, and education are distributed practices of “intra-acting with the world as part of the world in its dynamic material configuring, its ongoing articulation” (2007, p. 379). This onto-epistemology offers promising opportunities for understanding climate knowledge as something that arises through relations with and as climate.

CLIMATE AS ENTANGLEMENT

Climatology is a “vast machine” whereby a range of climate data is observed, recorded, collected, transmitted, checked, reconciled, stored and catalogued by human scientists (P. Edwards, 2010). We tend to think of this climate data as pure, raw, natural observations existing independently of the practices required to generate it. However, as science studies scholar Demeritt outlines, 21st century climate science is “very different from simply reading a thermometer” (Demeritt, 2006, p. 461) and is far from this idealised vision of scientists reading self-evident measurements of nature. Rather than “collect data,” scientists “literally make data” (P. Edwards, 2010, p. 110) through “complicated statistical techniques,” making climate science “quite literally an act of reconstruction” (Demeritt, 2006, p. 461). For example, the thermodynamic qualities of the instruments which measure temperature, such as the thermometer, provide the basis for scientific knowledge of the climate. Paul Edwards explains this through the example of the thermoelectric probe, “which derives ambient temperature from the current generated by two dissimilar metals joined inside the probe” (P. Edwards, 2010, p. 282). As Edwards further states, “relating these currents to temperature requires parameters for each metal’s magnetic permeability. The

probe's temperature measurements must be understood as outputs of a physically instantiated mathematical model" (P. Edwards, 2010, p. 282). That is, Edwards shows us that there is modelling *built into* the instrumentation that creates climate science's "raw data." Edwards argues that "it is easy to forget that data are never an abstraction, never just 'out there'," however, we must understand that climate data are "a human creation, and they are always material" (2010, p. 110).

It is useful here to begin with Barad's interpretation of Bohr, to understand temperature as an embodied concept. Barad contends that "theoretical concepts are ... specific physical arrangements" (2007, p. 109) and that "reference must be made to bodies in order for concepts to have meaning," that is, to be objective (2007, p. 198). So temperature as a concept comes to have meaning through specific physical arrangements of bodies—in contemporary climate science, this is achieved through scientific instrumentation. However, these modern physical set ups are arranged to be analogues for human sensitivity to the environment. That is, it is not that temperature is a theoretical concept that disembodied scientists, in their God-like status, thought up in their minds and built instruments around. Temperature is a concept that emerged through human bodies intra-acting with the atmosphere, through our specific ecological embodiment. Through our brain-skin-nervous system-air intra-action, we come to sense something as hot(ter) or cold(er). This sensation of difference is the process through which the distinction (cut) between the external environment and body is articulated. It is this specific material arrangement, with its particular agential cut between the human and the atmosphere, which is embodied in the instruments that measure atmospheric temperature.

However, the distinction between bodies and atmospheres is not fixed and does not precede their intra-action—ecology is far more transcorporeal (Alaimo, 2008) than such an

atomistic perspective acknowledges. While our skin is a somewhat convenient boundary, it has a viscous porosity (Tuana, 2008): as mammals, our warm-blooded bodies create heat which radiates from our bodies, changing the temperature of the air around us. In small enclosed areas this becomes more evident, such as wearing clothes, or putting your head under the blanket to warm up your bed through your breath. Yoga practitioners know well that a different physical set up—for example, ujjayi or sitali breath, utkatasana (chair pose) or savasana (corpse pose)—will heat or cool the body (Ferorelli, 2013), and in a busy vinyasa class, numerous warm bodies lead to steamy studios. On very cold days, we can feel the cold air in our bodies as we breathe in. That is, in differing material circumstances, the sensible boundary between body and atmosphere is cut differently. What the temperature of “the atmosphere” is or will be is indeterminate until a specific bodily arrangement is enacted that, through an agential cut, enables the delineation of a body from the atmosphere. This determination of the body and the atmosphere as separated entities enables the meaningful measurement of atmospheric temperature.

Climate science works—achieves objectivity—by consistently performing a particular agential cut through embodying it in its concepts and instrumentation. Indeed, the World Meteorological Organization (WMO, 2008) has detailed instructions on maintaining the specific material arrangement of the instrumentation used to measure atmospheric temperature—solar radiation, precipitation, or vegetation, among other factors, can create a false temperature reading. Further, according to this guide, instrumentation should not be placed in micro-climates. That is, in order for objective temperature readings to be collected, rigorous maintenance of the atmosphere’s identity and boundaries must be enforced. The atmosphere to be measured is not the air in a fernery, within a house, or indeed, within a human body; it is out there, global, vast and undisturbed by local or temporary biological, industrial or human conditions. That these cuts are enacted consistently does not equate to an

inherent distinction, but does allow for the concept of atmospheric temperature to be objective, through reference to specific physical arrangements.

However, following Barad further, “concepts” are a “particular material articulation of the world” (Barad, 2007, p. 139), and apparatuses are open ended material-discursive practices that include the larger physical arrangement beyond just instrumentation, including the emergent knowing subject. Understanding temperature simply as a concept embodied in an instrument leaves the human scientist unaccounted for. By contrast, conceptualising the sensing of temperature as a material-discursive apparatus considers the human as a co-emergent phenomenon, materialised through intra-action with the instrument and the atmosphere. Objectivity in this account requires a description of the entire experimental arrangement including the emergent knowing subject. What is measured is the entanglement—the contingent, co-generated phenomenon—rather than a pre-existing property of a pre-determined entity. For example, science cannot measure the temperature of the atmosphere, as though temperature is a property that belonged to an atmosphere which existed independently of the scientific measurement of it. Science can measure atmospheric temperature where atmospheric temperature is an entanglement composed of the intra-action between atmospheres, scientists, and the scientific practices enacted.

Understanding the sensing of temperature, including scientific measurements of it, as a material-discursive practice enables us to attend to how sensing temperature is a worldly means of differentiation, a lively flow of dynamism involved in the articulation and reconfiguration of bodies (and not just human ones). Bodies of water are a useful example. Temperature differentials are responsible for the melting of glaciers and sea ice, which play crucial roles in planetary thermal regulation. Temperature also causes the evaporation of liquid water—oceans, lakes, rivers—into the atmosphere, and its condensation into rain,

which cools or warms soil and rocks as it falls, encouraging biological activity. Temperature differentials—as differences in pressure—enable plants to defy gravity by transpiring water into and out of their bodies, returning water vapour—a major contributor to Earth’s greenhouse effect—to the atmosphere. Animal, bacterial and fungal bodies consume plants and engage in their own iterative transformation of water, creating heat as they metabolise. These “sub-systems” of the climate—the hydrosphere, cryosphere, lithosphere, biosphere and atmosphere—do not pre-exist each other or their intra-action with temperature. Rather, temperature and these sub-systems are all entangled with each other and their intra-action is generative of the “differential patterns of mattering” that unfold in the world’s “iterative becoming” (Barad, 2007, p. 151).

Temperature, therefore, is not just a property of an entity or a concept that can be measured, but a simultaneous manifestation-and-co-facilitator of the vibrant forces of matter-energy that participate in the ongoing agential (re)composition of the world. And this is why climate change *matters*: in a warming world, more turtles are born female (Laloe, Cozens, Renom, Taxonera, & Hays, 2014; Lolavar & Wyneken, 2015), bees’ tongues shrink (Miller-Struttman et al., 2015) and multitudes of sympoietic (Dempster, 2000) processes diverge, leading to mass extinction and ecosystem breakdown. The sensing of temperature is a “process of the world’s ongoing articulation through which part of the world makes itself intelligible to some other part” (Barad, 2007, p. 207): matter and meaning cannot be separated; identities, bodies and relationships are reconfigured.

Thus, sensing temperature, and therefore, knowing weather and climate, are performative practices whereby bodily boundaries—such as those between human and climate—emerge. Climate science generates certain human-climate distinctions, through the consistent enactment of a specific agential cut, one that is configured through particular

arrangements of bodies. In other words, we can see that climate science today may be based in seemingly detached, disembodied, neutral observations. However, bodies—including, but not just human bodies—are at the core of its “concepts” (“particular material articulations of the world”): objectivity is achieved through being part of the world. Therefore, “climate,” when understood as an entanglement refers to the phenomenon that includes climate, climate scientists (and their bodies) and climate science (and its material practices). We are a part of that climate which we seek to understand.

So, for Barad, apparatuses such as the practices of climate science are “specific material reconfigurings of the world that do not merely emerge in time but iteratively reconfigure spacetime-matter as part of the ongoing dynamism of becoming” (2007, p. 142). Thus, what climate science describes is not the climate itself but “our intra-activity as part of” the climate (2007, p. 207). As such, all practices of knowing climate, including science, are material discursive apparatuses through which “climates” and “humans” are intra-actively re-constituted as part of the agential becoming of the universe. Such intra-actions “are not the result of human interventions; rather, ‘humans’ themselves emerge through” practices of knowing (and not knowing) climate (2007, p. 352).

This posthuman, performative analysis of the scientific methodology offers important openings for climate change pedagogy. By situating climate science as an ecological practice that achieves objective, rigorous knowledge through being part of and intervening in the world, it provides a strong ballast against climate denial without requiring that we consider human climate knowers as inherently separate from the climate. It calls our attention to how climate realities are not out there awaiting discovery by an independent human knower, but how climate, humans and climate knowledge are performed into be(com)ing through intra-action. It therefore enables us to reconsider the boundaries and qualities of what has come to

be assumed as the subject (individual humans) and object (the global climate) of climate change education. This in turn provides opportunities to rethink what might constitute valid and desirable climate knowledge, who and what is capable of changing climate and how, and thus, what the purpose of climate pedagogy might be.

CLIMATE INTRA-ACTION: INTRA-SECTIONALLY DIFFR-ACTING-WITH

INTRASECTIONALITY: BECOMING-CLIMATE

Most climate pedagogies believe that humans can know climate or act on it from a distance and remain generally unaffected while doing so. But understood as an entanglement, climate is not an object that can be clearly bounded and represented from afar. It cannot be coherently located, it cannot be bottled: any effort to delineate it from its constitutive parts is immediately compromised. Climate infiltrates and emerges from every planetary being and process. It is inherently an outcome, a phenomenon, an event that is both everywhere, all the time, and yet nowhere, never. While it has no body, all bodies are part of it (Sasser, 2016). Rather than an entity, climate is a set of relationships (Knox, 2015) in which all earthly bodies participate (Neimanis & Walker, 2013). Climate thus tells us about how we engage with, in and as the world: it is an indicator of the vitality, intensity, quantities and qualities of our relationships. That is, climate change epitomises the fact that we are all connected to and intra-act with everybody and everything else.

An intra-active ontology brings attention to how humans (like other worldly bodies) do not exist independently of their relations with climate, but are composed and recomposed through their participation in the climate-world. In contrast to the traditional Western ontology which considers the world to be composed of distinct things, an intra-active entangled ontology understands worldly phenomena (such as humans and climate) as both

waves *and* particles. Particles are closed entities that occupy positions in time and space whereas waves are material-energetic disturbances extended in and enfolding spacetime (Barad, 2007). According to classical physics, particular forms of matter are either waves or particles. Barad's quantum informed approach contests that matter's ontology is in fact characterised by wave-particle duality. Via its wave capacities, matter can overlap, combine, interfere and become entangled with other matter, and these enmeshed matterings can coalesce and perform like particles (see e.g. Figure 27, Barad, 2007, p. 299). The world is therefore composed of matter that can constantly evolve into differently determinate, discrete and located entities due to its extensile capacities that entangle it with dynamic relations. This entanglement of wave-particles with other wave-particles is termed a *superposition* (Barad, 2007). Superpositions are characterised by indeterminacy, encompassing multiple potentialities for further differentiations as their constitutive wave-particles amplify, nullify and/or reconfigure each other and interfere with the world. This process of identity change emerging through intra-action with the non-human world is encapsulated in the more specific term *intraactionality*.

Building on Barad's intra-active ontology and the important black feminist notion of intersectionality (Collins, 2000; Crenshaw, 1991; Lorde, 1984), Mellander and Wiszmeg (2016) developed the term *intraactionality*. *Intraactionality* foregrounds how important critical concepts relating to power and hierarchy like standpoints, positionalities, and social location are not erased or flattened but dynamically reconfigured through intra-action. This approach of "relational positionality" accounts for how identities and subjectivities come "into being through relationships which are ever changing and constituted at multiple scales" (Neely & Nguse, 2015, p. 141). In line with this, I find it useful to consider identities as *superpositionalitys*. Emerging through the ongoing interference of naturalcultural waves (such as gender and climate change), *superpositionalitys* are momentarily articulable

sociomaterial relational-locations which are both situated and dynamic. Understanding identities and/or subjectivities as intrasectionally composed superpositionality helps us attune to how we are all waves of possibility (K. L. O'Brien, 2016). This is not the exclusive domain of humans; more-than-human matter participates in this account of situated, rippling and compositional relationalities (Huggan & Tiffin, 2010; Kirksey & Helmreich, 2010). Posthuman approaches have been criticised for erasing or negating politics in their “flat ontologies” (Neimanis, 2017; Pearse, 2017; Quinn, 2013; Tuck & McKenzie, 2014), but intrasectionality navigates this by accounting for the dynamic processes of connecting-excluding that compose situated-but-emergent hierarchies.

For example, while it is still common in posthumanism to romanticise or idealise being connected to nature (Clare, 2016), climate change and the notion of intrasectionality affirm that such connectedness is neither a choice nor necessarily desirable (Swanson, Tsing, Bubandt, & Gan, 2017). Mass extinction and sea level rise do not happen in worlds composed of independent, autonomous entities, and this entanglement highlights how some bodies systematically—although perhaps indirectly or unintentionally—kill, poison, starve, displace and/or otherwise harm other bodies, or at least benefit from practices which do so. Climate intra-action is therefore not about dissolving boundaries in search of oneness, but about accounting for which boundaries are produced and how, and who benefits from such articulations (Barad, 2007; van Dooren et al., 2016). As Haraway (2016) reminds us, connections are never innocent and the details of the connections matter.

In relation to climate change pedagogy, intrasectionality references processes we can understand as *becoming-climate*: how all entities differ from themselves due to intra-action with climate; how climate is simultaneously changed; and also how the boundaries between entities and the climate are differentially enacted through these processes. That is, the

moving, blurring and at times, dissolving, of boundaries is part of climate intra-action, as is the articulation of different or new boundaries. Intrasectionally becoming-climate thus asks us to recognise not just how climate change is human induced, but also how humans are simultaneously climate induced—and how non-humans induce and are induced by climate. These are not parallel or subsequent processes; they do not occur alongside each other or one after the other. Rather, processes of becoming-climate are simultaneous, mutual, ongoing, dynamic, ephemeral, continual, contingent, and complex (Neimanis & Walker, 2013; Sasser, 2016).

Intrasectionally becoming-climate thus refers to the changing relationships that emerge through intra-actions, including emergent human subjectivities and changing climates. For example, as humans, through intra-action with climate, we become differently human. Some of us become carbon counters, carbon offsetters, carbon neutral, carbon taxed. Some of us become entrepreneurial subjects (Prudham, 2009) accumulating green capital (Bee, Rice, & Trauger, 2015). Climate change genders us (Pearse, 2017) as some of us become population growth monitors, family planners, voluntarily childless (Conceivable Future, 2017; Sasser, 2016), or “brides of the sun” (“Brides of the Sun,” n.d.). Climate change also transforms more-than-human worlds, and these changes in relationships can happen abruptly. For instance, “river piracy” was recently documented first hand for the first time. The sudden climate change induced retreat of the Kaskawulsh glacier in Canada’s Yukon territory led to the Kaskawulsh River “hijacking” the entire flow of the Slims river over the course of just four days (Hansen, 2017, n.p.). As Devlin describes, climate-body entanglements cascade and unfold into each other:

In a geological instant, the local landscape was redrawn. Where the Slims once flowed, Dall sheep from Kluane National Park are now making their way down to eat the fresh vegetation, venturing into territory where they can legally be hunted. The formerly clear air is now often

turned into a dusty haze as powerful winds whip up the exposed riverbed sediment. Fish populations are being redistributed and lake chemistry is being altered. (Devlin, 2017, n.p.)

Where bodies begin and climate ends, is unclear, unfixed, ever shifting (Neimanis & Walker, 2013; Sasser, 2016). And such ecological changes constitute changes in climate. As we become-with climate, climate becomes different, responding to our changing repertoires of relating.

Intrasectionality raises important challenges to more anthropocentric and representational climate pedagogies. Intrasectionality brings our attention to how humans—both specific individuals and the category—are becoming different to themselves through their participation in climate, including through practices of knowing and acting on climate change. Such personal and social transformations are likely to be challenging, uncomfortable and to have unpredictable impacts. If education is serious about changing people’s ways of engaging with climate change it will need to attend more closely to who those people are becoming and how the process of becoming-climate is affecting them and their climate relations. An intra-active pedagogy encourages such responsiveness.

ACTING-WITH: WE CLIMATE TOGETHER

Climate change education and posthuman approaches to education share appreciation for action, doing and responding. As I identified in Chapter 2, in science deficit and social constructivist approaches to climate change pedagogy, agency is often understood to be something that is possessed by individual humans and exerted over the non-human world. Intra-action provides two notable challenges to such anthropocentric understandings of agency: firstly, that agency is not attributable just to humans or even to individual non-human entities, as these entities “do not preexist as such” (Barad, 2007, p. 179), and secondly that

agency is therefore not a correlate of intentionality. An intra-active approach contends that no being is ever alone and that therefore no being ever acts alone; rather, everything is always acting-with a confederation, assemblage or entanglement of more-than-human forces, intensities, entities and processes (Barad, 2007; Bennett, 2010; Haraway, 2016). As Barad makes explicit, the problem is “the framing of agency as a localizable attribution” (2007, p. 216). For Barad, matter does not possess agency, rather, matter is “a congealing of agency” (2007, p. 151). That is, agency and entities co-emerge through their intra-actions. Climate change is such a “congealing of agency” and all the actions that create, mitigate and/or adapt to climate change occur through acting-with the world (Lee, 2013).

As articulated above, climate is a set of dynamic more-than-human relationships (Knox, 2015) and climate *change* is a change in those relationships. Climate change is therefore not a thing created by a homogenised and autonomous humanity that acts upon the world. Rather, climate change is a radically disrupted sequence of lively, more-than-human repertoires of responsiveness, emerging out of the novel intra-actions between some (not all!) humans, fossil fuels, industrialisation, animal metabolisms, technologies, extractivist cultures, and the climate’s own patterned dynamics (Neimanis & Walker, 2013; Sasser, 2016; Walker, 2013). A small minority of fossil-fuelled-humans benefit from climate change in the short term, but even that small minority never intended to create the climatic changes that are occurring. Climate change thus totally challenges the anthropocentric belief that human agency and intentionality are aligned; despite our best efforts, we cannot seem to control our “own” effects on the world (Clark, 2010; Dürbeck, Schaumann, & Sullivan, 2015).

Climate/change is acting-with.

Climate is something *we do*, a more-than-human performative practice. Climate is embodied, and “worldly embodiment is always a verb, or at least a gerund” (Haraway, 2008,

p. 249). Climate is “always in formation... ongoing, dynamic, situated and historical” (Haraway, 2008, p. 249). Thus, rather than (just) speak of “the climate,” as though it is an entity, an additional and alternative unit of analysis could be “practices of climating,” where climate is a verb, and the subject is always a worldly we—we *climate together*. Climating refers to the co-enacted, worldly practices and processes of producing climate-bodies, where climates and bodies are material-discursive phenomena whose boundaries are enacted through intra-action.

A recognition that climate comes to be through the various components of the world acting-with each other is an important step towards decentring the human from climate pedagogy. It does this in three ways. Firstly, it undermines the presumption of individual humans as the default location of climate changing agency, turning attention to the more-than-human entanglements, assemblages, networks and/or collectives that collaboratively climate together. Secondly, it puts humans in their geological place. We are not destroyers, controllers, managers or savers of the planet. Rather, we are some unwitting bits of earthly matter who, through our relations with other parts of the world, are accidentally unleashing the phenomenal agency of climate itself (Clark, 2010). Thirdly, it attends to how “we” are not really “we” in any easy sense. Acting-with emphasises that any individual’s capacity to change or stabilise climate depends on their unique, specific and contingent historical and geographical situation. “Humanity” does not change climate, and neither do individual humans “act on” climate; rather, through their relations *some humans* participate in climate changing and/or climate stabilising intra-actions, intra-actions which catalyse cascading processes of becoming-climate across the whole planet. Acting-with enables educators to direct attention to how climate is being performed through these more-than-human entanglements, and thus potentially, to work with these messy networks to cultivate more ethical practices of climating.

DIFFRACTIONS: CLIMATING OTHERWISE

The goal of climate change education is often climate action, understood as discrete, identifiable and measurable behaviours that relatively rational, generic, individual humans do to the climate. Yet an intra-active pedagogy challenges the belief that this is desirable or consistently possible. Given we are always acting-with, the future is contingent and open due to the un-anticipatable effects of the myriad diverse intra-actions that continuously re-compose the world (Grosz, 2008; Haraway, 2016; Knox, 2015). To reiterate, following Barad, climate can be understood as “a dynamic intra-active becoming that never sits still—an ongoing reconfiguring that exceeds any linear conception of dynamics in which effect follows cause end-on-end, and in which the global is a straightforward emanation outward of the local” (2007, p. 170). Climate’s inexhaustible “dynamism is generative not merely in the sense of bringing new things into the world but in the sense of bringing forth new worlds, of engaging in an ongoing reconfiguring of the world” (2007, p. 170). Put alternately, if the world in which we participate is continuously changing and not controllable, we may not be able to determine in advance what kinds of climate actions will be achievable or worthwhile.

Thus, we need to reconceptualise the purpose, goals or aims of climate change pedagogy, as well as consider whether having “goals” is itself feasible or desirable. If teachers and students are not autonomous individuals who can freely act upon the world, but intrasectionally dynamic superpositions composed through acting-with the world, then the feasibility of consistently achieving standardised climate actions such as recycling better/driving less/eating less meat/writing to a politician is challenged. To predetermine pedagogical goals in such a way would be to presume the individual human is the sole and independent location of agency. Such a focus on outcomes is argued to be patriarchal, teleological and anthropocentric (Lenz Taguchi, 2010; McKnight, 2016; Rooney, 2018a;

Snaza, 2015) and can foreclose attention to previously unimagined means of responding to climate change. For these reasons, posthumanism advocates exploratory, risky, open ended, processual, fluid, moving, curious and responsive pedagogies (Hickey-Moody et al., 2016; Leibowitz & Naidoo, 2017; Nxumalo, 2017; Snaza et al., 2016; Sonu & Snaza, 2015; C. Taylor & Iverson, 2013) which “meet the universe halfway” (Spector, 2015, p. 449, paraphrasing Barad, 2007). In tension with this, climate change is an incredibly urgent and massive problem and there are many obvious practices which can effectively reduce greenhouse gas emissions. I believe Donna Haraway and Barad’s work on diffraction can help in developing posthuman climate pedagogies that navigate this tension.

Diffraction is the effect of the patterns of movement that waves (and thus, matter in its wave-particle duality) create as they disturb the world (Barad, 2007; Haraway, 1997). Diffractions are therefore generative, enabling new, novel, innovative, creative or different phenomena to emerge (Bozalek & Zembylas, 2016b; Mellander & Wiszmeg, 2016; Neely & Nguse, 2015). However, diffractions are eco-historically situated—they do not emerge out of nowhere or no-when (Barad, 2007). Diffraction has been enacted widely as a research methodology (Kaiser & Thiele, 2014; van der Tuin, 2014), including within education research (Bozalek & Zembylas, 2016b; Lather, 2016; Leibowitz & Naidoo, 2017; Lenz Taguchi, 2010, 2012; Mazzei, 2014; Orlander & Ståhl, 2018; Phillips & Larson, 2012; A. Taylor & Blaise, 2014; C. Taylor, 2013). Diffraction has been less discussed as a pedagogy, although educational literature developing this is beginning to emerge. Within these accounts, a diffractive pedagogy is figured as one where learning emerges from the collisions of wave-particles such as students and the wider material world. A diffractive pedagogy therefore cultivates creativity, reconfigures bodies and subjectivities, is dynamic, non-linear, transdisciplinary, multi-modal, disruptive, unchartered, transcorporeal, interwoven, and one that troubles established categories (Hickey-Moody et al., 2016; Lenz Taguchi, 2010;

Postma, 2012; Spector, 2015).

Taking the compositional parts of diffraction as *diffr* (different, difference, differentiation, differing) and *action*, we have a pedagogy that can understand that our actions that create, mitigate and/or adapt to climate change produce and are produced by difference: they contribute to, and are emergent enactments of, the ongoing differentiation of the climate-world (Neimanis & Walker, 2013). We can understand our climate actions as diffractions—as gatherings of confederations of human-and-more-than-human agencies which interfere and are interfered with as they surge, radiate into and become enfolded in the world’s ongoing becoming. Thus, while we might start with intentions and directions, attention to climate diffractions allows us to be open to how the world might bump into, disrupt, reinforce, invert and/or displace our desired trajectories and inclinations, perhaps blocking or resisting our efforts, but also potentially generating novel, new, innovative, different forms of climate action and actors, and of course therefore, different climates (Gannon, 2017; Lee, 2013; Rooney, 2018b).

Intrasectionality, acting-with and diffraction together articulate the processes through which humans and climate come to be entangled. An intra-active climate pedagogy thus recognises that humans and climate do not pre-exist their relations, but are co-emergent, and that their relationship collaboratively enacts climate meanings, knowledges, and actions (Neimanis, 2015; Neimanis & Walker, 2013; Rooney, 2018a, 2018b; Walker, 2013). Climate intra-action asks us to attend to the ongoing, situated, dynamic reconfigurations of humans, climate, and human-climate relations that are enacted in everyday and extraordinary encounters, including within education. Yet, while they explore processes, these concepts do not specify any particular direction, goal or aim for climate change education. Although diffractive pedagogies suggest that predetermined goals are both problematic and unrealistic,

we do have to take a stand and work towards some worlds and not others (Haraway, 1997). As educators and learners, we need some something to yearn towards or aspire to (hooks, 1990), not just ethically disconnected observations that we are becoming-with climate.

CLIMATE RESPONSE-ABILITY

Climate response-ability may be a valuable alternative or additional aspiration for climate change pedagogy. Unlike the knowledge-attitude-behaviour approaches to climate change pedagogy, neither Barad nor Haraway distinguish between knowledge and action, as to do so requires the mind/body dualism. Expanding on the discussions above, for both Barad and Haraway knowledge and action are entangled in response. Barad argues that “knowing is a physical practice of engagement” (2007, p. 342) and “a matter of differential responsiveness” (2007, p. 149). For Haraway, similarly, response-ability “is a relationship crafted in intra-action through which entities, subjects and objects, come into being” (Haraway, 2008, p. 71). Response-ability is thus a “collective knowing and doing” and pedagogy is therefore about rendering each other capable of response (Haraway, 2016, p. 34). Knowledge, learning, and education are only possible through entanglement, through collective, embodied, inter-species connectivities, worldly material exchanges and intra-actions (Braidotti, 2013; K. Wright, 2014). In such accounts, “learning is defined as expanded possibilities for action, or engaging in more sophisticated and flexible action” (R. Edwards & Fenwick, 2013, p. 56). As Barad succinctly puts it, “knowing is a matter of intra-acting” (2007, p. 149).

Yet response-ability is not just about the entanglement of knowing, being and doing. As Barad argues, response-ability is an *ethico-onto-epistemology* (2007, p. 185):

Particular possibilities for (intra-)acting exist at every moment, and these changing possibilities entail an ethical obligation to intra-act responsibly in the world's becoming ... We are responsible for the cuts that we help enact not because we do the choosing (neither do we escape responsibility because 'we' are 'chosen' by them), but because we are an agential part of the material becoming of the universe. (2007, p. 178)

That is, for Barad, responsibility—as an ethical accountability that demands action—is articulated through intra-actions. Our abilities to respond are emergent, arising through the interplay of unpredictable and uncontrollable entanglements. This means they are not a matter of free, rational choice, but neither are we unable to respond: like it or not, we are always responding-with.

For Haraway, response-ability is about survival and ongoingness, about striving to sustain or change particular networks of relations, specific patterns of living and dying. Such response is only possible “with intense commitment and collaborative work and play” (2016, p. 101) in “multispecies alliance” (2016, p. 118). That is, ethical outcomes cannot be achieved through trying to cut our entanglements apart, but by acknowledging them and tying stickier knots: we must “join forces” (Haraway, 2016, p. 118). This is a task that is never innocent or completed. It is an ongoing ecology of practices which yearn for some worlds and not others. Working within situated, particular, embodied circumstances, no universal set of ethics should rule; rather the task is to “stay with the trouble” (Haraway, 2016) that ecology demands of us, where who lives and who dies, which worlds are opened and which closed, is always an implication of our engagements.

As climate change is a collective action problem (Esty & Moffa, 2012; Ostrom, 2010; Tosun & Schoenefeld, 2017), a climate response-able subject must therefore be a collective subject in some sense, or a subject capable of collective action, of acting-with, or responding-with. Individuals will not stand a chance—not least because “individuals,” as such, do not

exist. As K. Wright (2014) explains, we cannot disconnect from or opt out of our ecological relations. But failing to attend to our entanglements inhibits our capacity for collaboration, leading to delusional individuality, unsustainability, degradation and suffering. Collectives, not individuals, are required for effective climate response-ability, as collectives and the commons are mutually assembled (A. Taylor & Giugni, 2012). This raises significant challenges for climate change education which has assumed a self-evident individual human subject, or at best, conceptualised collectives as a straightforward aggregation of such humans (Divakaran & Nerbonne, 2017; Obradovich & Guenther, 2016). Working with posthuman concepts such as becoming-with (Haraway, 2008; K. Wright, 2014), transcorporeality (Alaimo, 2008), sympoiesis (making-with) (Haraway, 2016) and viscous porosity (Tuana, 2008) suggests that novel conceptualisations of the climate response-able subject are needed that attune to our more-than-human entangled co-becoming.

Response-ability is thus an alternative aspiration for climate change pedagogy. In an account of climate as entanglement, responsibility is attributable, and it emerges through the specific entanglements within which we participate. Climate change responses are feasible only within specific networks of social, political, economic, ecological and material conditions, networks which are historically situated but always emerging. Rather than the epicentre of climate change knowledge, emotions and/or actions being located in a discrete individual or a homogenous human collective, people's responses to climate change are understood to be attributable to and contingent upon the broader socio-material, geo-historical context with which they intra-act. There is no one-size-fits-all response, as each entanglement is different, and indeed, unfolds in iterative becoming with every intra-action. Responsibility, as response-ability, is determined according to our capacities and capabilities for responding with and within the entanglements in which we are situated and constituted. Climate response-ability is thus a keen attunement—an art of attentiveness (van Dooren &

Rose, 2016)—to the specific conditions with/in which the response-able subject becomes constituted as they unfold, and a sustained engagement to mustering collective capacities aligned with the most practical ethical principles possible, which will almost always be non-innocent (Haraway, 2016). A pedagogy aspiring for climate response-ability might therefore still advocate for and achieve similar knowledges and practices to more anthropocentric ones: understanding the greenhouse effect or eating less meat. But it would also acknowledge that such knowledges and practices may not always be feasible, sufficient or desirable, and it might also aspire for novel, unpredicted climate diffractions to emerge.

CONCLUSION

Climate science provides integral knowledge about how our planet's climate is changing. However, even when informing us of climate's relational composition, climate science achieves this through distinguishing the human knower from the climate. As such, climate can come to be "understood as a purely physical phenomenon" (P. Edwards, 2010, p. 63), and the human against which it is distinguished can emerge as an undifferentiated, homogenous, universal actor (Israel & Sachs, 2013), destined to be a climate changer. Epitomised in environmentalism's catchcry "think global" (Gough, 2002), the agential cuts that science enacts can lead climate change to seem distant, rather than being felt as a pressing issue here and now (Moser, 2010; Wachholz et al., 2014). As practice makes practice (Britzman, 2003; McKenzie & Bieler, 2016), reiterative or exclusive employment of representational climate science in climate pedagogies may perversely sediment the hyper-separation (Plumwood, 1993), disconnection and apathy we seek to redress (Israel & Sachs, 2013).

My proposal is to move from understanding climate science as an exceptional form of

knowledge where humans occupy the “standpoint of the master, the Man, the One God” (Haraway, 1988, p. 587)—as external, neutral observers of climate—to understanding it as an entanglement: an ecologically situated, embodied, material-discursive performative practice, which co-generates emergent realities, subjectivities, and knowledges, like any other practice. Conceptualised as an entanglement, climate science achieves objectivity through “particular and specific embodiment” (Haraway, 1988, p. 582), making it partial in the sense of being both limited and biased (Israel and Sachs, 2013). Climate science may be important, indeed crucial, but it is not exceptional (Harding, 2008). Climate-as-entanglement accounts for how climate science works, without conceptualising humans and the climate as independent entities that pre-exist their intra-action. Seeing climate scientists as entangled with the climate, and climate science as an entanglement, situates all climate knowers—not just scientists, nor just humans—as *of* the climate, not outside it. Climate as entanglement foregrounds how climate knowers, climate and climate knowledge co-emerge through intra-action.

In this posthuman climate pedagogy, climate is understood as a set of relationships, and changes to climate therefore emerge through changes in relationships. That is, the ability to change, or stabilise, climate is not attributable to individual humans, but to more-than-human relationships. Which is not to deny or erase human responsibility for climate change, but to account for how our agency arises through acting-with the particular, situated contexts in which we are (becoming) situated (Lee, 2013). As Barad argues:

Learning how to intra-act responsibly within and as part of the world means understanding that we are not the only active beings—though this is never justification for deflecting that responsibility onto other entities. The acknowledgment of ‘nonhuman agency’ does not lessen human accountability; on the contrary, it means that accountability requires that much more attentiveness to existing power asymmetries. (2007, p. 218-219)

Regarding such power asymmetries, intrasectionality builds on important social justice concepts regarding the enmeshment of human identities and hierarchies, but extends this into a more relational and more-than-human register. Understood as the convergence of multiple more-than-human wave-particles, socio-ecological superpositionality emerges as momentary, situated identities when we intra-act with climate change. The subject of climate change pedagogy therefore cannot be presumed in advance, and is certainly not universal, individualistic, nor solely human. Rather, what it means to be human, and particular modes of being human, co-emerge through intra-action with climate change.

Predetermined, discrete climate actions are not as highly held in this posthuman climate pedagogy. It is not that behaviours such as cycling, purchasing green electricity, or eating less meat are not valued. It is more that they are understood to be less achievable than previously considered, due to how we—both teachers and students—are always acting with and becoming-with the world. Further, it is recognised there are vastly more ways in which we may change or stabilise climate than what such lists often suggest (Lee, 2013; Rooney, 2018b; Verlie & CCR15, 2018). Indeed, it is not possible to even imagine in advance what all of those diffractions may be.

Through intra-sectionally diffractionally acting-with climate, climate response-abilities are articulated. An intra-active climate pedagogy emphasises that teachers themselves cannot fully control educational outcomes, and thus must be open to intra-acting with their students and climate and the diffractions that may emerge. Yet within this, teachers can attend to the climate response-abilities that are emerging, and can strive to cultivate particular response-abilities. The diffractive climate educator therefore, to the best of their intra-active abilities, gathers components that *might* cultivate more response-able student-climate entanglements, which in turn *might* be able to create different and more promising futures with the world.

This posthuman climate pedagogy builds on that which exists in the literature. It aligns with those approaches which attend to how weather phenomena move through and interpermeate us (Neimanis, 2015; Neimanis & Walker, 2013; Rooney, 2018a, 2018b); those which advocate the creation of open, exploratory pedagogies (Rousell et al., 2017); and with those which encourage the consideration of the how the Earth community participates in climate change education (Cole, 2016; Godfrey, 2015). It does so through rethinking climate science as an ecological practice which is both objective, but situated and thus partial (Israel & Sachs, 2013). It therefore avoids the human/nature dualism (Tuana, 2008, 2013) while eschewing climate denial. Conceptualising climate as an entanglement which emerges through climate intra-action enables rigorous and nuanced attention to climate responsibilities: the dynamic, situated, diffractive subjectivities which act-with particular eco-historical contexts to *climate together*. This posthuman climate pedagogy is therefore non-anthropocentric and non-representational, yet capable of working with the valuable contributions that science deficit and social constructionist pedagogies have provided.

4. CLIMATE CHANGE RESPONSES 2015: COURSE CONTEXT, CONTENT, AND RESEARCH DESIGN

In mid 2015 I was offered the opportunity to teach as a tutor in RMIT University's new course Climate Change Responses (CCR15), which was a twelve-week course running in Semester 2, from July to October. I decided to use this opportunity as an empirical example of climate change education to help me develop the posthuman climate pedagogy advanced throughout the thesis. Chapters 5–10 of the thesis discuss the experiences of my tutorial students and my own experiences learning and teaching in CCR15 in order to explore and elaborate upon the theoretical ideas offered in Chapter 3. My intention was not to critique the pedagogical approaches employed in CCR15 through a posthuman lens. Rather, it was to “read the data in ways that exceed the intentions of the pedagogies studied” (McKenzie & Bieler, 2016, p. 131). I wanted to explore how a posthuman pedagogy might make sense of the educational occurrences within my tutorials, and to further develop a posthuman climate pedagogy from these lived experiences. This chapter outlines the context and content of CCR15, as well as the research design and data creation methods I enacted in order to develop the thesis.

CONTEXT

RMIT AND MELBOURNE IN 2015

Climate Change Responses was taught at RMIT University, which is situated in Naarm (Melbourne), on unceded Wurundjeri Country. RMIT University (“RMIT”) is a public university which brands itself as a “global university of technology, design and enterprise” (RMIT, 2018a, n.p.). This speaks to the influence of neoliberalism, and relative

invisibility of sustainability, as drivers of RMIT's institutional values. CCR15 was a mandatory course for the Bachelor of Urban and Regional Planning and the Bachelor of Environment and Society students, as well as the students from the double degree of Bachelor of Environment and Society/Bachelor of Environmental Science. CCR15 was taught to second and third year students from these degrees.

RMIT's main campus is located at the northern edge of Melbourne's central business district. Rather than a bounded and clustered campus, RMIT's buildings are integrated throughout the city (see Figure 1, p. 76). As such the campus is highly urban, with little public outdoor space for students. RMIT's campus includes parts of the Old Melbourne Gaol, and the site where Victoria's first public hanging occurred. A memorial for Tunnerminnerwait and Maulboyheenner, the two Tasmanian Aboriginal men, now stands on campus. Erected in 2016, this very recent addition to Melbourne's public art attests to the general erasure of Aboriginal and Torres Strait Islander histories and cultures at RMIT, and in Melbourne and Australia more broadly. RMIT's campus is also opposite Melbourne Central which is a large shopping centre that includes Melbourne Central Station, and the Victorian State Library.

The Victorian State Library is where many protests and rallies occur in Melbourne. This included the People's Climate March in November following the end of our semester in 2015. The People's Climate March was a globally coordinated protest leading up to the twenty first Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change in Paris. During the semester Malcolm Turnbull, a centre-right politician, challenged Tony Abbott, the more conservative and right wing Prime Minister of Australia at the time, for leadership of the Australian Liberal Party. Turnbull won the challenge and thus became Prime Minister of Australia. At the time, this was seen as a somewhat hopeful

outcome for climate change, as Abbott had been (and continues to be) an explicit climate denier, whereas Turnbull had advocated taking action on climate.



Figure 1: RMIT's main campus, right side of street and interspersed with the city scape on left side of street. Photo taken from Victorian State Library side of Melbourne Central Tram Stop. Image: Author.

Victoria has diverse climatic regions which range from cool temperate to semi-arid. Victoria is one of the world's most bushfire prone regions, as the northern, central and western parts of Victoria can be very hot and dry. Melbourne, wrapped around Port Phillip Bay which is situated on the southern coast of Victoria, is infamous for having "four seasons in one day," referencing the instability and variety of its weather (see e.g. Figure 5, p. 230). In 2015 we had exceptionally cold weather in July (ABC, 2015b), followed by the hottest ever start to October (ABC, 2015c) and a very early fire season (ABC, 2015a). 2015 was the fifth hottest year on record in Australia (BOM, 2016a, 2016b) at that time.

But the classrooms we had our lectures and tutorials in were climate controlled (see

Figure 2, below), meaning that we were insulated from the semester’s weather while in class. Our classrooms were in the engineering building which had bare grey walls and male dominated corridors. The tables and chairs were set out in exam conditions, although we rearranged them each week into more discussion friendly configurations. The classrooms had fairly new, although now common, audio-visual technologies—i.e. a projector with a screen and a whiteboard at the front of the classroom, speakers and internet access.



Figure 2: One of our climate controlled classrooms. Image: Author.

PEOPLE

I was born and grew up in the regional Victorian city of Bendigo on Dja Dja Wurrung Country, and moved to Melbourne in 2005 to complete a Bachelor of Science at the University of Melbourne. Following this I then enrolled in the Masters of International Urban

and Environmental Management social science degree at RMIT, which is how I heard about and applied for a job tutoring undergraduate students there. At the time of teaching CCR15, I had just turned 29, and had taught at RMIT for four complete years. I had been teaching in the common undergraduate social science courses which were taught to all first-year students (i.e. about 400 or so students) in the school of Global, Urban and Social Studies. Because of the large number of students in these courses, we taught in teams of up to ten staff. This was my first experience teaching at a university, and when I started at RMIT, I had been told that our approach was to be based in social constructionism and thus to avoid lecturing or providing excessive reading materials in tutorials. Rather, we were to get students as actively engaged as possible through small group activities and discussions so that they could construct their own personally relevant meanings through social interaction. Those four years of teaching in supportive teams were very valuable for me and have influenced my pedagogical approach which is founded on democracy, equality, critical theory, and participation. CCR15 was my first experience working with students who were not in their first year. I had previously taken tutorials of just Bachelor of Environment and Society students, and this meant that in CCR15, I had taught approximately thirty percent of the students in my tutorials at least once before, some two or three times.

I had two tutorials in CCR15, and between my classes, there were about 45 students; 150 were in the course as a whole. The majority of my students were enrolled in the Bachelor of Society and Environment degree (some doing the double degree with the Bachelor of Environmental Science) and were in their second or third (final) year of study. In addition, I had four students who took the class as an elective, coming from business, communication and engineering degrees. Most of the students were aged 18-21, but a significant number were older than this. Most, but not all, of the students were of predominantly Anglo or European descent. In terms of gender, the distribution was fairly representative of the general

population, with a fairly equal proportion of men and women as well as a number of LGBTIQ+ students.

Given that all of my students had chosen to enrol in a degree focused entirely on environmental issues, or had taken CCR15 as an elective, this meant that the classes were composed of people who already knew, cared about, and were (or wanted to be) acting on, climate change. Further, as there were other tutorials in the course, students were able to switch tutorials if they did not want to be in my class, for example if they were uncomfortable participating in my research project, or for any other reason. Thus, all the students that were in my classes were taking the course due to being interested in it, and were sufficiently happy to be in tutorials with myself and the other students in them. All of these factors combined meant that we established good class rapport very quickly. Having taught the course again in 2016 and 2017, I can now say that the 2015 cohort of students were especially engaged with the course, and especially open to exploring climate change with me. This is not to say that all students attended regularly or put in their absolute best efforts all the time. Particularly in my second tutorial which started three hours after the lecture finished, students often missed classes. A small number dropped the course during the semester, and a few completed the course without coming to class very often at all. For some, this was due to social anxiety which made participating in class discussions difficult for them. We made adjusted assessments for those students (see below section regarding assessments) and I made time to see them individually outside of class.

Associate Professor Lauren Rickards was the Course Coordinator and Lecturer for CCR15, which was a new course designed by her. Lauren's approach to the course was to focus on *responses* to climate change, as is evident in the naming of the course: how we can respond to climate change through mitigating carbon emissions and adapting to the impacts

of climate change. This structure—of focusing on adaptation and mitigation—echoed the Intergovernmental Panel on Climate Change’s reports. Lauren is a human geographer whose work includes empirical and conceptual research regarding resilience, climate change adaptation, farming communities, and bushfire. This background influenced the lectures Lauren delivered, as well as her choice of guest lecturers and the assessments she designed.

COURSE CONTENT AND STRUCTURE

OVERVIEW

CCR15 was a social science course, examining the social, political, economic, psychological, and cultural causes and impacts of, and responses to, climate change.

CCR15’s course learning objectives were to enable students to:

- Discuss social and cultural responses to the science of climate change;
- Critically appraise the roles of both mitigation and adaptation approaches, specifically in relation to urban and energy policies and strategies;
- Critically assess Australian and global climate change responses;
- Analyse strategies for making particular cities more energy efficient and resilient to climate change impacts, and
- Debate cultural impediments and opportunities for adaptation to climate change impacts.

Classes ran on Wednesdays. The lecture with Lauren began at 9:30am, and ran for 1.5 hours. There was then a 1.5-hour gap between the lecture and my first tutorial, which started at 12:30pm. Each tutorial ran for 1.5 hours, meaning my second tutorial started at 2:00pm and ended at 3:30pm.

ASSESSMENTS

The assessments consisted of in class participation, two consultant style reports—one on mitigation and one on adaptation—for a specific group of stakeholders, and an end of semester written reflection. As tutor, it was my role to assist students in understanding and completing the assessments, and to grade and provide feedback on them.

REFLECTIVE JOURNAL

The reflective journal was an 800 word written assessment, due at the end of semester after the completion of classes. It was worth 20% of the students' overall mark for the course. The reflective journal asked students to discuss how their ideas about climate change progressed over the semester, that is, to articulate what they had learned. Students were marked against the following assessment criteria:

- A summary of their initial assumptions about climate change;
- A quality reflection on how their understanding of at least one core concept had developed over the course;
- An engagement with at least one reading and discussion of how that helped develop their thinking, and
- Clarity of expression.

TUTORIAL PARTICIPATION

The second assessment task was in class participation. This assessed students' constructive contribution to each of the tutorial activities. This assessment was worth 20% of students' overall mark, and was assessed on their participation in 11 of the 12 tutorials.

Students were marked on:

- Their willingness to engage with discussion and activities;

- The insightfulness and relevance of their contributions to the class, and
- Evidence of engagement with the set readings.

IMPACTS AND ADAPTATION REPORT

The third assessment task was a consultant style report, where students had to choose a case study and then complete a report about what climate change impacts the case study would be likely to experience, the ways in which the case study was vulnerable to those risks, and what adaptation options the case study could consider. This was a 1500 word written assessment, due at the end of week 7, and was worth 30% of their overall mark.

Students had to designate a specific real-world example, and were able to choose from the following categories for their case study:

- Residential tenants;
- Schools;
- Clothing retailers;
- Zoos;
- Farmers (rural or urban);
- Asylum seekers, or
- Mining communities.

Students were marked on:

- The comprehensiveness and insightfulness of their analysis;
- Their use of grey and academic literature to develop a sufficient understanding of the issue;
- Their use of academic literature to explain and use key climate change concepts and to intelligently speculate about how these applied to the real-world issue;
- Their quality of expression, including clear structure and use of subheadings;
- Their design and use of at least one original figure or table, and
- Appropriate academic referencing.

EMISSIONS AND MITIGATION REPORT

The final assessment was a complement to the Impacts and Adaptation Report. It was a 1500 word written assessment, also worth 30% of students' overall mark, which was due after the completion of the semester's classes (week 13). Based around the same case study that students chose for their Impacts and Adaptation Report, the Emissions and Mitigation Report required students to identify the most significant sources of greenhouse gas emissions that their case study was responsible for producing, and to make recommendations for how the case study could reduce these. Students were marked on the same criteria as for the Impacts and Adaptation Report.

COURSE CONTENT AND ACTIVITIES

The following table (Table 1) summarises some of the key ideas and topics from CCR15's lectures and core readings, and some example activities from my tutorials. Evidently this twelve week course covered a lot more than has been summarised here, however the table provides an indicator of the scope and flavour of the curricular content and the format of class activities. Where possible, I have provided footnotes with hyperlinks to webpages containing some examples of the media provided, which the reader can follow if desired.

TABLE 1: OVERVIEW OF CCR15 COURSE CONTENT AND ACTIVITIES.

Note: “CC” refers to climate change.

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
<p>Week 1</p> <p>Introduction to the course</p>	<p>Lauren Rickards.</p> <p>What CC is; the scientific consensus; CC as a new issue and an exposé/ driver/ twister of existing issues; CC as an opportunity to consider assumptions about how the world works; the complexity of CC, including enmeshment in social inequality; introduction to mitigation and adaptation as responses to CC.</p>	<p>Hulme (2009).</p> <p>Hulme argues that climate is an idea which can be understood through either physical science or culture.</p>	<p>Introductions, and small group discussion of the following questions: What do you think of when you think of climate change? In what ways do you think climate change is important (or not)? Why/why not? How is climate change likely to affect you, in your personal and professional life? Discussion of Hulme’s reading.</p>
<p>Week 2</p> <p>Climate science</p>	<p>Lauren Rickards and a guest lecturer, a climate scientist.</p> <p>How the climate system works; what causes climate change; changes that have been observed so far; what the projected changes are likely to be; who is responsible for what proportion of global emissions; emissions reductions are possible and affordable.</p> <p>Lots of graphs of past and projected emissions and temperatures.</p>	<p>Review of the Australian Government’s (2016) website Climate Change in Australia which includes information on how climate science works, observed climatic changes, projected climatic changes and data, and potential impacts and adaptation options.</p>	<p>Discussion of “what is climate?”</p> <p>Exploration of key terms such as: greenhouse effect, albedo, forcings, feedbacks, variability.</p> <p>Role play in pairs: one person as climate sceptic, the other tries to convince them using science. Class reflection on challenges. Discussion on value and limitations of science as a communicative method.</p>

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
	Image: Climate change risks to Victoria ¹ Video: Climate scientist rap video ²		
Week 3 Perceptions of climate and climate change	Lauren Rickards. Understandings of climate are culturally constructed; overview of climate denial and its causes, such as political ideology and biased reporting by the media in the name of balance; stealth denial: the acknowledgement that climate change is real, while living as though it is not happening; depression among climate scientists. Website: Is This How You Feel? ³	Norgaard (2011a). Climate denial is socially organised and situated in political economies, and not just an individual psychological response.	Discussion based class. Examples of discussion questions: To what extent can we “know” climate/CC, and to what extent do we need to let go of the desire to be all knowing? Whose knowledge is generally promoted in CC discussions, and are they the experts in low carbon living?
Week 4 Impacts and Vulnerability	Lauren Rickards. Overview of concepts of impacts, vulnerability and resilience. Examples of Hazelwood coal mine fire and Indigenous vulnerability to CC through changing relationship with Country. Image: Those who contributed the least greenhouse gas	Bulkeley (2013). Chapter 2: Climate risk and vulnerability in the city. Explores how cities are vulnerable to CC risks in part due to their situated locations (often coastal), the process of urban development, and by context specific social and economic conditions. Urban heat island and Cape Town’s water supply are	Role play activity: class split into small groups, each has one stakeholder group from a local government to pretend to be. Students asked to brainstorm their group’s exposure, sensitivity and vulnerability to CC, and to make recommendations to the council for adaptations to be implemented. Followed by a

¹ <https://climatesafety.info/renew-geelongs-air-spirit-and-economy-with-renewables/climate-change-risks-in-victoria/>

² <https://www.youtube.com/watch?v=LiYZxOICN10>

³ <https://www.climatechangeinaustralia.gov.au/en/>

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
	emissions will be the most impacted by climate change ⁴ Image: Climate change impacts in Asia ⁵ Image: 2030 sea level, 2050 sea level ⁶	examples in the text.	discussion about how different experiences produce different knowledges, and how different groups are respected and treated differently to others (i.e. a discussion of “climate justice” and how knowledge, power, and experience intersect).
Week 5 Adaptation	Lauren Rickards. Overview of concept of adaptation and different approaches to it, such as generic versus specific resilience, and transformational versus incremental adaptation. Examples of electricity transmission lines being vulnerable to extreme weather, and low lying Pacific Islands being vulnerable to sea level rise. Image: City of Melbourne Urban Forest Visual ⁷ (in relation to urban heat island and canopy cover) Video: Its time for climate change adaptation now ⁸	Bulkeley (2013). Chapter 6: Urban adaptation—towards climate resilient cities? Defines adaptation as a complex and deliberate process of responding to anticipated and experienced climatic changes. Discusses the importance, characteristics of, challenges to and opportunities for adaptation in developing and developed cities, and of adaptation undertaken by municipalities and by communities.	Revision of key adaptation concepts. Completion of table of “five capitals” (social, natural, financial, physical, human) for their chosen stakeholders for their assessments. Individual reflection on what makes “good” adaptation and the personal and professional responsibilities we do/will have to help others adapt to CC.
Week 6	Lauren Rickards and a guest lecturer on	Serrao-Neumann, Crick, Harman, Schuch, and	Class discussion: how has your understanding

⁴ <https://skepticalscience.com/graphics.php?g=15>

⁵ <http://coastalcare.org/2011/09/asia-pacific-region-faces-climate-change-induced-migration/>

⁶ <https://www.vox.com/2015/1/15/7552539/sea-level-20th-century>

⁷ <http://melbourneurbanforestvisual.com.au/#mapexplore>

⁸ <https://www.youtube.com/watch?v=FO46sPwm4xk>

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
Disasters and risk	<p>participatory planning for flood management.</p> <p>Disasters are not short-term events but long term complex socio-ecological challenges (example of Queensland drought); integrating disaster risk reduction and CC adaptation; the adaptive cycle and panarchy; participatory adaptation planning.</p> <p>Video: Climate extremes⁹</p>	<p>Choy (2015).</p> <p>This paper argued that the planning profession can better prepare for CC through integrating climate change adaptation and disaster risk reduction policies and strategies through the sector.</p>	<p>of CC changed (or not changed) across the semester?</p> <p>Assessment activity: development of risk matrices and vulnerability assessments for their chosen stakeholders for the Adaptation report; reflection/discussion of how their stakeholders could participate in adaptation planning.</p>
Week 7 Energy	<p>Lauren Rickards and guest lecturer on energy systems and management.</p> <p>Energy is central to CC; we use many forms of energy in modern society; we need to mitigate greenhouse gas emissions as well as adapt our energy systems to CC; energy often concentrates social power; energy reform is integral to CC mitigation; most energy produced is wasted in the production and transmission process; we need better energy efficiency.</p>	<p>Draft paper by guest lecturer.</p> <p>Paper outlined the need to decouple our belief that we need more energy if we are to have better lives.</p>	<p>Class discussion. Example questions:</p> <p>What are the sources and flows of energy in our world? How do these sources and flows generate us? i.e. in what ways are “we” (social, political, material, economic groups of beings) interconnected with, and dependent on, these flows and sources?</p> <p>What do you think are the issues (problems) with existing social relationships with energy?</p> <p>What are some different ways of thinking about and relating to energy?</p>
Week 8	Lauren Rickards.	IPCC (2014b).	Discussion questions:

⁹ <https://www.climatechangeinaustralia.gov.au/en/climate-campus/climate-extremes/>

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
Mitigation	<p>Overview of the concept of mitigation (“any action that prevents, limits, delays or slows the rate of CC”); the gases in question and sources of them; approaches to reducing emissions; governance mechanisms; climate projections under different emissions scenarios.</p> <p>Video: Carbon budget for 2 degrees explained¹⁰</p> <p>Image: Net exporters of emissions embodied in finished goods¹¹</p>	<p>Globally, urbanisation is increasing, and cities are responsible for the majority of the world’s greenhouse gas emissions. Urban planning has a significant potential to prevent future emissions, especially in cities/countries where infrastructure is not already “locked in” to carbon intensive development.</p>	<p>What sort of energy society do we want? Discuss your ideal energy world in terms of access, efficiency, ownership, security, freedom.</p> <p>Do you think clean energy is enough, or do we need to use less?</p> <p>Activity: choose either the health, housing or education sector, and consider their sources of emissions and possibilities for reducing them, as well as any co-benefits and/or barriers/limitations.</p>
<p>Week 9</p> <p>Mitigating via the market</p>	<p>Lauren Rickards and guest lecturer on the making of low carbon markets.</p> <p>Policy makers can use “sticks” (regulations, taxes, laws), “carrots” (incentives) and can eliminate perverse incentives to regulate economies to make them “greener”; example of Volkswagon cheating on emissions reporting and their share price dropping; how carbon taxes work; fossil fuel subsidies; the issue and importance of framing.</p>	<p>Hyams and Fawcett (2013).</p> <p>Explores the practice of carbon offsetting, whereby one party produces emissions but pays another to reduce or sequester emissions. Explores the issues of the scientific legitimacy and the challenges of accurate carbon accounting. Then discusses the moral objections to offsetting.</p>	<p>Video: Livelihood impacts of global mitigation programs on Indigenous peoples¹³</p> <p>Discussion: what micro-scale conditions might enable mitigation projects to be successful?; and what values might we use to decide if something is a “good” mitigation project?</p> <p>Student driven discussion about climate change refugees.</p>

¹⁰ <http://shrinkthatfootprint.com/carbon-emissions-explained>

¹¹ <http://shrinkthatfootprint.com/solar-panel-origin>

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
	Video: How a carbon tax works ¹²		
Week 10 Local scale mitigation	Lauren Rickards and guest lecturers. Three theoretical approaches to changing people’s behavior: 1) the ABC approach to behavior change—changing people’s attitudes, beliefs, choices; 2) “nudge economics” —changing the decision making structure; 3) social practice theory —attending to meanings, materialities and capacities; example of a local council’s efforts to mitigate CC through planning policy and community engagement.	Moloney and Horne (2015). This paper detailed the status of Melbourne’s transition to a low carbon city, through reviewing national, state and regional governance policies and programs.	Overview of the new Global Goals for Sustainable Development and review of upcoming Paris Summit, in response to student questions. Activity: choose either cafés and food waste, suburban drivers, or office workers and recycling, and explore how a behavior change, nudge economics, and social practice approach might differently influence the approach taken to reduce emissions. Evaluate strengths and weaknesses of each.
Week 11 Corporate responses	Lauren Rickards and guest lecturer on climate change and corporations. The corporate sector has a massive influence on the climate; currently they are responsible for huge amounts of emissions; there are challenges for individuals within corporations to effect change. Video: Advertisement for Nissan Leaf electric	Rickards, Wiseman, and Kashima (2014). A literature review of the micro, meso and macro factors that (may) influence those in positions of power who have the capacity to make big decisions and exert significant influence on climate.	Assessment preparation. Discussion of capitalism and the climate, in reference to Naomi Klein’s This Changes Everything (Klein, 2014). Example questions: Can capitalism help address CC, or is capitalism the source of the problem? Is it better or more effective to work within or from without corporations? Where do you see your role in relation to this?

¹³ <https://vimeo.com/7834531>

¹² <http://www.carbontax.net.au/how-a-carbon-tax-works-video/>

Week and topic	LECTURE: Lecturer. Key ideas and topics.	READING: Citation. Key ideas.	TUTORIAL: Key activities and questions.
	car ¹⁴ Images: Hurricane Katrina refuge ¹⁵ Typhoon Haiyan ¹⁶ Grandparents and children sheltering from bushfires in dam ¹⁷ Diesel's <i>Global Warming Ready</i> advertising campaign ¹⁸		Exploration of each student's personal capacities, skills, networks and other factors that contribute to their agency to influence mitigation efforts.
Week 12 Wrap up	Lauren Rickards. Overview of key concepts of adaptation and mitigation; outline of climate justice and its importance in guiding climate change responses; the important and influential role of young people. Video/Poem: Dear Matafele Peinem ¹⁹	Nyberg and Wright (2012). This paper examines how large corporations (or specific employees within them) discursively justify and defend their pro-environmental practices from internal and external critiques.	We went to a local park, had a picnic, and had a general question and answer session as well as discussing what people were already doing about climate change.

¹⁴ <https://www.youtube.com/watch?v=VdYWSsUarOg>

¹⁵ <https://theconversation.com/still-waiting-for-help-the-lessons-of-hurricane-katrina-on-poverty-46666>

¹⁶ <https://www.thenational.ae/world/asia/corpses-hang-from-trees-in-typhoon-haiyan-s-vision-from-hell-1.594268>

¹⁷ See Figure 3, p. 151, also available at <https://www.theguardian.com/film/2013/jun/05/guardian-firestorm-tasmania-dunalley-competition-docfest>

¹⁸ <http://theinspirationroom.com/daily/2007/diesel-global-warming-ready/>

¹⁹ <https://www.youtube.com/watch?v=DJuRjy9k7GA>

RESEARCH DESIGN, DATA CREATION AND DOCUMENTATION

As mentioned in the introduction to this chapter, my broad aim in working with CCR15 as an empirical example of climate change education was to study the experiences of my students and I in learning and teaching about climate change, in order to explore and further develop a posthuman climate pedagogy. The following chapter, Chapter 5, discusses the methodology enacted in order to make sense of these experiences. Before discussing that, in this section I outline the preliminary practices I implemented in order to create empirical data from CCR15 to engage in the thesis. I say create rather than collect to refer to—as discussed in Chapter 3—how “data” (whether scientific or social) is not something “out there,” separate from the researcher and simply awaiting discovery, but how researchers are involved in the worlds that they seek to know about. For example, Table 1 above demonstrates that my desire for a posthuman, performative pedagogy influenced the discussions and activities I tried to implement in the tutorials, for example by discussing affect and how energy flows constitute us. That is, I intervened in my own teaching practice, which influenced what occurred and my own becoming, and I am studying those interventions and their effects. These issues of researcher influence and entanglement are discussed in more depth in Chapter 5.

My general aim during the semester was to document as much of CCR15 as I could. I was trying to be open to what emerged and not to foreclose unanticipated occurrences and questions. This required beginning with broad, rather than narrow and predetermined, research questions and aims. I knew that I was interested in exploring how human-climate relationships were enacted and reconfigured during the course, and that this would encompass processes to do with individual and collective identities. I also knew I was interested in embodied responses to climate change. I was aware that I had questions about

how to conceptualise human agency and responsibility within posthuman frameworks.

Finally, I was interested in how knowledge related to these issues.

In line with these broad areas of interest, during the semester I documented verbal and more-than-verbal communication and embodied practices performed in the tutorials by myself and students, such as statements, questions, laughter, looking away, re-arranging chairs, etc. I did this through writing down what I remembered had happened in class later that day, each week for the twelve weeks of the semester. Sometimes, I remembered something that had happened much later, and so added it then. If originally hand written, these observations were later typed into a word processing document. Audio or video recording the tutorials would have created different kinds of data, and probably much more. However, our tutorials were discussion based and we tended to work in small groups so there were usually many voices speaking at once. Therefore, audio or video recordings of the class would have been largely uninterpretable.

Other forms of data that have been created and stored in line with my broad research aims include the students' assessments, emails they sent me and anonymous qualitative end of semester feedback collected through RMIT's Course Evaluation Survey. As they were already in typed form when I received them, they were saved through directly copying and pasting the text into the same word processing document that my observations were kept in. I also kept the butcher's paper brainstorming that students created, and took photos of any whiteboard notes that I made during our discussions in class. I saved lecture and workshop slides and course readings so that I could refer back to them when needed. Finally, I kept a journal during the semester, writing and typing things I was thinking, feeling, and doing during lectures, after class and throughout the semester as a whole. In this thesis, I have included a few of my own personal experiences that occurred after the formal conclusion of

CCR15 when they appeared to be somehow entangled with CCR15 and thus relevant to the discussions and arguments made in the thesis.

As such, the data creation process largely took the form of participant observation and auto/ethnography, journaling, and the storing of relevant documentation. Students were not asked to do anything in addition or anything different to their normal study in order to participate in the research project—for example, I did not interview anyone. One reason I employed this research design was that it was similar to how my teaching practice is normally performed: engaging with students face to face and online, reading their assessments, and thinking about our experiences. In that sense, this research design is my teaching practice amplified: I have evidently had a lot more time to consider and make sense of the issues and occurrences than I normally would, but the practices enacted are very similar.

As the research project became more refined during 2016 and 2017, I chose not to engage so much with the Impacts and Adaptation or the Emissions and Mitigation reports. This was in part due to the quantity of qualitative data that had been created: the students' Reflective Journals and my feedback on them gave me about 50,000 words, and my document with my own journal entries, notes and observations also contained almost 50,000 words. It was also in response to my emerging interest in the affectivity of climate change and CCR15 which was more explicitly evident in the Reflective Journals and my observations and experiences. Chapter 5 explores the methodology enacted in partnership with CCR15 in order to explore whether and how this “data” can be interpreted through posthumanism.

5. ENCOUNTERING, WITNESSING AND STORYING CLIMATE CHANGE'S AFFECTIVE ATMOSPHERES

INTRODUCTION

The main purpose of this chapter is to explain the empirical methodology I enacted in order to explore posthuman pedagogical theories in partnership with CCR15. However, taking the onto-epistemology of entanglement seriously has made the delineation of theory, methodology and findings difficult, or messy or mangled as Law (2004) and Pickering (1995) might say, and this chapter therefore addresses a number of matters. It begins by discussing three specific modes of intra-acting: encountering, witnessing and storying. I found these were common ways in which students and I were intra-acting with climate change in CCR15. Inquiring into how climate change manifested in our climate controlled classroom, I then argue that we were encountering, witnessing and storying the affective atmospheres (B. Anderson, 2009) of climate change. Affective atmospheres are diffuse intensities that emerge from and reconfigure bodies.

Building on these findings, I outline how encountering, witnessing and storying climate change's affective atmospheres became a sort of "meta" methodology for me. That is, in the following chapters (6–9) encountering, witnessing and storying climate change's affective atmospheres compose both the "data" and the "methodology" that analyses the data. My methodology involves encountering encountering, witnessing witnessing, and storying storying, as well as encountering witnessing, witnessing storying, and storying encounters (etc.) with climate change's affective atmospheres. This affective and intra-active methodology situates me, the researcher, as intimately and unavoidably a part of that which I am studying. Encountering, witnessing and storying climate change's affective atmospheres

is a performative methodology which does not represent CCR15 as though I—or you—are external to it, but is a practice that continually intervenes with and reconfigures climate-human relationships through affective intra-actions. By eschewing representational and anthropocentric approaches to methodology, this chapter contributes to developments in postqualitative and posthuman methodology (Lather, 2016; C. Taylor & Hughes, 2016) through an affective (Stewart, 2011; Zembylas, 2016), entangled, more-than-human ethnography (Reinert, 2016; van Dooren et al., 2016). As a whole, the chapter argues that in CCR15 our intra-actions of encountering, storying and witnessing climate change entangled us affectively with climate change.

ENCOUNTERING, STORYING AND WITNESSING CLIMATE CHANGE

ENCOUNTERING

I understand encounters to be unanticipated or surprising meetings or forms of contact that reconfigure those who participate in them. Encounters *counter* existing ways of being and relating, contributing to the intrasectional reconfiguration of subjectivities, identities and relations. Encounters thus “trouble classification” (Barua, 2015, p. 266) as they engage us in processes of “becoming-with” (Haraway, 2008, p. 244). Encounters are a process of “cutting together-apart” (Barad, 2014, p. 168). That is, participants in encounters are already entangled in some ways, and they become differently entangled through the diffractive forces of encounter. As Haraway puts it, “encounterings do not produce harmonious wholes, and smoothly preconstituted entities do not ever meet in the first place...there is no first place” (Haraway, 2008, p. 287). Rather, encounters emerge through participants acting-with each other and their situated histories: participants “become who they are in the dance of relating, not from scratch, not *ex nihilo*, but full of the patterns of their sometimes-joined, sometimes-

separate heritages both before and lateral to this encounter” (Haraway, 2008, p. 25).

Encounters are thus specifically unfamiliar and can be disconcerting, and they exceed intentions and expectations (Gannon, 2017). An encounter can therefore produce divergent patterns, changes in affective intensities or orientations (Knudsen & Stage, 2012), and thus “poses problems” (Barua, 2015, p. 265).

Encountering climate change is an unavoidable intra-action in our climate changing world, and attention to how climate encounters are transforming the world is therefore important. The term encountering is often used in the environmental humanities to explore how different species or bodies interpermeate and influence each other (Kirksey & Helmreich, 2010; Haraway, 2008; Reinert, 2016; A. Taylor & Pacini-Ketchabaw, 2017). To examine specific encounters (such as those between her and her dog), Haraway (2008) identifies and explores particular “contact zones,” edgy time-space-body entanglements where species intra-act and emerge differentially due to bio-techno-social exchanges of matter and meaning. Attending to how, unlike organisms, climate is not a boundable entity but a set of relationships can ensure that the climate contact zone is not limited to just direct bodily contact with altered weather but includes the various ways in which climate change can be encountered, for example, through encountering changing economic policies, dietary preferences or pollen counts. As one example of this, later in this chapter and throughout the remainder of the thesis I explore CCR15’s encounters with the affective forces of global climate change.

STORYING

Storying is the connection of occurrences into socially comprehensible narratives with embedded beliefs about subjectivity, causality, agency, temporality, and truth. Stories thus try to make sense of encounters, although not all encounters can be fully comprehended and/or

perfectly storied. Storying can be fictional or speculative, or can seek to speak truth about real occurrences or experiences (Haraway, 2016). However, it is important to note that reality and experience (such as encounters) do not precede or in other ways exist independently of signification (such as storying) (McKenzie & Bieler, 2016; St. Pierre, 2008). Rather, experience and signification, or encountering and storying, are intimately entangled.

As an intra-action, storying is diffractive, enactive or performative, reconfiguring realities and subjectivities (Jackson, 2008). It does not neutrally capture, preserve, objectively reflect on or re-create the past exactly as it was (St. Pierre, 2008, 2013a). Rather, storying is “a doing” (Mazzei & Jackson, 2016, p. 1095) and stories are “active technologies of worlding” (van Dooren et al., 2016, p. 118) that intervene in the world. Stories are agential participants in entangled relationships (Mazzei & Jackson, 2016), and thus whether referring to the past, present or future, storying reconfigures temporalities: words spoken or written change things, and in so doing, storying acts in the present as a performative interruption (McKenzie & Bieler, 2016). When referring to chronologically prior events, stories re-live, re-create, and/or re-enact the past, where “re” means *to do again differently*. That is, storying can be both reproductive and generative (McKenzie & Bieler, 2016), it works with existing scripts and templates but can also rework them.

Storying emerges through acting-with. Stories are always “enabled by assemblages of human and more-than-human actors” (McKenzie & Bieler, 2016, p. 93). Rather than understanding storying as “present, stable, authentic, and self-reflective” (Mazzei, 2016, p. 2) and “emanating from an essentialist subject” (Mazzei, 2013b, p. 732), stories can be understood to emerge from an assemblage or an entanglement (Mazzei & Jackson, 2016). Ideas themselves emerge in intricate material-discursive webs and can traverse social locations, reverberating with unpredictable inter-subjective political effects (Alcoff, 1991).

Thus, the effort to identify an originary “author” of a story can become reductive and overly individualistic and loses the ability to account for storying’s performative capacities (Alcoff, 1991; Mazzei, 2013b, 2016; Mazzei & Jackson, 2016). Understanding stories as attributable to the entire, specific socio-material entanglement from which they emerged is therefore more in line with a posthuman approach (Mazzei & Jackson, 2016).

Storying is thus an intrasectional practice which composes, acts on and reconfigures the narrating subject. Storying provides “performative images which can be inhabited” (Haraway, 1997, p. 11) and is therefore a pedagogical practice that patterns us into webs of reality (Black, 2010). Such stories are received, activated and enlivened in particular, specific contexts which contribute to their ongoing differentiation (Alcoff, 1991; MacLure, 2013; Mazzei & Jackson, 2016). Through stories, we can become-witness to the experiences and lives of human and non-human others, which enables the exploration, creation and inhabitation of different ways of becoming obligated and responding to them (Despret & Meuret, 2016; Haraway, 2016; Rousell et al., 2017; van Dooren & Rose, 2016). Storying therefore “does something to us, our relations to others, and to more-than-human places” (McKenzie & Bieler, 2016, p. 93).

Storying climate change is an intra-action through which we come to understand, make sense of, and respond to climate change. In the context of stories being promoted as an important addition to climate change education repertoires (Moser, 2016; Veland et al., 2018), *how* climate change is being storied is significant. The latter parts of this chapter and the remainder of the thesis engage with this issue further.

WITNESSING

Witnessing is a practice that seeks to authenticate certain encounters and/or stories about them, that is, to validate experiences as real and true (Abrams & Kacandes, 2008; Butler, 2013). Legitimizing particular epistemologies and ontologies is therefore at the heart of what it means to engage in witnessing (Haraway, 1988; Tuana, 2008; Zembylas, 2006). Witnessing thus enacts, or performs, distinct worldviews and metaphysics, bringing them into be(com)ing.

Witnessing is said to involve and/or enact two or more subjects (Butler, 2013; Zembylas, 2006) and is therefore always performed through acting-with others. The eyewitness stories their understanding of the truth of their own experience, which may be of traumatic, disturbing, or potentially unbelievable encounters (Appelbaum, 2008; Rose, 2004). Such storying should not be understood as a case where a stable, autonomous “subject who knows who she is, says what she means and means what she says” (Maclure, 2008, p. 104) produces an objective, neutral reflection on her experience. Rather, the performance of story within intra-active witnessing is an act whereby subjectivities and experiences are co-constituted and made meaningful in partnership with the available material-discursive contexts (McKenzie & Bieler, 2016; St. Pierre, 2008), which includes the potential witnesses.

As the subjects experiencing trauma often occupy disrespected or disempowered positionalities their story, or truth, is frequently erased, disregarded or denied by the mainstream (Abrams & Kacandes, 2008; Butler, 2013; hooks, 1989). Therefore, often someone more privileged is interpellated into the role of (secondary) witness, who listens to and thus validates the eyewitness’ testimony (Butler, 2013; Zembylas, 2006). As an exercise in authenticating, respecting and subjectifying a previously objectified other, witnessing is thus a seriously ethical and political practice (Hoyt, 2014; Spivak, 1988). Witnessing has

therefore long been advocated by feminists and other activists as a means for working towards justice and reparation (Abrams & Kacandes, 2008; hooks, 1989; Husanovic, 2009; Kaalund, 2004; Schwartz, 2015; Spivak, 1988). As bell hooks states:

Moving from silence into speech is for the oppressed, the colonized, the exploited, and those who stand and struggle side by side a gesture of defiance that heals, that makes new life and new growth possible. It is that act of speech, of ‘talking back’, that is no mere gesture of empty words, that is the expression of our movement from object to subject—the liberated voice. (hooks, 1989, p. 8)

Witnessing involves the performance of diffractions. As hooks (1989) cautions, for “talking back” to lead to liberation, empowerment or legitimation, a witness must listen in ways that do not appropriate, simplify, stereotype or disregard testimony (Husanovic, 2009). Many authors therefore argue that witnessing is an affective, emotional and ethical action, labour, or series of tasks (Abrams & Kacandes, 2008; Appelbaum, 2008; Rose, 2015a) that involves attending to the eyewitness’ story. Such attention involves becoming aware of (van Dooren et al., 2016) what may have been a previously unthinkable violence or injustice. The witness must therefore to some extent (but not fully or exactly), vicariously experience the eyewitness’ trauma and empathise with the eyewitness (Butler, 2013; Zembylas, 2006) which may lead to affective discomfort or empathetic unsettlement (Zembylas, 2006). Attending to also involves responding (van Dooren et al., 2016), and witnesses must respond to testimony in the form of advocacy or support (Appelbaum, 2008; Blaise et al., 2017; Hoyt, 2014; van Dooren & Rose, 2016), lest they become a bystander. Witnessing therefore emerges through encounters with difference, and the actions that it performs aim to make a difference in the world.

To clarify, witnesses intrasectionally become-with eyewitnesses through the enactment, reception of and response to story (Butler, 2013; Husanovic, 2009; Rose, 2004;

van Dooren & Rose, 2016; Zembylas, 2006). Witnessing then “names a specific relationship between individuals or groups” (Butler, 2013, p. 13) and is a process of subjectification and transformation (Zembylas, 2006) which enacts, consolidates and/or reconfigures realities, experiences, truths and beliefs. Witnessing can not only alter individual subjectivities but can also constitute new subjectivities, such as collective subjectivities (Abrams & Kacandes, 2008; Butler, 2013; Hoyt, 2014; Zembylas, 2006).

Witnessing is often presumed to involve or enact exclusively human subjects, and such an approach would engage in anthropocentrism. Given the common presumption that witnesses are human, discussion of witnessing often refers to speech, words, text or voice as the medium through which story is provided, acknowledged and responded to (Butler, 2013). Yet, humans can act as witnesses for non-human oppressed others (Rigby, 2009; Tuana, 2008) and witnesses themselves need not be human (Abrams & Kacandes, 2008; van Dooren, 2014; van Dooren & Rose, 2016). Even within exclusively human contexts, clearly, more than verbal language can constitute story (Appelbaum, 2008) and in more-than-human contexts we cannot wait for nature to “speak” for itself if we define speech or voice in terms of human language (DeMello, 2012; Huggan & Tiffin, 2010; Reinert, 2016; van Dooren et al., 2016).

Such more-than-human practices of witnessing climate change abound in our climate changing world, as do practices of refusing to witness climate change. Whether and in what ways climate change is witnessed affects the kinds of climate change in/action that is possible. Witnessing, therefore, is an important form of intra-acting with climate change. Through witnessing, we bring particular worlds, realities, truths and knowledges into be(com)ing, validating and recognising particular ways of relating to climate, and thus, bringing particular climatic possibilities into being.

Encountering, witnessing and storying are often involved with each other and are sometimes similar, but they are not the same. Encounters may be subconscious and go unnoticed, or may exceed capacities for interpretation and meaning making. Witnessing acknowledges, articulates and validates encounters, and it often does so through storying those encounters. However, not all encounters are storied or witnessed. Not all stories witness, and not all witnessing is done through story. Encounters are specifically surprising and unfamiliar and can generate a wide range of emergent forms of relations. Witnessing and storying distressing encounters may also be unsettling. But witnessing demands response and is therefore also a supportive practice. Witnessing thus brings subjects into a specific form of relation and can produce soothing or affirming affects. Storying is much more open ended and can compose diverse affects and relations. Both storying and witnessing require some kind of intentionality on the part of the subject, whereas encountering may happen to, rather than be conducted by, the subject. Each of these forms of intra-acting is influential in how we become-with, act-with and know-with climate change. None of this is to suggest that encountering, storying or witnessing climate change are necessarily good or nice. Rather, they are common and sometimes unavoidable intra-actions, and attention to how they work, what they do, and how we can responsibly engage in them is important.

AFFECTIVE ATMOSPHERES: ENCOUNTERING, WITNESSING AND STORYING CLIMATE CHANGE IN CCR15

Identifying and delineating encountering, witnessing and storying was only a partial articulation of how we were intra-acting with climate change in CCR15. I had not clarified exactly what forms or parts of “climate change” we were intra-acting with. That is, I needed to specify how I could practically identify “climate change” within CCR15. As one of my students stated, “climate change is everything,” echoing Margaret Atwood (2015) and Naomi

Klein (2014) who respectively tell us that climate change “is everything change” and “changes everything.” The “climate change is everything” ontology might be right, yet it is this monumental scale that makes it notoriously hard to engage with. Thus, for this thesis, while not ignoring that climate change potentially manifested as “everything change,” I needed to refine, define or limit climate change to something more methodologically manageable. I responded to this challenge by conceptualising climate change to manifest in CCR15 as an affective atmosphere.

Climate change is perhaps most easily identified as meteorological or ecological changes. But our classrooms at RMIT are insulated from the outside by a thick, industrial wall and fossil fuelled air conditioning (RMIT, 2018b), creating a kind of “secessionary climate” (Adey, 2013, p. 301) (see Figure 2, p. 77). This challenged my ability to easily identify climate change and thus, how humans were intra-acting with it. Situated inside the classroom we were physically disconnected from the direct meteorological or ecological realities of climate change, such as sea level rise, extreme temperatures or bushfires—unlike the body-weather intra-actions that posthuman educational literature on weathering (Neimanis, 2015) and becoming-weather (Rooney, 2018a, 2018b) discusses. Of course, the carbon footprint of our locally climate controlled classroom helped create the greenhouse gas emissions that are spinning the global climate out of control. So we were not really disconnected from climate change (Rooney, 2018a), just entangled in specifically insulated-but-climate-changing ways (Adey, 2013). Being situated in such enclosed classrooms can lead to representational pedagogies, where “outside” becomes a resource to be learnt about, to be known through disembodied, mental, cultural constructions of the world (Neimanis, 2015). Given our physical insulation and the predominance of screens and words in our methods of engaging with climate change, it would have been all too easy for me as a researcher to reduce climate change to an “idea” (e.g. Hulme, 2009, 2015c, 2017). But I

wanted to avoid assimilating climate change back into such an anthropocentric and representational ontology, and I think this challenge has provided an important opportunity to rethink ontologies of climate change beyond just this thesis.

In a preliminary consideration I noted that in CCR15, climate change manifested as a multifaceted phenomenon, including, but not limited to:

- Videos, imagery and texts, including verbally delivered lectures and academic research that were used as learning resources, such as those previously mentioned in Chapter 4;
- Particular weather events and variations in Melbourne's seasonality. As mentioned in Chapter 4, we had a very cold winter followed by a very hot spring. While these were not experienced directly in our classes, evidently students and myself still experienced these phenomena outside class time and carried those experiences with us into the classroom, including through discussing them;
- The Australian climate "situation" and its connection to the international climate context, including: mass systemic denial and scepticism; local, national and international policies (or non-policies); Australia's historical dependence and continuing allegiance to the fossil economy (particularly coal); and campaigns and efforts seeking to address this inaction, especially the People's Climate March and the Paris Climate Summit (COP21) which happened in late November, 2015, and
- Material-energetic flows, such as the air conditioning, audiovisual systems, buildings and classroom furniture, food and our bodies, which all contribute to the production of climate changing greenhouse gases.

I conceptualised these diverse manifestations of climate change in CCR15 to constitute an affective atmosphere, rather than cultural constructions or purely physical phenomena. Affective atmospheres is a concept advanced by geographer Ben Anderson (2009) and deployed and refined in geographical work exploring the spatiality of human emotions and feelings (Buser, 2013; Fregonese, 2017; Lupton, 2017; Michels & Steyaert, 2017). For Anderson, affective atmospheres are enveloping, spatially diffuse affective forces

which “emerge from, enable and perish with” human and more-than-human bodies (2009, p. 80). As a term, affective atmospheres—sometimes just referred to as atmospheres within the disciplinary discourse—draws on the morphology of meteorological atmospheres to understand how “affect” is constituted and circulates (B. Anderson, 2009; Michels, 2015). The concept’s development was a response to the slipperiness of the term affect itself (B. Anderson, 2009).

Affect has many competing definitions and approaches, but some generally shared understandings are that affect refers to pre-personal sensual or somatic forces (Roelvink & Zolkos, 2015), intensities or energies that flow or circulate between and through subjects and objects, bodies and environments (B. Anderson, 2009; Buser, 2013; Gregg & Seigworth, 2010). Affects are intrasectional, as they are produced by, and produce, bodies of all kinds—human, non-human, inanimate (Latour, 2004; Vermeulen, 2014). These forces can manifest as physical, mental, or emotional responses; affect thus draws us into relations of proximity and/or intimacy (B. Anderson, 2006; Cunsolo Willox et al., 2013). Affects therefore produce new and emergent embodied connections and relationships (Gregg & Seigworth, 2010; Mulcahy, 2012), and within those, affects increase or decrease a body’s capacity to act (Buser, 2013; Roelvink & Zolkos, 2015). That is, affect participates in the creation of agency, and given that it is transcorporeal and relational, is a specific way in which we act-with others.

Affect is distinguished from emotion in that affect is argued to be “excess,” “non-representational,” independent of meaning, pre- or non-subjective, a-signifying (Vermeulen, 2014), beyond the register of consciousness, uncontainable and intangible (Mulcahy, 2012). In contrast, emotions are understood as personalised, territorialised, or owned, felt and named by individual subjects (Vermeulen, 2014) and as such, as phenomena that domesticate

worldly forces into humanist registers. Affect is often understood as the force that elicits emotions, but this is not a causal or teleological relationship (Gregg & Seigworth, 2010): the emergent emotions are but one of the possible diffractive responses to affect (B. Anderson, 2006; Vermeulen, 2014). Hence while affects are material, they are never fully tangible, locatable, or understandable. Thus, attending to affect remains a difficult task given the excessive, pre-personal and a-signifying nature of affect. Excluding emotions and focusing just on affect may therefore let us “off the hook” (Boler & Zembylas, 2016, p. 315), allowing us, through its definitive vagueness, from differentiating between specific forms of arousal and attachment (Johansen, 2015).

In response to such problems and challenges, Anderson (2009) developed the concept of affective atmospheres as a method for attuning to affects that can bridge the divide that has been built up between emotion (as personal, narrative, signifying) and affect (as impersonal, non-narrative and a-signifying) within affect theory. Affective atmospheres are affective forces that, like meteorological atmospheres, radiate from and surround entities, and which are “always in the process of emerging and transforming” (2009, p. 79). Affective atmospheres are “impersonal in that they belong to collective situations,” however, they “can be felt as intensely personal” (2009, p. 80). Affective atmospheres can be ambiguous, ill defined, absent, vague, and asignifying, exceeding “rational explanation and clear figuration” (2009, p. 78), yet “the affective qualities that are given to this *something* by those who feel it are remarkable for their singularity” (2009, p. 78, italics in original). Affective atmospheres enable us to understand “affective experience as occurring beyond, around, and alongside the formation of subjectivity” (2009, p. 77), “*across* human and non-human materialities, and *in-between* subject/object distinctions” (2009, p. 78, italics in original). Anderson (2009) and related geographers mainly use atmospheres to explain the morphology and movement of affects (Bissell, 2010; Edensor, 2012), including the role of ecological, non-human and

material objects and forces in composing those atmospheric affects (Edensor, 2012; Shaw, 2014). A few geographers explicitly seek to consider “atmospheres as simultaneously meteorological *and* affective” (Adey, 2013, p. 293, italics in original; McCormack, 2008). For example, Adey (2013) attends to the oppressive and effervescent polluted airs of megacities and McCormack (2008) to the buoyant anticipation of the Swedish explorer Andrée’s hot air balloon flight to the North Pole in 1897.

Yet little work uses affective atmospheres to explore that quintessentially atmospheric and affective phenomenon, climate change. Lee’s (2013) PhD thesis which explores the affective atmospheres produced by climate change activists and their more-than-human partners and contexts is a notable exception. Yet even here climate change is not figured as an active participant in the composition of the affective atmospheres, but a background condition to the active human and non-human actors who create the affective atmospheres *about* climate change. More promising is Boggs’ literary criticism which figures anthropogenically changed atmospheres as sentient narrative actants, which refers to “the intimate co-existence of human and nonhuman actants” and thus also “the felt life of the embodied humans that are affected by such atmospheres” (2016, p. 15). Gannon’s exploration of the affectivity of everyday weather encounters most usefully encourages attention to how atmospheres have an elusive agency that “incites relations and provokes changes” (2016, p. 85), which she argues is important in the context of “the monumental and ... global” issue of climate change (2016, p. 88).

Taking seriously research and insight into the affective and emotional experiences of encountering climate change (Brugger, Dunbar, Jurt, & Orlove, 2013; Cunsolo Willox et al., 2013; Drew, 2013; Roelvink & Zolkos, 2011) demonstrates that while affects may be atmospheric, climatic atmospheres are also affective (Adams-Hutcheson, 2017; Adey, 2013;

McCormack, 2008; Gannon, 2016; Rooney, 2018b). For example, weather conditions are found to influence people's moods and mental states (Baylis et al., 2018; Brandl et al., 2018; Dodd et al., 2018); emotions influence people's carbon mitigating behaviours (Burke et al., 2018; Hufnagel, 2017; K. Stevenson & Peterson, 2016); and potential future climatic changes arouse intense emotions in people (Cunsolo Willox, 2012; Cunsolo Willox et al., 2013; Head, 2016; Richardson, 2018; Swim et al., 2009). An ecologised account of affective atmospheres therefore understands affective and meteorological atmospheres not as separate, but as entangled, mutually co-composed material-discursive phenomena. As Adey (2013) puts it, understanding atmospheres as "a material-affective ecology" (p. 293) enables attention to how we "simultaneously exist within and produce a climate" (p. 297), both living and embodying the "vitality, corporeality and expressiveness" of atmospheres (p. 293).

Affective atmospheres, as used in this thesis, refers to how atmospheric affects both produce and emerge from the affected atmospheres that constitute climate change. Which is not to suggest generalised patterns of weather/climate and emotions (Adams-Hutcheson, 2017). Rather, different bodies/subjects will intra-act differently with the affective atmospheres of climate change (Ahmed, 2014; Michels, 2015). Ahmed terms this the "angled" nature of affective atmospheres: even "when [affective] atmospheres seem thick and palpable, like something that can fall and settle, almost like pollen in the air" people can still experience them very differently (2014, n.p.). Indeed, the actual pollen in the air is changing as the climate changes, and Melbourne's deadly 2016 thunderstorm asthma event which saw over ten thousand people rush to emergency rooms and ten people die while others were obviously unaffected demonstrates that it is not just the affectivity of atmospheres that is angled (Kenner, 2018; R. Smith, 2018). The affected meteorological atmospheres of climate change are experienced radically differently by different bodies in different places and different times (Kaijser & Kronsell, 2014). Further, understanding climate change as an

affective atmosphere is not to reduce climate change to an issue that can be fully encapsulated in the short time frames usually associated with atmospheres, but to acknowledge the long histories and the far-reaching tendrils of the complex patterns of more-than-human intra-actions which compose atmospheres, no matter how ephemeral they may seem (Gottzén & Sandberg, 2017). And the diversity of participating components in atmospheres emphasises the dynamism and potential for reconfiguration of atmospheres due to their contingent, transient, and intercorporeal composition (McCormack, 2008).

In CCR15, I found that the manifestations of climate change mentioned so far in this chapter all produced affective forces which collectively coalesced as an affective atmosphere. The collision and layering of affective forces of different temporal and spatial scales contributed to the affective atmospheres of CCR15, such as the semester's weather unfolding in the context of the climate most of us had grown up in, and the national political discourse of scepticism in the context of global scientific consensus. The course learning resources also participated in this. As Ahmed (2014, n.p.) points out, "atmospheres surround certain words, hovering, a thickening of air." "Climate change" is one such phrase which carries complex and intense affective baggage, and while we were not in direct bodily contact with drought, floods or ocean acidification, our course learning materials discussed these issues. This meant that these temporally, spatially and socially distant phenomena were affectively experienced and encountered within the classroom, albeit from a different "angle" to how those phenomena were experienced by others. All these manifestations of climate change carried and produced excessive, intangible energies and intensities that produced changes in us. These "viral" (Rousell et al., 2017, p. 655) or "contagious" (Bissell, 2010; Knudsen & Stage, 2012, p. 148) affective forces of climate change all swirled into, infiltrated and intra-actively mutated with our climate controlled classroom. Collectively, the constantly emerging assemblage that they produced formed an overwhelming, uncontainable affective atmosphere

of “everything change.” These atmospheric affects of affected atmospheres seemed to take on a life of their own, always morphing, never fully definable, and influencing us in unpredictable ways. I identified this affective atmosphere as the contact zone (Ahmed, 2010, 2014; Haraway, 2008) in which we encountered, storied and witnessed climate change.

Additionally, I became aware that as part of these preliminary affective encounters with climate change, students and I performed myriad emotional and affective responses ourselves, which often took the form of witnessing and/or storying. This was evident through students naming specific emotions that they felt (e.g. “I feel overwhelmed”), or performing embodied emotional/affective practices (e.g. crying), or storying affective, embodied experiences where no specific emotion was stated (e.g. “I am constantly butting heads with sceptics”). Across the semester, we had become climate-changed. Through encountering, witnessing and storying climate change we had become different to our previous selves: we were now overwhelmed, upset, and engaged in different relationships (Cunsolo Willox et al., 2013; Drew, 2013). That is, we encountered changes in climate which were affective and we responded affectively. Our affective pedagogical responses therefore further contributed to the affective atmosphere of CCR15 (Juelskjær, 2017). In so doing, we were participating in creating climate change, we were *climating*: climate change continually re/emerged as an affective atmosphere through our intra-actions with climate change.

I also found that in CCR15 our newly climate-changed selves encountered, witnessed and storied our own affective and emotional responses, performing secondary affective responses (Watkins, 2016). Examples included laughing at another student’s exasperation, or being shocked by our own apathy. Students and I were acting as witnesses to each other’s and our own stories of our affective climate encounters. Climate change, as a change in relationships, was being performed into being through our changing relationships with

ourselves and each other. Encountering, witnessing and storying the affective atmospheres of climate change was thus “both process and product” (Mulcahy, 2012, p. 10) in our class. Put alternately, the myriad manifestations of climate change in the climate controlled classroom contributed to the composition of an affective atmosphere, which we encountered, witnessed and storied, in turn participating in and co-composing it. We became affectively entangled with climate change.

In summary, in response to my preliminary methodological challenge, while climate change can be understood as “everything change,” for this research project I conceptualised climate change to manifest as an affective atmosphere. This affective atmosphere was itself composed of many forces, events, stories, intensities, materials, and was constantly emerging as they intra-acted with each other. That is, while methodologically I have limited my focus on climate change to its manifestation as an affective atmosphere, this affective atmosphere was composed through the affective intensity of the entirety of climate change which infiltrated our classroom through various means. I also identified that the humans in CCR15—myself and students—were intra-acting with and as part of this affective atmosphere in particular ways: encountering, storying and witnessing climate change. Across the remaining chapters (6–9), I demonstrate how these cascading forms of encountering, witnessing and storying climate change affectively contributed to specific changes in our human-climate relationships. By understanding climate change as an uncontrollable affective force that infiltrates, shapes and exudes from us in surprising and uncontrollable ways, these chapters provide an alternative to the often individualistic, anthropocentric and mechanistic approaches to emotions in climate change education (Chapman et al., 2017). Further, the emphasis of affective atmospheres on the in-between—of the personal and the collective, the physical and the psychic, the excessive and the identifiable—affords an attention to the “socio-ecological learning” that occurs “in between the thought and the sensed”, “the lived

and the articulated,” the embodied and the cognitive (McKenzie, 2008, pp. 362, 369). Of course, I was entangled with these affective atmospheres not just as a learner and teacher, but also as a researcher.

METHODOLOGICALLY INTRA-ACTING WITH CLIMATE CHANGE’S AFFECTIVE ATMOSPHERES

My aims in working with a real example of climate change education in this thesis were to experiment with posthuman ideas in practice, to explore whether empirical climate education could be interpreted through posthumanism, and to further develop the thesis’ theoretical posthuman pedagogy through those attempts. In order to do this, I was keen to experiment with alternative methodologies that themselves could contribute to such a rethinking and redoing of ways of knowing climate. A preliminary effort towards this was to be open to what emerged, which is argued to be less extractivist than methodologies which presume in advance what they want to know and what they will find (Reinert, 2016; Sundberg, 2015; Weaver & Snaza, 2016). This openness was promoted by the overwhelming intensity of climate change whose affective agency meant that during the semester I did my best to stay afloat of my teaching requirements and just take lots of notes and store as much information as I could. Due to this, during the semester I participated in the same forms of encountering, witnessing and storying climate change as my students did, as outlined above. As a teacher, I also encountered, witnessed and storied students’ encounterings, witnessings and storyings of climate change. For example, I had to read their assessments and respond to them in the form of a numerical grade, written feedback, and face to face support and encouragement. I had to listen attentively to their comments and discussions in class, respond to their questions, and make sense of their experiences so that I could appropriately plan and facilitate future class discussions and activities.

Arising from these relations, encountering, witnessing and storying have become my empirical research methodology. This meant the methodology was not so much designed by me, as something that co-emerged with me as I was becoming-climate, and which I then attuned to, embraced, and reiterated. Beyond the encountering, witnessing and storying that I participated in during the semester of CCR15, I have also been engaged in further encountering, witnessing and storying since then. This takes the form of reading, re-reading, thinking about and writing about the data created and documented during the semester and my own experiences. Such methodological encountering, witnessing and storying raises many questions. How can I responsibly tell students' stories, whose experiences no doubt exceed what I can comprehend, know, understand or remember? How can I avoid appropriating their voices, and allow them to "talk back"? Then when considering my obligations as a witness to climate change itself, these questions become even more confusing. These methodological practices also raise questions regarding the boundaries between myself, students and climate, and whether I can—or should—try to clearly delineate these. Remembering that encountering, witnessing and storying are intra-actions helped me work through these questions, and thus develop a posthuman performative methodology.

FROM REFLECTION TO DIFFRACTION

Developed as an epistemological and ethical imperative throughout feminist, postcolonial and anti-capitalist research methodologies, reflection has often been touted as a means to account for the researcher's influence on the research and to avoid the pitfalls of speaking for others (Alcoff, 1991; Lykke, 2010). Reflection involves an analysis of the influence of the researcher's (or other privileged actor's) positionality or standpoint: the social and political distance between a researcher and that which she is researching (Alcoff, 1991; Mellander & Wezsmeg, 2016; Schneider, 2002). Through this, the researcher's

influence can be subtracted out through various techniques, to develop a more legitimate analysis of what that researched object would have been like without the researcher's interpretational bias. Specific techniques developed through reflection include "stepping back" (Maclure, 2008, p. 99), or the "retreat" (Alcoff, 1991, p. 17): prioritising presenting research participants "own" voices or words, or letting data "speak for itself" to avoid the issue of researchers' subjective interpretations (Jackson & Mazzei, 2008; Maclure, 2008; St. Pierre, 2013a). Another strategy has been presenting multiple voices (Jackson & Mazzei, 2008) in order to avoid an essentialist approach. A third has been to "step forward"—making the author's own voice more audible so that its influence is more obvious, and thus transparent and eliminable (Maclure, 2008, p. 99). Yet these practices have limitations. Firstly, none of these techniques for presenting participants' voices take account of how the words spoken by participants, and those selected for inclusion by researchers, have already been shaped by research practices and the wider socio-material assemblage (Jackson & Mazzei, 2008; Mazzei, 2016). That is, it assumes that the research subjects and the data they produce are autonomous from the social and ecological conditions with/in which they were generated and of which the researcher is a part (Maclure, 2008). And if this mutual co-composition is recognised, it then undermines the notion that a researcher's positionality is fixed, separate and exists in advance of the research entanglement and can thus be subtracted from the research findings (Sundberg, 2015).

In contrast to the representationalism and anthropocentrism of reflective methodologies, diffraction (Barad, 2014; Haraway, 1997) has been promoted as an alternative posthuman, performative methodology. Understood as an empirical methodology, diffraction encompasses both the theoretical methodological (Chapter 2) and pedagogical (Chapter 3) forms I have already outlined in this thesis: the effort to engage, participate in, warp, generate, and follow difference. Diffractive methodologies emphasise entanglements

and performativity, and therefore situate the researcher as unavoidably part of and emergent with the research “object” (Mellander & Wiszmeg, 2016). Unlike representational reflective methodologies which see social location as fixed, pre-existing and thus extractable from the research, “diffraction attends to the ways in which actors intra-act with, interfere with, and reinforce one another to produce difference in those bodies (and their positionalities) and in research” (Neely & Nguse, 2015, p. 142). Diffractive methodologies understand knowers as composite, thought as distributed, and knowledge as “something emerging through disruptive processes” (Mellander & Wiszmeg, 2016, p. 103). Thus rather than describe or reflect on the world, entangled, diffractive methodologies interfere or intervene with/in the world to collectively enact knowledge (Lather, 2016; Mellander & Wiszmeg, 2016). Diffraction is thus inventive as well as critical (Lather, 2016), a practice which “makes waves” because “description is always intervention” (Mellander & Wiszmeg, 2016, p. 106).

A diffractive, intra-active methodology of encountering, witnessing and storying climate change contends that responsibility is not about me standing apart from CCR15 in order to reflectively produce “objective” truths about it (as though that were possible). Rather, intra-acting and diffracting involves me becoming intrasectionally engaged in the project and acting-with it, in order to produce new diffractive phenomena (Barad, 2007; Latour, 2004). Subtracting my influence thus becomes not only an absurdity, but an irresponsibility, a failure to participate in the world and an effort to know through distance. The methodology enacted in this thesis, then, must be understood to be an entangled affective encountering, witnessing and storying that does not represent a researcher-independent reality, but that co-enacts a reality that is constantly in the making and of which I am an unavoidable part (Mazzei, 2013a). This emphasises that the effects of methodology do not begin or end with the writing process, but diffract beyond the paper (or screen) back into real people’s lives (Reinert, 2016; van Dooren et al., 2016). This diffractive methodology enables

the climate-human entanglements to “talk back,” to participate agentially in producing this research through affecting and changing me (Haraway, 1997; hooks, 1989; Latour, 2004). It situates “me” not as an independent power holder, but as someone constituted with and through my engagements, and also attends to how boundaries and hierarchies can be reconfigured through methodology (Mellander & Wiszmeg, 2016). As diffractive intra-actions, encountering, witnessing and storying CCR15 to the best of my (entangled) ability ensures that the intimate details of these (mostly) young peoples’ encounters with climate change are not ignored or erased, which is an important social step towards intergenerational and more-than-human equity.

To enact such ethical encountering, witnessing and storying requires a diffraction of taken for granted ontologies and epistemologies, especially as they underpin the stories that are told about humans and climate, whether that be by scientists, activists, lecturers, students, or myself. That is, if we are seeking to engage differently with the world rather than inhabit the same old anthropocentric tales, then “which figures figure figures” and “which stories tell stories,” matters (Haraway, 2016, p. 160; see also Cole, 2016). As Haraway argues, “we need stories (and theories) that are just big enough to gather up the complexities and keep the edges open and greedy for surprising new and old connections” (Haraway, 2016, p. 101). Thick, descriptive, ethically charged, lively stories can be “powerful tools for ‘connectivity thinking’” (van Dooren & Rose, 2016, p. 85). The “insurrectionary potential” of such lively stories can “unsettle the given, ... challenge orthodoxy and direct attention to the enactment of the otherwise-possible” (Reinert, 2016, pp. 106–107). As such, many researchers in multispecies, relational and posthuman studies are creating stories or narratives, generating figures, working with anecdote, imagination or speculation, playing with grammar, and/or using other textual tools to enact the world differently as part of their practices of witnessing (J. Lorimer, 2010; Salazar, 2017; van Dooren et al., 2016).

STORYING CLIMATE CHANGE WITH AN ENTANGLED VOICE

The remaining chapters in this thesis seek to engage such alternative practices of storying to respond as witness to what I encountered in CCR15 as ethically as possible. Across Chapters 6–9, I engage methodological encountering, witnessing and storying to explore CCR15’s pedagogical encountering, witnessing and storying of/with/as climate change. In Chapter 6, the thesis presents a story of CCR15 in narrative form, which could be considered a “results” chapter, as it is composed almost entirely of empirical data created during CCR15 (a few of my experiences that occurred following the semester are also included). The remaining chapters (7–9) “analyse” or “interpret” the narrative, or, to put it alternately, engage in analytical storying. To clarify, the distinction between these terms is not particularly appropriate: analysis is embedded in the narrative and the narrative is illuminated through the analysis.

One of the key aspects of intra-active storying, as discussed above, is that words emerge from an entangled voice. In both the narrative (Chapter 6) and analytical chapters (7–9) that follow, it is important to recognise that the words are not solely mine, even when they appear to be so, and neither are they ever simply an individual human student’s. To think this way would be to deny that the ideas, experiences and words emerged through acting-with many, many human and more-than-human others over a complex process before, during and after the semester of CCR15. Considering that none of the data created was easily or solely attributable to any particular individual enabled me to more creatively organise the narrative in Chapter 6 in order to identify, explore, convey and enact the intrasectional morphing identities that emerged in CCR15. That is, experimenting with the writing of Chapter 6 provided opportunities for analytical insights to emerge: it engaged me in a kind of “haptic description in which the analyst discovers her object of analysis by writing out its inhabited

elements” (Stewart, 2011, p. 445).

To develop the entangled narrative story in Chapter 6, I trimmed, edited, and re-arranged my data document (see Chapter 4) across a few years. I worked on this until the story was sufficiently generative so as to get beyond anthropocentric scripts, but also sufficiently reproductive of cultural conventions so that it was comprehensible. Chapter 6, titled “*A climate change therapy group*” is therefore one story of CCR15, although it is not the only possible story. The story is made, but not made up (van Dooren et al., 2016). Techniques used that depart from more traditional, Western/modern, liberal-humanist research practices include switching between various modes of first person narration. One of these modes is of individuated students’ perspectives, which is indicated with a pseudonym. Another technique involves combining statements and experiences from “separate” people such that they appear to be narrated by one subject. For example, there is a section that says “climate change makes me feel anxious, frustrated, confused, uncertain,” No single person ever said this; however, at least one said “climate change makes me feel anxious,” and at least one said “climate change makes me feel frustrated,” or words to that effect. This approach is employed in the other two narrating perspectives, which are my teacher’s perspective and a kind of coalitional-but-singular I. That is, both these two perspectives include words spoken by multiple people. This is experimental writing that loosens the “heavy [methodological] presumptions of a proper and automatic relationship between thinking subject, concept, and world” (Stewart, 2011, p. 445). The entangled narration functions to emphasise the affective entanglement that emerged in the course, where witnessing the stories of others aroused particular sensations and generated novel encounters, which in turn were solidified into further stories, which subsequently also circulated and affected others, leading to a sense of being unsure whose experience was whose and where the self ended and others began. This is similar to Rousell et al.’s “viral” speculative climate

change fiction, where the stories produced over time “developed into a nonlinear collaborative narrative in which the voices of individual authors became entangled, and at some points, indistinguishable” (2017, p. 661). The entangled voice is not a unified voice: entanglement is not about dissolving boundaries, but about processes of cutting together-apart, of collaboratively becoming differently different (Barad, 2007). The entangled voice thus expresses how no-one is ever fully separate from others or their environment, even as we intrasectionally diverge from each other through our processes of becoming-with. This entanglement of selves, others and climate is embedded in Chapter 6, and explained explicitly in Chapters 7–9. But it is also important to note that the thesis as a whole is a product of these entanglements: I could not have written any of this in a vacuum. “My” research is not really just “my” ideas, but work enabled through “a complex network of human and non-human forces” (Mazzei, 2016, p. 3).

Storying with an entangled voice addresses the potential matter of relying on my memory, by emphasising that at all stages in the research project, I am acting-with a climate changing world much bigger than my own intentions. As discussed in Chapter 4, part of the data creation process involved writing down what I remembered had happened in class. This raises the question of how objective and reliable my witnessing is. Barad’s discussion of memory is useful here:

Memory does not reside in the folds of individual brains; rather, memory is the enfoldings of space-time-matter written into the universe, or better, the enfolded articulations of the universe in its mattering. Memory is not a record of a fixed past ... And remembering is not a replay of a string of moments, but an enlivening and reconfiguring of past and future that is larger than any individual. Remembering and re-cognizing do not take care of, or satisfy, or in any other way reduce one’s responsibilities; rather, like all intra-actions, they extend the entanglements and responsibilities of which one is a part. (2007, p. ix)

Rather than trying to recall or perfectly document an objectively knowable pure past, what

was documented was what affected me, and as has been discussed affect itself is a collectively produced force that entangles bodies with each other (Childers, 2013; Watkins, 2016). What I remembered may not be a perfect, “pure” or full recollection, but neither is it simply my “own interpretation.” Rather, the words that emerged on the page as my observations were a collective, affective, reiterative “enlivening” produced by my entanglement with climate change and my students.

TEXTUALLY PERFORMING AFFECTIVE ATMOSPHERES

Put alternately, this thesis acknowledges and engages with climate change’s affective intensity as a methodological technique. Zembylas suggests that “educational researchers might need to develop more innovative and evocative ways of writing up their accounts in order to ‘show’ the performativity of the emotions and affects they study” (2016, p. 212).

Similarly, Stewart argues that researching affective atmospheres

incites forms of writing and critique that detour into descriptive eddies and attach to trajectories. This is writing and theorizing that tries to stick with something becoming atmospheric, to itself resonate or tweak the force of material-sensory somethings forming up. (2011, p. 452)

Taking up this challenge, in Chapter 6 I experiment with the ideas introduced in this thesis—entanglement, intra-action and response-ability; encountering, witnessing and storying; and affective atmospheres—in order to story climate otherwise. Rather than trying to objectively discuss students’ affective entanglements with climate change from a position of detached distance, my own passionate immersion (van Dooren et al., 2016) is embraced explicitly as a tool for knowing through “being with what we research” (Mellander & Wiszmege, 2016, p. 94). For example, the “data” (what a cold term!) from CCR15 continued to affect me intensely (Childers, 2013; Mazzei, 2013a) long after the semester finished, producing

diffractive interventions in my own methodological efforts, challenging the belief that I, as researcher, could somehow disentangle myself from it.

Chapter 6 is an experimental effort to acknowledge this, by bringing climate change's affective atmospheres onto the page, or indeed, screen. It is an effort to enrol the reader (hello!) in the intra-actions of encountering, witnessing and storying, and to thus entangle the reader with CCR15's affective atmospheres. It is my hope that this may provide some kind of experiential understanding of the theoretical and empirical claims being advanced in other chapters of the thesis. This approach emphasises the performative, rather than representational, methodology, which aims to produce research that is not a neutral reflection of a research-independent reality, but an ongoing intervention in ways of relating to climate change (J. Cameron et al., 2011; Mellander & Wiszmeg, 2016; Stewart, 2011). Due to my efforts to performatively story these affective atmospheres, I anticipate that readers may become affectively entangled with the story in their own diverse ways. Reading and trying to make sense of (i.e. encountering, witnessing and storying) the narrative may generate similar affects to some of those that were experienced in CCR15: overwhelm, frustration, empathy, discomfort and unsettlement. I once read an excerpt of this narrative to a group of peers and one stated that hearing it "felt like climate change." This is what I am trying to cultivate: an experiential appreciation of the affectivity of climate change. Of course, reading it may also lead to sensations of boredom, irrelevance or apathy, but these are also common responses to climate change. Whatever the case, by providing a lengthy, entangled-first-person narrative Chapter 6 provides scope for the reader to attune to how they are actively intra-acting with the text, and attend to the diverse and unpredictable ways in which stories of climate change affect us.

Explaining too much in advance may detract from these potential performative

possibilities. But some explanation of the methodological techniques I have experimented with may be beneficial in understanding the ethical yearnings at work in the chapter. In order to bring an attention to our enmeshment and co-becoming with the climatic throughout the semester, I have used meteorological symbols to indicate a break in the story and I have given individualised voices a weather-related pseudonym which are also accompanied by a meteorological symbol. Insufficient, awkward or representational as they may be, these are experimental techniques striving to speak to the entanglement of climate and humans. Including my own stories of affective climate encounters and interpermeating them with students', the chapter seeks to disrupt epistemologies of distance and reductive individualism. This storying of my own emotional and interpersonal entanglement with the "research object" explores some of the ways in which I became-with my students and with climate during and beyond the semester. The story is somewhat lengthy, and such a detailed repository of supposedly "raw data" without apparent interpretation by the researcher is uncommon in qualitative research. I have kept it long in part because I found it really difficult to delete people's experiences from it, evidencing my affective entanglement with the research. But I also believe that the length of the story is an important means of bringing attention to the affectivity of the semester: its duration, oscillating intensities, and moments that exceed easy explanation (Stewart, 2011). Presenting the data this way means there is far more contained in the story than what this thesis is able to analyse explicitly. This provides scope for climate and students to speak back (Latour, 2004), leaving the story "big enough" and keeping the "edges open" (Haraway, 2016, p. 101) such that other ways of encountering, witnessing, and storying it are still possible (van Dooren & Rose, 2016). That is, Chapter 6 is not a bank of "raw data," but a carefully curated collation of uncontainable stories created through intervening with/in the world. Following Chapter 6, Chapters 7–9 return to a more traditional form of methodological storying, interpreting CCR15 with a more distanced and

analytical, but still entangled, voice.

CONCLUSION

Anthropocentrism and representationalism are founded on logics of spatial separation (Barad, 2007) which justify hierarchies and oppression (Plumwood, 1993). “Off-the-shelf” practices of knowing climate that presume to know what climate or humans are in advance of encountering and becoming-with them risk repeating such imperial practices of extraction (Desmond, 2014; Mellander & Wiszmeg, 2016; Reinert, 2016; Weaver & Snaza, 2016) which render the world as a set of passive, bounded resources “available for research” (Sundberg, 2015, p. 121). In order to resist and rework such destructive practices, methodology must recognise that “the world which we try to know is not distant” (Mellander & Wiszmeg, 2016, p. 100). Therefore, “critical engagement, rather than critical distance, becomes the goal of research” (Neely & Nguse, 2015, p. 142), because “the knower can never be singular and knowing is not an activity enacted in isolation, but through convergence and composition” (Mellander & Wiszmeg, 2016, p. 99). An intra-active, diffractive methodology can enable attunement to humans’ epistemological, ontological, ethical and affective enmeshment with climate.

The specific intra-actions of encountering, witnessing and storying are collaborative knowing practices through which climate change and humans become differently and further entangled. These intra-actions unfolded in CCR15, emerging in response to, and as part of, climate change manifesting as an affective atmosphere. Climate change’s intense, overwhelming affective forces demanded and compelled us to witness and story our encounters with it “through the affective capacities of our own bodies” (K. Wright, 2014, p. 279). Through doing so, we reiteratively contributed to the ongoing emergence of climate

change as an affective atmosphere, and to our own entangled becoming. These collectively enacted intra-actions spiralled and coiled around each other, diffractively interfering, amplifying and/or inverting each other and creating feedback loops, as we became affectively entangled with climate change. The outline of these specific modes of climate intra-action and their effects offered here enables the remaining chapters' close attunement to how particular climate response-abilities were composed or decomposed in CCR15.

These intra-actions function as a “meta” ethico-onto-epistemology in this thesis, methodological techniques for studying their own enactment. They constitute my empirical methodology for studying CCR15's encountering, witnessing and storying. As methodological intra-actions, encountering, witnessing and storying are “detailed practices of attentiveness to the complex ways that we, all of us, become in consequential relationship with others” (van Dooren et al., 2016, p. 3). Thus, they allow me to investigate *how* the human-climate relationships changed during CCR15, which has been partly answered in this chapter: they emerged through the intra-actions of encountering, witnessing and storying climate change's affective atmospheres. They also allow me to study in *what ways* they changed, which is explored in the coming chapters.

Encountering, witnessing and storying climate change is a performative and affective methodology which aligns with Haraway's contention that researchers “must be in the action, be finite and dirty, not transcendent and clean” in order to “make a difference in the world, to cast our lot for some ways of life and not others” (Haraway, 1997, p. 36). Rather than trying to stand apart from and objectively recall and document a “pure,” researcher-independent object of study, this approach acknowledges that methodology co-enacts the realities that it studies. Because “being is always already entangled, then something called data cannot be separate from me” (St. Pierre, 2013a, p. 226), and thus as a researcher I am a co-emergent

assemblage enacted by the following chapters' production and analysis of "data" (Childers, 2013; Mazzei, 2013a). This methodology acknowledges that knowing climate emerges through acting-with and becoming-with, and the entanglement of the affective and the atmospheric is a key way through which these response-abilities arise or are reconfigured. Attempting to textually perform these ideas, Chapter 6 is narrated by an affective, entangled (but not necessarily unified) voice.

6. “A CLIMATE CHANGE THERAPY GROUP”: AN ENTANGLED NARRATIVE STORY OF CCR15

“The first thing I think of when I think of climate change, is that I don’t what to think about it.”

This was one of the first statements to greet me in week 1. I had decided to ask students in their first class to discuss “what do you think of when you think of climate change?”

Most of the responses from my students were emotional, including being overwhelmed, frustrated and sad about the magnitude, urgency, and quantity of inter-related problems that climate change creates. This included the disproportionality—the higher impacts of climate change on those who contribute least to it—and the subsequent issues of injustice, as well as the lack of rational action to what seems to be an obvious problem. A few students mentioned how climate change can be an exciting opportunity to create a better world. We discussed hope and despair, and how both can be motivating, or, how motivation is a balance between them. Climate change was understood generally as a negative thing, a problem, the biggest issue, one that effects everything, a topic that is associated with doom and gloom.

The topic in week 2 was climate science and the emotion was toned down a bit as we clarified our understanding of the greenhouse effect, feedback loops, future climatic projections, and other geo-physical and statistical aspects. After this we did a communication activity, and students were asked to come up with a metaphor to explain a particular element of climate change science. One example was that the time between emitting greenhouse gases

and the climate changing is like putting the brakes on in a car—you don't stop immediately, it takes some time, and the earlier you start the safer it is. Another which the students jokingly developed in reference to feedback loops and tipping points was “it's like we've abused the Earth and now it has PTSD.” Thus, while the scientific lens dampened the emotional intensity, students continued to make connections between climate change, emotions, and mental health.

In week 3 the topic was about perceptions and ways of knowing climate change. The readings for this week outlined a spectrum of climate denial, ranging from that we typically label scepticism to the inaction that many people engage in despite concern about and belief in climate change (called stealth denial). The lecture explored cultural relationships to climate and how these have changed over time; how knowing the science doesn't lead to mitigating behaviour; and how Australians are the (developed) world's worst climate sceptics. The lecture also explored some trends in climate change communication which seek to humanise climate scientists, for example, through looking at climate change depression and getting scientists to talk about how they feel about the future.

I found the lecture quite overwhelming, as it provided a broad overview of the issue and scale of climate change and also of denial, which was one of those moments that makes you question the relevance or utility of what you're doing and whether it is “enough” or the most effective use of your time and energy. Having been reading about affect that week and feeling quite affected myself, I spontaneously scrapped my lesson plan and decided to make the first activity in our tutorial to get students to discuss “what affected you in the lecture”—which I briefly explained as something that generates some kind of embodied response in you.

Recurrent themes in the discussion were (again, echoing week 1) feeling

overwhelmed and frustrated at Australia's current (non)response to climate change in the context of our high carbon economy and the feasibility of reducing our emissions. Many students were also confronted by the notion of stealth denial and having to come to terms with their own micro-denials and how they justify this to themselves. One student argued that the concept of "a spectrum of denial is important because it breaks it down from good and evil, black and white; there's so much more to denial. We're all guilty of being stealth deniers" and then referring to how even though we "get it," there's times life intervenes and we "forget": "the system twists our arms, forces us, to go against our conscious choice." This discussion led to one student commenting "I like Australia, Australia's a cool place. But it's disheartening. You look around, and it's like, where'd everyone go? And they're running away... It's like, [sigh] Jesus guys." The student's exasperation led to empathetic laughter from the group.

From here students began discussing the role Australia's national identity and culture play in leading to such high levels of scepticism. Issues cited included that we eat a lot of meat, that our economy has historically benefitted greatly from coal extraction and combustion, our idealisation of being working class and of identifying as rural/farming communities. Towards the end of the discussion, one student stated that "there is not enough space to talk about how climate change makes you feel, and I think that's important. If scepticism is embedded in our national identity, we almost need climate change therapy."

After the class, I received the following in an email from another student: "I'm so glad I changed into this class—it's more of a climate change therapy group than a university subject."



My initial reaction to the first few weeks of the class was a mixture of frustration, confusion and despair. Perhaps this is because much of the airplay surrounding climate change follows a “worst case scenario” narrative. It is a constant reminder that the Earth is fucked.

In the first week’s tutorial I remember a unanimous feeling of frustration shared by the whole class when talking about climate change action. I felt this frustration towards governments, companies, humans and myself. I hate the fact not everyone is taking climate change seriously! The thought that scientific knowledge of climate change has existed for years, yet seems to always fall through the cracks of society, saddened me. It gets to me that we obviously have the methods to overcome these problems in front of us, but we don’t. We can’t.

Climate change is everything and it is going to affect everything. It is a massive issue globally, it is the biggest issue that we as custodians of this planet will ever have to contend with. The climate is changing because of human designed and constructed processes, which perpetuate unsustainable extraction, production and disposal of goods that we have based our whole lives around. Climate change is huge, overwhelming, and I feel frustrated and angry. I am extremely cynical that humanity will do anything to mitigate climate change before it is too late. The political and economic structures that underpin society have led to my cynicism.

Ultimately though, this is what intrigued me the most, the aspect of neglect and the level of response, or lack thereof, in the face of the “most significant environmental issue of our time.” I wonder what truly is the implication of a species that conducts themselves in the manner in which we do; is our current environmental situation a product of our arrogance?

Our ignorance?

Our indifference?

Our apathy?

Our greed?

Our hubris, or all of the above?

This is what resonates most strongly for me, at the core of all these environmental and social issues of greed and apathy, is the truth that our current social system is one of acquisition of resources, individualistic gain rhetoric and the satisfaction of more, having more, gaining more, wanting more, needing more.

The capitalist structure currently in place renders those towards the lower-middle income bracket far more at risk to the impacts of climate, yet also, leaves them with far less resilience to cope. Throughout the semester, I have struggled to understand how those who are less vulnerable and more resilient for the most part seem disenchanted with the idea of climate change, even when it is occurring before their eyes.

This realisation came at a great emotional cost to myself. I questioned whether my own actions were creating any positive change. Was I simply another facet at the root of this problem? The hypocrisy played on my conscience, and caused me many sleepless nights, as I grappled with the contradictions between what I practice and what I preach.

Am I doing enough?!

Am I actually doing anything useful at all?!

I feel unsettled that I can sit in a very privileged university, RMIT, and learn about individual lives that are going to be severely impacted by climate change because of the

society I participate in.

I feel unsettled that I know I have less of a dependence on climate than others purely because I was born in a wealthy country and live in a well-off family.

I feel bitter towards individuals and systems and fail to understand why people are not being charged for climate crimes.

I feel an uncertain future is inevitable, and it deeply upsets me that the ruling decisions of the human race are centred around short-term profit, focussing on self-interest and money over the natural environment.

Climate change makes me feel anxious, frustrated, confused, uncertain, cynical, scared, overwhelmed, emotional, devastated, depressed, frightened, angry, gloomy, resentful, challenged, isolated, desperate, disheartened, shocked, concerned, confronted, unsettled, bitter, sad, sick, upset, perplexed, guilty, stressed, amazed, daunted, defeated, dismayed, pessimistic, uneasy, tired, appalled, terrified.



Audra

During a small group discussion in the week 10 tutorial, one of the members of the group I was sitting with made an assertion while we were discussing climate change mitigation, that they thought anyone who owned a cat could not “truly call themselves an environmentalist.” This, even though said in passing really shocked me. As I was sitting there in my coat covered in cat fur, I felt as though I had never really properly considered cat ownership through the lens of climate change mitigation. As someone who has always been

environmentally conscious and concerned about climate change, especially at home—I take pride in having a low carbon footprint—I started to question how legitimate my “environmentalism” could be if I had overlooked something like how cat ownership could be interpreted as an act of anti-environmentalism. Even though I thought I was caring for my cat in an ethical manner, as an “indoor” cat so that she is unlikely to pose any threat to native biodiversity, there were clearly other aspects that I hadn’t considered about how pet ownership could contribute to climate change. For example, the exotic tinned food I feed her in the evening which is different to the dry, plastic packaged biscuit-like food I give her during the day, her collection of cat toys, kitty litter and other possessions like brushes, pillows, blankets and plants which take up half my apartment along with more indirect purchases like buying new curtains, blinds and upholstery sooner than would otherwise be needed due to rips and clawing. I wondered if being blinded by affection for my cat has caused a “cognitive dissonance” effect on my ability to seriously consider her contribution towards climate change. Ignoring my cat’s contribution to climate change in favour of giving her what I thought was a comfortable and enjoyable life could be seen as a form of climate change denial. Without being entirely conscious of it, my actions meant that my cat was an active consumer within the Western neo-liberal capitalist economy at the same time that I was trying to reduce my own involvement within it. Thinking about this gave me the opportunity to understand in a more personal way the possible challenges to climate change mitigation, particularly the motivations behind inaction, and the barriers to lifestyle changes that might prohibit individuals from taking steps towards reducing emissions.



Our classrooms were in one of the older buildings, the engineering building, with

rigid, square classrooms with north facing windows that couldn't be opened and had no blinds. The tables were always arranged in examination conditions. Sometimes the class before would run late, and I would have to poke my head in to get the teacher to wrap up his class of multi-ethnic, all male students so that my painfully white but more gender diverse class could come in and re-arrange the chairs into small groups.

Timetabling was pretty painful. Being a new course, we'd been slotted into the gaps. There was a one and a half hour break between the end of the one and a half hour lecture and the first one and a half hour tutorial. During this time a number of students would hang out together at one of the local cafés or cruise around on their bikes waiting for their tutorial. This was generally with enthused, engaged and energised demeanours. Sometimes we would chat after the lecture, before I had a meeting in the break with the lecturer and other tutor.

Some students in my first tutorial had a clash, so would have to leave after 50 minutes, which was also pretty annoying.

For students in the second tutorial class, timetabling meant a three hour period of waiting between the lecture and tutorial. This class rapidly dwindled in size, from 20 enrolled students to about 15, although usually only 7 would attend each week. However, this was rarely the same 7—a few came regularly but most seemed to dip in and out. One day, one student arriving early to class, wandering in at the back of the room while I was logging onto the computer, distractedly commented “this class is a bit strange, people coming in and out. I guess that's a bit like climate change, you know, a bit vague, so many aspects, so much information, hard to grasp.”



I find climate inaction so annoying and perplexing. Even though people know about

climate change and express concern, they still don't take action—why? This has bugged me for some time.

For example, I am constantly butting heads with sceptics and non-believers (particularly my father in law) regarding climate change. It is so frustrating that fellow inhabitants don't understand the magnitude of the situation, and worse still, they don't care to learn more about it to educate themselves. I have learnt that this social response is hard to explain, humans are complicated organisms and there are many different theories to explain why someone is in climate denial, I just hope it is not because they have stopped caring about the environment and future generations.

I feel that Australian society has buried their heads in the sand at the thought of climate change and this has to do with certain Australian leaders not valuing a sustainable future. Our national identity is somewhat influenced by the government of the day, whose policies are creating confusion even though people believe climate change is an issue. Over the semester, I found that Australians are some of the worst climate sceptics in the world. I feel that people must become numb to hearing about this issue all the time and it just becomes white noise.

That disinterest sums up a lot of the general public's view on climate change. In the real world, who really cares? Who is going to go out of their way to prevent increasing greenhouse gas emissions? I know that climate change is a collective problem, but who is going to actually contribute to a solution?

So reading Norgaard's chapter about climate denial resonated with me—perhaps studying environmental science, eating organic sourdough, occasionally using my “keepcup,” and riding my bike everywhere isn't enough? I could see myself in the characterisations she

was depicting: climate change as background noise, avoiding thinking about it so as to not confront feelings of guilt and helplessness, concerned but apathetic. And yet, when she tells of public interest declining as scientific evidence mounts, I'm appalled. Like many of those in her ethnographic research, I'm able to live a "double reality," where knowledge of climate change is denied in favour of maintaining the comfortable, non-confrontational status quo.

Norgaard states that citizens of wealthy nations who do not respond to the issue of climate change generally benefit from their denial in economic terms. For me, this hit the nail on the head and placed my own perspectives on the table. As I live in a high carbon country and benefit from all the luxuries it brings, I too am in some way a denier. Though I feel I am doing my part: I struggle at times with a vegan diet, I have not used a heater over the last two winters, and I nag housemates, workmates and friends who live less sustainably than me on a constant basis. I am aware of my actions yet at times I too take the cheaper option because I "benefit from my denial in economic terms." Such as clothes or the toilet paper I buy—there are ethical and sustainable options available but I often take the cheaper option knowing full well it is the wrong one.

It's like living in *The Matrix* hey.

To some extent every one of us is a stealth denier and that fact indicates the overarching problem of climate change itself. A lack of accountability on a global scale.



At some point in the middle of semester, they gave our room new chairs and tables.

Larger tables, with chairs with swivels and wheels. I noticed that this saved us time rearranging the individual tables that were always set out in examination conditions into small clusters, which we'd come to do automatically without being directed to do so.



My hand drew a blackhole with a question mark in it, when asked as part of a community workshop on climate grief, to draw my worries about the future.

Reading Bulkeley's chapter on "climate risk and vulnerability" broadened my mind on the eventualities to come: privileged countries are able to inadvertently ruin the lives of the deprived. The increased floods in Dhaka, the severity of drought arising in Cape Town, the extreme unpredictability of weather occurring in Toronto and the increased likelihood of hurricanes decimating coastal regions represents a future that becomes more real year after year.

This hit me a little hard.

The future, for me, is dark, cloudy, a black hole of uncertainty. I don't know how it will play out: we have uncertain predictions, but I think we don't really grasp the complexity and nuance of the changes to come. I don't think the nuance and complexity means it will be better than the starkness of the blunt projections we have: mass migration, mass extinction, conflict, hunger, desertification, destruction, loss. I just think that it will be in the details that the real misery is experienced.

I've been crying myself to sleep a lot lately. And crying at random times too. It's not as though I watch a video about climate change, and I cry during it. I mean sometimes that happens. It's more like, something little happens, like my toast burns, and I can't cope with it

and I fall to the floor of the kitchen and sit there sobbing, wailing, staring at the floor and realising how dirty it is, and thinking I should clean it and being like, what the fuck? We're all so obsessed with cleanliness, presentation, image, flat out trying to be someone, impress people, meanwhile we have this tsunami of species extinctions going on, and we're too busy contesting our parking fines or some shit to even notice. And then I have to get up and go to class or something. And so I say sorry I'm late, its cos I am having trouble with my contact lens, to legitimise my puffy eyes while hiding the fact that I had an existential breakdown because I thought my charred toast was a metaphor for how the world was burning because we aren't paying attention.

It is so overwhelming to travel overseas and see the big contrast, while we, and Western society, hyperconsume and waste everything, yet there are countries who can barely find enough food for one meal a day. I saw this first hand in a recent trip to Central America, where I saw the impacts of climate change on tropical rainforests and the multitude of challenges it had created for the local communities. The extreme contrast in the lifestyles and values towards the environment of the communities I encountered in Central America compared to the values and behaviours of Australian societies was so extreme. What gets me the most is that the societies and the people that contribute most to climate change are the ones that will be least affected. What happened to karma? That just makes me so angry. In fact we are the ones who cause most of these issues and for them to be given the consequences?

Learning that everyone is vulnerable at their own level only made me confused to what approaches would be ideal to tackle these issues individually. This level of confusion often develops some sort of anxiety in me, or even just a mild sick feeling, the feeling of not being able to predict the future and predict the best thing to do whilst minimising as much

harm as possible. This feeling often comes by me when I watch how the leaders of Australia approach issues like these, and it makes me feel sick.

I found myself dry retching in the shower for over an hour one evening. The contractions of my stomach muscles, sense of my throat exploding, and my whole body convulsing, felt like I was trying to spew up some kind of demon, a wretchedness, a loneliness and desperation, a sense of loss for all that could have been but probably won't, for that which is but will no longer be.

It is such an emotional challenge to deal with, especially when you accept the fact that you and the society we live in today is to blame. Ignorance is bliss, because on a daily basis, I feel like I'm not doing enough, I'm not achieving enough to create this huge impact I'm waiting for. Though I feel like I'm not doing enough, I don't know what else I can do.



How to respond when students send you the letters they have written to their parents about how worried they are about the future? When they ask how can they address climate change now that they are back home in Brazil, where the social and economic situation is so dire? How to respond, as someone whose task is to evaluate their work—to give it a numerical grade—when their assessments are full of fear about planetary collapse, frustration at human selfishness, existential questioning of their potential for agency? When they tell you, that “week to week there is always a moment where I am filled with sadness at how I, who am so young, can feel so passionate about a situation seemingly moving backwards.” That they “feel emotionally tied to the fate of our environment”?

When they state that “as long as humans dominate the world then there is no hope,”

that “human nature can be cruel, unforgiving and damaging to any form of sustained life”? When they describe climate change as “unrelenting and real, a crazy ethical labyrinth which may lead to a devastating conclusion”? That the course left them “with an overwhelming sense of guilt, and many questions surrounding the basic morality of humankind which sees so many people turn a blind eye”? When they ask “how can we as humans confront the ethical dilemmas that planetary management demands of us?”

I found this—responding—the hardest part of the semester.



A challenge in acquiring weekly knowledge of climate change has been to keep walking the scary line of learning. I’ve realised learning about climate change is a traumatic process. I was thinking of the dark, foreboding nature of climate change. Like the “pristine” forests in Fukushima, post nuclear tsunami, where no one is now, they look beautiful, but underneath is a poison.

Like warm, sunny winter and early spring days. Like, I remember walking in the park on a sunny spring day, with the light glistening through young green leaves. Everyone is happy due to the nice weather, you have this renewed energy, looking forward to summer, beaches, colour. Everyone else was happy. But knowing about climate change, you know it means someone somewhere is not getting the rain they need. I felt the warm spring weather was just an indication that the fires will be worse this summer, and that if I looked hard enough, I felt I could see the trees burning rather than shimmering. So it’s sort of, you can’t enjoy it, it’s an uneasiness amongst the glory that everyone else seems to be celebrating.

I had a similar experience when a friend returned from overseas and we sat at the café

at uni to catch up. I felt all the things my society liked, thought was good, like all the consumer products, tidiness, efficient public transport, etc.—all the marks of a “good society”—were like an enforced anti-depressant that we hadn’t been told we had been given, and everyone was walking around in a capitalist induced trance, numb to the reality and unable to address our problems as we couldn’t face them. I felt that the shiny-ness was a mirage, that there was a force field of “shiny” that capitalism and global climate denial allowed us—coerced us—to see, but behind that, I felt an ominous sense of doom, of utter desolation. I was staring at the metal chairs, the sun reflecting off them. I felt they were so shiny. New, glossy, clean, happy-industrial-hipster chairs. But yeah, if I looked hard enough, I could see the blood dripping from them, that their eco-and social- footprints created. I remember telling him that I was thinking this, and he looked at me as though I was a little crazy.

Sometimes when I think of climate change, I see this dark, vague, tsunami towering behind me, a frothing wall of utter destruction of which we have felt tremors, but by turning our backs, have not fully comprehended. I catch glimpses of it over my shoulder, about to crash down upon me, obliterating everything, but in front of me, life goes about its daily flow, oblivious to the imminent disaster. Alternatively, rather than rising up behind me, I see climate change as a chasm opening up before me, and I stand on a precipice overlooking the deep ravine, teetering on the edge.

Like someone said in class—I feel small in the face of climate change.



At some point in the semester, I go to get a blood test. I have been so utterly

exhausted. Some days I have not been able to get out of bed in any effective or enduring manner. This is noted consistently throughout the semester in my diary. It's a year since I became vegetarian, and I think I may not be getting enough protein or iron, or something.

Doctor says it's all good: turns out, medically, I'm fine.



I'm in Fiji, at the Warwick Hotel, on the Coral Coast for a conference. I spend every day staring at the Pacific Ocean. It's nine months after Cyclone Winston, and when I go snorkelling, I am surrounded by a coral cemetery. The view reminds me of the opening image of Kathy Jetñil-Kijiner, Marshallese Poet, in the YouTube clip²⁰ made to accompany her poem, *Dear Matafele Peinem*, spoken at one of the United Nations climate change conferences. Kathy stands on the rocky beach, looking across the reef to the breakers beyond. Lauren showed the video during one of our lectures. I recall Kathy's words to her daughter, about how it is said that their sleepy lagoon will one day devour her. I notice the Fijian men employed by the Warwick using a wheelbarrow and shovel to redistribute the sand along the beach in order to cover the rocky shelf that becomes exposed around the deck chairs after each high tide. I think of that phrase about "rearranging the deck chairs on the Titanic" and the irony that they are *rearranging the sand underneath the deck chairs* as the island slowly sinks hits me and I can't stop staring at them.

I'm on a grassy hill, and there is a huge Fijian celebration—there are so many people. The military is there as security. Everyone is happy and merry, with huge smiles. They're

²⁰ <https://www.youtube.com/watch?v=DJuRjy9k7GA>

oblivious to the fact that I, the solo white tourist, somehow intuit: that this is about to become a mass execution. The Fijians have been rounded up, and are about to all be shot. But it's actually a mass euthanasia. The Fijian Government has decided that a painless, quick death for its citizens is the most ethical thing to do, given the encroaching sea level rise, increasing frequency of tropical cyclones, water and food insecurity, immigration from surrounding Pacific Islands, and Australia's refusal to participate in any kind of mitigation efforts or support for their neighbours with any kind of resettlement program. The terror of this situation dawns on me, and I walk to the back of the crowd, around the side, past the soldiers, down the hill, and get on my plane. We spend two hours on the tarmac, waiting out the worst wind of the tropical depression just off the coast, and I am forced to bond with a white Aussie guy who's been here for a wedding and complains about the shitty weather on his weekend away. As we take off, I'm astounded by the beauty that the almost-cyclone has at sunset, looking like the love child of a pink marshmallow and an atomic bomb mushroom cloud.



One day before the lecture there is some sort of large protest accompanied by police cars outside the lecture theatre. We're not sure what it's about, but someone joked "it must be Karen" and we all laughed, followed by a soft sigh of collective resignation.

Karen was the fictitious young woman the Federal Government used as a case study in its "Radicalisation Awareness Kit,"²¹ which was to be distributed to teachers across the country so they could identify the early warning signs of terrorism in their students. "Karen" had got involved in alternative music, student politics and left wing environmental activism while at university, leading to multiple arrests and alienation from her family. However after

²¹ <https://www.livingsafetogether.gov.au/help-and-advice/Documents/what-is-radicalisation.pdf>

a while Karen apparently saw the light and eventually “adopted a more moderate eco-philosophy” (Living Safe Together, 2015), reconnecting with her family and working within the law.

“Karen” came in the wake of the Federal Government seeking to amend the Environment Protection and Biodiversity Conservation Act (EPBC) so that only people “directly affected” (i.e. local landholders) could protest developments. This was a response to the Mackay Conservation Group’s successful challenge of Adani’s proposed Carmichael coal mine in Queensland through the EPBC, due to its approval not having considered impacts on endangered species—the yakka skink and ornamental snake. Despite the fact that only 0.5% of development proposals had been affected by third parties in the Act’s 15 year history, right wing politicians and the coal lobby labelled environmentalists “vigilantes” who were “sabotaging” and waging “war” on development (Sturmer & Conifer, 2015). The Radicalisation Awareness Kit prompted public backlash, with tweeters using the hashtag #freekaren to disclose their own involvement in the alternative music scene.



In week 6, we spent some time reflecting on what we had learned or how we had changed over the semester in response to the course. After some small group discussion we opened it up to the whole class.

One young woman said “I used to like, not be so aggressive, to my housemates. But now, I’m just sort of, being a bit of a bitch”, to which the class laughed. “Like, going through the rubbish bin and telling them to recycle better, making them take green bags to the supermarket, just generally telling them to clean up their act.”



When starting Climate Change Responses, quite naively I thought of climate change in terms of facts and numbers. In my head, there was a climate problem. There was too much CO₂ in the atmosphere and humanity needed to stop emitting it. It was a scientific problem that could be fixed with a scientific impact. It was the role of scientists, policy makers, planners and politicians to implement policies that addressed that. Coming from a background where I was taught to value science above all, the lectures and readings frustrated me because they so heavily focused on people and human nature in society—I truly believed that they were missing the point and couldn't wait to get around to learning more about the science of it all.

Hulme's week 1 reading quickly squashed this with his ability to elucidate and explain climate in a way I had yet to touch on. Never did I expect that the course would focus on the cultural element of climate change. It was more like I never considered that climate change was a "cultural" thing. Hulme's claim that climate is an idea threw me through a metaphoric loop. I was astonished. To fully understand climate, both the physical dimensions and cultural dimensions of climate must be interlinked, otherwise, the idea of climate itself is "incomplete." I saw this approach as putting a human face to climate change, rather than just numbers.

My initial response to the reading was full agreement yet by the end of the semester, I wasn't sold on it. Climate change in my opinion is a multitude of issues that collectively make up the problem. To categorise them in order to understand them is like categorising sexuality or race in order to understand them. It may provide some form of indication where on the spectrum it resides but ultimately it doesn't provide a multifaceted understanding of

what it entails. I don't believe climate can be a purely constructed idea because...because *feel* it, we can feel it, not just with our senses but with our emotions and in our subconscious.

I have always felt very connected to the environment through spending much of my time growing up in a natural landscape. I have lived alone for a month in the Californian wilderness where I realised the dependency we have on climate and the pure beauty of a natural environment. I have trekked up to 5000m in the Himalayas where climate is not just the weather you check on an app so that you can dress accordingly. Climate is a live or die reality, unpredictable and raw. To experience the power of the natural energy of climate was very impactful and helped me gain an appreciation for our dependence on our environment.

Despite this appreciation, I fail to remember how I felt about climate for the first 22 years of living. I know I didn't have a grasp on the concept, the reality or the interconnectedness between climate, our environment and ourselves. I know this because I have never felt so emotionally connected to a concept I have learnt in a classroom, as I do now after completing Climate Change Responses. But if I as a student who discusses and thinks about this subject four or more days a week can forget, then it's no wonder the rest of the world does too. Whatever the case this is what Climate Change Responses has taught and reinforced in me. That I easily forget the scope of our environment and its presence with me—that the more I know, the more I don't know and that's a scary and depressing thought.

I find this really fascinating, that there is a problem, but just because it isn't immediate or is associated with some "uncertainty" it is dismissed. The physical issue of there being too much CO₂ in the atmosphere, although true, is the not the issue in and of itself. Once you take the scientific data out of climate change you can see that the problem is essentially a social one. In retrospect, I feel as if I was somewhat dismissive as to the impact on sociology in climate change, however I learnt through discussions in the tutorials that

while science is great at discovering what things exist, the social sciences are much more capable of applying practices to the world so that things can actually change. I also think that the initial reading from Hulme really made this entire process a lot easier to engage with given that it really opened up my entire thinking about what climate actually is, and the ways it has been wrestled down into a whole bunch of arbitrary numbers rather than being a unifying and conquering factor for so much of humanity. This course has lead me to the understanding that attitude is the vital factor.

Throughout the course, readings and lessons have given me a broader understanding into the way climate change not only destroys some of the most beautiful and vulnerable places in the world but also ancient living cultures. Understanding the lessons learnt throughout the course has helped redirect my interests from a mere physical understanding to a more integrated socio-ecological understanding. I feel that I have a clearer sense into the issue that is climate change and can understand how it effects not only our urban societies but also how it is impacting traditional Indigenous land and cultures—which in my opinion may be one of the keys in combating the problem, through a deeper respect for the land and for each other.



I noticed in a few tutes that only the guys in the class were speaking. About 5 guys would speak in a row and take up quite a bit of “space.” I think this is a product of a wider societal problem where women’s opinions are less valued and women often do not feel confident enough to voice their opinion. A lot of people need a few seconds of silence before they are comfortable to say something.



Students write long assessments. Really long. I always make clear to students that if word counts are not specified in the assessment rubric (which they aren't in this course), then they can't be penalised for going over the word count—but that usually, really long papers tend to just be poorly written anyway. But these aren't—they're great. And I stop trying to convince them to write shorter ones.

I've also stopped applying the 5% penalty that applies for each day an assessment is submitted late. I've always been very flexible with the one week extension we are able to give students per assessment, but usually have been a stickler for the 5% penalty if they submit later than their due date. Some students' papers are *really* late though.

In week 9, while we are waiting for everyone to arrive, I mention to Skye that I'm not sure if I have received her report (due in week 7). The conversation goes back and forth a little bit, she looks tired/anxious, as she did during the lecture, and states that she hasn't submitted it yet. I jokingly ask, "how is that going?" with what I intend to be a relaxed but cheeky smile—I know I'm not going to deduct marks from her assessment. But she doesn't know that, of course. She manages to get "can I speak to you outside" out of pressed lips, puts her head down, and leaves the room. She's crying, overwhelmed, stressed out by uni, says she can cope with not understanding an assignment, but can't cope with not having her shit together, she's not sure what's going on. She says at some point that she doesn't want to disappoint me. I can't work out if it's appropriate to hug her in my role as teacher, but I feel like I would otherwise, so I hug her. But I think it might be awkward.

Eventually we decide that she is going to call me tomorrow and organise a time to catch up about it, and we go back into class. I am shaky, my voice wavering, I choke on some

words. I'm conscious of sweat patches on my shirt during the class.



The fires came in the first week of October. A week after I had driven down the Burke and Wills Track, checking out land in that area of Victoria I thought less climate vulnerable due to its higher altitude and generally cooler weather, somewhere I could potentially afford to buy and viably live in the future, it burned.



Eira

I have noticed an unfortunate shift in my thinking throughout the last few years studying the environment: I have subconsciously begun to consider my science work (lab work, field work, the production of slick graphs, tables and statistical analyses) as “real work,” and begun to devalue the social sciences as pretentious fluff. My identity has become more and more wrapped up in being a “rational,” intelligent, skilled woman of science, and this identity is continually reaffirmed by the respect I receive from others. This phenomenon is likely at least in part caused by some internalised misogyny: as Haraway explains, our patriarchal, individualistic, modernist society values masculinist science far above other types of knowledge.

This attitude at first tainted my reaction to the Climate Change Responses subject. Though I understood there was great social complexity in a global and universal problem such as climate change, I thought of the problem as “too urgent” for the social sciences.

Spending the first week talking about the relationship between culture and climate almost had me wriggling in my seat. My thought process was pretty narrow-minded: “We don’t have time for this! Climate change is happening right now! Let’s do the science and get this thing solved!” I may have been using the unemotional, disinterested framework of science as a way of shielding myself from the sheer terror of climate change. Of course, we have “done the science” and are continuing to do the science: the IPCC has been bringing out frequent and alarming reports, and the scientific community has known and reported on climate change for decades.

I have come to learn that what is urgently needed, as evidenced by the guest lecturer’s cringe-worthy climate scientist rap²², is the political and social knowledge of the social sciences. Science’s claims of objectivity in regards to climate change reporting can be overly-limiting or simply untrue. At a basic level, value judgements are necessary to be able to determine the best courses of action for adapting to and/or mitigating climate change. At a more complex level, the biases and ignorance inherent in science can have catastrophic impacts on oppressed groups who have low adaptive capacities. Climate science has been particularly ignorant to the social context because the problem of climate change was alerted by scientists rather than activists, unlike other environmental problems throughout history. And a lack of social awareness is a huge problem: our knowledges and ignorances about climate change will impact who will live and who will die.

My adaptation and mitigation reports were my first attempts at reconciling positivist science and justice frameworks and using these fields to inform one another, and I am grateful for this experience. I have developed an understanding that climate change really can be an opportunity for justice reparations, and that it can be thought of as an intellectual

²² <https://www.youtube.com/watch?v=LiYZxOICN10>

resource rather than an insurmountable problem. The final lecture made me feel genuinely inspired about collective humanity—and it was a poem, not a graph, that made me cry and gave me a kick in the arse to get politically active.



In week 11, the lecture topic was capitalism and corporations. The guest lecturer discussed the few ways in which corporations are responding to climate change: through profit making ventures and greenwashing. After discussing the already occurring and non-linear (i.e. rapidly increasing) collapse of the Antarctic ice sheet, he articulates capitalism's response as "creative self-destruction": "they melted the Arctic, now they're rushing to drill in the open water." He says all of this with a bit of a grin, a happy go lucky approach. In my notes that I took during the lecture, I've written "anxiety. Or am I tired? Shaky arms, slight nausea."

During the lecture, he shows a range of emotive images, including one of a family huddling in a dam under a jetty (see Figure 3, p. 151), with a hellish sky of fire surrounding them. Later he shows an advertisement for the Nissan Leaf²³, a zero emissions electric car. It depicts glacier calving and then its protagonist, a polar bear, floating on a skerrick of ice, swimming alone, away from the Arctic and heading along highways into sunny suburbs, hiding under bridges and drinking from polluted puddles. I note "burning in the head, eyes, jaw, the bones under the eyes, this is what the early stage of tears feels like," trying to use note-taking as a means to distract myself and prevent crying publicly. We hear so much about how we are living through a mass extinction, but rarely are we confronted with the individual animal scale of suffering—of starvation, loneliness and scavenging in foreign

²³ <https://www.youtube.com/watch?v=VdYWSsUarOg>

environments—that precedes extinction. It turns out that “the polar bear ... found a man who is trying to make the world a better place to live by driving a 100% electric, zero emission Nissan Leaf car” and so the polar bear gives “him a hug, thanking him for his action.” The ad was supposed to be a happy video! It totally messed me up though.



Figure 3: Tammy Holmes, second from left, and her grandchildren take refuge under a jetty from a bushfire in the Tasmanian town of Dunalley, January 4, 2013. Photograph: Tim Holmes, Reproduced with permission of Guardian News & Media Ltd. Available at <https://www.theguardian.com/film/2013/jun/05/guardian-firestorm-tasmania-dunalley-competition-docfest>

After the lecture, I walk up the front to speak to the guest lecturer and the course coordinator, but they’re busy debriefing. So I turn to a group of my students who are sitting at the front, and say “hey, that killed me. I nearly had to leave, just really full on hey.” One says something like, “oh, I already know all that, so I’m fine with it” as he is getting up to leave. I speak to the course coordinator and say “that was really intense, I nearly cried.” She gives me a hug.

In the tutorial, knowing some students have to leave early, I ask if they want to do the

topic discussion, or work on assessments first. One student quips that he “is in a fiery mood today,” and so, doesn’t want to talk about capitalism as it might get out of hand. More generally though, the students who need to leave early are keen to know how to do well on the assessments. So we talk about the assessments first. One student asks whether the assessment piece is supposed to prove that they have been doing the readings. Others ask questions about how formal it needs to be, how many references they need, what about the word limit, what questions should they respond to, etc. etc.—clarifying how do well on the assessment.



Talia

What I thought we would be learning at the start of this course was better communication of science. Rather, I should have been wondering about the ways other than science. We have almost all heard the scientific arguments, and for some people it’s resonated and others it hasn’t. However, that does not mean we need to put more effort into communicating that same scientific data, it means we need to think harder about how and what we communicate. What resonates with people? How can we connect on that emotional level? How do we get them to understand that we are scared too, and that they are not alone? Would that make a difference to their understanding and feeling? We live in a very individualistic society, but there are some issues that you just cannot deal with by yourself; and I think the biggest environmental challenge of our time counts as one of those.

In fact, my initial understanding—that science was the way to communicate about climate change—is a form of socio-psychological denial. I thought, if only the media would

portray things accurately, they are to blame. But it is much more complicated than that. Australia's history is built off of coal. In most ways, we still rely on coal. The denial is almost cultural as it would not serve Australia well to believe in climate change. Our economic prosperity is tangled with it. Many people's identity is intertwined with it.

When you think about it like that, like a change in identity, it is easier to see why people are in denial.



This semester has been a rollercoaster of emotions. I have been overwhelmed by joy, fear, and passion. From being absolutely motivated and inspired to wanting to shut myself away from the world and everything in between. I felt scared and overwhelmed or emotional and didn't know how to explain the importance of the issue or speak about it. I have now come to realise the problem is so immense and entwined via almost any issue you can think of in this world. Climate change is beyond weather and climate, it's extremely cultural. Climate change relates to social inequality, warming of the globe and oceans, food security, ocean acidification, rising sea levels, biodiversity, conservation and loss of the ice sheets; skyrocketing greenhouse gas emissions and extreme drought, fires and floods, mental illness, gender inequality.

Listening to students in class and all the guest speakers was really interesting as they all came from such different areas yet they are all working on the one thing: climate change. This class has given me hope, as everyone was so open and happy to share, while I have had a strong feeling of anxiety during this course as I feel everyone is so smart, powerful and brilliant and I'm sometimes too anxious to speak. I think this is a result of how emotional this subject and course material truly is. The tutorials were scary; though I feel I learnt so much

from simply listening to people speak from their heart and experience always leaving feeling refreshed.

The complexity of the scientific information provided in graphs and figures by the scientist I felt was quite confusing and without detailed explanation, hard to understand. I left feeling very unsettled at the information on the impacts the developed world has created globally and how much work is needed to reduce them. The feelings of uncertainty and confusion explained to me why so many people choose to deny or ignore the facts of climate change, as it is often framed negatively and explained in complex forms. I think the bleak future predictions and cynical framing of climate change is partly the reason for society's denial and lack of behavioural change. If we could reframe climate change with an optimistic outlook on our ability to change towards a sustainable future, people will have an incentive to make lifestyle changes and reduce their impact.

But what I leave this course with is a growing uncertainty of how the social perception of climate change will play out. It is a poor choice to wait for a new destructive level of nature to manifest itself before we (globally) start to take immediate action on combatting climate change. But this may be the only way to inspire such actions, as humans are woeful at responding to slow moving dangers. This is not to say I am entirely cynical about humanity's chances of surviving this growing threat. There are countless institutions and communities actively reducing their impacts on the world and its natural systems. My totally cynical view is that non-fossil fuel based energy production will only become the norm once the renewable-energy corporations can provide more money than fossil fuel corporations in bribes to political interests.

On the other hand, it's highly likely that, in 10,000 years, the effects of humanity on the climate today will be negligible, perhaps immeasurable when compared against the larger

state of the Earth, where the climate changes dramatically between ice ages over the course of millions of years. To believe that we, today, can have such large scale, long term impacts on the Earth admittedly seems quite arrogant: the Earth and its life systems have mitigated and adapted to threats larger than anthropogenic climate change for billions of years.

My perspective of the climate change problem has changed dramatically over the semester. I now view the problem under a whole new set of assumptions, causes and consequences. It's not the Earth that is in need of protecting and saving, it's humanity. I now see climate change as a social justice issue, with a massive array of causes and consequences. Yet instead of this truth overwhelming me with fear and dismay, I see an opportunity to take part in humanity's most comprehensive attitude and social responsibility shift.

I really valued the ferocious intensity of information that was shared with us. Wednesday became my favourite day because of this subject. A group formed to discuss the challenging aspects of each lecture and this was continued in the tutorial classes. I appreciated that we were dealing with ethically challenging topics, it became as much of a philosophical class about life's most challenging questions, a platform for deeper thinking, ideas and discussion with like-minded people. We had the tutorial and each other to help guide our understandings and relationship with climate change. The class felt like a home for ideas and discussions.

This class if anything has spurred my optimism further. We have a group of amazing human beings heading out there setting prime examples of the better people we all can be. The better people we can be, the better our world can be. I've felt inspired by the contribution of teachers and guest speakers in the Climate Change Response course. They have progressed my understanding of climate change, sure, but they've also offered a view to what is at times the front lines of climate change responses. Despite the sometimes gloomy subject matter,

I've often left lectures feeling hopeful, for I can begin to envisage the path ahead, and also how I might have a role in creating it.

Coming into this course with a completely different background to all the other people in the class and not knowing anyone was actually quite daunting. But after listening to everyone talk and interact with each other in the tutes, I soon found that everyone was on the same page and this feeling of being overwhelmed diminished somewhat. Being in a classroom full of the people who are going to be having to change the world and just hearing how scared and tired other people really are was really cathartic. Knowing that all the individuals in this subject are all about making a change towards a better future helped break down the huge task of reducing the impacts of climate change and helped me realise that there are many likeminded people who are all doing their bit to make the world more sustainable and tackling the vast amount of issues within climate change, and I felt reassured and somewhat optimistic. I guess in many ways going to University, in a course which is interesting to me, surrounded by people who share similar values is an empowering environment.

Through participating in this unit, I feel inspired to move forward, to further develop my understanding of climate change and share my newly acquired knowledge. Through all this overwhelming, devastating news and understanding the reality of climate change, I have grasped hold of an exciting potential for global unification. I have been encouraged by the possibility that the climate changing might be the one factor that pulls our divided world together; to form a united social mass of individuals who want to see a brighter future and to see people and our environment being put over profit. I hope climate change can be the catalyst we need, a disaster response that fights inequality and builds a just economy through a common lens. I never imagined that we would have to adapt so much, but I hope that

through embracing the positives, we can move faster to the place we need to be, and change our own behaviours and those of others to get there. Alternative culture and collective empowerment is necessary to challenge the root causes of a world on the brink of ecological collapse, and create a culture built on shared values and vision to accelerate global behavioural change. I have hope that culture around unsustainable and unjust models are transforming. Maybe we are just too close to see, but our input does matter and we can make a difference.



In week 10, I ask students what they want to do for our final class, as an end of semester celebration. In the second tutorial, I ask if they have class after ours, and someone says “no, I have work, but I could pull a sickie if there are actual plans on the table.”

Another suggests that “we could go to a pub or something,” and another jokes “a carbon neutral pub?”

I suggest that we could go to a park if the weather is nice.

Someone says “why don’t we stand on the State Library steps and protest?” and there is laughter from the group.

One of the long haired guys (there are so many of them in this class!)—the one taking the class as an elective from an engineering degree—asks “could we do a little kris kringle? Everyone buy someone else a beer, like everyone buy your favourite beer and we trade them.”

And so there it is: the weather in week 12 is glorious. We decide to combine both classes, and we all meet in Carlton Gardens at 12pm. People bring some snacks and their

favourite craft beers to participate in the most hipster of end of year celebrations.

We don't do much formally to wrap up, but people chat in small groups. A few have to leave and so I decide we need to do something for closure. I'm not entirely sure how it starts, or what I suggest we do, but we end up sitting in a circle on the grass, and we go around the circle and people share what they are already doing about climate change, or environmental or social justice. Of about 30 students, 3 choose not to share.

Students are delivering organic bread on bikes for their jobs, breaking into factory farms, making films and documentaries, cycling from Melbourne to Queensland to raise money for Nepal, starting NGOs for Pacific climate resilience, helping at homeless shelters, working and volunteering at local environmental NGOs, running youth environment groups, teaching vegetarian cooking classes, working at waste diversion and upcycling projects, amongst more things I have unfortunately forgotten. One student mentions that he is getting into poetry—and one of his friends points out that last night he performed for his first time at an open mic event. We are all keen to hear the poem.



Gale

Prime Minister denier

Raising your economic bible higher

Where are you taking us? Venus isn't green this time of year... or ever...

Earth's crying acid over the hot aired elephant in the room

Sleep walking through fire

Prime Minister denier

Blueprints drawn of intergenerational homicide
You quiver and thumb at the ho hum of the economic conundrum
While stomping all over Gaia's sand castles in the name of progress
Prime Minister denier
We did start the fire, but it doesn't have to keep burning
Sandy has friends and they are all redecorating
Their Feng Shui has been messed with and they are salivating
Prime Minister denier
Open your eyes to see the fire
Before we all burn.

At some point later in the afternoon, most people have left, and the remainder are hungry. About 10 of us wander through the city to a Hare Krishna restaurant for some cheap vegetarian. We discuss the politics of eating meat, and the challenges of engaging our parents in environmentalism. At 5pm, I have to leave to go teach my postgrad class.

Following the conclusion of the semester, we go out for coffees, go out for dinners, go out for drinks. I go to students' birthdays and their graduation parties. We go to public climate talks together, we join NGOs together, host climate discussions together. This continues from 2015 into 2018 as I finalise writing this thesis.

One day—week 5—Sunny had asked me if I would like to speak about climate change at a music festival he is organising for November. I feel flattered, a bit embarrassed or nervous, but also obliged, so I say yes, send me the details and if I'm not the right person, I can find someone more suitable.

I end up going, but convince another student, Luna, into speaking with me and rope Sunny in at the last moment too. With the others we've brought along with us, and some random festival goers who are keen, we make a banner together at the festival. It's painted in red, pink, orange and purple, the colour of the festival's logo, which mimics the epic sunsets of the Dja Dja Wurrung Country on which it is situated. We finish it with purple hand prints. It was pretty nerve racking, everyone is there to have fun and we get up and talk about climate change. Way to make friends, hey! So we tried to make it positive, the banner said "loving low carbon life."



Figure 4: Our banner made for the People's Climate March. Image: Author.

There are limited grand visions of what a positive, low or zero carbon world may actually look like, no decisive government plans, or political leadership towards a vision of a reinvented future. The discourse is often around giving something up or losing the cultural benefits which have created who we are, as opposed to transforming them. The pursuit of liberal freedom is often misrepresented by conservative neoliberal agendas, which allow the perpetuation of a destructive economic cycle based on the false pretence that market freedom equates to individual freedom and choice. But what choices are we not being offered through this model and who is in fact losing their freedom? What about the benefits of a new vision and global change?

So that's why we went with "loving low carbon life," and we spoke about how great the simple life—epitomised by camping and playing music—can be. And some other, perhaps less coherent stuff—we'd just shotted some tequila to calm the nerves. I suppose we conveniently left out how most of us had driven three or more hours to get there, how the sound system was running off dirty power, etc.

People were really into it. We got people to sign the banner, so we could take it to the People's Climate March, before the Paris Climate Summit. I end up at the banner talking to some dude about ants. He's really interested in ants all of a sudden, but knows nothing about them, but has got really interested—the way drunk people do—in the ants because they are so big here, and there are so many of them. I write something on the banner about how I love Dja Dja Wurrung country—but I spell it wrong—because I grew up on a farm not far from here, with a similar dry creek bed with similar winding river red gums, perfect for climbing, which we have spent all weekend doing. It was just like being a kid again—the gum trees over the water course that has obviously been created by heaps of water, but is almost always empty these days, bone dry. And I think about the power of water, and its evident past presence in the landscape, which emphasises its utter absence now. And I think of the variability and extremity of the Australian landscape and climate. It was pretty magical, climbing the trees in the long summer twilight, with live music in the background, and happy young people everywhere, a real sense of connection to people, and also to the land.

But also a real trauma, knowing that the land is changing and there's probably no future for you or anyone else there on that land. That there are farming families all over the country, and Indigenous Australians, and people all over the world who have much more of a connection to their Country than me, and knowing that their future is probably going to involve that changing, rupturing their cultural identity and sense of place, often through no

fault of their own. It struck me that the world as we know it, and the way we live, is going to dramatically change. Even if we stop our current globally destructive practices right now, the climatic flow on effects will continue into the future.

Anyway, some others made t-shirts for the climate march, and on the day we all meet on campus where it is quiet—being outside semester dates—and it feels quite sombre. Then we walk around the block to the State Library, and woah, all of a sudden we are in a crowd of a size I haven't seen before. We pretty much have to hold hands not to lose each other—the banners and Aboriginal flag we have brought form useful connective threads. There are 60,000 other Melburnians, and hundreds of thousands of people around the world marching. There is such a buzz, an electric energy: hope is in the air.

Across the weekend, and throughout the Paris Climate Summit, activists around the world really amp up the creativity and the intensity. People are mobilising. They are calling out the carbon footprints of the corporate sponsors of the event²⁴ (seriously, wtf? An intergovernmental conference on climate change has corporate sponsors? And they are car and airline companies? Jesus). They are turning the Arc de Triomphe into a golden sun²⁵. They are resisting the post-terrorist attack police state by leaving 20,000 pairs of shoes²⁶ to represent those that would march if they weren't prevented from doing so. They are printing the IPCC's Fifth Assessment Report on toilet paper²⁷, distributing it throughout the conference to indicate that negotiators are “wiping their arses with the science.” They are uniting across class and race, putting Indigenous people and voices at the front. I feel like, maybe, something might change.

²⁴ <https://www.thisiscolossal.com/2015/11/brandalism-fake-ads-paris/>

²⁵ https://www.huffingtonpost.com.au/entry/activists-paint-massive-sun-on-paris-streets-to-push-for-renewable-energy-policy_us_566b1745e4b0f290e5230645

²⁶ <https://www.cbc.ca/news/world/climate-protest-paris-1.3342384>

²⁷ www.yorkblog.com/hot/2015/11/30/give-a-st-about-climate-change/

And shit! The politicians surprise us all by committing to try to limit global warming to 1.5 degrees. Where did that come from?!? After so many “failed” global negotiations, most of us had lost faith in those processes.

Of course, as I finish writing this thesis now in 2018, we’ve already passed 1 degree of warming, we are pretty much locked into 1.5 degrees, and current Australian policies would be happy to see us hit 3.5 degrees by the end of the century (Cox, 2018; IPCC, 2018). Trump is pulling America out of the Paris Agreement, and Tony Abbott suggested Australia should follow suit. At times like this, I hear one student’s end of semester comment echoing in my head: I don’t want to think about climate change anymore.

But, you know, it’s important to keep at it I guess, because *maybe we are just too close to see*.

7. DECOMPOSING RESPONSE-ABILITIES THROUGH ENCOUNTERING CLIMATE CHANGE

INTRODUCTION

Re-casting climate change as the work of mourning means that we can share our losses, and encounter them as opportunities for productive and important work. ... In mourning [we] lose our former selves. ... We are changed internally and externally by the loss in ways that we cannot predict or control, and in ways that may be disorienting, surprising, or completely unexpected. These responses ... [can leave] us more open to ... our transcorporeal connections with all bodies, species, and life forms. (Cunsolo Willox, 2012, pp. 145, 157)

Drawing on the narrative offered in Chapter 6, this chapter demonstrates how the pedagogical *encounter* with climate change decomposed damaging ways of being human throughout CCR15, and how this capacity of encountering climate change provides exciting, if disconcerting, possibilities for humans to become-climate otherwise. I begin by exploring a few examples which are not fully explicable, demonstrating that climate change is an affective force which exceeds our capacities for understanding or controlling it. I then explore the emotional experiences in CCR15 that were more easily identifiable for both students and I. There is increasing psychological literature documenting the emotional impacts of climate change (Clayton & Manning, 2018; Hayes et al., 2018), and my purpose is not to provide an in-depth analysis of any individual student's experiences. Rather, it is to situate such emotional responses to climate change in a posthuman, performative ontology by showing that through emotional encounters with climate change we become climate changed. I discuss how experiences of climate grief, guilt, anxiety, frustration, hope and being overwhelmed countered existing ways of relating to ourselves, each other, and to climate change, decomposing—countering—neoliberal response-abilities.

This chapter therefore furthers the thesis' posthuman reconsideration of emotions and their role in climate change education. It suggests that emotional responses to/with/as climate change are not the containment, territorialisation or domestication of the more-than-human world by a human subject, as some theories of affect might attest (Vermeulen, 2014). Rather, they are subject changing phenomena that speak to the affective force, or agency, of climate change (Gannon, 2016). Through this work, this chapter also brings attention to the significant emotional challenge of learning to live-with climate change, which is discussed further in the remaining chapters.

ENIGMATIC AFFECTIVE ENCOUNTERS WITH CLIMATE CHANGE

Encountering is a specific form of intra-action. To encounter is to meet unexpectedly, with some form of confrontation against (i.e. counter to) the self. Encounters are unfamiliar, uncertain, surprising events that exceed our control. Encounters transform subjects, relationships, space, time, and politics (Barua, 2015) and are therefore processes of becoming-with that “make beings” (Haraway, 2008, p. 67). While encountering could be understood as a practice where pre-existing, individuated entities meet, understanding encounters as intra-active emphasises how already-entangled phenomena become differently entangled through encounters. Encountering, therefore, is intrasectional, diffractive, and involves acting-with. Through encountering and becoming entangled with another, prior difference generates new differentiations, and participants' intrasectional identities are diffracted through acting-with each other. Encounters therefore have value (Haraway, 2008), and this value can be specifically pedagogical (Gannon, 2017), generating emergent skills and knowledge (Barua, 2015). In CCR15 encountering the affective atmospheres of climate change (both pedagogically and methodologically) generated surprising responses in us that exceeded our ability to explain them, decomposing modern epistemologies that see climate as

fully knowable through distance and disconnection.

In CCR15, climate change manifested as an affective atmosphere that was constantly being reproduced and reconfigured. Throughout the course, we disclosed and performed embodied, affective or emotional experiences and practices. Frequently, these were triggered or influenced by other bodies' affective responses. That is, the encounter with climate change included the affective responses of others' encounters with climate change, as well as our own. This further enacted climate change's affective capacity. As Roussell et al. (2017, p. 666) contend, climate change is a "geo-traumatic" event that can "enter into the classroom not only as discursive topics, but as transcorporeal forces that pass through and infect the very structures of bodies." This "viral" (Roussell et al., 2017, p. 655) capacity of climate change's affectivity meant that during the course our bodies sighed, smiled, sweated, frowned, paused, laughed, cried, leaned back in our chairs, wriggled in our chairs, rearranged the chairs, closed our eyes, rubbed our eyes, rolled our eyes, established, maintained or averted eye contact, lost sleep, hugged each other, "buted heads" with sceptics, were "hit a little hard," felt climate change as a tsunami, a ravine, a black hole, a sense of "living in *The Matrix*," or of living a "double reality." Climate change was often referred to as being incomprehensible, and when asked at the end of semester to write a reflection on what they had learned, most students wrote about what they felt. Further, the temporal disjunction between stimulus (e.g. provision of information about climate change) and response (e.g. crying) which was experienced by a number of us demonstrates the "affective residue" (Watkins, 2016, p. 73) of climate change.

As an affective atmosphere, climate change was more than an external object that generated distinct, coherent emotions within individual human psyches. Its enigmatic affects which infiltrated us countered epistemologies of control and distance. As one example, one

student stated at the start of my second tutorial one day “this class is a bit strange, people coming in and out. I guess that’s a bit like climate change, you know, a bit vague, so many aspects, so much information, hard to grasp.” This comment has stuck with me for years because I struggle to make sense of it. It affects me, troubling my capacity to interpret its significance (Reinert, 2016; Sjögren, 2014). But that is sort of the point—climate change is hard to grasp. It is slippery, vague, strange, overwhelming (Gannon, 2016). His comment attends to how this incongruity of climate change is embodied in students’ attendance patterns—elusive, inconsistent, dispersed. And in this sense, this comment’s very unintelligibility for me perhaps articulates most clearly how climate change materialised as an affective atmosphere: a continuously emerging, collectively produced yet personally experienced, nebulous, enigmatic, ambiguous, enveloping force that enabled, reconfigured and emerged from bodily arrangements (B. Anderson, 2009). This should not be read as though atmosphere is simply a metaphor for how affectivity travels (Boggs, 2016). These changed patterns of relating emerged from meteorological-affective forces and co-created climate change as a geophysical phenomenon (Knox, 2015), for example, by students either taking transport to class or staying at home and using different forms and amounts of fossil fuelled energy in the process. While perhaps a mundane, reductive or insignificant example, this serves to remind that affects and atmospheres are not easily disentangled (Gannon, 2016).

A second example of the elusive and puzzling ways that climate change infiltrates human body-minds further countered my supposed all-knowing researcher subjectivity. On October 6 2015, a planned fire in Lancefield (just 70km from Melbourne) exceeded authorities’ control and went on to burn over 4000 hectares (Gray, 2015), prompting the official start of the bushfire season to be moved forward a month (ABC, 2015a). The next day our guest lecturer from the business school provided us with a lecture of the kind he

gives to the business community—those with generally little concern or understanding about climate change, unlike us who were highly engaged and informed having already completed ten weeks of study on climate change. The lecture was thus designed to arouse concern, and featured images and stories of numerous climate induced disasters such as Hurricane Katrina, floods in Pakistan, Typhoon Haiyan and the Russian heat waves, and the Black Saturday bushfires, the worst fires in Australia’s history which killed 173 people in 2009. It also included a photo of a woman holding her grandchildren in a dam²⁸ to try to survive the Dunalley bushfires in Tasmania in 2013, with a hazy red sky surrounding them and looks of desperation and terror on their faces. I had not seen the image before, but it has been seared into me, affecting me in part because it looks like the dam from my family’s farm. The lecture also included discussion of the despicable practices of multinational corporations who have known about climate change for decades, funded misinformation, and continued to extract, sell and burn fossil fuels. In our tutorial after this lecture, when I asked students if they wanted to discuss capitalism or work on their assessments first, one who had to leave mid-way said he would rather skip the discussion of capitalism because he was “in a fiery mood,” and so, he would rather work on the assessments first before he had to go.

How to make sense of this? Where do we draw the spatial and temporal boundaries between bushfires and bodies? To what extent was the student affected by the Lancefield fires, blazing out of control at that moment 70km away? Can we say that he was affected by the Dunalley fires which had occurred two years earlier, but were in some ways present through the photo in the lecture? And what about Black Saturday, a dark and horrifying period six years earlier which has altered most Victorians’ understandings of the terror of

²⁸ See Figure 3, p. 151, image also available at <https://www.theguardian.com/film/2013/jun/05/guardian-firestorm-tasmania-dunalley-competition-docfest>

bushfire? Could the experience of living through a state on fire for days have been burned into his embodied memory, and then been triggered by the discussion and flared up? Gibbs suggests that

bodies can catch feelings as easily as catch fire: affect leaps from one body to another, evoking tenderness, inciting shame, igniting rage, exciting fear. ... Communicable affect can inflame nerves and muscles in a conflagration of every conceivable kind of passion. (2001, n.p.)

While affects may function *like* fire, fires are also affective, and perhaps this student caught fire's affects, or caught fire affectively.

Working with the notion of affective atmospheres suggests that potentially both events permeated him through media such as the photograph in the lecture and news reports (Cunsolo Willox, 2012). While bushfires might also generate resigned, panicked, or other moods, the use of "fiery" to describe a mood suggests that the aggravated and unpredictable intensities of combustion can exceed the spaces, times and bodies usually considered within their bounds. This apparently momentary encounter with climate change could therefore be understood as a process which extended over a period of at least six years and across the mountain range that separates Melbourne and Lancefield, or the sea that separates Tasmania from mainland Australia (Barua, 2015). This is the "inbetween of encounter" (Hayward, 2010, p. 581) in "affective ecologies" (Hustak & Myers, 2012, p. 96), the transferal and reconfiguration of intensity and expressivity across kinds which generates movement, infoldings of relations, and emergent difference. It emphasises the transtemporal, transpatial and transcorporeal (Alaimo, 2008) nature of climate change, a rapidly morphing set of multiscaled, non-linear relationships. It further indicates the ambiguous distinction between meteorological conditions and affective forces (Gannon, 2016; Rooney, 2018b), as the smoke, haze, charcoal and cinders of Black Saturday and the Lancefield fires potentially

infiltrated this student's body-mind, arousing particular sensations and moving him into particular actions. His avoidance of discussing capitalism due to his inflamed temper meant that he and the other students who shared the timetable clash became more informed about and prepared for the assessments, and thus potentially more academically successful in the process, than if we had discussed capitalism before they had to leave. In these ways, one student's pedagogical encounter with climate change changed both his and his peers' relationships with capitalism, climate change, and their academic transcript, potentially having a wide range of longer term diffractions (Gannon, 2017). But of course, this is somewhat speculative. Perhaps it was purely coincidental, maybe his choice of "fiery" to describe his mood was unrelated to the fires that had swirled into our classroom; I can't be sure. Such phenomena exceed capacities for identifying, tracing, and disentangling particular occurrences from their constitutive relations (Gannon, 2016).

Understanding climate change as an affective atmosphere enables us to attune to, but not fully decipher, the curious ways that climate and humans can become entangled, and as such both advances our knowledge while emphasising the limits to it. It counters controlling subjectivities and epistemologies of extraction (Reinert, 2016). Acknowledging that climate change—including our participation in/as/of it—is uncontainable, never fully comprehensible, and always *more than* our understandings is an important step towards letting go of the anthropocentric desire to contain and control the non-human world (Sjögren, 2014). This approach is also important in order to account for how climate action is always intra-active; how we all—researchers included—are becoming-climate. However, to halt the analysis at recognition of this excessiveness and ambiguity would be to fail to attend to the more tangible, intelligible, specific emotional responses that emerged (Boler & Zembylas, 2016), and whose intensity is significant for climate change education.

CHARACTERISTIC EMOTIONAL ENCOUNTERS IN CCR15

Our emotions in CCR15 constituted both responses that emerged from our encounters with climate change, as well as affective forces that in turn constituted climate change which we further encountered. That is, they were part of the affective atmospheres of climate change which infiltrated and were reconfigured in our class. In this section, I discuss emotions with this in mind: that they emerged from and co-composed climate change. In this sense, I understand emotions to arise from, and constitute, intra-actions (such as pedagogical encounters). This approach to emotions does not situate them as individually or mentally contained or as exclusively human productions. Rather, an intra-active account considers emotions as “performative and embodied, produced within and between relational bodies, triggered by external events yet experienced both psychologically and physiologically” (Ryan, 2016, p. 6). That is, emotions are something we both experience and do (Kuby, 2016), and which are generated through transcorporeal relationships with the more-than-human world (Bozalek, 2016). Emotions therefore do not occur to pre-given individuals, rather, emotions are part of the process through which “the sense of the ‘me’ or ‘us’ harbouring the emotion” is generated, consolidated or verified (Johansen, 2015, p. 50). Emotions create “impressions” and “surface” us (Ahmed, 2004; Brennan, 2004), creating boundaries between subjects and objects depending on where and how they are felt (Wolfe, 2017).

In order to explore the pedagogical intra-action of encountering, in the following sections I discuss six emotional responses I found to be characteristic of our encounters with climate change: anxiety, frustration, being overwhelmed, grief, guilt and hope. These are common emotional responses to climate change (Clayton & Manning, 2018). These six were the most commonly named ones in CCR15 and generally encapsulate the range that were

experienced. For example, frustration does not fully account for but does align with feeling angry, resentful, challenged, disheartened, confronted, defeated, dismayed and tired. But it is important to remember that affective atmospheres are always “angled” (Ahmed, 2010, p. 37); that is, specific human bodies intra-act with affective atmospheres differently according to their always unique situation in particular socio-ecological histories (Kleres & Wettergren, 2017). The point of this section is not that each individual human experienced all of these emotions in the same ways, or indeed, ever. Rather than describing *universal* experiences, my purpose is to use such *characteristic* experiences to demonstrate that encounters with climate change counter existing ways of being and relating. As such, I show that these emotions were collectively produced by specific humans and specific manifestations of climate change encountering each other, and when they were experienced these characteristic emotions had certain effects on us.

Through exploring what the emotional responses did to us, that is, how they countered us and how we became climate changed, this chapter departs from more common approaches to emotions in climate change education. It differs from more individualistic accounts through attending to the socio-ecological transcorporeality of emotions. It also diverges from the reductive laboratory style research which assumes immediate and isolated cause and effect processes to be representative of people’s consistent and ongoing experience (i.e. climate information of type A generally leads directly to emotion X) (Chapman et al., 2017). That is, I do not consider specific emotions to be disentangled from other emotions, or one person’s momentary experience of a specific emotion to necessarily indicate a lasting experience (B. Anderson, 2006; Ojala, 2016). The semester long ethnographic approach enables me to emphasise how our emotional experiences of climate change education were more like a “rollercoaster of emotions” (student quotation). I also avoid judging whether our experiences of hope or despair are good or desirable (Chapman et al., 2017), in part through

recognising that they are not oppositional, but entangled, affective processes.

ANXIETY: TROUBLING CERTAINTY AND ENTITLEMENT

Anxiety is a characteristic response to climate change (Weintrobe, 2013) and it destabilises modern subjectivities through undermining promises of secure and stable futures (Head, 2016). Specific climate changes (such as location- and time-specific bushfires, or exactly how much the planet will warm) are both terrifying as well as highly unpredictable due to the non-linear intra-acting agencies of the planet including, of course, the wide ranging possibilities of what fossil burning humans might do (Harrison, 2013; Seaman, 2016). Because of such ontological indeterminacy and thus our epistemological uncertainty, potential climate futures are expressed by science as probabilities (Mastrandrea et al., 2010). Uncertainty is said to be central to anxiety, which is an emotional state characterised by worry about the future (Grupe & Nitschke, 2013). Thus, given the high uncertainty of specific future climate changes, anxiety is a common affective response to climate change (Brugger et al., 2013; Cunsolo Willox et al., 2013; Ojala, 2012; Robbins & Moore, 2013; Weintrobe, 2013; C. Wright & Nyberg, 2012). Climate change's uncertainty and its association with gloomy feelings like anxiety is articulated in the statement from CCR15 that "the future, for me, is dark, cloudy, a black hole of uncertainty. I don't know how it will play out." Another student's end of semester reflection stated that "a challenge in acquiring weekly knowledge of ... climate change has been to keep walking the scary line of learning." Such experiences of "climate anxiety" (Lomas, 2014, n.p.) were common in CCR15. While specific outcomes are uncertain, changes of some kind are unavoidable and already happening, and so this anxiety can also be directed to the *certainty of unpredictability*, as this statement attests: "I feel an uncertain future is inevitable, and it deeply upsets me."

It is harder to control and plan for the uncertain and the experience of climate anxiety

therefore troubles modern subjectivities and futures. Settler-colonial and over-industrialised communities have been promised certainty, progress, and control of the future (Head, 2016; Katona, 2015; Tuck, McKenzie, & McCoy, 2014). As a form of anticipatory grieving for potential future losses (Randall, 2009), including the loss of safe and beneficial settler-industrial futures, climate anxiety can be understood as a disruption of this sense of entitlement to a better future (Katona, 2015) and therefore a destabilisation of privilege and discourses of planetary domination. This statement attests to the unsettling feelings of not being able to settle (i.e. identify, contain, control and manage) the future:

[climate change] often develops some sort of anxiety in me, or even just a mild sick feeling, the feeling of not being able to predict the future and predict the best thing to do whilst minimising as much harm as possible. This feeling often comes by me when I watch how the leaders of Australia approach issues like these, and it makes me feel sick.

Such visceral feelings speak to the intensity with which climate anxiety can disrupt our sense of security (Ojala, 2016), and with it, the green modernism that believes that rational choices can contribute to progressive, sustainable development (Thoyre, 2015). Comments regarding the uncertainty of how global humanity will respond, and that serious responses might not be catalysed until “a new destructive level of nature” manifests itself emphasise that climate anxiety disrupts our taken for granted beliefs about ourselves, human nature and our individual and collective abilities to act rationally or exert control over non-human nature.

As such, we can see that in CCR15 encountering the certainty of climatic uncertainty affected (at least some of) us and in response we performed anxiety. Our sense of entitlement to a promising future was disrupted by climate’s complex, non-linear indeterminacy. Subsequently, experiences of future potential worlds, of bodies, and of subjectivities were diffracted. Such anxiety can lead us to attempt to fix or respond to the problem, which if unsuccessful, can lead to frustration.

FRUSTRATION: DISABLING INDIVIDUALS

Frustration is another characteristic response to climate change, and its particular way of countering us is that it disables our sense of individual agency. Frustration arises when a subject is faced with barriers or obstacles and is thus unable to achieve their plans, goals, or ideals (Hufnagel, 2017). It is thus a sense of a loss of agency or power. Frustration is a common emotion experienced by those who have tried to respond to climate change but have been confronted with inefficacy, disempowerment, disappointment, and/or non-achievement (Albrecht, 2005; Bray et al., 2018; Cunsolo Willox et al., 2013; Lenzen, Dey, & Murray, 2002; Randall, 2009). Such inefficacy is articulated in this statement from CCR15: “on a daily basis, I feel like I’m not doing enough, I’m not achieving enough to create this huge impact I’m waiting for. Though I feel like I’m not doing enough, I don’t know what else I can do.”

The frustration of inefficacy can lead to a disintegration of the sense of the self as a capable actor. Given climate change is a collective action problem (Tosun & Schoenefeld, 2017), it makes sense that individualised efforts at agency produce frustration (Kelsey, 2017; Ojala, 2016). Acknowledgement of the need for coordinated collective action and the frustration that emerges from the lack of it is evident in this quotation: “In the real world, who really cares? I know that climate change is a collective problem, but who is going to actually contribute to a solution?” While disabling individualised agency, frustration can thus reconfigure the boundaries between self and other. As this statement suggests, frustration can rupture otherwise close relationships: “I am constantly butting heads with sceptics and non-believers (particularly my father in law) regarding climate change. It is so frustrating that fellow inhabitants don’t understand the magnitude of the situation.” On the other hand, shared feelings of frustration can be “we-creating” (Cunsolo Willox, 2012, p. 149), as this

student articulates: “I remember a unanimous feeling of frustration shared by the whole class.” Rather than frustration distancing this student from others, frustration served to articulate the inability and complicity they share with others: “I felt this frustration towards governments, companies, humans and myself.”

Frustration forces us to acknowledge that we are always acting-with—whether we like it or not—and it thus disables our sense of our individual capacities to exert agency over others. Frustration then, like anxiety, emerges from neoliberal individualism acting-with climate change, and diffracts our existing ways of relating to ourselves, to others, and the world. We intrasectionally emerge as people situated in different relationships through experiencing and performing frustration. Because climate change can seem to be “the biggest issue,” this frustration can be overwhelming.

OVERWHELM: SINKING THE INDIVIDUAL SELF

Being overwhelmed can be a feeling of intense awe, awe that impresses (Ahmed, 2004) from all directions. The awe of overwhelm can also be, like frustration, a feeling of being rendered incapable. But overwhelm emerges from encounters with problems of an incomprehensible and possibly insurmountable scale, ones that do not just disable, but dissolve our sense of self. Being overwhelmed is a common response to climate change, due to its temporal urgency and spatial scale (Henderson et al., 2017; Weintrobe, 2013). The inertia of the climate system means that greenhouse gas emissions do not warm the planet immediately and neither do all the earth system changes begin simultaneously with that warming; rather, these changes may take effect in, and/or last for tens to hundreds (if not thousands) of years to come (IPCC, 2007, p. 101). This means that past emissions and potential future climates are experienced as a temporal pressure on the present, as scientists,

activists and policy makers urge us to reduce emissions before it is “too late,” year after year (Adam, 2008; Figueres et al., 2017; IPCC, 2018; Pearce, 2005; Thornhill, 2013). Spatially, the interconnectedness of the climate system which means that leaving the lights on in Australia may mean death for polar bears exerts a global pressure—the “weight of the world”—on the local arena. The massive scale of climate change was repeatedly discussed by students in CCR15, such as the statement that “climate change is everything and it is going to affect everything.”

The intensity and scale of climate change’s “impressions” can “surface” us otherwise (Ahmed, 2004, pp. 26–27). Being overwhelmed by climate change can thus upend or crush the self, as space-time-matter condenses and implodes in on us. As one student said in CCR15: “I have felt small in the face of climate change before,” indicating the intrasectional capacity of overwhelm. Another commented that “climate change is huge, overwhelming, and I feel frustrated and angry. I am extremely cynical that humanity will do anything to mitigate climate change before it is too late,” which succinctly connects these issues of scale—including the condensation of temporality in the experience of urgency—and emotional responses to them. We can also be overwhelmed by a strong experience of other emotions, as articulated by this statement: “I have been overwhelmed by joy, fear, and passion.” In this sense, being overwhelmed—and the frequency with which students cited feeling overwhelmed—demonstrates how the affective encounter with climate change is diffractive: a process that elicits, although does not determine, the experience of a wide range of apparently conflicting, but very intense emotions.

To be overwhelmed also has a specifically climatic etymology: to be inundated by water. Feeling overwhelmed feels like drowning, being engulfed and submerged as we flail against tides far exceeding our strength. In the context of melting glaciers, rising sea levels,

bigger storm surges and more intense flooding, being overwhelmed seems likely to be a characteristic experience of climate change in more ways than one. Feeling overwhelmed by climate change—for example experiencing climate change as a tsunami hanging over one's head—speaks to how the affective and ecological dimensions of climate change are not so neatly separated.

Encountering climate change's temporal urgency and its planetary spatial scale can elicit uncontrollable performances of overwhelm. Being overwhelmed diffracts and reconfigures experiences of the world and of bodies in relation to it, intrasectionally generating affective responses such as cynicism and shrinking bodies. This huge problem inevitably leads to questions being asked about who is to blame.

GUILT: INTERNALISING RESPONSIBILITY

Guilt is an internally directed sensation that the self has committed wrong or failed to be accountable. Guilt is thus an internalisation of blame which can operate at individualised or collective scales (Ferguson & Branscombe, 2010; X. Wang & Lin, 2018). As such, performances of guilt function to articulate, and potentially counter, the boundary of the subject that is responsible (see e.g. Conradie, 2010; “Guilt trip,” 2012). Climate change engagement efforts have often sought to induce feelings of guilt as it has been thought that guilt motivates mitigative action (Ferguson & Branscombe, 2010; Markowitz, 2012; Markowitz & Shariff, 2012). Thus, for those of us who live in high carbon economies or live high carbon lifestyles, encountering climate change commonly involves the experience of guilt (Höijer, 2010; Jacquet, 2017; Kleres & Wettergren, 2017; Lenzen et al., 2002; Randall, 2009; Weintrobe, 2013).

Guilt was a common emotional response in CCR15. Frequently, guilty performances

articulated a neoliberal subjectivity, as this statement suggests: “I questioned whether my actions were creating any positive change. Was I simply another facet at the root of this problem?” Such neoliberal forms of individual responsibility were also evident in the “moral math”: self-governance, consumer choice and individualisation of carbon footprints (Thoyre, 2015, p. 146, see also Brand, 2007; Guthman, 2008) performed throughout the course, such as interrogating cat food purchases, advocating vegetarianism and the use of keep cups. However, at other times, climate complicity was recognised as a social phenomenon, and knowledge of these social processes functioned to blur the boundaries between the self and others, attributing responsibility to a more collective kind of subject. For example, one student stated that “the concept of a spectrum of denial is important because it breaks it down from good and evil, black and white; there’s so much more to denial. We’re all guilty of being stealth deniers” (see Rowson, 2013, re: stealth denial). Relatedly, one student stated that the course left them “with an overwhelming sense of guilt, and many questions surrounding the basic morality of human kind which sees so many people turn a blind eye,” which suggests that both the individual and the species were seen to be responsible for climate change. In these latter examples, responsibility does not begin and end at the skin, but filters through society and cultivates a (problematically) homogenised category of “human kind.” At other times, distinguishing “us” from those in other countries “who can barely find enough food for one meal a day,” students argued that “we” and “Western society” who “hyperconsume and waste everything” are “to blame.” Such analyses led to moral interrogation, such as the rhetorical question “what happened to karma?”

As such statements indicate, guilt is a practice of articulating the responsible subject, which while uncomfortable, can be a step towards effective response-ability. In CCR15, sometimes guilt did compose a neoliberal response-ability. However, when combined with the overwhelming experiences of frustration, anxiety and grief, guilt frequently functioned

intra-sectionally to decompose this. As the skin-bounded individuals were disabled, guilt was distributed between “humanity” as a unified collective, or across “Western society.” Cunsolo Willox (2012) argues that research needs to pay more attention to how in carbon intensive societies such guilt is caused by the very same practices that cause our grief.

GRIEF: DIAGNOSING RELATIONSHIPS

Grief is an intense and sustained feeling of sorrow that emerges in response to the loss of desirable relationships (Brinkmann & Kofod, 2017). Loss follows unwelcome change, and climate change “changes everything” (Klein, 2014) and will thus initiate and accelerate myriad, irreversible losses (Barnett, Tschakert, Head, & Adger, 2016; Haraway, 2015, 2016). Grief and sadness are thus characteristic responses to encountering climate change (Barnett et al., 2016; Cunsolo Willox, 2012; Hall, 2013; Head, 2016; Hobbs, 2013; McKinnon, 2014; Randall, 2009; Yusoff, 2012). Most empirical research documenting climate grief is of people who are encountering the direct ecological impacts of climate change (Cunsolo Willox et al., 2013; Drew, 2013; Roelvink & Zolkos, 2011), and there is significantly less empirical research documenting such feelings when they arise from indirect or “existential” engagement with climate change (but see Head & Harada, 2017; and Kelly, 2017). However, as Seaman puts it, “the closer one gets to ‘the truth’ of climate change, the higher the psychological impact” (2016, p. 21), and it is to be expected that young people completing an entire degree about the environment will experience similarly intense, although different, forms of grief to those encountering direct climatic impacts such as coastal erosion or food shortages (Cunsolo Willox, 2012; Hasbach, 2015; Head, 2016).

Performances of climate grief diagnose relationships. To experience, identify and express grief involves articulating or recognising relationships at the same moment as realising that they are under threat or ailing (Mathews, 2011; Ruddick, 2017). As Haraway

states, sometimes those of us who “think, read, study, agitate, and care [about ecological crises] know too much, and it is too heavy” (Haraway, 2016, p. 4). Yet while painful, grief “is a path to understanding entangled shared living and dying” (Haraway, 2016, p. 39). Grief articulates that which is or may become lost as a valuable entity, and therefore, constitutes it as a political subject (Cunsolo Willox, 2012).

Throughout CCR15, we encountered the wide variety of changes that climate change engenders, and in response, performed a wide range of variations of sadness, such as being gloomy, depressed, disheartened, dismayed, etc. Our climate grief was evident in statements like “the Earth is fucked” and “I feel emotionally tied to the fate of our environment.” The following quotation from CCR15 concisely demonstrates a moment of identifying a relationship at the same time as noticing it is under threat:

It struck me that the world as we know it, and the way we live, is going to dramatically change. Even if we stop our current globally destructive practices right now, the climatic flow on effects will continue into the future.

The following one more explicitly articulates the upsetting affects that accompany such diagnoses:

[It is] a real trauma, knowing that the land is changing and there’s probably no future for you or anyone else there on that land. That there are ... people all over the world who have much more of a connection to their Country than me [and whose] future is probably going to involve that changing, rupturing their cultural identity and sense of place, often through no fault of their own.

In CCR15 many of us performed climate grief, diagnosing relationships, as the “everything change” (Atwood, 2015, n.p.) of climate change was encountered. This grief generated recognition that we are intrasectionally composed through the multitudes of others we are always acting-with. This experience probably sounds somewhat depressing, given the

strong social norms of positive talk in climate discourse (Randall, 2009; Rickards et al., 2014; Roberts, 2017). However, a range of authors understand that engaging with these “negative” emotions is not the opposite of hope but a part of it, nor a barrier to response but a necessary step towards it (B. Anderson, 2006; Cunsolo Willox, 2012), and it is thus important for cultivating less anthropocentric worlds.

HOPE: BEARING WORLDS

Hope is a belief that positive future outcomes are possible (Kelsey, 2017). Haraway (2016) contends that hope is not a sensible attitude to ecological crisis, premised as she sees it on the false promises of technofixes, or assuming someone else will take care of it all. However, as McKinnon (2014) argues, hope is different to optimism. Optimism is a sense of certainty that things will be okay, but hope emerges from the same conditions as anxiety: uncertainty and contingency (Ojala, 2016; Roelvink & Zolkos, 2011). We often oscillate between feeling hopeful and anxious about the same thing (Brown & Pickerill, 2009), and at times can feel both simultaneously. As Anderson articulates, hope “is entangled in the circulation, and displacement, of other affects and emotions” (2006, p. 747). Hope is thus a characteristic affective performance that emerges from encounters with climate change, which, as argued earlier, is inherently uncertain (Ojala, 2016).

To hope is to expend energy bearing worlds, in two complementary ways. Hoping bears worlds in the sense of labouring to generate desirable and possible, though always uncertain and indeterminate, futures (Albrecht, 2005; Hauer, Østergaard Nielsen, & Niewöhner, 2018; Rose, 2013, 2015b). Without action towards such worlds, we cannot properly be said to be hoping—if we feel hopeful but do nothing, we are really feeling optimistic, believing that someone else will look after it or that it will be okay. Hoping is thus

a practice of diffraction, acting to generate difference, to create alternatives, to do things otherwise (Hauer et al., 2018; Ojala, 2016). Hoping also bears worlds in the sense of enduring (Hauer et al., 2018; Ojala, 2016) the pain that current and potential climate change engenders, as discussed above in the section on grief. This aligns with the work of Head (2016, p. 44) who believes that in a climate changing world grief will be our constant “companion,” and with Cunsolo Willox (2012), Haraway (2016) and Randall (2009) who argue that in order to respond effectively to climate change we must engage in the “work” (Cunsolo Willox, 2012) or “tasks” (Randall, 2009) of “mourning irreversible losses” (Haraway, 2015, p. 160). Without effectively mourning, we will not be able to process our grief and we will thus be unable to effectively respond (Andrew, 2016; van Dooren, 2014). And if we cannot effectively respond, *then* there is no hope. Thus, mourning is a necessary part of hoping. As such, mourning and hoping are understood to be complementary and entwined labours or responses (Cunsolo Willox, 2012; Ojala, 2016) that together “enable bodies to go on” (Anderson, 2006, p. 744) while ensuring that we make waves, or make a difference in the world (Haraway, 1997).

Hope, understood as a practice of bearing worlds, was performed in CCR15, and the positive feelings associated with it were sometimes explicitly articulated. Learning about climate change was described as “a rollercoaster of emotions” on more than one occasion, evidencing the oscillation between the painful and reassuring emotions (Ojala, 2016). One student stated that “the tutorials were scary; though I feel I learnt so much from simply listening to people speak from their heart and experience always leaving feeling refreshed.” Such statements indicated that the affirmative affective experiences were entangled with those that overwhelmed or undermined us. Similarly, another articulated a sense of agency emerging from such entangled hoping-mourning: “despite the sometimes gloomy subject matter, I’ve often left lectures feeling hopeful, for I can begin to envisage the path ahead, and

also how I might have a role in creating it,” aligning with research which suggests that sensations of hope can inspire climate change action (Feldman & Hart, 2017; Li & Monroe, 2017; Ojala, 2012; K. Stevenson & Peterson, 2016). Understanding hoping and mourning as entwined labours makes sense to me in light of bearing witness to such an outpouring of grief from my students in class, while knowing that outside class they were educating, protesting, innovating, experimenting, conversing—*working* on various projects, which suggests a belief in the possibility, however small, of better worlds.

Understood as an embodied labour of bearing worlds, hoping-mourning establishes novel, ethical and political relationships and subjectivities (Cunsolo Willox, 2012). As discussed above, we mourn lost or potentially threatened relationships (Yusoff, 2012). Through this labouring we enact new connectivities (Brown & Pickerill, 2009), losing “our former selves” (Cunsolo Willox, 2012, p. 145) and articulating new collective subjectivities (B. Anderson, 2006). While unpredictable and uncontrollable, this “we-creating” (Cunsolo Willox, 2012, p. 149) potential of hoping-mourning is itself political and ethical (Head, 2016; Roelvink & Zolkos, 2011) as it destabilises the individualistic subject and enables us to act-with (Seaman, 2016). Conversely, a sense of “we” can create hope (Divakaran & Nerbonne, 2017; Kelsey, 2017), or perhaps more accurately, hope and collective subjectivities co-enact each other through intra-action (Singh, 2013). Of course, if such collective subjectivities cannot be constituted, grief can be intensely isolating and individuating too (Cunsolo Willox, 2012; Swim et al., 2009).

This co-emergence of connection and hopeful sensations was evident in CCR15. Students occasionally stated that they felt enthused, encouraged, inspired, motivated, joyful, reassured, empowered and/or optimistic, but much more frequently, that they felt hopeful. These feelings exclusively emerged through the actual or potential establishment of

connections with other humans: knowing that others shared their frustrations, cared about the world too, and were doing things to address climate change. This first quotation speaks to the endurance of mourning and the diffractive, hopeful potential of acting-with others on a global scale:

Through all this overwhelming, devastating news and understanding the reality of climate change, I have grasped hold of an exciting potential for global unification. I have been encouraged by the possibility that the climate changing might be the one factor that pulls our divided world together; to form a united social mass of individuals who want to see a brighter future and to see people and our environment being put over profit.

Other hopeful statements referred to physically meeting and connecting with others within the class. This first one discusses how meeting others with shared aspirations can generate a sense of agency: “[being] surrounded by people who share similar values is ... empowering.” As another stated, the climate action enacted by one’s peers—whether in the present or the future—can generate hopeful sensations: “knowing that all the individuals in this subject are all about making a change towards a better future and are tackling the vast amount of issues within climate change, I felt reassured and somewhat optimistic.” This co-emergence of hope and collectives is due at least in part to climate change being a collective action problem, and the requirement for multiple humans to collaborate if the disabling emotions of frustration, anxiety and overwhelm are to be endured.

In the context of climate change, hope is entangled with mourning. Mourning—as the processing of grief—enables us to diagnose connections, and as such, hope emerges from and enables collective subjectivities. That is, hoping is enabled through acting-with others and intrasectionally composing novel collective subjectivities. This is the labour of bearing worlds: collectively working through ongoing pain to generate change and difference, and thus, better, more positive, yet never certain, futures.

In sum, through encountering climate change as an affective atmosphere and acting-with our own emergent emotional responses, our existing selves, relationships and futures were diffracted, and we intrasectionally emerged otherwise. Climate change's temporal urgency and global scale, its inherent uncertainty, its nature as a collective action problem and its relational composition intra-acted with our situatedness in neoliberal, high carbon economies which had promised us individual success and better futures if we worked hard. Across the semester, in various ways and with various intensities, our sense of ourselves as capable moral individuals was decomposed, and in its place a promising, if ill defined, collective was emerging.

CONCLUSION

Encounters are meetings between entangled phenomena that counter their existing ways of being and relating. Encounters epitomise Barad's (2014, p. 168) notion of "cutting together-apart," as the entities or forces that encounter each other become differently differentiated, and thus more intimately related even if the encounter seems to push them away from each other. Our current selves are always indebted to complex histories of encountering and becoming-with others (Haraway, 2008). In CCR15, despite the climate controlled classroom we were in, we encountered climate change manifesting as a collectively composed affective atmosphere—a socio-material set of nebulous meteorological-emotional forces that arose within, infiltrated between, and collided with us, producing unforeseen and inexplicable phenomena. These encounters decomposed worlds where the neoliberal, anthropocentric, individual (white male) hero saves the planet to enable perpetual progress. These futures were disrupted, as our modern, individualistic subjectivities—including my own researcher subjectivity—were destabilised, disabled, and drowned. As such, we were engaged in processes that Braidotti (2013) terms dis-

identification: the breakdown of established ways of being, identifying and relating. Rather than humans containing or domesticating the climate, these emotional and affective responses speak to climate change's architectural capacities to tame, shape and direct us in ways we cannot fully understand, anticipate or imagine.

Encountering climate change—manifesting as an affective atmosphere—is thus a way in which response-abilities are articulated and established, or as this chapter has discussed, decomposed. Encountering climate change is thus diffractive: as climate change crashes into us our emergent emotions make a difference, they differentially reconfigure bodies, boundaries, relationships, entanglements, and possibilities. Our historical eco-social locations are superpositioned with climate change and our identities are intrasectionally reconfigured. Climate change moves through, in and as us, and in CCR15 this different climate-human enfolding was expressed as overwhelming climate-anxiety, climate-frustration, climate-guilt, and climate-grief. These agential emotional responses are thus forms of acting-with climate change.

But these practices of mourning—enduring the suffering, trauma, and despair of current and potential worlds—can be understood as hopeful. The decomposition of anthropocentric, individualistic and neoliberal delusions of agency, such as that which occurred in CCR15, allow an opening for alternative climate-human entanglements and response-abilities to be generated (Cunsolo Willox, 2012). Across the following two chapters, I elaborate on these processes of bearing worlds that were enacted in CCR15.

8. WITNESSING MULTIPLE CLIMATE REALITIES

INTRODUCTION

Witnessing is seeing; attesting; standing publicly accountable for, and psychically vulnerable to, one's visions and representations. Witnessing is a collective, limited practice that depends on the constructed and never finished credibility of those who do it. (Haraway, 1997, p. 267)

In the Introduction to this thesis I discussed the high stakes of “reality” in climate change debates. For example, in a recent blog post climate science writer Peter Boyer tackled a conservative Australian politician's comments regarding fossil fuel extraction thus: “in Barnaby Joyce's eyes, people who support schemes like Queensland's proposed \$21.7 billion Carmichael coal mine are ‘realists’ [but] it's up to science, not Barnaby Joyce, to determine what's real and what isn't” (Boyer, 2017, n.p.). Following on from Chapter 7's discussion of climate-human encounters in CCR15, this chapter aims to explore the pedagogical intra-action of witnessing and how it contributes to emergent climate-human entanglements. This is done through attending to the multiple climate realities that were realised in CCR15, which emerged from but exceeded both the scientific climate reality and the business-as-usual reality discussed by Boyer.

The chapter begins by exploring the predominance of the visual as a metaphor of knowing (i.e. witnessing) climate change in Western climate epistemologies, and engages with critiques of the presumption that there are normal, predetermined, or universal ways to see. I argue that in CCR15 we *learned* to visually witness climate change in specific, embodied and dynamically changing ways, through intra-action with both science and social science. The chapter then explores how the multidisciplinary collective witnessing engaged in CCR15 enabled us to see, feel, live in and story visions of “double” and “unreal” climate

realities. Working with nightmarish experiences where future and/or global climate change became felt-seen in the local present pushes the chapter's conceptualisation of the visual as a means of intra-actively knowing climate change further. I argue that CCR15's multidisciplinary affective pedagogy enabled synaesthetic experiences of diffractively seeing-feeling-imagining-witnessing climate change. I then take the contention that secular-realist ontologies, however ecological or posthuman, perpetuate the ongoing erasure and marginalisation of Indigenous cosmologies (Te Punga Somerville, 2016) as "grounds for reanimating reality" (Mathews, 2003, p. 3). As a methodological practice of witnessing climate change, I thus venture beyond a Western (agential) realist interpretation of these imaginaries by speculating that these dreamings of double/unreal climate realities may be experiences of spirited Climate Country calling out in distress and making itself heard-felt-seen. Finally, the chapter discusses how all of the affective witnessing enacted in CCR15 diffracted science through denial, and in so doing reconfigured science as an epistemology. The chapter as a whole attends to how witnessing as a practice of validating particular climate realities—and not others—reconfigures human-climate entanglements, in the sense of generating different realities, different knowledges, different identities, different time-space-matter enfoldings and different worlds.

VISUAL WITNESSINGS: LEARNING TO SEE (WITH/AS) CLIMATE CHANGE

Witnessing is a practice that validates or legitimises particular realities (ontologies, encounters) and truths (epistemologies, stories) (Abrams & Kacandes, 2008; Butler, 2013; Haraway, 1988; Tuana, 2008; Zembylas, 2006). Witnessing is not an isolated, discrete behaviour that one individual (human) subject does on their own, but an intra-action, a relationship. Like other intra-actions, witnessing involves the intrasectional reconfiguration of identities, emerges through acting-with more-than-human others, and emerges from and

produces worldly diffractions. Witnessing involves ethical and political responses, perhaps as recognition, support, advocacy, translating and/or speaking on behalf of when necessary. In these ways, witnessing is performative, realising particular worlds, and not others.

At a species level, vision is humans' most dominant means of sensing and knowing our worlds (Haraway, 1988; J. Lorimer, 2007). Thus, while witnessing does not necessarily involve vision, often for humans, it does. As Haraway argues, "struggles over what will count as rational accounts of the world are struggles over *how* to see" (Haraway, 1988, p. 587, italics in original). Such challenges of articulating and asserting particular forms of sight as knowledge are prevalent in debates about how to respond to climate change. Climate change communication and education seek to enable and encourage people to witness climate change, and the invisibility of climate change is one of the most commonly identified challenges to this (Moser, 2010; Pruneau, Khattabi, & Demers, 2010). Imagery is often recommended to enable the student or the audience to see, i.e. know or believe, climate change (Chapman et al., 2016; Feldman & Hart, 2017). Thus, studies about visual discourses and representations of climate change proliferate (DiFrancesco & Young, 2011; Hawkins & Kanngieser, 2017; Moser, 2016; O'Neill & Nicholson-Cole, 2009). Further, there are calls for climate change education to enable students to better envision futures, and/or to generate visionaries (Kagawa & Selby, 2010; Monroe et al., 2017). Across this work, vision is equated with knowledge, and how climate change is seen plays an important role in which climate realities are witnessed and thus, enacted, built upon and responded to. But this ocular centrism is not particular to climate change: optical metaphors of knowledge abound throughout Western epistemologies (Haraway, 1988). In such accounts, things are firmly bounded and separate from each other and thus clearly visible to a (human) knower who gazes at them from a distance. But these approaches reiterate representationalism, individualism and anthropocentrism (Barad, 2007; Haraway, 1988).

Therefore, equating vision with knowledge and normalising certain forms of vision poses problems for climate change education. Firstly, doing so situates particular bodily abilities in hierarchies (McKnight & Whitburn, 2017). Climate change will impact visually impaired and blind people differently and disproportionately due to socially organised disabling structures (Gaskin et al., 2017; Wolbring & Leopatra, 2012). Further, non-humans are also capable of climate knowledge despite not sharing human forms of sight. Thus, no effort towards climate justice can responsibly embrace assumptions that normalised human sight automatically or easily equates to climate knowledge or response-ability. As Haraway has argued, Western science's strategies which universalise and promote a view from nowhere-and-everywhere serve mainly to erase the situatedness, partiality and accountability of the knower (Haraway, 1988, 1997). And it is potentially this "God's Eye" view of climate change—the distanced gaze—that produces, rather than counters, the sense of apathy, disconnection and irrelevance that climate change education wishes to address (Israel & Sachs, 2013; Neimanis, 2017). However, evidently the visual cannot simply be dispensed with as a means of knowing climate change. What is needed is a better account of vision, one that does not figure vision as a pre-given, taken for granted, normal ability, which if focused on climate change results in the same climate knowledge for all (and just humans at that). Haraway is adamant that we "reclaim" vision, and develop accounts of the "particularity and embodiment of all vision" (1988, p. 582).

This chapter explores the pedagogical intra-action of witnessing while refiguring the visual as means of knowing climate change. Rather than normalising and promoting a taken for granted approach to visually witnessing climate change, I find it more useful to attend to how in CCR15, we *learned* to see (*with/as*) climate change *through intra-action with climate change*. This understands vision and visual knowing to be relational, distributed, worldly, co-enacted achievements that emerge through and co-produce the objects and subjects that

participate in seeing. Our task as learners in CCR15 was to listen, read, discuss and validate—or not—the varied epistemologies and ontologies of climate change presented in the course learning resources. Intra-actively witnessing them, we learned to collaboratively enact different “viewpoints” or “lenses” for knowing (with/as) climate change.

Learning to see climate change in CCR15 was enabled by both scientific and social scientific epistemologies. Witnessing through these disciplines often articulated a fairly standard Western human/climate boundary, one where humans know climate change by being somewhat separate from it and looking at it. The role of epistemologies as lenses through which we could visualise and thus know climate change is articulated in this excerpt which discusses the influence of social science on the student’s learning: “My perspective of the climate change problem has changed dramatically over the semester. I now view the problem under a whole new set of assumptions, causes and consequences. ... I now see climate change as a social justice issue.” The representational ontology enacted here echoes that of science’s objectivity achieved through spatial separation, perhaps like a microscope where climate change sits underneath the social science lens and thus becomes more clearly visible to the vertically segregated human eye, revealing climate change to be a social justice issue. As Barad argues, “objects are not already there; they emerge through specific practices” (2007, p. 157). That is, climate change’s “seeming visual self-evidence... is not simply a result of how things are independently of specific practices of seeing and other bodily engagements with the world... [but is the] result of the repetition of (culturally and historically) specific bodily performance” (Barad, 2007, p. 155). While social sciences provide a different lens to science, they do not necessarily shift the location of the lens, and can contribute to the ongoing objectification of climate change through reiteratively enacting ontological spatial separation and epistemologies of knowing through a lens, that is, of knowing mediated representations.

But in CCR15 some of us also learned to see *with* and *as* climate change due to the multidisciplinary practices of witnessing enacted. For example, referencing our collective distress towards “a world on the brink of ecological collapse,” one student stated: “maybe we are just too close to see, but our input does matter and we can make a difference.” As Haraway argues, “an optics is a politics of positioning” (1988, p. 586), and this being “too close to see” is a politico-optics of be(com)ing deeply entangled within, not standing outside, climate change. In this moment, the student sees (or does not) from Haraway’s “partial perspective” (1988, p. 583), knowing from a specific and thus limited superpositionality. Barad argues that “we do not see merely with our eyes” (2007, p. 157), and in CCR15, through different bodily engagements with the world, climate change itself became the lens, incorporated into the visual apparatus. As the following quotation articulates, some of us learned to see the world through climate change: “climate change can be the catalyst we need, a disaster response that fights inequality and builds a just economy through a common lens.” Given that “ways of seeing are ways of life” (Haraway, 1988, p. 583), this looking through climate change to interpret the world indicates a change in the articulation of human-climate boundaries, and thus, suggests significant changes in the realities that the students may be able to (co-)world.

In summary, in CCR15, our visual apparatuses for witnessing climate change were not pre-given, natural, normal, or universal. Rather, they were collaboratively composed throughout the course, via the intra-action of science, sociology, our bodies and climate change. In learning to see (with/as) climate change, we enacted varied climate-human boundaries, at times distancing ourselves, and at other times being “too close”; each superpositionality allowing varied, though always partial, knowings and possibilities for responding. This flexible witnessing—being able to see from differently entangled viewpoints and with differently composed lenses—can realise multiple climate realities.

WITNESSING DOUBLE CLIMATE REALITIES

In CCR15, some students referred to learning about climate change as “like living in *The Matrix*,” referencing the 1999 science fiction action film (Wachowski Brothers, 1999). In *The Matrix* machines have taken control of the planet and they breed human bodies to create electrical energy to power themselves. The Matrix is a computer generated simulation designed and operated by the machines which humans are plugged into so that the machines can pacify and thus farm them. In *The Matrix* (the film), after becoming aware that reality is not what it seems, the protagonist Neo is offered a choice between a red pill or a blue pill: if he chooses the blue pill, he will go back to obviously living in the Matrix (the comfortable computer simulation); if he chooses the red pill, he will find out the truth and live in the real but distressing world. Notably, only by living in reality will he be able to contribute to a better real world.

Examples comparing climate change to *The Matrix* abound in mainstream climate discourse as well. Industrial business-as-usual civilisation has been compared with the Matrix (“Damn The Matrix, n.d.”), and climate deniers compared to those in *The Matrix* who opt for the blue pill (Nuccitelli, 2017). One blogger uses the pill metaphor to ask his readers to engage with the reality of climate change (Winn, 2014) and it is also used to discuss the challenges of being concerned about climate change yet living in a society of mass climate denial which “doesn’t bear any resemblance to our felt reality” (Johnson, 2011, “Sugaring the pill” section). While this is a common metaphor, conflicting climate realities are not always explored using *The Matrix*. For example, Caldwell argues that those who believe in climate change often “feel like we are living in a parallel universe” (2010, pt. 3), a phrase that is also widely used (Eickhout & Taylor, 2016; Gilding, 2009) to explain sensations such as an “invisible force field” (G. Marshall, 2014, p. 81) separating business-as-usual society from

those who acknowledge that climate change is real and is a big deal. In line with the emotional experiences of CCR15 discussed in Chapter 7, living in these parallel universes is characterised by incomprehension at other people's climate indifference and careless carbon consumption, coupled with anxiety, stress, fear, hopelessness, anger and irritability (Caldwell, 2010).

In discussions of these parallel universes, often individual people are positioned as being either believers or deniers who witness and therefore occupy one of the realities, but not both. Yet, we can also inhabit both of these realities, expressing acceptance of climate science but living as if climate change is not happening (Norgaard, 2011b). Norgaard, whose work was included in CCR15's course readings (Norgaard, 2011a), terms this living a "double reality," and argues that this form of climate denial often arises as a psychological or emotional coping strategy when people feel too overwhelmed and incapable of taking meaningful action. Randall (2009, p. 118) suggests that these double realities are the result of what she terms "parallel narratives." This refers to social stories that suggest that while climate change is real and is bad, the bad parts will occur in an unspecified, distant future. Thus "the present continues to feel safe" (Randall, 2009, p. 119) because all potential losses are understood to be located elsewhere and/or elsewhen. The parallel story results from the desire to engage people in solutions, which has led to climate actions having been presented as hyper-palatable and involving no losses whatsoever. Randall (2009) argues that this means we tend to engage in what are basically meaningless actions, like switching off lights, rather than accepting that we may need to encounter some losses in the present in order to effectively reduce total losses over the long term. As Randall puts it, these parallel stories offer us "on the one hand, nightmare, on the other false comfort" (2009, p. 119).

Aligned with this research, in CCR15, many of us witnessed our own experiences of

inhabiting or enacting both of the double realities or parallel universes—the business-as-usual reality and also the climate-change-is-real reality that climate science and the other course learning materials asked us to witness. This following story discusses these lived experiences, and how Norgaard’s writing (co-)constituted another visual apparatus, such that the student could view themselves and witness their own cognitive dissonance:

reading Norgaard’s chapter about climate denial resonated with me—perhaps studying environmental science, eating organic sourdough, occasionally using my ‘keepcup’, and riding my bike everywhere isn’t enough? I could see myself in the characterisations she was depicting: climate change as background noise, avoiding thinking about it so as to not confront feelings of guilt and helplessness, concerned but apathetic. And yet, when she tells of public interest declining as scientific evidence mounts, I’m appalled. Like many of those in her ethnographic research, I’m able to live a ‘double reality’, where knowledge of climate change is denied in favour of maintaining the comfortable, non-confrontational status quo.

This statement demonstrates multiple forms of witnessing at work. Firstly, the student witnessed climate change through science, validating that climate change is real. Secondly, the student witnesses a social reality, the systemic denial of the scientific climate reality, which is storied in both Norgaard’s social research as well as encountered in the student’s own life. Thirdly, the student stories his witnessing and through doing so, asks for his storying to be witnessed in turn. As such, these experiences of double realities are further realised, performed into being through social sharing and acceptance. And such storying of personal witnessing was not limited to students’ assessments, but was enacted in our class discussions throughout the semester. Our respectful listening to each other enabled varied climate realities to be storied, shared, validated, and thus solidified and intensified.

DIFFRACTIVE DREAMINGS OF CLIMATE UN/REALITIES

Across the semester many of us witnessed how we performed these two climate realities in distinct, separated ways. But the intense and ongoing witnessing of climate change across the semester meant that for some of us, rather than running parallel, these two realities collided and interfered with each other. The nightmare which Randall (2009) argues we often story as occurring in the distance interrupted and contaminated everyday life in the present, producing visceral lived experiences. The following are three examples of this which were storied in CCR15:

[one day] my toast burn[ed], and I ... had an existential breakdown because I thought my charred toast was a metaphor for how the world was burning because we aren't paying attention.

Like warm, sunny winter and early spring days ... with the light glistening through young green leaves. Everyone is happy due to the nice weather. ... But knowing about climate change, you know it means someone somewhere is not getting the rain they need. I felt the warm spring weather was just an indication that the fires will be worse this summer, and that if I looked hard enough, I felt I could see the trees burning rather than shimmering. So it's sort of, you can't enjoy it, it's an uneasiness amongst the glory that everyone else seems to be celebrating.

I had a similar experience when a friend returned from overseas and we sat at the café at uni to catch up. I felt all the things my society liked, thought was good, like all the consumer products, tidiness, efficient public transport, etc—all the marks of a 'good society'—were like an enforced anti-depressant that we hadn't been told we had been given, and everyone was walking around in a capitalist induced trance, numb to the reality and unable to address our problems as we couldn't face them. I felt that the shiny-ness was a mirage, that there was a forcefield of 'shiny' that capitalism and global climate denial allowed us—coerced us—to see, but behind that, I felt an ominous sense of doom, of utter desolation. I was staring at the metal chairs, the sun reflecting off them. I felt they were so shiny. New, glossy, clean, happy-industrial-hipster chairs. But yeah, if I looked hard enough, I could see the blood dripping

from them, that their eco- and social-footprints created. I remember telling him that I was thinking this, and he looked at me as though I was a little crazy.

These three encounters might be considered *unreal*, and the narrators, the listeners and others could choose not to witness them. The trees in that park were not *really* aflame, not at that point in time. The chairs at that café were not *actually* covered in blood. The burnt toast was *just* a metaphor, an imagination, a thought, a daydream. On the other hand, they are real lived experiences. In class time, we listened respectfully to these stories, unlike the friend at the café whose expression conveyed doubt. In so doing, we collectively witnessed the storytellers' truths of their own experiences as real and valid. Sometimes this was done through sharing a story of a similar experience: storying such un/real encounters, and witnessing them, generated cascades of such encountering-storying-witnessing.

As learners engaging in pedagogical witnessing we accepted these stories without needing—or perhaps being able—to explain them. But as a researcher, I feel my methodological witnessing requires some kind of justification of how or why these otherworldly climate encounters were realised. This is because witnessing requires support or advocacy, and these stories could easily be dismissed as inexplicable and thus unreal and/or insignificant, or on the other hand, be colonised by over explanation that defers to anthropocentric understandings of such occurrences. Therefore, this section speculatively stories these unreal witnessings to make some partial posthuman sense of them. Yet posthumanism and new materialism themselves have tended to reiterate Western science's hygienic designation of “the real,” paying little attention to the invisible, spiritual, dreamlike, imaginary or soulful in their “animated” ontologies (Schaeffer, 2018; Todd, 2016). This erases Indigenous and non-Western spirited cosmologies from relational materialist accounts (Te Punga Somerville, 2016; Todd, 2016), and this failure to witness such important knowledges in climate advocacy is itself a cause of climate injustice (Birch, 2016; E.

Cameron, Mearns, & McGrath, 2015; Leduc, 2007; A. Wright, 2011). Thus, this section engages, in what can unfortunately be only an extremely limited way, with spirited Indigenous cosmologies to speculate on what might be contributing to the emergence of such un/real climate encounters. And while my speculative storying is not the only way, it usefully furthers the exploration of what witnessing climate change can or might entail.

I speculate that these experiences that were witnessed in CCR15 could be understood as diffractive dreamings. The un/real experiences in CCR15 shared a dreamlike, or nightmarish, quality. Some were actual dreams, those lively imaginations which we experience when we are asleep. For example, my paternalistic white-guilt induced nightmare which analogised my departure from Fiji during a devastating tropical depression (Ralago, 2016) as walking away from genocide. Little research exists on climate change and dreams, but enough to suggest that dreams and/or nightmares of climate change are not experiences unique to CCR15 (Gillespie, 2013; ITHYF, 2017; J. Marshall, 2011). Mostly though, these un/real experiences were more like daydreams: fantasies, visions or imaginations occurring while awake. They were also like dreams in the sense of being stories of potential futures—although largely of distressing, rather than promising, futures. However, I also use the term dreamings to allude, very loosely, to Australian Aboriginal Dreamings. For the diverse Aboriginal and Torres Strait Islander peoples of Australia, “The Dreaming” or “Dreamings” is an English term that attempts to convey their widely varied but somewhat aligned ethico-cosmo-onto-epistemologies of storied, spirited, emplaced ancestral relations with Country (Benterrak, Muecke, & Roe, 2014; Emmanouil, 2016). Somewhere between these varied meanings of “dreamings”—as elusive, spirited, emplaced, otherworldly nightmares of the future—lies a plausible and promising story of CCR15’s un/real encounters with climate change.

The dreamlike qualities of these un/real experiences are potentially evidence of diffraction at work. Barad has promoted diffraction as a methodology of allowing different disciplines to interfere with each other and then following the emergent insights (Barad, 2007, 2014). Situated within a global discourse that prioritises scientific understandings of climate change, CCR15 began with a week on climate science, and then proceeded to build on students' scientific knowledge with a social scientific approach across the semester. One of the assessment tasks was an end of semester journal, and in order to work towards that, students were encouraged across the semester to attune to what they were thinking, feeling and doing. Thus, perhaps these resulting un/real dreamings emerged due to the diffractive, i.e. transdisciplinary and multimodal, pedagogy at work which involved not just science and social science, but also lived experience.

Like dreamings, diffractions produce blurry images, where borders are elusive and indeterminacy reigns (Anker, 2017; Barad, 2007). A simple diffraction (e.g. with just two waves of light interfering with each other) can produce a pattern of alternating bands of entwined difference, such as light-dark-light-dark-light (Barad, 2007). More complex diffractions may produce less definable and interpretable patterns. In the climate un/realities witnessed in CCR15, the interference of lived climatic experiences, climate science and social science produced shimmering, indistinct, overlapping, splintered and messy images, as climate realities were super(im)posed with mass consumption and climate denial. These climate un/realities were hard to see, hidden behind the “shiny” “forcefield” or “mirage” of business-as-usual. But, as evidenced by the repeated “if I looked hard enough,” diffraction “train[ed] us to a more subtle vision” (Haraway, 2004, p. 64). Diffractive visual witnessing emerges from the non-linearity and non-separability of spacetime-matter (Barad, 2007) and produces “not effects of distance, but effects of connection, of embodiment, and of responsibility” (Haraway, 2004, p. 64). This connectedness is evident in the entanglement of

present-future, local-nonlocal and personal responsibilities in the climate un/realities, for example where the potential summer bushfires are intuited in an urban park in spring and generate uneasiness rather than celebration.

But these diffractive witnessings were not just visual but were intensely visceral and affective, affirming J. Marshall's comment that "we imagine and feel with [climate change's] images" (2011, p. 267). Perhaps the diffractive pedagogy developed a new (or emerged from a latent) visual-affective sensory apparatus. The excerpts above demonstrate what Hayward (2010, p. 577) refers to as "fingeryeyes": the synaesthetic amalgamation of seeing, feeling, sensing and touching that emerges from more-than-human encounters. With this "tentacular visibility" (2010, p. 580) "optical groping, or tactful eyes, haptically and visually orient the sensual body across mediums" (2010, p. 582). Statements such as "I felt I could see," "I felt they were so shiny," and "everyone was...numb to the reality and unable to address our problems as we couldn't face them" suggest this diffraction of "seeing through touching" (Hayward, 2010, p. 582) as the "ripples of investigation" (2010, p. 580) in our climate change class collided with the world.

Potentially this diffractive "haptic-optic" (Hayward, 2010, p. 580) of "distributed sensuousness" (Hayward, 2010, p. 582) emerged through our engagement in what Neimanis (2015, 2017, 2018) calls posthuman phenomenology. Posthuman phenomenology understands human embodiment to always be distributed and more-than-human, yet unequivocally *lived* (Neimanis, 2017, p. 26 & 30). Posthuman phenomenology is a practice of attuning to this dispersed embodied experience (Neimanis, 2017). This witnessing allows us to "join with another, to see together without claiming to be another" (Haraway, 1988, p. 586). Working with the sciences, arts, and attention to personally embodied experience, a posthuman practice of phenomenology allows us to better witness some of those ecological

processes that we are part of and which compose us but which are typically incomprehensible in standard (Western) human scales of time and space. These amplified capacities might reveal or enact uncanny experiences such as those of CCR15 discussed here, those that

might otherwise be too submerged, too subcutaneous, too repressed, or too large and distant (or even too obvious, mundane, and taken for granted), to readily sense: a drought experienced at the back of a parched throat, a fishy ancestor swimming up my unfolding vertebrate body, a glacier melting felt in my gut. (Neimanis, 2017, p. 55)

Seeing Planet Earth afire during one's breakfast routine speaks to this capacity of diffractively engaging science, social science, arts, activism, and lived experience to materialise such visual-affective encounters of "the more-than-human scales of planetary distresses" (Neimanis, 2017, p. 42). That is, these multidisciplinary, multimodal and multisensory practices of witnessing climate change may interpermeate each other, collectively realising such embodied, situated, dreamlike climate realities.

But transgressing the mind/matter binary requires not just recognising that human minds are materially and ecologically generated, but that all matter is minded, sentient, psychic or subjective (Mathews, 2003). If we in the West are to move beyond understanding the non-human world as, at best, a set of living natural resources to be extracted for our use, then we must stop presuming that we know what something is and can do in advance of encountering and becoming with it (Reinert, 2016). We must open ourselves to witnessing animist ontologies that "subjectify the universe" (Le Guin, cited in Reinert, 2016, p. 114), because seeing "the world as coding trickster with whom we must learn to converse" (Haraway, 1988, p. 595) can be a strategy for sustainability. For these reasons, I now move beyond where new materialist and posthuman theories of liveliness and vitality typically wander, into the spirited terrain of Indigenous cosmologies of Country and Dreaming.

I speculate that our climate un/realities were not just the achievement of human body-

minds attuning to climate change, but Climate Country actively calling out to us in distress. Every Indigenous culture, ontology and epistemology differs and generalising across them risks appropriation, homogenisation, stereotyping, reductionism and tokenism (Todd, 2016). Acknowledging this trouble, my purpose here is not to attempt a thorough exploration and discussion of Aboriginal and Indigenous cosmologies or of Westerners' in/abilities to engage with them, but to speculate briefly as an opening. My methodological witnessing does not claim full, thorough and resolved understanding of these un/real climate dreamings, but simply an alignment with such possibilities.

Country is an Australian Aboriginal English word that refers to spirited place, law, family and kin, ecological relations, and identity (Burarrwanga et al., 2013; Emmanouil, 2016; Rose, 1996). Country is understood as a subject: Country thinks, feels, speaks, knows, cares, desires, lives and provides life, has a past and a future, its own imperatives, and is capable of self-reflection (Benterrak et al., 2014; Bessarab, 2008; Burarrwanga et al., 2013; Rose, 1996, 2004). For Aboriginal and Torres Strait Islanders, Country can include Sky Country and Sea Country (Rose, 1996). Among the multiple beings that compose Country, Dreamings play an important role. Dreamings are the more-than-human spirits that live in, as and with Country, the stories about them *and* the practices of telling and living these stories (Benterrak et al., 2014; Emmanouil, 2016; Mowaljarlai & Malnic, 2015; Roe & Muecke, 1983). Dreamings exist in (non-linear) past, present and future and they guide law, kin, culture and ceremony (Benterrak et al., 2014; Emmanouil, 2016; Mowaljarlai & Malnic, 2015; Roe & Muecke, 1983). It is people's responsibility to care for Country, which "doesn't mean engineering it" (Rose, 2013, p. 9) but involves speaking and singing to Country and living (with) Dreamings (Emmanouil, 2016; Rose, 1996).

Being of and with Country requires attunement and openness to Country's diverse

modes of speaking to and relating with us (Black, 2010; Emmanouil, 2016). While tens of thousands of years of intergenerational relations composed Country and family, and kin relations enculturate people into relation with Country, biological inheritance of region-specific human genetics is not a requisite for communicating with Country (Roe & Muecke, 1983; Schaeffer, 2018). Rather, a committed practice of embodied, spiritual attunement to Country's possibilities, even for non-Indigenous people, can allow Country to be heard (Anker, 2017; Emmanouil, 2016; Woollorton, Collard, & Horwitz, 2017). Which is not to suggest that cultural and biological heritage play no role in our abilities to communicate with Country, but that these are not the sole defining factors, and, further, Country exerts effort and makes itself felt: it is not just human agency at work when Country speaks to us.

My speculation-as-witnessing is that, possibly, the climate un/realities experienced in CCR15 could be understood as Climate Country calling to us, expressing its distress and asking that we care for it. This storying requires a speculative melding of Western climate science, Australian Aboriginal and Torres Strait Islander understandings of Country and other spirited Indigenous ontologies. Country is usually a somewhat regionally situated subject. But Countries can communicate with other each across territories including through weather (Burarrwanga et al, cited in S. Wright et al., 2012, p. 55), and spirit matters are not spatially bounded (Schaeffer, 2018), as the Inuit *Sila* evidences. *Sila* is often translated into English as climate or weather, but is actually much more than this Western understanding of atmospheric temperature, pressure and humidity (E. Cameron et al., 2015). *Sila* is more fully a "raw life force that lay[s] over the entire Land; that [can] be felt as air, seen as the sky, and lived as breath" (Qitsualik cited in Todd, 2016, p. 5), giving *Sila* "intellectual, biological, psychological, environmental, locational, and geographical dimensions" (Qitsualik, 2013, p. 29). A complex and diverse "super-concept" (Qitsualik, 2013, p. 29), *Sila* is also associated with knowledge or wisdom (Leduc, 2007). Such diverse Indigenous understandings of

climate-worlds can help us conceptualise climate as a sentient commons (Todd, 2016) or a spiritual force (Leduc, 2007), which I tentatively term Climate Country.

Possibly, the diffractive un/realities that we encountered, witnessed and storied in CCR15 were Dreamings of Climate Country. Traumatic experiences can provide openings to the spiritual (Schaeffer, 2018), and climate change is a “geo-trauma” (Rousell et al., 2017, p. 659) of unfathomable scales. Perhaps our diffractive, phenomenological pedagogy, involving and emerging between Western science, social science, and embodied personal experience provided the “participatory and embodied pattern thinking” (Anker, 2017, p. 206) which enabled us to feel “multidimensional beings and space/times of the past-present-future ... in one moment and in one place” (Schaeffer, 2018, p. 1006). These climate un/realities appeared to manifest themselves in times when our logical, focused selves were relaxed—such as walking in parks, chatting with friends about travel, or engaging in routine tasks that tend not to require too much focused thinking, such as making toast. In such circumstances, our ability to think more relationally is potentially amplified (or less repressed) (Anker, 2017), and this may have enabled us to “surrender the safety of rational thinking” and become “vulnerable to other embodiments of visioning” (Schaeffer, 2018, p. 1007). But, it is not just human attentiveness that generates such paranormal experiences; the point is that Climate Country and its Dreamings make themselves heard, seen or felt. It is not just humans that tell or listen to stories (S. Wright et al., 2012), and it is feasible to consider that Dreamings of diverse Countries, Sila, and other spirit matters (Schaeffer, 2018) were uniting to story their distress and ask us to witness it. We can consider CCR15’s “animist stories [to] express a truth of a participatory consciousness, in which spirits are a phenomenon produced by the interaction of human minds with other self-organising properties of the world” (Anker, 2017, p. 194).

Such speculative witnessing helps make some partial sense of our diffractive

dreamings of climate un/realities in CCR15. The condensations of past-present-future and local-global in CCR15's stories of tsunamis overshadowing us, burning tree leaves glimpsed on warm winter days, and metallic chairs seeping blood speak to these paranormal, un/real, nightmarish Dreamings interrupting our sanitised modern ontologies and comfortable business-as-usual realities. This includes my own experience of dry retching in the shower one night for an hour. In his discussion of Sila as climate-breath-spirit-wisdom, Leduc (2007) informs us that even in Latin the etymology of *respiration* is spirit. Respiration—of plants, bacteria, animals, fungi—is a fundamental climatic process, and for humans, it is the respiratory muscles that are involved in vomiting. Following years of learning and teaching about climate change, knowing climate change materialised as trauma-induced contractions of my respiratory muscles, which I described at the time as trying to “spew up a demon.” This was potentially a Dreaming of Climate Country, the geo-traumas of Sila (as climate-breath-spirit-wisdom) being forcefully expelled from my body.

Witnessing climate change generates or reaffirms particular climate ontologies and epistemologies. In CCR15 we collectively witnessed scientific, social scientific, and embodied personal stories of climate change for at least the twelve weeks of the course. This lead to multiple climate realities being realised, including those that could be considered dreamings (as nightmares, aspirations, daydreams or spirit matters). That is, through this multidisciplinary and multisensory witnessing we enacted multiple climate ontologies and epistemologies. For some, this multimodal witnessing led to the explicit interrogation of science as a legitimate epistemology for witnessing climate change.

SCIENCE AS DENIAL?

As discussed throughout this chapter, across the semester in CCR15 we engaged with climate change through multiple disciplines and through embodied experience. This included witnessing our own and others'—including each other's—emotional and affective encounters with climate change, such as the nightmarish un/realities discussed above. This diffractive pedagogy enabled us, as Latour argues, to become more sensitive to difference and to add articulations of reality to our understanding of climate change (2004). However, this diffractive pedagogy of witnessing multiple climate realities did more than just validate additional epistemologies, as the following two excerpts collectively articulate:

What I thought we would be learning at the start of this course was better communication of science. Rather ... we need to think harder about how and what we communicate. ... How can we connect on that emotional level? How do we get [people] to understand that we are scared too, and that they are not alone? ... In fact, my initial understanding—that science was the way to communicate about climate change—is a form of socio-psychological denial.

[Before taking this course, I had] subconsciously begun to consider my science work ... as 'real work', and begun to devalue the social sciences. ... My thought process was pretty narrow-minded: 'We don't have time for this! Climate change is happening right now! Let's do the science and get this thing solved!' Of course, we have 'done the science' and are continuing to do the science. ... I may have been using the unemotional, disinterested framework of science as a way of shielding myself from the sheer terror of climate change. ... Science's claims of objectivity in regards to climate change reporting can be overly-limiting or simply untrue. ... Climate science has been particularly ignorant to the social context. ... And a lack of social awareness is a huge problem: our knowledges and ignorances about climate change will impact who will live and who will die.

Reading these two stories together, an entangled voice emerges that troubles the assumption that climate science is oppositional to and a productive antidote to climate denial. These stories demonstrate that science is not the only epistemology that can disclose the truth

of (i.e. witness) climate change. Indeed, if deployed exclusively, the “unemotional, disinterested” form of witnessing that science enacts can form a “shield” that precludes people from “connecting” through realising that we are all “scared” of the “sheer terror” of climate change, and that they are “not alone.” In CCR15, our reiterative multidisciplinary and interpersonal witnessings diffracted climate science and climate denial through each other such that patterns of denial became visible within the previously unblemished realm of science. As these students articulate, scientific epistemologies—or over reliance on them—can “limit,” “ignore” or “deny” embodied emotional experiences of climate change as well as the socially distributed causes and impacts of climate change. While science catalysed and facilitated our multidisciplinary, embodied climate encounters, CCR15’s diffractive pedagogy disclosed phenomena that climate science could not fully interpret or respond to, such as the un/real dreamings discussed above. Thus, across the semester, climate science itself was reconfigured, from a value-neutral epistemology providing objective and full knowledge, to a limited and even hegemonic one. Witnessing climate change, thus, does not just validate and legitimate epistemology after epistemology: it is a practice of critically interrogating ways of knowing reality and selectively aligning with, and/or refining, those that enable desirable response-abilities.

CONCLUSION

Witnessing climate change is an intra-action which, at its heart, is about how we understand climate change. Which knowledges, truths, epistemologies and/or stories of climate change are validated perform particular climate realities, experiences, ontologies and/or cosmologies into becoming. This makes witnessing climate change—whether pedagogically or methodologically—an ethico-onto-epistemological practice, as Barad (2007) would put it: involving the entanglement of knowledge, world, and ethics. As such,

witnessing is a practice that emerges through intra-actions, and constitutes particular forms of climate (ir)response-ability.

In CCR15 multiple climate realities were witnessed: scientific, social scientific, and affective realities, as well as intensely nightmarish “diffractive dreamings.” Through a semester of engagement in multidisciplinary, multisensory and multimodal witnessings, new sensory capacities were generated, providing us the “ability to feel what we cannot see” (Schaeffer, 2018, p. 1020) or to see-feel (Hayward, 2010) climate change from varying view-and-touch-points. At times we were able to see-feel climate change, at others climate change became the apparatus through which we were able to see-feel alternative futures. In this way, witnessing was a diffractive practice: it both emerged as an important but unanticipated action (a *diffraction*), and it generated intrasectional differentiations in ourselves, our knowledges, and the climate worlds we participated in and inhabited. Our un/real experiences of climate change in CCR15 are examples of “part of the universe making itself intelligible” (Barad, 2007, p. 176) to us; that is, they are examples of us acting-with and knowing-as climate change. As such, while attempting to witness these, we must “meet the universe halfway” (Barad, 2007), accepting that climate change will always exceed our abilities to fully know, understand, or explain it.

In Chapter 7, I discussed how our neoliberal, modern response-abilities were decomposed through the encounters we had with climate change. In this chapter, I have discussed how our multidisciplinary, multimodal and multisensory witnessings of climate change enabled us to enact diverse and otherwise imperceptible climate realities. Haraway contends that “valid witness depends ... on nurturing and acknowledging alliances with a lively array of others, who are like and unlike, human and not, inside and outside what have been the defended boundaries of hegemonic selves and powerful places” (1997, p. 269).

Relatedly, Gillespie argues that witnessing painful and/or “unreal” climate dreamings like we did in CCR15 can enable the “finding and telling new stories about self, society and the world” (2013, p. 344). In Chapter 9 I discuss how our reiterative mutual witnessings in CCR15 enabled students to tell stories about the emergence of a more-than-human collective, thus attending to the recomposed climate response-abilities that emerged in CCR15.

9. STORYING RECOMPOSED CLIMATE RESPONSE-ABILITIES

INTRODUCTION

The stories we tell are powerful contributors to the becoming of our shared world. ... Telling stories has consequences, one of which is that we will inevitably be drawn into new connections and, with them, new accountabilities and obligations. ... Stories are opportunities to test and explore different modes of responsiveness, to ‘learn to be affected’ in new ways, to cultivate the intellectual, emotional, and critical capacities necessary to recognize our own implication in the world, the consequences of our actions, and possibilities for other kinds of futures. (van Dooren & Rose, 2016, pp. 89–90)

In CCR15 climate change materialised as an affective atmosphere, as we encountered, witnessed and storied climate change and performed a wide range of uncontainable emotional and affective responses. The distress experienced through intra-action with climate change produced dis-identification (Braidotti, 2013) with anthropocentric subjectivities and disablement of neoliberal climate response-abilities. The decomposing and painful affects were entangled with the practice of hoping. We witnessed each other’s stories of our climate encounters, validating emergent climate epistemologies and ontologies that may have otherwise been erased, ignored or undermined. As Chapter 7 discussed, these labours of bearing worlds co-emerged with connections with other humans.

This chapter attends in more detail to the form and kind of recomposed climate response-abilities that emerged and in so doing, furthers the exploration of storying as a pedagogical intra-action. The chapter begins with moments in CCR15 where students storied their experiences of the class as being a therapeutic safe space which allowed a kind of group to form. This exploration affords attention to the intra-activity of storying climate change. Given the capacity of storying to generate new ways of relating and the urgency of such

possibilities (McKenzie, Hart, Bai, & Jickling, 2009), I then augment and elaborate on students' stories. I propose that our collective practices of encountering, witnessing and storying did not unfold "in" a "safe space", but emerged from and co-composed an affective-atmospheric refuge. This was not an escape from climate change but one that encouraged engagement with, rather than immunity from, climate change complicity and vulnerability. I discuss how the affective-atmospheric refuge did not provide therapy as such, but did enable us to bear worlds, or "stay with the trouble" as Haraway (2016) puts it, and thus to partially recuperate and recompose ourselves (Haraway, 2016). This included the composition of a "cloudy collective", a nebulous, moody and ephemeral more-than-human entanglement that was capable of forming and emerging from affective-atmospheric refuges. The capacity to compose affective-atmospheric refuges thus became a "viral response-ability" (Haraway, 2016, p. 114), as the cloudy collective carried the practice beyond the classroom.

STORYING CLIMATE INTRA-ACTIONS IN CCR15

Storying is the production of narratives about experiences (McKenzie & Bieler, 2016). Storying connects occurrences in socially comprehensible ways, which means that elements of established ontologies, epistemologies and social templates or scripts are reproduced so that the story is understandable and meaningful (Black, 2010; McKenzie & Bieler, 2016). Yet storying can also rework such ontologies, epistemologies and/or scripts, becoming a generative practice (McKenzie & Bieler, 2016; van Dooren et al., 2016). As an intra-action, storying is achieved through acting-with: that is, stories do not belong to autonomous individual subjects but emerge from entangled, more-than-human voices (Mazzei, 2016; Mazzei & Jackson, 2016). Storying is also performative, and diffractive: rather than accurately and neutrally describing an experience objectively, such as through reflective distance, storying is a *doing* that intervenes in the world (Jackson & Mazzei, 2008;

Reinert, 2016; St. Pierre, 2008). It therefore brings subjects, worlds, relationships and knowledges into be(com)ing (Haraway, 2016; van Dooren et al., 2016). In this sense, storying is intrasectional: through acting-with social scripts and emergent phenomena, the subject storying and being storied emerges differently (McKenzie & Bieler, 2016). In CCR15, we reiteratively and intra-actively encountered climate change materialising as weather and climatic events, graphs, literature, imagery, and personal experiences. We witnessed and storied these encounters, and in turn, encountered, witnessed and storied these experiences, in a looping, webbed cascade of encountering-witnessing-storying.

The stories of intra-acting with climate change that emerged in CCR15 can be understood to emerge from entangled voices—voices that emerge not from a unified collective, but from individuals who are always becoming-with others and who are therefore perpetually re- and de- individuated. During class in week 3 where we had encountered, witnessed and storied climate change, one student stated “there is not enough space to talk about how climate change makes you feel, and I think that’s important. If scepticism is embedded in our national identity, we almost need climate change therapy.” Following that class, another emailed me and said “I’m so glad I changed into this class—its more of a climate change therapy group than a university subject.” Both students are engaged here in storying, and the stories are not isolated or attributable just to the individuals, rather, they emerged from an entangled voice. This is perhaps best demonstrated by the notion of “therapy” cited in these two stories which are enabled to emerge through acting-with particular situated socio-economic-political contexts and discourses. “Therapy” is a practice aiming to provide emotional, psychological and/or mental wellbeing. It is typically provided by a professional psychologist and engaged by those in the middle and upper classes (Seaman, 2016), and within these economic boundaries, therapy has become a mainstream concept. These lay or pop culture understandings of therapy—such as requiring a “safe

space” (Seaman, 2016, p. 15) where people can uncover, identify, acknowledge, disclose, share and validate the painful emotions they experience (Hasbach, 2015; Lomas, 2014; Michaels, n.d.; Randall, 2005; Seaman, 2016)—are part of what enabled students to perform stories of “climate change therapy.”

Stories are always situated, and they both reproduce and reconfigure possibilities. As such, there were also other elements that participated in the entangled voices of CCR15, enabling the particular statements to emerge. The first narrative which stated that “we almost need climate change therapy” had emerged through citing earlier statements generated in class regarding emotional responses to climate change, climate denial, Australia’s national identity and culture, and coal. Those statements had in turn been enabled by the history of colonisation, convicts and capitalist resource extraction in Australia, course learning resources, and the fossil fuel industry’s funding of climate misinformation, for example. The emergent story synthesised these ideas: it reproduced the earlier insights, but connected them in a novel way, generating a slightly different template of human-climate relations, one where emotions, epistemologies, and nationalism come to require psychoanalytic interventions. This statement thus performs promising possibilities, opening opportunities for diffractive climate-human intra-actions—therapeutic ones—to emerge. The story in the subsequent email emerged from all of these relations, reproducing the notion of climate change therapy which had been developed in class, but this time generatively articulating the idea that climate change therapy was not just a possibility, but something we were already engaging in.

Storying is therefore a performative doing which interferes with the world. Emerging from these conditions and similarly storying their experience of the class as providing therapeutic benefits, at the end of the semester one student wrote: “Being in a classroom full of the people who are going to be having to change the world and just hearing how scared

and tired other people really are was really cathartic.” This narration of prior events is not (just) an objective reflection on the past from temporal distance, but a diffractive intervention, re-enacting and re-enlivening the past. This storying acts on the present and the future: rather than suggesting that the students might or even will be able to change the world if they so desire, which is a more common script, this is now a non-negotiable eventuality. Instead of people choosing or not choosing actions, the actions are thrust upon people. In this sense, the storying both reproduces elements of existing climate-human discourses but also slightly reworks them. And while “changing the world” is the most obvious mention of climate actions, hearing about other students’ fear and tiredness became an important diffraction. Performing and listening to stories of fear and tiredness are not actions that typically appear on lists of “things you can do about climate change.” Storying affective climate encounters and witnessing these stories were therefore not standard or anticipated forms of climate action, but they were clearly important to this student—as evident in the repeated use of “really.” These different actions generated relief and a sense of soothing, acting on the student and producing difference. He became differently affected and differently connected, now part of a group of scared and tired people who will go on to change the world.

Similarly producing a story of a kind of unified collective emerging in the class, the following story was a response to the anonymous end of semester feedback question “what are the best aspects of this course?”

I really valued the ferocious intensity of information that was shared with us. Wednesday became my favourite day because of this subject. A group formed to discuss the challenging aspects of each lecture and this was continued in the tutorial classes. I appreciated that we were dealing with ethically challenging topics, it became as much of a philosophical class about life’s most challenging questions, a platform for deeper thinking, ideas and discussion

with like-minded people. We had the tutorial and each other to help guide our understandings and relationship with climate change. The class felt like a home for ideas and discussions.

Again this statement is an example of storying, and this storying is intra-active. The statement emerges from an entangled voice, that is, it is produced through acting-with. The statement emerges from the intra-action of the course information, the other students and the tutorial which collectively provided the experiences that are narrated. As was argued in Chapters 5, 7, and 8, the course information, the other students and the tutorial are all *part of* the worldly set of relationships that compose climate change (Knox, 2015; Neimanis & Walker, 2013; Rousell et al., 2017), collectively materialising as and co-composing an affective atmosphere (B. Anderson, 2009). These more-than-human forces act-with each other as a distributed subject who is enabled to write these words. Further, this entangled voice is not just produced by, but also produces the collective subject. The story names “like-minded people” who formed a “group,” an “us” and a “we” that guided “our” understandings of climate change. This collective is storied as positive and beneficial, and throughout the story the boundaries of the self dissolve as it becomes more integrated with a collective. The story therefore solidifies what may have otherwise been a less tangible collective, bringing different relations and subjectivities into being.

Due to such intrasectional capacities to reconfigure subjectivities, storying therefore is not politically neutral or equally accessible to all. The above two stories present the witnessing and storying of affective climate encounters as largely positive occurrences. By contrast, the following story is more ambiguous:

During the course, I felt scared and overwhelmed or emotional and didn't know how to explain the importance of the issue or speak about it. ... From being absolutely motivated and inspired to wanting to shut myself away from the world and everything in between. ... This class has given me hope, as everyone was so open and happy to share, while I have had a strong feeling of anxiety during this course as I feel everyone is so smart, powerful and

brilliant and I'm sometimes too anxious to speak. I think this is a result of how emotional this subject and course material truly is.

While the earlier quotes story the classroom as feeling like “home,” a place that feels safe, helpful, favoured and appreciated (Gottzén & Sandberg, 2017), this story demonstrates that such safety is always “angled” (Ahmed, 2010, 2014). Publicly storying affective encounters with climate change may feel safe for one individuated experience while being exclusive and alienating for others. The student's storying indicates that she still found listening to others' stories generative of hope, but did not always feel able to engage in her own verbal storying, due to her individual characteristics and context. She was left feeling less “smart, powerful and brilliant” than others due to being disabled by overwhelming emotions. Her storying collates her experiences and ideas and organises them into a comprehensible ontology, one where climate change causes particular emotional responses in her. This generates her insight that climate change is a very emotional phenomenon, evidence of the pedagogical capacity of storying to generate learning.

The angled (Ahmed, 2010, 2014) nature of storying was also discussed by one (presumably woman-identifying) student in the anonymous end of semester feedback, in response to the question “what parts of this course are most in need of improvement?”:

I noticed in a few tutes that only the guys in the class were speaking. About 5 guys would speak in a row and take up quite a bit of ‘space.’ I think this is a product of a wider societal problem where women's opinions are less valued and women often do not feel confident enough to voice their opinion. A lot of people need a few seconds of silence before they are comfortable to say something.

This story directly articulates the important point that storying climate change emerges with and reconfigures subjectivities and the hierarchies they are entangled with. This student's narration of storying and being witnessed (validated, valued) as practices that are

distributed along gender binaries, but do not have to be, re-enacts the gender binary in order that it may be undone. It speaks to the intrasectional ways that gender is made and unmade, reproduced and reworked in partnership with climate change. While (some of) the men may have engaged in the supposedly feminine practices of emotional interrogation and disclosure (Bray et al., 2018; Brown & Pickerill, 2009; Norgaard, 2011b), their storying continued to receive more attention than women's, as is typical in university classes (Sadker & Sadker, 2010; Sandler, 1996). As their teacher, I was enrolled as their most responsible witness and their emotional storying demanded significant affective labour from my feminised body, reproducing existing gendered economic patterns (Brown & Pickerill, 2009; Gannon et al., 2016; Lloro-Bidart & Semenko, 2017) as I patiently and encouragingly attended to their concerns. In these ways, storying climate change was intrasectional, generating emergent superpositionality in partnership with gendered social norms and practices.

In sum, in CCR15 we reiteratively encountered, witnessed and storied climate change, collectively reproducing and emerging from the affective atmospheres of climate change. Students storied these intra-actions as being like therapy or being cathartic. Such storying emerged from entangled voices: mainstream conceptualisations of “therapy,” climate change's affective agency and course information and other students enabled these stories to emerge. The stories were performative acts, reproducing but also regenerating subjectivities, hierarchies and relationships. These stories produced generative “templates,” promising possibilities for intra-acting differently. Yet these stories retain some anthropocentric elements. In what follows I posthumanise these stories in order to further demonstrate the intra-active capacities of storying, and to offer a less anthropocentric account of our collective efforts to bear worlds.

AFFECTIVE-ATMOSPHERIC REFUGE

From the literature and the entangled statements from CCR15 already cited, climate change “therapy” is said to require “enough space” and this space needs to be a “safe space” (Seaman, 2016, p. 15), one accessible for all to participate in encountering, witnessing and storying climate change. Along similar lines, Haraway argues that refuges are necessary if we are to “render each other capable” (2016, p. 8) of cultivating that something we might loosely term “sustainability”:

One way to live and die well as mortal critters ... is to join forces to reconstitute refuges, to make possible partial and robust biological-cultural-political-technological recuperation and recomposition. ... Maybe, but only maybe, and only with intense commitment and collaborative work and play with other terrans, flourishing for rich multispecies assemblages that include people will be possible. (Haraway, 2016, p. 101)

But the idea that bodies are situated in pre-given spaces implies a firm body/environment boundary and a passive environment (Barad, 2007). Haraway argues that “we *must* change the story” (2016, p. 40, italics in original) away from such anthropocentric accounts.

Drawing on the understanding of climate change as an affective atmosphere enables a posthuman storying of the “space” of “therapy” as a performatively enacted affective-atmospheric refuge. In CCR15 our practices of encountering, witnessing and storying climate change co-composed an affective atmosphere *with* climate change and the classroom, and this decomposed existing neoliberal subjectivities and agencies. However, these same practices were storied by students as feeling beneficial and being related to the formation of a kind of group. That is, the affective atmosphere that emanated from and radiated through our bodies (B. Anderson, 2009) did not just generate painful emotions and decompose subjectivities, but it also co-emerged with more soothing emotions and new collective subjectivities. This is the

joining forces and partial recuperation of refuge (Haraway, 2016), but the forces that were joining together in CCR15 were not just capacities, powers or abilities, but also affective intensities.

I argue it was this dynamic, collectively produced affective atmosphere, rather than the classroom as an independent and permanent physical space, which constituted the refuge (Gottzén & Sandberg, 2017; Lupton, 2017) and enabled students to experience and perform stories of therapeutic benefits or sensations. And as discussed across this thesis, affective atmospheres emerge from, circulate around, and diffuse across human and more-than-human bodies (B. Anderson, 2009), and can compose “little worlds” of “attachments and detachments, differences and indifferences, losses and proliferating possibilities” (Stewart, 2011, pp. 448–449). Thus, the human bodies did not arrive into a pre-established safe space but became performers and products of affective-atmospheric refuge. It was not the room itself, but the fact that it was “full of the people who are going to be having to change the world” who were all “so open and happy to share” how “scared and tired” they were which made the class feel “like a home for ideas and discussions,” provided catharsis and generated sensations of hope. Further, specific timings participated in the establishment of the affective refuge, such as the gap between the lecture and the tutorial which enabled a “group” to form and engage in encountering, witnessing and storying the “ethically challenging” issue of climate change outside the classroom. And times of silence—and more of them—were required in order for all the bodies to be able to feel comfortable and confident enough to be moved into the therapeutic practice of storying. Temporalities thus were entangled with the formation of specific affective states, as the statement that “Wednesday became my favourite day because of this subject” suggests.

Finally, it must be emphasised that climate change was the defining participant in the

affective-atmospheric refuge. Words, images and ideas contribute to affective atmospheres as much as bodies, conditions, and events do (Ahmed, 2014; Cunsolo Willox, 2012). In CCR15 the “ferocious intensity of information” about climate change provided in course materials meant we had to engage with “life’s most challenging questions.” Such information included theories and examples (stories) from disaster and emergency management and images of the kinds of refuge that are more commonly associated with climate change, such as a dam during bush fires (see e.g. Figure 3 p. 151) and a sports stadium following a hurricane. It was the affective intensity that emerged through encountering climate change in these ways which put us in “fiery moods” and made us feel so “scared,” “overwhelmed” and “anxious.” The sharing of and listening to these painful emotions that climate change made us feel is what constituted the therapeutic and cathartic experiences. Thus, the refuge emerged in between and through our climate changed bodies and our ongoing intra-actions with/as climate change.

Therefore, it is not that we entered into a pre-existing safe space and then conducted therapy in it. Rather, an affective atmosphere was generated by our bodies intra-acting with climate change and the specific spatial and temporal arrangements of CCR15. That is, our pedagogical practices of encountering, witnessing and storying climate change performed an affective atmosphere, and this atmosphere—the affective forces emanating from, radiating around, and reconfiguring us—constituted and iteratively reconfigured the refuge (Gottzén & Sandberg, 2017).

STAYING WITH THE TROUBLE

Understanding refuge as an affective atmosphere composed with and as part of climate change also helps trouble the notions of therapy and safety that underpinned the students' stories of their positive and beneficial experiences in CCR15. For Haraway (2016), refuge enables recomposition and partial recuperation. Refuge is not easy or gratifying, it is an unsettling, a movement, both rejuvenating but disconcerting. This emphasis on regeneration (giving life to emergent difference) rather than restoration (returning to a pre-given state) is somewhat different to notions of therapy which often idealistically emphasise healing, wholeness and the finding of our true selves (Michaels, n.d.; Seaman, 2016). I find Haraway's concept of refuge more apt for storying CCR15 as its emphasis on recomposition and recuperation is more intra-active (performative, posthuman and diffractive) than the potentially romantic idea of therapy. Understood as an affective atmosphere, refuge also avoids the allusion to diagnosis and treatment that therapy can risk and keeps the focus on the practices of encountering, witnessing and storying of climate change which we enacted in CCR15.

Most significantly, unlike therapy, refuge is not about safety but about what Haraway (2016) terms "staying with the trouble." In our case, staying with the trouble means that CCR15's refuge had to acknowledge and stay with our complicity in historical and ongoing fossil fuel extraction and the injustices and hierarchies that enable and emerge from this. Further, this meant we had to stay with the fear and distress of living in changed climates. Affective-atmospheric refuge was not (and could not ever be) an escape from climate change, because it was composed *of* and *with* climate change. The affective-atmospheric refuge was often enacted in our climate controlled classroom, which meant it was a climatic refuge in one sense (Adey, 2018). But the carbon footprint of this air-conditioned space contributed to

the ongoing warming of the planet, meaning that any momentary meteorological refuge only displaced our climatic vulnerability elsewhere and elsewhen. Further, the meteorological components of our affective-atmospheric refuge traversed temporal and spatial scales far exceeding the bounds of this “thermal enclosure” (Rickards & Oppermann, 2018, p. 4), as future potential climates and past extreme weather events affectively permeated our classroom. Therefore, our affective-atmospheric refuge could not “fix” climate change or make our complicity or vulnerability go away, but it did help us identify and face up to these challenges, as storied in Chapters 6, 7 and 8. Thus, CCR15 was not “climate change therapy” conducted “in” a “safe space,” and it certainly was not a refuge with closed borders. Rather, through bearing worlds we collectively performed affective-atmospheric refuge, an entangled and porous microcosm where partial healing was possible, but not guaranteed.

And this is part of the exciting potential of the pedagogical intra-actions of encountering, storying and witnessing climate change: through composing affective-atmospheric refuge, they enabled us to stay with the trouble and become climate response-able. As Haraway argues, we need:

on-the-ground collectives capable of inventing new practices of imagination, resistance, revolt, repair, and mourning, and of living and dying well [that] remind us that the established disorder is not necessary; another world is not only urgently needed, it is possible, but not if we are ensorcelled in despair, cynicism or optimism. (2016, p. 51)

It is the cultivation of the capacities for resistance and revolt that make affective-atmospheric refuging in middle class contexts a promising practice. Our need in CCR15 for refuge pales in comparison to that of human and more-than-human others around the world historically, now, and in the future. Yet, we must not see affective-atmospheric refuge as just a luxury for already privileged people. Rather, the existence of affective-atmospheric refuge indicates climate response-abilities are at work. Composing affective-atmospheric refuge emerges

from response-abilities, and once composed, affective-atmospheric refuge enables ongoing climate response-ability. This is because affective-atmospheric refuge does not just soothe, but also activates us, so that we can more effectively and consistently mitigate and adapt to climate change and thus create more ecologically just worlds (Brown & Pickerill, 2009). As McKenzie and Bieler (2016) argue, establishing and maintaining critical solidarities is essential if we are to effectively resist and reconfigure dominant social norms and practices. Thus, the capacities to perform affective-atmospheric refuge—e.g. by storying and witnessing affective climate encounters—are important climate actions, and with their co-emergent collective subjectivities compose novel climate response-abilities.

Affective-atmospheric refuging was an important climate diffraction, and it did indeed enable us to stay with the trouble and to bear worlds in CCR15. The following students' end of semester stories attest to affective activation emerging through engagement with climate vulnerability and complicity:

I now see climate change as a social justice issue, with a massive array of causes and consequences. Yet instead of this truth overwhelming me with fear and dismay, I see an opportunity to take part in humanity's most comprehensive attitude and social responsibility shift.

I have developed an understanding that climate change really can be an opportunity for justice reparations, and that it can be thought of as an intellectual resource rather than an insurmountable problem. The final lecture made me feel genuinely inspired about collective humanity, ... made me cry and gave me a kick in the arse to get politically active.

These attest to the recomposition and regeneration that affective-atmospheric refuge enables: these students are not fully healed, they are not returning to a pre-traumatic state, but are regenerating into an active, collectively-connected and thus response-able subject. This response-ability emerges through the continued engagement with the “massive array of

causes and consequences” of climate change, as this complicity and vulnerability becomes a “resource” and an “opportunity” “rather than an insurmountable problem.” Recomposed, partially recuperated subjectivities that are not “ensorcelled in despair, cynicism or optimism” and which can engage in “new practices of imagination, resistance, revolt, repair, and mourning” (Haraway, 2016, p. 51) are emerging. That is, in CCR15 the composition of affective-atmospheric refuge through grieving-with others (Haraway, 2016) catalysed and sustained collective climate response-abilities (Cunsolo Willox, 2012; Divakaran & Nerbonne, 2017; Roelvink, 2010; Singh, 2013).

A CLOUDY COLLECTIVE

Towards the end of CCR15, students storied the formation of some kind of “group.” This section works with these articulations to explore what kind of collective subjectivity enacted and emerged from the affective-atmospheric refuge. That is, it responds to Kohn’s provocation: “Any ethical and political project needs to specify who the “*we*” in question is. What kind of *we* is worlding and being worlded?” (Kohn, 2018, p. 100, italics in original). I could focus on recomposed individualised subjectivities to demonstrate the intrasectional nature of climate change intra-action, and they certainly emerged, as I have discussed elsewhere (Verlie & CCR15, 2018). However, here I focus on the form and capacities of the emergent collective subjectivity, because climate change is a collective action problem “par excellence” (Tosun & Schoenefeld, 2017, p. 2). As Haraway articulates, “movements, not just individuals, are critical” (2016, p. 47), and I think (re)considering the form of multi-human collectives is both interesting and integral for climate change education. We need new and additional ways for thinking through climate capable collectives, ones that are able to meaningfully story collectives which are not unified, clearly defined, or solely human. In order to do this, I argue that in CCR15 a “cloudy” collective subjectivity co-emerged with the

composition of the affective-atmospheric refuge.

Clouds are a useful means for storying the emergent collective in CCR15, due to their qualities of being porous (Tuana, 2008) more-than-human aggregations which move and metamorphose, affecting and climating as they go. Clouds are gatherings of liquid or solid matter suspended in an atmosphere, and “cloud” can also refer to other kinds of collectives: a cloud of electrons, or a cloud of gnats, for example. Clouds arise from the relations between the ecological, hydrological, atmospheric, geological and social, and form depending on processes spanning the molecular to the planetary, the momentary to the epochal. The multiple forces which compose clouds are themselves constantly in flux, and thus while clouds have some kind of sense of unity, they are constantly metamorphosing. Clouds can emerge slowly or almost instantaneously, and can disappear or dissolve just as quickly. Clouds are continually coalescing, moving, retracting, extending and dissipating (Adey, 2013), and their boundaries are permeable, blurry and indistinct. Accordingly, particular bits of matter are variously incorporated into or expelled from them, and clouds are thus relentless shape-shifters. Clouds are also key actors in both local and planetary atmospheres; that is, clouds and atmospheres intra-act, co-composing each other. Yet exactly how climate change will affect clouds, and how clouds will in turn affect climate change is uncertain: depending on their form, location and their intra-actions, they may increase or decrease planet Earth’s overall average temperature (Lucy, 2018). And as we have seen, atmospheres are affective, and the clouds they harbour have the potential to cultivate various affective forces. Clouds have often been associated with gloom, frustration and heaviness, yet also lightness, pleasure or refreshment. For these reasons, I have found cloudiness an apt form for storying this elusive “group” in CCR15.

But to story a climate capable collective as cloudy is to do more than use a metaphor.

We are not just “like” clouds. As breathing, sweating, radiating bags of gas and liquid that metabolise and reconfigure carbon, hydrogen and oxygen, we are “only precariously contained in a skin sac” (Neimanis, 2017, pp. 40–41). We are “instead profoundly distributed, inherited, gestational [and] differentiated” bodies of water (Neimanis, 2017, p. 41), and we are implicated in the existence of clouds as much as they precipitate the conditions that make our lives possible. The humid air we expire is but a breath of cloud, and one that percolates through our peers’ bodies in its journey of planetary circulation and weathering. Thinking the “group” as a cloudy collective enables serious attunement to how humans and climate become-with each other. In CCR15, our cloudy climate collective was composed physically, affectively and socially “across species and elemental lines, across timescales both vast and molecular, across generations and geographies” (Neimanis, 2017, p. 165).

The recomposed collective in CCR15 was undeniable, yet indistinct: nebulous, indeterminate, hazy. The porosity of the boundaries, and the perpetual expansion, retraction, and reformation of this collectivity is usefully storied as cloudy. It was evident through its effects: as the affective-atmospheric refuge that was enacted radiated, enveloped and slipped between bodies (B. Anderson, 2009; Gottzén & Sandberg, 2017; Stewart, 2011) the production of it could not be performed by an individualised subject but demonstrates some kind of collective agency at work. However this was not a coherent, distinctly defined collective, but a diffuse, distributed and metamorphosing more-than-human subjectivity (Lupton, 2017). As B. Anderson articulates, both atmospheres and the subjectivities they intra-act with “are perpetually forming and deforming, appearing and disappearing... They are never finished, static or at rest” (2009, p. 79). For example, one week the discussion led to a student commenting “I like Australia, Australia’s a cool place. But it’s disheartening. You look around, and it’s like, where’d everyone go? And they’re running away. ... It’s like,

[sigh] Jesus guys.” The student’s exasperation led to empathetic laughter from the group, and this laughter established an in-group based on a common feeling of disappointment, a feeling directed at other Australians who are not facing up to climate change who were thus excluded from the group. This “affectively contagious, easily shared” (Cunsolo Willox, 2012, p. 145) and “we-creating” (Cunsolo Willox, 2012, p. 149) nature of climate change as an affective atmosphere was articulated by one student who identified a “unanimous feeling of frustration shared by the whole class” at the start of the course. Yet, as the two women’s stories of being alienated due to feeling anxious or uncomfortable demonstrated earlier, the “whole class” did not share affective experiences at all times. Particular affective regimes sometimes included, and at other times excluded, some from the collective. Further, this “group” exceeded the bounds of the classroom, as the comment about a group forming in the gap between the lecture and the tutorial attests. This was a collective of the kind that “some people immerse themselves in, or dip in and out of ... or build a light and temporary link to before they move on to something else” (Stewart, 2011, p. 452). Storying this collective as “cloudy” intentionally describes the ambiguity of its defining characteristics and participants, acknowledging diversity, differentiation and discord. This is in contrast to the “bubble,” another socio-spatial metaphor that is often used to story groups of people who think and feel similarly (Kato, 2011; Maxwell & Aggleton, 2010) but that homogenises and solidifies boundaries. Cloudiness also obscures visibility, and it thus attends to the difficulty of identifying and delineating exactly what this group was. For example, one student said the class was “more of a climate change therapy group than a university subject,” which is not to say it was a climate change therapy group, but to grasp at what might be an effective label. This collective was enigmatic; there was definitely some kind of collectivity occurring, but it was shifty: changeable and thus hard to pin down.

Storying this collective as cloudy also retains a focus on its affective, atmospheric,

climatological, and meteorological participants and effects (see e.g. Figure 5, p. 230). The cloudy subject was not simply a collective of humans but a more-than-human entanglement where climate change was *the* key participant. The affective atmospheres of climate change led to the cloudiness of the collective: while we might not have been “on cloud nine” very often, the collective enabled us to see the “silver lining” in our sensations of being “under the weather.” As The Cloud Appreciation Society put it, “clouds are expressions of the atmosphere’s moods” (2016, n.p.), and in the affected atmospheres of climate change, a cloudy collective is one that engages in the affective labours of hoping-mourning. We became more than fair weather friends: we became a cloudy collective, one that tackles the “rollercoaster of emotions” together, that “keeps walking the scary line of learning,” that talks “about how climate change makes you feel” and composes an atmospheric “home for ideas and discussions.” We were enduring the affective pain of climate change complicity and vulnerability in order to “change the world.” That is, the human participants had become specifically *climate changed* across the semester, and were therefore more-than-human “specific configurations of the differential becoming of the world” (Barad, 2007, p. 352). Thus while this thesis has discussed more-than-human entangled subjectivities throughout, storying this particular entanglement as a cloudy collective acknowledges the murky ethical considerations involved in practices of climating, as our striving to mitigate climate change unavoidably contributed to climate change in other ways, not least through our climate controlled classroom. Cloudy collectives stay with such trouble, they bear worlds, they climate together.



Figure 5: Clouds of Melbourne, 27 November 2018, 6:30–8:30pm, showcasing their ephemerality and dynamism in terms of form and mood. Images: Author.

Collectively, the cloudy subjectivity and its co-emergent practices—the composition of affective-atmospheric refuges via encountering, witnessing and storying climate change—constitute (some of) the recomposed climate response-abilities that emerged in CCR15. And, importantly, these atmospheric and cloudy climate response-abilities were extensile, unfurling and dispersing beyond the original relations that cultivated them. The cloudy collective became “infect[ed with] processes and practices that might yet ignite epidemics of multispecies recuperation and maybe even flourishing” (Haraway, 2016, p. 114). This story which discusses the conclusion of the course and thus the potential end of the affective-atmospheric refuge attends to these proliferating qualities:

This class if anything has spurred my optimism further. We have a group of amazing human beings heading out there setting prime examples of the better people we all can be. The better people we can be, the better our world can be.

As this story demonstrates, affective-atmospheric refuging became a “viral response-ability” (Haraway, 2016, p. 114). The “affective residue” (Watkins, 2016, p. 73) was sedimented into the cloudy subject, enabling it to continue to perform atmospheric refuge as it dispersed and expanded beyond the classroom (Gottzén & Sandberg, 2017). These practices of climating offer templates that others can potentially inhabit, thus cultivating the possibility for future refuges to sprout in the world. The affective patterning and habituation generated in the atmospheric refuge re-emerged and diverged following the conclusion of CCR15. Both myself and a number of students continue engaging in similar affective intra-actions with climate change in our respective communities, potentially seeding additional cloudy collectives and affective-atmospheric refuges. Yet on the other hand, these response-abilities have also dissipated in other ways, and by 2018 there is little sense of our cloudy collective’s continued existence.

This ephemerality, and capacity for extension, dissipation and reconfiguration affirm

the value of storying the collective as cloudy. Constantly bulging, wrestling, squirming, imploding and writhing, cloudy collectives break up, splinter, dissolve, and yet are capable of coalescence, condensation and growth. A cloudy collective is tangible, yet expansive and only ever loosely associated. The “edge” of clouds makes this evident: what and where is the edge of a cloud? The “edge” is more of a wispy transition zone where intra-active reconfigurations occur. “Cloudy collectives” is thus a useful addition to current means of storying pro-environmental collectives, which tend to limit their analysis to the human participants (such as social movement theory) (Flesher Fominaya, 2010; Svensson, Neumayer, Banfield-Mumb, & Schossböck, 2015), overemphasise unity and stability and thus erase difference and differentiation (Neimanis, 2017; Saunders, 2008) or emphasise the more-than-human species, at the expense of the more-than-human matters, that participate in worlding (Despret & Meuret, 2016; Reinert, 2016). While we demand coordinated and concerted climate action at regional, national and international scales (IPCC, 2018), cloudy collectives may be doing a lot of work behind the scenes, enabling us to make such demands, and potentially generating important climate diffractions of their own.

CONCLUSION

Storying is a pedagogical intra-action that performatively reconfigures climate response-abilities. Emerging from entangled voices, stories of climate change intervene in the world, re-writing scripts and generating possibilities for novel climate-human relations to emerge. In CCR15, encountering, witnessing and storying climate change collectively constituted an affective-atmospheric refuge where partial recuperation and recomposition could occur. But the composition of affective-atmospheric refuge was not a goal I had intended or even imagined for my climate change class. These actions were thus diffractions, actions that were not prescribed, directed, or anticipated in advance of becoming-with the

climate, but which nonetheless contributed valuable means of mitigating and adapting to climate change. Being diffractions, they both emerged from and produced difference in the world. As climate change affected us, we became climate changed, and we reiteratively encountered, witnessed and storied climate change, becoming further climate changed in the process. These climate changed selves were not permanent or applicable or inclusive of all, but did constitute a “cloudy” collective composed by multiple more-than-human elements. These intrasectional subjectivities and diffractions were enabled by acting-with the intensely affective atmospheres of climate change.

Through storying our experiences, this chapter has demonstrated the pedagogical importance of actively and collectively engaging with the painful affects climate change arouses. In CCR15, collectively witnessing and storying affective climate encounters enabled us to stay with the trouble of learning to live-with climate change. As cultural, geographical and psychological literature is increasingly finding, climate denial and inaction often occurs due to caring *too much*, feeling overwhelmed and paralysed, and thus disengaging as an emotional coping mechanism (Head, 2016; Norgaard, 2011b; Randall, 2009). If this is experienced in tandem with isolation, it can be exponentially more disempowering (Cunsolo Willox, 2012). We can make non-anthropocentric arguments about how humans are always more-than-human entanglements (Barad, 2007) and are therefore “never alone” (Haraway, 2016, p. 58). But such intellectual rhetoric can be cold comfort for animals who have evolved with strong intra-species social needs and who are facing a planet that will be more than 3 degrees warmer by 2100 based on the world’s current policies (Climate Action Tracker, 2017; IPCC, 2018).

This chapter therefore reconsiders, rather than erases or overstates (Sonu & Snaza, 2015), the important role of “humans” in climate change education. Creating a *human and*

more-than-human “we” through grieving-with (Haraway, 2016) other *climate changed* humans and non-humans (Cunsolo Willox, 2012) is a pedagogical imperative if we are to engage in the affective labours of bearing worlds (Seaman, 2016). The exploration of the cloudy collective as one which becomes-climate through its practices of bearing worlds epitomises Neimanis and Walker’s claim that “humans and nonhuman climate and weather phenomena are co-constitutive. We are mutually emergent, coextensive. Together, we *weather* the world” (2013, p. 564, italics in original).

My re-storying has rethought “the educable subject responsible for more sustainable futures ... in light of theories of entangled humans and nonhumans” (Sjögren, 2014, p. 5), thus moving away from the “compulsory humanity” (McKay, cited in Pedersen, 2010, p. 237), “anthroponormativity” (A. Taylor & Blaise, 2014, p. 377) and the fetishised “I” of education (Pedersen & Pini, 2017). This re-storying, as a performative methodological intervention, raises many questions for climate change education practice, where the individual human is normally assumed to be the “location” of knowledge, concern, and action. How do we educate (for) cloudy climate response-abilities, when they are so ephemeral, dynamic, and distributed *in between* humans and the wider world? In (partial) response, the thesis conclusion discusses pedagogical strategies I have considered and implemented in subsequent iterations of Climate Change Responses.

10. LEARNING TO LIVE-WITH CLIMATE CHANGE

CLIMATING OTHERWISE: AFFECTIVE ENTANGLEMENTS

This thesis began with a concern about the anthropocentrism embedded in scientific epistemologies of objectivity-via-separation because this underpins most climate change pedagogies and potentially disables our capacity to respond effectively. I wanted to be able to contribute to efforts to think about, relate to and respond to climate change otherwise. But because of the global institutionalisation of climate denial, while I wanted to develop a climate change pedagogy that was more attuned to our embodied relations with and as climate, I felt this effort needed to also have a rigorous account of how Western climate science works. Although social constructionism provides really important contributions to our understanding of human psychology, power structures, values and culture, I felt that social constructionist climate pedagogies retained a problematic individualism, implicitly understood humans to be separate from the environment, and could not defend against post-truth regimes. Indigenous and other animated approaches to climate change may have offered the relational, embodied pedagogy I was searching for, yet I also felt that an Indigenous (or Indigenous-inspired) climate pedagogy would be a complement to, rather than a reworking of, scientifically based climate change pedagogies. Perhaps this is an oversight, lack of understanding or lack of research on my part, or perhaps it is a future pathway for me. But the resources I had available to me at the time that could decentre the human from climate science and develop an embodied, relational climate pedagogy were posthuman feminist science studies, particularly the work of Karen Barad and Donna Haraway. These authors enabled me to situate climate science as itself a relational, embodied practice, and to argue that objective climate knowledge was an ecological achievement enacted through being part of climate.

The effort to develop a climate change pedagogy that could resituate humans ecologically and non-humans ethically (Plumwood, 2002) meant I needed posthuman conceptualisations of climate, climate change, climate-human relationships, climate knowledge and climate changing agency. Exploring these ontological and epistemological issues quickly led me to the realisation that I also needed to reconsider the goals of climate change education. Reconsidering all of this is no small feat and of course what I have proposed in this thesis can only be considered additions to the literature that already exists, or novel openings, rather than “conclusions.”

In response to these aims, I have argued that it is feasible and desirable to understand climate as an entanglement. This is a posthuman scientific approach. A humanist scientific climate ontology identifies the climate as a system composed of subsystems which interact; an entangled account conceptualises climate as a set of relationships, and its compositional parts to *emerge from* planetary intra-actions. The lithosphere, the hydrosphere, the cryosphere, the biosphere (including humans), and the atmosphere do not pre-exist each other, but co-emerge through ongoing, reiterative, dynamic intra-actions. This demonstrates that climate is better understood as a verb, rather than a noun: climate is something that we—all of us, all Earthly bodies—do, and we do it together. All of us—soil, worms, hurricanes, glaciers, Melburnians—are all climating, becoming-climate, and making kin with climate.

Climate-as-entanglement, unlike Earth system science, situates the knower as inherently part of that which is known. A classical scientific approach believes climate is an object that can be known objectively due to inherent spatial separation between human knowers and climate. But an entangled account situates such valuable knowledge as something achieved through intervening in and as part of climate. Our objective knowledge

emerges due to enacted—not inherent—separation, which entangles us in specific ways with climate change. Climate science cuts humans and climate together-apart (Barad, 2014): these agential separations momentarily distinguish us from climate, which entangles us with climate in a specific way, one that enables us to partially (in both sense of the word) identify, track and manage how we might become-with climate in the future. But, if these agential cuts are assumed to be inherent, we can cultivate dispassionate or reductive relations with climate change, and fail to respond appropriately to the very issues our inquiries are identifying. Therefore, our intellectual endeavours do not just represent climate, but participate in its—and thus our—very becoming.

This performative approach to climate change brings attention to how boundaries and identities change through the worldly relationships which co-compose climate, intrasectionally generating emergent “superpositionality” as we enfold and radiate into the world. Nuanced attention to such interpermeating and generative relationships means that agency, the capacity to affect change in the world, can never be possessed by individuals (as individuals do not exist). Rather, agency is exerted through enmeshed particle-waves of worldly matter acting-with each other. Climate change is not caused by humans, but emerges through specific parts of the universe intra-acting with other specific parts, in particular ways. Which is not to deny but to reconceptualise our climate changing agency. As the material-energetic particle-waves which compose the world collide into each other, overlap, become entangled and amplify or reconfigure each other, diffractions emerge—different patterns of relationships, different configurations of agency, different ways of acting with/as/for climate.

In an educational setting, an intra-active approach brings attention to how students’ and teachers’ identities change through climate change education, how their capacities for “climate action” are always enabled or disabled by the relational networks they are situated

in, and how the difference emerging from their relationships with climate change might interrupt and reconfigure the world and possibilities for responding to climate change. These new possibilities for responding to climate change—the novel response-abilities—that emerge are learning at work. Climate knowledge, in this account, is not (just) a set of universal and neutral objective facts, nor (just) some subjective cultural meanings. Rather than (just) compare individual human students' mental models of climate to those of scientists, or the climate actions they engage in to a predetermined list, we can take a more nuanced, participatory, embodied and relational approach. Knowing climate is about becoming more attuned to difference and subtlety, and thus becoming more responsive and/or able to respond in additional or alternative ways. Cultivating climate response-ability is therefore about increasing the capacity of “individuals” to enter into, and attend to (to become aware of, to nurture, and to respond to), relationships with human and more-than-human others such that they can collectively contribute to more flourishing futures for all.

To summarise, the ethico-onto-epistemology (Barad, 2007) articulated in Chapter 3 reconceptualises climate as an entanglement, climate and humans to be intrasectionally entangled, climate knowledge to emerge through this entanglement, and climate changing agency to emerge through acting-with the world. It promotes climate response-ability as an alternative aim for climate change education, while acknowledging that such response-abilities will be diffractive: productive of, and emerging from, difference. I have explored and developed this pedagogy through the case study of CCR15, an undergraduate applied social science course taught at RMIT University in Melbourne. Through the more-than-human auto/ethnographic approach employed, I have demonstrated how we engaged in different intra-actions across the semester and how we thus became differently entangled with climate change and different to ourselves. While CCR15 enabled me to explore and refine the pedagogy offered in terms of how relationships, knowledge, agency and goals were

conceptualised, it also brought my attention to an important area I had under-acknowledged when originally formulating my research questions.

In my effort to rethink climate science, in some ways I was drawn into the scientific epistemology even while critiquing it: just like scientific approaches, I had underestimated the significance of emotions and affect. But of course, another meaning of “climate” is the general or prevailing mood, disposition, feeling, temper, tone, aura, attitude or ambience. In CCR15, I found that our experiences teaching and learning with climate change were highly emotional and affective and that this was one of the most predominant mechanisms through which we intra-acted with and became entangled with climate change. Thus, (re)considering “the affective” and how it was intimately enmeshed with climate knowledge and agency became an additional key aim of this thesis. That is, the consideration of affective experiences in this thesis was driven by encountering them in the field, whereas I had wanted to consider relationships, agency and knowledge from the beginning. For this reason, at times I have felt that I had two theses in production: one articulating a posthuman account of climatic agency and knowledge, and another which was about the emotional intensity of learning about climate change. And so, responding to my own presumptions, in the latter parts of my candidature I have worked to ensure the thesis has problematised the knowledge/emotion/action division that is so frequently enacted in environmental education (Heimlich & Ardoin, 2008; Russell & Oakley, 2016; Scott, 2002). I have worked towards this effort to climate otherwise through the discussion of and development of the notion of climate change’s affective atmospheres: the contention and demonstration that meteorological and affective processes are intimately enmeshed. To further this argument, this chapter re-articulates the findings of the thesis to emphasise how *our relations with climate change are always affectively entangled*. It therefore proposes that we consider climate change education, or life in a climate changing world, as a process of *learning to live-*

with climate change.

LEARNING TO LIVE-WITH CLIMATE CHANGE

The last 4 chapters (6–9) have demonstrated just how affecting learning about climate change can be. Even in our climate controlled classroom in a privileged inner-urban university campus, we encountered climate change in visceral ways. Climate change’s affective forces emanated from course learning materials, national and international political (in)actions and media discourse. These forces enveloped and infiltrated us as we learned more about climate change and how to mitigate and adapt to it. In turn, we participated in climating. By witnessing and storying these affective encounters, we (re)produced novel affective forces and performed promising possibilities for future relations, recomposing the affective atmospheres of climate change. Through this affective intra-active pedagogy, across the semester, our prior subjectivities were reconfigured, as our modern, neoliberal response-abilities were significantly decomposed through the affective intensity of the encounter with climate change. This affective intensity and our multimodal, multidisciplinary and multisensory pedagogy meant that we witnessed multiple climate realities throughout the semester, including some fairly nightmarish, “unreal,” materialisations of climate change, and came to understand climate change as an emotional issue. But through respectfully witnessing each other’s affective encounters, our response-abilities were somewhat recomposed. At least temporarily, we cultivated an affective-atmospheric refuge and formed a “cloudy” collective subjectivity which enabled us to stay with the trouble of climate change. That is, it was through affective relations that we became entangled with climate change. We were learning—implicitly and explicitly, consciously and subconsciously—that who we are and how we live is always affected by and entangled with climate, and we were also increasing our capacity to engage with and endure the unsettling and distressing realities

of climate change. We were learning to live-with climate change.

Learning to live-with climate change speaks to two enmeshed processes. The first is that which is encompassed by the ideas of entanglement, intra-action, and becoming-with: life arises through relations. Living is always living-with. There is no life outside of relationships. As K. Wright argues:

We can never disconnect from Earth's ecological community, because we are always becoming-with, in a living multispecies world composed of phenomena and transitions. But we can terribly damage our ability to respond to that world. Failing to attend to ecological connectivities does not break them, but leaves them disfigured. (2014, p. 280)

Learning to live-with climate change is thus partly about learning to live-with in a more general sense, irrelevant of climate change. It is about a deep attunement to the entanglement of all life and the cultivation of appropriate ways of relating to and engaging with that world. This process could be facilitated through intra-actions that are not explicitly articulated as climatic. But climate change epitomises our ecological entanglement (Tuana, 2008) and is thus an ideal pedagogical partner for learning to live-with. By engaging with the varied ways in which we are becoming-climate and climating, we can develop more embodied, animated, ecological and response-able ways of inhabiting and enacting our shared world. Learning to live-with climate change is thus an ethico-onto-epistemology, an informed practice that yearns for and creates more liveable climate futures. In managerial terms, it is therefore a process that mitigates climate change.

Relatedly, learning to live-with climate change also involves the emotional and affective forms of adaptation that are encompassed in the common idiom "learning to live with" something. This is not about becoming resigned to climate change, giving up, or thinking that it is too late to do anything. It is about recognising that future ways of living-with will be radically different to those we have come to know and/or love, and grieving for

the losses we are already experiencing and those we are likely to experience. That is, learning to live-with climate change arises from the practice of diagnosing relationships: in an era of rapid global climate change, any effort to acknowledge interconnection or entanglement will identify that valuable relations are threatened, and thus involve grief for those changing relations (Cunsolo Willox, 2012). Learning to live-with climate change refers to the entwined affective labours of identifying and mourning relationships as they are torn apart, disfigured and/or regenerated as the planet warms. But learning to live-with climate change also involves continuing to act (-with) for a future which is desirable despite being different, or perhaps acting-with for a future that is less bad than it would have been if we did not act. It is a process of bearing-worlds, of hoping-mourning, of staying with the trouble.

In this way, learning to live-with climate change is not just an ethico-onto-epistemology, but it is also an affective practice; perhaps an affective-ethico-onto-epistemology. As I have shown throughout this thesis, these affective labours are processes of intra-acting: they emerge through more-than-human entanglements; they reconfigure identities and relationships; and they produce difference in the world. Through learning to live-with climate change we will become-other to ourselves which is both necessary and desirable if we are to decompose, rather than just displace, the anthropocentrism that led to climate change (Head, 2016). Yet despite its value, learning to live-with climate change is going to be disconcerting and distressing—which does not mean that it will not also be joyful, reassuring, refreshing and/or invigorating. These varied affective experiences will accompany us as we transform our identities, cultivate collective response-abilities, and enact situated knowledges, which are all central to the practice of learning to live-with climate change and which make it an inherently educational process.

But learning to live-with climate change speaks to how the task facing us is far bigger

than cognitive comprehension or behaviour change approaches to climate change education have recognised (Kagaway & Selby, 2010). Learning to live-with climate change is an existential and ontological task of composing not just new lifestyles, but new conceptions of what life is, what it means to live, and how to live well. We are asking students, and people more generally, to engage with what has been described as a “super wicked problem” (Lazarus, 2008, p. 1153) and the “greatest moral challenge of our time” (Hudson, 2017, n.p.), but I am not sure any words we have available can do justice to the political, social, personal, emotional, ethical, intellectual and ecological complexities and challenges facing us, in all our different ways. Learning to live-with climate change is a pedagogy that acknowledges that while climate change is “not a problem to be solved”, nor is it simply “a condition in which we are enmeshed” (Hulme, 2009, p. 364). Learning to live-with climate change recognises the myriad, overlapping, compounding and continuously morphing situations that climate change poses, which are unfair, painful and unresolvable, but which still demand our best efforts. While 1.5°C *might* still be achievable and is certainly more desirable than 2 or 3 or 4, 5, or 6 degrees of warming (IPCC, 2018), the one degree we have already experienced is horrifying, and our best-case scenarios still involve massive losses, unconscionable injustices, complex and traumatic compromises, and a whole lot of unpredictable, uncontrollable and unmanageable eventualities. Learning to live-with climate change acknowledges that there are no easy “solutions”; that we will be living-with climate change in some ways or others, no matter how coordinated or ethical our collective actions may be; and that we—in all our myriad forms of “we”—have to find ways to keep going despite this. Graphs, imagery and art (Chapman et al., 2016; Hawkins & Kanngieser, 2017), storytelling (Carlin, 2010; Rousell et al., 2017; Veland et al., 2018), meditation and mindfulness (Panno et al., 2017; Wamsler & Brink, 2018; J. Wang, Geng, Schultz, & Zhou, 2017), community building (Cole, 2016; Divakaran & Nerbonne, 2017), political action (Grady-Benson & Sarathy, 2016), active

participation and leadership (Cutter-Mackenzie & Rousell, 2018; Monroe et al., 2017), personal reflection (Leduc & Crate, 2013), self-care (Lloro-Bidart & Semenko, 2017), virtual reality and games (Rumore et al., 2016; Wu & Lee, 2015), friendship and love (Godfrey, 2015), justice framings (Stapleton, 2018; Waldron, Ruane, Oberman, & Morris, 2016), ethical interrogation (Krueger, 2014), embodied (Neimanis, 2015; Rooney, 2018b), place based (Hu & Chen, 2016) and faith based (Hitzhusen, 2012) approaches are all useful. But most likely nothing we can do will be sufficient to achieve what we want or help society feel okay about it all, and we just have to grapple onwards with the ever-shifting complexities of climate change, doing our entangled best to reduce emissions and adapt to the impacts.

While learning to live-with climate change is an intrinsically educational task, this does not mean that it is limited to the enclosed spaces or times that are designated for formal (or even informal) education. Educational programs can certainly contribute significantly to processes of learning to live-with climate change, but so can—and must—other sectors of society, such as the media and communication industry, community development efforts, religious communities, governments, and others. I consider learning to live-with climate change to be a process that over-developed societies need to partake in, and so we need as many participants engaging in this as possible. This is not to suggest that the Global South and/or marginalised people do not, but the power hierarchies and emissions differences mean the processes for them may be considerably different to what this thesis has explored. Suggesting that all (or at least, many) sectors of society can and should engage in this process is certainly not to say that it involves clearly definable, pre-given practices or identifiable goals or standards. It is, as Snaza (2013) articulates, a “bewildering” process through which we are likely to encounter dead ends, get lost, and reconfigure individual and collective human identities as we go. What we might do in order to learn to live-with climate change will be incredibly varied, as learning to live-with climate change will always be situated in

particular, unique time-places which will be experiencing context specific materialisations of climate change. Evidently this thesis cannot speak to the complexity of all the possible ways in which society will or needs to learn to live-with climate change. One mechanism this thesis can offer towards such efforts is the understanding of the potential role of the affective intra-actions of encountering, witnessing and storying climate change. Learning to live-with climate change will occur through various modes of encountering, witnessing and storying climate change: our existing ways of life will be countered, as we collectively but differentially witness climate change unfolding. We will tell stories of this, and we will need new stories to inhabit, if we are to learn to live-with climate change. Attending to how climate change is being encountered, witnessed and storied, educators and others will be better able to assist people to learn to live-with climate change.

SPARKING PEDAGOGICAL INTRA-ACTIONS

Across this thesis, I have found that (critical feminist) posthumanism can contribute usefully to climate change education. Understanding climate change as an entanglement and working with theories of affect has enabled me to (begin to) reconceptualise what it means to be human in an era of monumental planetary change, as well as some of the related implications such as how to understand identities, hierarchies, agency, distress, hope, knowledge, learning, and accountability. It has not been easy or straightforward to do this work, and it has certainly been harder to implement an explicitly posthuman climate pedagogy in my teaching practice than it has been to use it as research methodology. That being said, my posthuman pedagogy theorises that teachers (or community activists, parents, science communicators, schoolkids and everyday people) will face barriers and limitations in their climate education practice, because they are always acting-with. In that sense, the limitations I have faced in implementing this pedagogy in practice validate the pedagogy's

own theorisations of how climate education works. That is, while this thesis calls for more efforts to enable humans to learn to live-with climate change, it undermines the belief that such efforts can be conveniently planned, implemented, or expected to deliver predetermined or measurable outcomes. This is because of the entanglement of all students and teachers with the complex, dynamic, wider world, which is ever changing and never controllable.

Given we are always acting-with this world, I now consider my role as teacher to be that of “sparking” pedagogical intra-actions. Fire has glimmered throughout this thesis, and living in such a fire-prone and fire-dependent part of this world gives me pause to think about fire as a metaphor for climate education processes. Sparks emerge through friction between bodies and atmospheres, and they transform matter and energy. As educators, we can gather particular forces and entities into relations where they may encounter each other and thus ignite promising diffractions, kindling novel response-abilities. But sparks can also fizzle out; sometimes they smoulder; and they can also explode, exceeding intentions and control and leading to undesirable and even catastrophic consequences. Once burning, fires can be difficult to stop or direct, but they can also be guided in some ways, sometimes. Embers can travel far from their parent fire, leading to different and unknowable inflammations. To consider climate education as a process of sparking pedagogical intra-actions is therefore to be prepared and informed, carefully paying attention to emergent conditions and to the becoming of the participants, and to be on your toes at all times. It is ultimately, to be humble and carefully attuned to process.

I have suggested that encountering, witnessing and storying climate change are three common ways of intra-acting with climate change, and I believe that climate educators can benefit from attuning to how these intra-actions are unfolding and in what ways they may be guided or catalysed. It matters how climate change is encountered, it matters whether and in

what ways climate change is witnessed, and it matters which stories we tell about climate change. I offer the following musings on my own attempts and experiences at sparking and handling such intra-actions.

I have now taught Climate Change Responses for three years and continue teaching about climate change in other courses at RMIT. In this role, I am situated in a highly urbanised university which has a strong focus on “applied learning,” itself situated within a very neoliberal nation. In this context, students have to receive individual numerical grades at the end of semester, meaning they have to have individual assessment tasks, and these have to include a large amount of written work. Acting-with this context makes the possibilities for enacting more collective and/or embodied intra-activities always somewhat limited. It also situates students in a reasonably competitive and capitalist discourse, where often their own objectives for class can include getting good marks and/or learning “job relevant” skills. And climate change itself is typically understood in the West through anthropocentric, representational, rational and managerial discourses. These are influences that need to be actively and collectively resisted if we are to enact more relational and exploratory intra-activities, but it is of course hard to do this. Each week there are also more specific structures and influences to be navigated, such as needing to didactically explain key ideas, in-class presentations to be delivered and marked, or course readings to be discussed. Once such requirements are subtracted from the semester, there is little time for the genuinely open, radical, posthuman relational intra-actions that this thesis could perhaps otherwise call for. Finally there are the students who always bring unique trails of relations with them and thus collectively constitute complex class cohorts. This socio-ecological complexity is probably obvious to teachers of all kinds; but emphasising it can clarify the foolishness of considering teachers as somehow able to direct and control their classrooms towards particular desirable learning outcomes.

Thus, while I still plan what to do in class, I am much more aware that the class will be diffractive. I consider that in my (entangled) role I can spark intra-actions, or cultivate a space where relations can emerge, but I cannot design, control, or fully know what those relations may be or involve (Sonu & Snaza, 2015). I cannot control where those intra-actions lead, nor who and what participates in them or what they might become through their intra-actions (Gannon, 2017). My classes may end up involving something similar to what I had intended, but not necessarily. Even when they do, they will always include so much more, and I will probably not be aware of all of it. Openness to these diffractions means that rather than aim for predetermined goals, I do my best to navigate the waves of emerging difference that radiate from our class's collective efforts.

And in so doing, my own superpositionality changes as I become-climate. For example, across four years of this PhD and of teaching about/with/as climate change, I have become much more sensitive, in many senses of the term. I am more sensitive to nuance and difference in my classes, as well as able to engage a wider range of sensory perceptions than previously (Latour, 2004). I am also more sensitive in the sense of sometimes being on the edge of panic, and having become aware of this, I am now more conscious that my students might also be experiencing some serious discomfort or distress when learning about/with/as climate change. That is, I feel that across the four years of this thesis my role as a teacher has become differently entangled with my students. I have become a better listener and more understanding, and this has often meant that rather than just occupying the roles of teacher and co-learner, with some students I have now become friends, and for others, perhaps a mentor. This might sound nice, and maybe it is, but it is also emotionally and physically demanding, and also raises its own set of ethical and pragmatic challenges.

Within this intra-active approach to pedagogy, where I ride the converging waves of

climate change-capitalism-students-Australia-RMIT (and, like all surfers, sometimes get dumped or wiped out by them), I now do my (entangled) best to encourage, inspire and support students to engage in encountering, witnessing and storying climate change's affective intensities. Asking students to consider and share how climate change makes them feel is one of the most common ways I try to spark these affective pedagogical intra-actions. I have also attempted various ways of more explicitly conceptualising, discussing, and teaching "self-care," despite the potentially neoliberal individualism at work in this term. In that sense, I am asking students to encounter, witness and story their own intra-actions with climate change, and to become response-able to their own emergent climate-changed selves, which may involve an expansion of their sense of self. I also try to cultivate multiple modes of intra-acting with climate change: involving science, embodied experience, social sciences, the humanities and the arts. By asking students to encounter, witness and story climate change in varied ways, I am seeking to spark "multiple ecologies of belonging" (Braidotti, 2013, p. 193) and multiple attachments (Haraway, 2008), so that we might become otherwise entangled with climate change. I also try to spark a sense of interdependent collective agency. To do this, I try to enable students to make connections and friends within our classes, and I encourage and help them to find networks beyond the class to support them, such as local non-government organisations, community groups or professional networks. By bringing their attention to how acting-with others can amplify their climate response-abilities, I am aiming to ignite alternative climate-capable collectives. Feedback from students over consecutive years and multiple courses affirms that they find these approaches beneficial. Most especially, they appreciate the consideration of their emotional experiences, the realisation that others have similar experiences, and the opportunity to explore ways of responding to the emotional intensities of climate change.

A QUANTUM LEAP?

Writing this final section has been difficult. Our dominant stories and affective norms suggest that a conclusion should offer something hopeful or inspiring, or some articulation of what can be done differently, given the findings of the research. But these norms and narratives of human efforts making things better are anthropocentric, both in respect to climate change and to research. They depend on an ontology that situates agency in individual humans and considers it to be aligned with intentionality, which this thesis has challenged throughout. Yet decentring humans from climate change does not negate human agency, but offers a closer attention to how it arises through intra-actions with the more-than-human world (Rickards, forthcoming) and is therefore diffractive. Bearing this in mind, in an effort to respond to the question of “so what?” I suggest that climate change demands, and potentially—if we are willing—supports us to take a quantum leap in how we understand ourselves and the wider world.

A quantum leap is understood in everyday use to indicate a sudden or large increase or improvement. However, technically a quantum leap is an unfathomably small quantity, referring to the “distance” covered by electrons when they “move” from one energy state to another within an atom, which they somehow manage to do without ever having existed in-between those states (Barad, 2007, pp. 108, 162, 182). Quantum leaps are thus a measure of change, although as Barad informs us, they challenge established beliefs about how change occurs, troubling “taken-for-granted notions of space, time, matter, causality, and agency, and epistemology, ontology, and ethics” (Barad, 2007, p. 182). A quantum leap is therefore about small, and perhaps bewildering (Snaza, 2013), but transformative changes, and I think that is what this thesis offers.

Despite quite radical philosophical differences, the quantum-informed posthuman

climate pedagogy offered in this thesis, if experimented with elsewhere, may sometimes appear similar to a science deficit or social constructionist pedagogy in practice. “Hockey stick” graphs will probably still be used. How the media frames climate change will probably still be discussed. Yet, differences in values and ontologies will lead to additional, and different, although perhaps seemingly subtle, changes in practices. What these may be is, of course, beyond my capacity to suggest, as they would arise out of the particular contexts that they are situated in and be partly cultivated by climate change itself. The point, of course, is to provoke, not predetermine, different forms of “climate action” and means of inspiring them.

As Grosz argues, the development of concepts provides us with opportunities to transform problems “into possibilities for being otherwise” (2011, p. 78). Of course, chaotic conditions such as the problems “of living with others, of mortality, of the weather ... have no solutions, only ways of living with [the] problems” (Grosz, 2011, p. 78). In line with this, my thesis offers a range of generative conceptual openings that can help implement a quantum leap in our efforts to learn to live-with climate change. Distinguishing between specific modes of intra-acting with climate change, such as encountering, storying and witnessing, affords a close attention to what is unfolding and how it could occur differently. Taking the atmosphere in affective atmospheres seriously facilitates an attention to how climate change (in its myriad manifestations) shapes, flows through, and is continually reconfigured by embodied and emplaced humans, enabling more sensitive attunement to differentiated and collective experiences and productions of climate change. Attending to the entanglements we are knowing-as and acting-with can lead to more informed, creative, passionate, ethical, realistic, adaptable and feasible suggestions of how to respond to climate change. The notions of becoming-climate, intrasectionality and superpositionality afford attention to how those relationships need to, might be, and are changing, and what kinds of

implications this may have. This facilitates an understanding of how the relational disruptions climate change imposes challenge what people have considered to be the very essence of themselves, thus decomposing and reconfiguring individuals and communities. This enables acknowledgement that the dis-identification involved in becoming posthuman will be painful (Braidotti, 2013), and that we need appropriate support processes, such as affective-atmospheric refuges, to guide people through the necessary transitions from one mode of being human into another. Diffraction and response-ability afford a more ecological humility in place of hero narratives, and a capacity for recognising and cultivating surprising and unanticipated collaborative responses to climate change, allowing us to engage in processes of bearing-worlds. Finally, cloudy collectives, diffractive dreamings, Climate Country and other case study specific offerings may also provide insight into others' actual and potential experiences of learning to live-with climate change.

Yet, climate deniers are not going anywhere quickly. Greenhouse gas emissions continue to rise (UNEP, 2018). Australia currently has no national policy to reduce them (Morton, 2018). As I write this, Paradise in California is burning like hell on Earth (Tilley & Leslie, 2018). The IPCC's (2018) new report tells us that we have less than twelve years left to avoid overshooting 1.5 degrees of global warming. But as The Leap Manifesto argues (The Leap Manifesto, n.d.), we certainly need to, want to, and can, take great leaps towards sustainable and equitable worlds. And, working with the quantum leap metaphor, quantum social theory suggests that social changes do not occur in a linear process, but that seemingly small local changes can have great effects on large scales (K.L. O'Brien, 2016). Of course, the world will kick back at all our efforts, intervening in, reorienting and reconfiguring our efforts. It is due to the uncertainty, contingency and challenges of climating otherwise that writing a concluding statement regarding an issue that is not only far from over, but rapidly burgeoning, seems both simplistic and impossible. The posthuman climate pedagogy

advanced in this thesis is ultimately, to paraphrase Barad (2007), about meeting climate change halfway. Thus, in “conclusion,” I emphasise that the conceptual developments in this thesis are not a blueprint to be rolled out, bulldozing over the work of others and paving the way for some kind of utopian “solution” to climate change. Rather, they are a set of apparatuses that can help facilitate the emotional grit, nimble responsiveness and ecological humility needed to learn to live-with climate change so that we may climate otherwise, in ways more conducive to climate justice and more-than-human flourishing.

REFERENCES

- ABC. (2015a, November 2). Victoria bushfires: Hot, dry conditions prompt early official start to state's bushfire season. Retrieved from <http://www.abc.net.au/news/2015-11-01/hot-dry-conditions-early-start-to-victorias-bushfire-season/6902948>
- ABC. (2015b, July 19). Victoria weather: Melbourne shivers through coldest morning in 18 years. Retrieved from <http://www.abc.net.au/news/2015-07-19/victoria-weather-melbourne-shivers-through-cold-morning/6631338>
- ABC. (2015c, October 5). Victoria's weather warms up as Melbourne experiences hottest start to spring on record. Retrieved from <http://www.abc.net.au/news/2015-10-05/melbourne-weather-hottest-start-to-spring/6828664>
- Abrams, K., & Kacandes, I. (2008). Introduction: Witness. *WSQ: Women's Studies Quarterly*, 36(1), 13-27. doi:10.1353/wsqr.0.0043
- Adam, D. (2008, December 9). Too late? Why scientists say we should expect the worst. *The Guardian*. Retrieved from <https://www.theguardian.com/environment/2008/dec/09/poznan-copenhagen-global-warming-targets-climate-change>
- Adams-Hutcheson, G. (2017). Farming in the troposphere: Drawing together affective atmospheres and elemental geographies. *Social & Cultural Geography, Online first*, 1-20. doi:10.1080/14649365.2017.1406982
- Adey, P. (2013). Air/atmospheres of the megacity. *Theory, Culture & Society*, 30(7-8), 291-308. doi:10.1177/0263276413501541
- Adlong, W., & Dietsch, E. (2014). Environmental education and the health professions: Framing climate change as a health issue. *Environmental Education Research*, 1-23. doi:10.1080/13504622.2014.930727
- Ahmed, S. (2004). Collective feelings: Or, the impressions left by others. *Theory, Culture & Society*, 21(2), 25-42. doi:10.1177/0263276404042133

- Ahmed, S. (2010). Happy objects. In M. Gregg & G. J. Seigworth (Eds.), *The affect theory reader* (pp. 29-51). Durham and London: Duke University Press.
- Ahmed, S. (2014). Atmospheric walls. *Feminist Killjoys*. Retrieved from <https://feministkilljoys.com/2014/09/15/atmospheric-walls/>
- Alaimo, S. (2008). Trans-corporeal feminisms and the ethical space of nature. In S. Alaimo & S. J. Hekman (Eds.), *Material Feminisms* (pp. 237-264). Bloomington, IN: Indiana University Press.
- Alaimo, S. (2016). *Exposed: Environmental politics and pleasures in posthuman times*. Minneapolis, MN: University of Minnesota Press.
- Alaimo, S. (2017). When the newt shut off the lights. In S. Siperstein, S. Hall, & S. LeMenager (Eds.), *Teaching climate change in the humanities* (pp. 45-50). New York, NY, and Milton Park: Taylor & Francis.
- Alaimo, S., & Hekman, S. J. (2008). Introduction: Emerging models of materiality in feminist theory. In S. Alaimo & S. J. Hekman (Eds.), *Material Feminisms* (pp. 1-19). Bloomington, IN: Indiana University Press.
- Albrecht, G. (2005). 'Solastalgia'. A new concept in health and identity. *PAN: Philosophy Activism Nature*, 3, 41-55.
- Albrecht, G., Sartore, G.-M., Connor, L., Higginbotham, N., Freeman, S., Kelly, B., . . . Pollard, G. (2007). Solastalgia: The distress caused by environmental change. *Australasian Psychiatry*, 15(sup1), S95-S98. doi:10.1080/10398560701701288
- Alcoff, L. (1991). The problem of speaking for others. *Cultural Critique*, 20, 5-32.
- Alsop, S., & Dillon, J. (2018). Encounters with a Narwhal: Revitalising science education's capacity to affect and be affected. In D. Corrigan, C. Bunting, A. Jones, & J. Loughran (Eds.), *Navigating the changing landscape of formal and informal science learning opportunities* (pp. 51-67). Cham: Springer International Publishing.
- Anderson, A. (2012). Climate change education for mitigation and adaptation. *Journal of Education for Sustainable Development*, 6(2), 191-206. doi:10.1177/0973408212475199

- Anderson, B. (2006). Becoming and being hopeful: Towards a theory of affect. *Environment and Planning D: Society and Space*, 24(5), 733-752. doi:10.1068/d393t
- Anderson, B. (2009). Affective atmospheres. *Emotion, Space and Society*, 2(2), 77-81. doi:10.1016/j.emospa.2009.08.005
- Andrew, M. (2016). Don't organize, mourn: Environmental loss and musicking. *Ethics and the Environment*, 21(2), 51-77. doi:10.2979/ethicsenviro.21.2.03
- Anker, K. (2017). Law as... Forest: Eco-logic, stories and spirits in indigenous jurisprudence. *Law Text Culture*, 21(1), 191-213.
- Appelbaum, J. (2008). Trauma and research: Bearing responsibility and witness. *WSQ: Women's Studies Quarterly*, 36(1), 272-275. doi:10.1353/wsqa.0.0003
- Atwood, M. (2015). It's not climate change, it's everything change. *Medium*. Retrieved from <https://medium.com/matter/it-s-not-climate-change-it-s-everything-change-8fd9aa671804>
- Australian Government. (2016). Climate change in Australia. Department of the Environment and Bureau of Meteorology. <https://www.climatechangeinaustralia.gov.au/en/>
- Bader, B., & Laberge, Y. (2014). Activism in science and environmental education: Renewing conceptions about science among students when considering socioscientific issues. In L. Bencze & S. Alsop (Eds.), *Activist science and technology education* (Vol. 9, pp. 419-433): Springer Netherlands.
- Banerjee, B., & Blaise, M. (2013). There's something in the air. *Cultural Studies ↔ Critical Methodologies*, 13(4), 240-245. doi:10.1177/1532708613487867
- Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Durham and London: Duke University Press.
- Barad, K. (2014). Diffracting diffraction: Cutting together-apart. *Parallax*, 20(3), 168-187. doi:10.1080/13534645.2014.927623
- Barnett, J., Tschakert, P., Head, L., & Adger, W. N. (2016). A science of loss. *Nature Climate Change*, 6(11), 976-978.

- Barua, M. (2015). Encounter. *Environmental Humanities*, 7, 265-270.
- Baylis, P., Obradovich, N., Kryvasheyeu, Y., Chen, H., Coviello, L., Moro, E., . . . Fowler, J. H. (2018). Weather impacts expressed sentiment. *PLoS ONE*, 13(4), 1-11.
doi:10.1371/journal.pone.0195750
- Bee, B. A., Rice, J., & Trauger, A. (2015). A feminist approach to climate change governance: Everyday and intimate politics. *Geography Compass*, 9(6), 339-350.
doi:10.1111/gec3.12218
- Bennett, J. (2010). *Vibrant matter: A political ecology of things*. Durham and London: Duke University Press.
- Benterrak, K., Muecke, S., & Roe, P. (2014). *Reading the country: Introduction to nomadology*. Fremantle: Fremantle Arts Centre Press.
- Bessarab, D. (2008). Country is lonely. In S. Morgan, T. T Mia, & B. Kwaymullina (Eds.), *Heartsick for Country: Stories of love, spirit and creation* (pp. 44-58). Fremantle: Fremantle Press.
- Birch, T. (2016). Climate change, recognition and social place-making. In E. Vincent & T. Neale (Eds.), *Unstable relations: Indigenous people and environmentalism in contemporary Australia*: UWA Publishing.
- Bissell, D. (2010). Passenger mobilities: Affective atmospheres and the sociality of public transport. *Environment and Planning D: Society and Space*, 28(2), 270-289.
doi:10.1068/d3909
- Black, C. F. (2010). *The land is the source of the law: A dialogic encounter with indigenous jurisprudence*. New York, NY and Milton Park: Routledge.
- Blaise, M., Hamm, C., & Iorio, J. M. (2017). Modest witness(ing) and lively stories: Paying attention to matters of concern in early childhood. *Pedagogy, Culture & Society*, 25(1), 31-42. doi:10.1080/14681366.2016.1208265
- Blok, A. (2010). Topologies of climate change: Actor-Network Theory, relational-scalar analytics, and carbon-market overflows. *Environment and Planning D: Society and Space*, 28(5), 896-912. doi:doi:10.1068/d0309

- Boggs, J. H. (2016). *Sentient atmospheres*. (Doctor of Philosophy), The University of Chicago, Chicago, IL.
- Boler, M., & Zembylas, M. (2016). Interview with Megan Boler: From ‘feminist politics of emotions’ to the ‘affective turn’. In M. Zembylas & A. P. Schutz (Eds.), *Methodological advances in research on emotion and education* (pp. 17-30). Cham: Springer International Publishing.
- BOM (Bureau of Meteorology). (2016a, January 6). Victoria in 2015: another warm and dry year. Retrieved from <http://www.bom.gov.au/climate/current/annual/vic/archive/2015.summary.shtml>
- BOM (Bureau of Meteorology). (2016b, January 6). Annual climate statement 2015. *Bureau of Meteorology*. Retrieved from <http://www.bom.gov.au/climate/current/annual/aus/2015/>
- Bourke, L. (2017, October 10). Tony Abbott says climate change ‘could be beneficial’ because people die in the cold. *The Sydney Morning Herald*. Retrieved from <https://www.smh.com.au/politics/federal/tony-abbott-says-climate-change-could-be-beneficial-because-more-people-die-20171010-gyxi9y.html>
- Boyer, P. (2017, April 18). Realists, butterflies and the lunacy that is Carmichael. *South Wind*. Retrieved from <http://southwind.com.au/2017/04/18/realists-butterflies-and-the-lunacy-that-is-carmichael/>
- Bozalek, V. (2016). A political ethics of care perspective in researching emotions. In M. Zembylas & P. A. Schutz (Eds.), *Methodological advances in research on emotion and education* (pp. 191-202). Cham: Springer International Publishing.
- Bozalek, V., & Zembylas, M. (2016a). Critical posthumanism, new materialisms and the affective turn for socially just pedagogies in higher education. *South African Journal of Higher Education*, 30(3), 193-200. doi:10.20853/30-3-652
- Bozalek, V., & Zembylas, M. (2016b). Diffraction or reflection? Sketching the contours of two methodologies in educational research. *International Journal of Qualitative Studies in Education*, 30(2), 111-127. doi:10.1080/09518398.2016.1201166

- Braidotti, R. (2013). *The posthuman*. Cambridge and Malden, MA: Polity Press.
- Brand, P. (2007). Green subjection: The politics of neoliberal urban environmental management. *International Journal of Urban and Regional Research*, 31(3), 616-632. doi:10.1111/j.1468-2427.2007.00748.x
- Brandl, E. J., Lett, T. A., Bakanidze, G., Heinz, A., Bermpohl, F., & Schouler-Ocak, M. (2018). Weather conditions influence the number of psychiatric emergency room patients. *International Journal of Biometeorology*, 62(5), 843-850. doi:10.1007/s00484-017-1485-z
- Bray, M. d., Wutich, A., Larson, K. L., White, D. D., & Brewis, A. (2018). Anger and sadness: Gendered emotional responses to climate threats in four island nations. *Cross-Cultural Research, Online first*, 1-29. doi:10.1177/1069397118759252
- Brennan, T. (2004). *The transmission of affect*. Ithaca, NY and London: Cornell University Press.
- Brides of the Sun. (n.d.). Retrieved from <https://www.bridesofthesun.com/research/>
- Brinkmann, S., & Kofod, E. H. (2017). Grief as an extended emotion. *Culture & Psychology*, 24(2), 160-173. doi:10.1177/1354067X17723328
- Britzman, D. P. (2003). *Practice makes practice: A critical study of learning to teach*. Albany, NY: State University of New York Press.
- Brown, G., & Pickerill, J. (2009). Space for emotion in the spaces of activism. *Emotion, Space and Society*, 2(1), 24-35. doi:10.1016/j.emospa.2009.03.004
- Brugger, J., Dunbar, K. W., Jurt, C., & Orlove, B. (2013). Climates of anxiety: Comparing experience of glacier retreat across three mountain regions. *Emotion, Space and Society*, 6, 4-13. doi:10.1016/j.emospa.2012.05.001
- Bulkeley, H. (2013). *Cities and climate change*. London: Routledge.
- Burarrwanga, L., Ganambarr, R., Ganambarr-Stubbs, M., Ganambarr, B., Maymuru, D., Wright, S., . . . Lloyd, K. (2013). *Welcome to my Country*. Crows Nest: Allen & Unwin.

- Burke, M., Ockwell, D., & Whitmarsh, L. (2018). Participatory arts and affective engagement with climate change: The missing link in achieving climate compatible behaviour change? *Global Environmental Change*, *49*, 95-105.
doi:10.1016/j.gloenvcha.2018.02.007
- Burnham, M., Ma, Z., & Zhang, B. (2015). Making sense of climate change: Hybrid epistemologies, socio-natural assemblages and smallholder knowledge. *Area*, *48*(1), 18-26. doi:10.1111/area.12150
- Buser, M. (2013). Thinking through nonrepresentational and affective atmospheres in planning theory and practice. *Planning Theory*, *13*(3), 227-243.
doi:10.1177/1473095213491744
- Butler, K. J. (2013). *Witnessing Australian stories: History, testimony, and memory in contemporary culture*. New Brunswick, NJ and London: Transaction Publishers.
- Caldwell, G. (2010, May 14). 16 tips for avoiding climate burnout. *Grist*. Retrieved from <https://grist.org/article/2010-05-12-coming-out-of-the-closet-my-climate-trauma-and-yours/>
- Cameron, E., Mearns, R., & McGrath, J. T. (2015). Translating climate change: Adaptation, resilience, and climate politics in Nunavut, Canada. *Annals of the Association of American Geographers*, *105*(2), 274-283. doi:10.1080/00045608.2014.973006
- Cameron, J., Manhood, C., & Pomfrett, J. (2011). Bodily learning for a (climate) changing world: Registering differences through performative and collective research. *Local Environment*, *16*(6), 493-508. doi:10.1080/13549839.2011.573473
- Carlin, S. (2010). Getting to the heart of climate change through stories. In W. Leal Filho (Ed.), *Universities and climate change: Introducing climate change to university programmes* (pp. 89-97). Heidelberg, Dordrecht, London, New York, NY: Springer
- Carmi, N., Arnon, S., & Orion, N. (2015). Transforming environmental knowledge into behavior: The mediating role of environmental emotions. *The Journal of Environmental Education*, *46*(3), 183-201. doi:10.1080/00958964.2015.1028517

- Carstens, D. (2016). The Anthropocene crisis and higher education: A fundamental shift. *South African Journal of Higher Education*, 30(3), 255-273. doi:10.20853/30-3-650
- Cassidy, R. (2012). Lives with others: Climate change and human-animal relations. *Annual Review of Anthropology*, 41(1), 21-36. doi:10.1146/annurev-anthro-092611-145706
- Chakrabarty, D. (2009). The climate of history: Four theses. *Critical Inquiry*, 35(2), 197-222. doi:10.1086/596640
- Chapman, D. A., Corner, A., Webster, R., & Markowitz, E. M. (2016). Climate visuals: A mixed methods investigation of public perceptions of climate images in three countries. *Global Environmental Change*, 41(Supplement C), 172-182. doi:10.1016/j.gloenvcha.2016.10.003
- Chapman, D. A., Lickel, B., & Markowitz, E. M. (2017). Reassessing emotion in climate change communication. *Nature Climate Change*, 7(12), 850-852. doi:10.1038/s41558-017-0021-9
- Childers, S. M. (2013). The materiality of fieldwork: An ontology of feminist becoming. *International Journal of Qualitative Studies in Education*, 26(5), 599-609. doi:10.1080/09518398.2013.786845
- Clare, S. (2016). On the politics of “new feminist materialisms”. In V. Pitts-Taylor (Ed.), *Mattering: Feminism, science, and materialism* (pp. 58-72). New York, NY & London: New York University Press.
- Clark, N. (2010). Volatile worlds, vulnerable bodies. *Theory, Culture & Society*, 27(2-3), 31-53. doi:10.1177/0263276409356000
- Clayton, S., & Manning, C. (2018). *Psychology and climate change: Human perceptions, impacts, and responses*. London, San Diego CA, Cambridge and Oxford: Academic Press.
- Climate Action Tracker. (2017). Temperatures. Retrieved from <https://climateactiontracker.org/global/temperatures/>
- Climate Council. (2017). About us. Retrieved from <https://www.climatecouncil.org.au/about-us>

- Climate Reality Project. (n.d.). Stand with us. Retrieved from <https://www.climaterealityproject.org/stand>
- Cole, P. (2016). Education in an era of climate change: Conversing with ten thousand voices. *TCI (Transnational Curriculum Inquiry)*, 13(1), 3-13.
- Collins, P. H. (2000). *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Milton Park and New York, NY: Routledge.
- Conceivable Future. (2017). Who we are. Retrieved from <http://conceivablefuture.org/about>
- Conradie, E. M. (2010). Confessing guilt in the context of climate change: Some South African perspectives. *Scriptura: Journal for Contextual Hermeneutics in Southern Africa*, 103(1), 134-152.
- Cox, L. (2018, September 14). Australia on track to miss Paris climate targets as emissions hit record highs. *The Guardian*. Retrieved from <https://www.theguardian.com/australia-news/2018/sep/14/australia-on-track-to-miss-paris-climate-targets-as-emissions-hit-record-highs>
- Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford law review*, 43(6), 1241-1299. doi:10.2307/1229039
- Cunsolo Willox, A. (2012). Climate change as the work of mourning. *Ethics & the Environment*, 17(2), 137-164. doi:10.2979/ethicsenviro.17.2.137
- Cunsolo Willox, A., Harper, S. L., Edge, V. L., Landman, K., Houle, K., & Ford, J. D. (2013). The land enriches the soul: On climatic and environmental change, affect, and emotional health and well-being in Rigolet, Nunatsiavut, Canada. *Emotion, Space and Society*, 6, 14-24. doi:<http://dx.doi.org/10.1016/j.emospa.2011.08.005>
- Cunsolo Willox, A., Harper, S. L., Ford, J. D., Landman, K., Houle, K., & Edge, V. L. (2012). "From this place and of this place." Climate change, sense of place, and health in Nunatsiavut, Canada. *Social Science & Medicine*, 75(3), 538-547. doi:10.1016/j.socscimed.2012.03.043

- Cutter-Mackenzie, A., & Rousell, D. (2018). Education for what? Shaping the field of climate change education with children and young people as co-researchers. *Children's Geographies*, 1-15. doi:10.1080/14733285.2018.1467556
- Damn The Matrix. n.d. Retrieved from <https://damnthematrix.wordpress.com/about/>
- Davenport, L. (2017). *Emotional resiliency in the era of climate change: A clinician's guide*. London and Philadelphia: Jessica Kingsley Publishers.
- Davidson, H., & Milman, O. (2017, April 22). Thousands rally around the world for "March for Science". *The Guardian*. Retrieved from <https://www.theguardian.com/science/2017/apr/22/global-march-for-science-protests-call-for-action-on-climate-change>
- de Freitas, E., & Palmer, A. (2015). How scientific concepts come to matter in early childhood curriculum: Rethinking the concept of force. *Cultural Studies of Science Education*, 11(4), 1201-1222. doi:10.1007/s11422-014-9652-6
- DeMello, M. (Ed.) (2012). *Speaking for animals: Animal autobiographical writing*. New York, NY: Routledge.
- Demeritt, D. (2006). Science studies, climate change and the prospects for constructivist critique. *Economy and Society*, 35(3), 453-479. doi:10.1080/03085140600845024
- Dempster, B. (2000). *Sympoietic and autopoietic systems: A new distinction for self-organizing systems*. Paper presented at the Proceedings of the World Congress of the Systems Sciences and ISSS.
- Deryugina, T., & Shurchkov, O. (2016). The effect of information provision on public consensus about climate change. *PLoS ONE*, 11(4), 1-14. doi:10.1371/journal.pone.0151469
- Desmond, M. (2014). Relational ethnography. *Theory and Society*, 43(5), 547-579. doi:10.1007/s11186-014-9232-5
- Despret, V., & Meuret, M. (2016). Cosmoecological sheep and the arts of living on a damaged planet. *Environmental Humanities*, 8(1), 24-36. doi:10.1215/22011919-3527704

- Devlin, H. (2017). Receding glacier causes immense Canadian river to vanish in four days *The Guardian*. Retrieved from <https://www.theguardian.com/science/2017/apr/17/receding-glacier-causes-immense-canadian-river-to-vanish-in-four-days-climate-change>
- DiFrancesco, D.A., & Young, N. (2011). Seeing climate change: The visual construction of global warming in Canadian national print media. *Cultural Geographies*, 18(4), 517-536. doi:10.1177/1474474010382072
- Divakaran, B., & Nerbonne, J. (2017). Building a climate movement through relational organizing. *Interdisciplinary Journal of Partnership Studies*, 4(2), 1-28.
- Dodd, W., Scott, P., Howard, C., Scott, C., Rose, C., Cunsolo, A., & Orbinski, J. (2018). Lived experience of a record wildfire season in the Northwest Territories, Canada. *Canadian Journal of Public Health, Online first*, 1-11. doi:10.17269/s41997-018-0070-5
- Drew, G. (2013). Why wouldn't we cry? Love and loss along a river in decline. *Emotion, Space and Society*, 6, 25-32. doi:10.1016/j.emospa.2011.11.004
- Duhn, I. (2017). Cosmopolitics of place: Towards urban multispecies living in precarious times. In K. Malone, S. Truong, & T. Gray (Eds.), *Reimagining sustainability in precarious times* (pp. 45-57). Singapore: Springer Singapore.
- Dürbeck, G., Schaumann, C., & Sullivan, H. (2015). Human and non-human agencies in the Anthropocene. *Ecozon@*, 6(1), 118-136.
- Edensor, T. (2012). Illuminated atmospheres: Anticipating and reproducing the flow of affective experience in Blackpool. *Environment and Planning D: Society and Space*, 30(6), 1103-1122. doi:10.1068/d12211
- Edwards, P. (2010). *A vast machine: Computer models, climate data, and the politics of global warming*. Cambridge, MA and London: MIT Press.
- Edwards, R. (2012). Theory matters: Representation and experimentation in education. *Educational Philosophy and Theory*, 44(5), 522-534. doi:10.1111/j.1469-5812.2010.00719.x

- Edwards, R., & Fenwick, T. (2013). Performative ontologies: Sociomaterial approaches to researching adult education and lifelong learning. *European Journal for Research on the Education and Learning of Adults*, 4(1), 49-63. doi:10.3384/rela.2000-7426.rela0104
- Eickhout, B., & Taylor, K. (2016, September 26). Planes need to stop existing in a parallel universe when it comes to the climate fight *The Guardian*. Retrieved from <https://www.theguardian.com/environment/2016/sep/26/planes-need-to-stop-existing-in-a-parallel-universe-when-it-comes-to-the-climate-fight>
- Emmanouil, O. (2016). *Being with Country: The performance of people–place relationships on the Lurujarri Dreaming Trail*. (Doctor of Philosophy), Charles Darwin University.
- Esty, D. C., & Moffa, A. L. I. (2012). Why climate change collective action has failed and what needs to be done within and without the trade regime. *Journal of International Economic Law*, 15(3), 777-791. doi:10.1093/jiel/jgs033
- Feldman, L., & Hart, P. S. (2017). Is there any hope? How climate change news imagery and text influence audience emotions and support for climate mitigation policies. *Risk Analysis*, 38(3), 585-602. doi:10.1111/risa.12868
- Fenwick, T., & Edwards, R. (2014). Networks of knowledge, matters of learning, and criticality in higher education. *Higher Education*, 67(1), 35-50. doi:10.1007/s10734-013-9639-3
- Ferguson, M. A., & Branscombe, N. R. (2010). Collective guilt mediates the effect of beliefs about global warming on willingness to engage in mitigation behavior. *Journal of Environmental Psychology*, 30(2), 135-142. doi:<https://doi.org/10.1016/j.jenvp.2009.11.010>
- Fernandez, G., Thi, T., & Shaw, R. (2014). Climate change education: Recent trends and future prospects. In R. Shaw & Y. Oikawa (Eds.), *Education for sustainable development and disaster risk reduction* (pp. 53-74). Tokyo, Heidelberg, New York NY, Dordrecht, London: Springer.

- Ferorelli, J. (2013, December 19). Yoga practice for the climate crisis. Retrieved from <https://www.elephantjournal.com/2013/12/yoga-practice-for-the-climate-crisis-josephine-ferorelli/>
- Figueres, C., Schellnhuber, H. J., Whiteman, G., Rockström, J., Hobley, A., & Rahmstorf, S. (2017). Three years to safeguard our climate. *Nature News*, 546(7660), 593-595.
- Flesher Fominaya, C. (2010). Creating cohesion from diversity: The challenge of collective identity formation in the global justice movement. *Sociological Inquiry*, 80(3), 377-404. doi:10.1111/j.1475-682X.2010.00339.x
- Fregonese, S. (2017). Affective atmospheres, urban geopolitics and conflict (de)escalation in Beirut. *Political Geography*, 61(Supplement C), 1-10. doi:10.1016/j.polgeo.2017.04.009
- Gaillard, E. (2012). *Learning for change in a changing climate: A community-based education perspective*. (Doctor of Philosophy), Griffith University.
- Gannon, S. (2016). Ordinary atmospheres and minor weather events. *Departures in Critical Qualitative Research*, 5(4), 79-90. doi:10.1525/dcqr.2016.5.4.79
- Gannon, S. (2017). Saving squawk? Animal and human entanglement at the edge of the lagoon. *Environmental Education Research*, 23(1), 91-110. doi:10.1080/13504622.2015.1101752
- Gannon, S., Kligyte, G., McLean, J., Perrier, M., Swan, E., Vanni, I., & van Rijswijk, H. (2016). Uneven relationalities, collective biography, and sisterly affect in neoliberal universities. *Feminist Formations*, 27(3), 189-216.
- Gaskin, C. J., Taylor, D., Kinnear, S., Mann, J., Hillman, W., & Moran, M. (2017). Factors associated with the climate change vulnerability and the adaptive capacity of people with disability: A systematic review. *Weather, Climate, and Society*, 9(4), 801-814. doi:10.1175/WCAS-D-16-0126.1
- Geiger, N., Swim, J. K., Fraser, J., & Flinner, K. (2017). Catalyzing public engagement with climate change through informal science learning centers. *Science Communication*, 39(2), 221-249. doi:10.1177/1075547017697980

- Gibbs, A. (2001). Contagious feelings: Pauline Hanson and the epidemiology of affect. *Australian Humanities Review*, 24. Retrieved from <http://australianhumanitiesreview.org/2001/12/01/contagious-feelings-pauline-hanson-and-the-epidemiology-of-affect/>
- Gilding, P. (2009, September 10). The parallel universes of climate change. Where do you live? *Paul Gilding*. Retrieved from <https://paulgilding.com/2009/09/10/cc20090910paralleuniverses/>
- Gillespie, S. (2013). Climate change and psyche: Conversations with and through dreams. *International Journal of Multiple Research Approaches*, 7(3), 343-354. doi:10.5172/mra.2013.7.3.343
- Godfrey, P. C. (2015). Teaching society and climate change: Creating an “earth community” in the college classroom by embodying connectedness through love. *Journal of Sustainability Education*, 9(1), 1-21.
- Goodley, D. (2007). Towards socially just pedagogies: Deleuzoguattarian critical disability studies. *International Journal of Inclusive Education*, 11(3), 317-334. doi:10.1080/13603110701238769
- Gottzén, L., & Sandberg, L. (2017). Creating safe atmospheres? Children’s experiences of grandparents’ affective and spatial responses to domestic violence. *Children’s Geographies, Online first*, 1-13. doi:10.1080/14733285.2017.1406896
- Gough, N. (2002). Thinking/acting locally/globally: Western science and environmental education in a global knowledge economy. *International Journal of Science Education*, 24(11), 1217-1237. doi:10.1080/09500690210136620
- Grady-Benson, J., & Sarathy, B. (2016). Fossil fuel divestment in US higher education: Student-led organising for climate justice. *Local Environment*, 21(6), 661-681. doi:10.1080/13549839.2015.1009825
- Gray, D. (2015, November 19). Victorian bushfires 2015: Lancefield fire report finds ‘significant shortcomings’ in handling of burn-offs. *The Age*. Retrieved from <https://www.theage.com.au/national/victoria/lancefield-fire-report-finds-significant-shortcomings-in-handling-of-burnoffs-20151119-gl2k8m.html>

- Gregg, M., & Seigworth, G. J. (2010). An inventory of shimmers. In M. Gregg & G. J. Seigworth (Eds.), *The affect theory reader* (pp. 1-25). Durham and London: Duke University Press.
- Grosz, E. (2008). Darwin and feminism: Preliminary investigations for a possible alliance. In S. Alaimo & S. J. Hekman (Eds.), *Material feminisms* (pp. 23-51). Bloomington, IN: Indiana University Press.
- Grosz, E. (2011). *Becoming undone: Darwinian reflections on life, politics, and art*. Durham and London: Duke University Press.
- Grupe, D. W., & Nitschke, J. B. (2013). Uncertainty and anticipation in anxiety: An integrated neurobiological and psychological perspective. *Nature Reviews Neuroscience*, *14*(7), 488-501. doi:10.1038/nrn3524
- Guilt trip. (2012). *Nature Climate Change*, *2*, 297. doi:10.1038/nclimate1526
- Guthman, J. (2008). Neoliberalism and the making of food politics in California. *Geoforum*, *39*(3), 1171-1183.
- Hall, C. (2013). What will it mean to be green? Envisioning positive possibilities without dismissing loss. *Ethics, Policy & Environment*, *16*(2), 125-141. doi:10.1080/21550085.2013.801182
- Hamilton, J., & Neimanis, A. (2018). A field guide for weathering: Embodied tactics for collectives of two or more humans. *The Goose*, *17*(1), Article 45.
- Hansen, K. (2017). River piracy in the Yukon. *Earth Observatory*. Retrieved from <https://earthobservatory.nasa.gov/IOTD/view.php?id=90116>
- Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, *14*(3), 575-599. doi:10.2307/3178066
- Haraway, D. (1997). *Modest_Witness@Second_Millennium.FemaleMan©_Meets_OncoMouseTM: Feminism and Technoscience*. New York, NY and London: Routledge.

- Haraway, D. (2004). The promises of monsters: A regenerative politics for inappropriate/d others. In D. Haraway (Ed.), *The Haraway Reader* (pp. 63-124). New York, NY and Milton Park: Routledge.
- Haraway, D. (2008). *When species meet*. Minneapolis: University of Minnesota Press,.
- Haraway, D. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making kin. *Environmental Humanities*, 6, 159-165. doi:10.1215/22011919-3615934
- Haraway, D. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Durham and London: Duke University Press.
- Harding, S. (2008). *Sciences from below: Feminisms, postcolonialities, and modernities*. Durham and London: Duke University Press.
- Harrison, S. (2013). Climate change, uncertainty and risk. In S. Weintrobe (Ed.), *Engaging with climate change: Psychoanalytic and interdisciplinary perspectives* (pp. 227-140). Sussex and New York: Routledge.
- Hasbach, P. (2015). Therapy in the face of climate change. *Ecopsychology*, 7(4), 205-210. doi:10.1089/eco.2015.0018
- Hauer, J., Østergaard Nielsen, J., & Niewöhner, J. (2018). Landscapes of hoping—urban expansion and emerging futures in Ouagadougou, Burkina Faso. *Anthropological Theory*, 18(1), 59-80. doi:10.1177/1463499617747176
- Hawkins, H., & Kanngieser, A. (2017). Artful climate change communication: Overcoming abstractions, insensibilities, and distances. *Wiley Interdisciplinary Reviews: Climate Change*, 8(5), e472. doi:10.1002/wcc.472
- Hayes, K., Blashki, G., Wiseman, J., Burke, S., & Reifels, L. (2018). Climate change and mental health: Risks, impacts and priority actions. *International Journal of Mental Health Systems*, 12(1), 28-40. doi:10.1186/s13033-018-0210-6
- Hayward, E. (2010). Fingeryeyes: Impressions of cup corals. *Cultural Anthropology*, 25(4), 577-599. doi:10.1111/j.1548-1360.2010.01070.x

- Head, L. (2008). Is the concept of human impacts past its use-by date? *The Holocene*, 18(3), 373-377. doi:10.1177/0959683607087927
- Head, L. (2016). *Hope and grief in the Anthropocene: Re-conceptualising human–nature relations*. New York, NY and Milton Park: Taylor & Francis.
- Head, L., & Gibson, C. (2012). Becoming differently modern: Geographic contributions to a generative climate politics. *Progress in Human Geography*, 36(6), 699-714. doi:10.1177/0309132512438162
- Head, L., & Harada, T. (2017). Keeping the heart a long way from the brain: The emotional labour of climate scientists. *Emotion, Space and Society*, 24, 34-41. doi:10.1016/j.emospa.2017.07.005
- Heimlich, J. E., & Ardoin, N. M. (2008). Understanding behavior to understand behavior change: A literature review. *Environmental Education Research*, 14(3), 215-237. doi:10.1080/13504620802148881
- Hekman, S. (2008). Constructing the ballast: An ontology for feminism. In S. Alaimo & S. J. Hekman (Eds.), *Material Feminisms* (pp. 85-119). Bloomington, IN: Indiana University Press.
- Henderson, J., Long, D., Berger, P., Russell, C., & Drewes, A. (2017). Expanding the foundation: Climate change and opportunities for educational research. *Educational Studies*, 53(4), 412-425. doi:10.1080/00131946.2017.1335640
- Hickey-Moody, A., Palmer, H., & Sayers, E. (2016). Diffractive pedagogies: Dancing across new materialist imaginaries. *Gender and Education*, 28(2), 213-229. doi:10.1080/09540253.2016.1140723
- Hitzhusen, G. E. (2012). Going green and renewing life: Environmental education in faith communities. *New Directions for Adult and Continuing Education*, 2012(133), 35-44. doi:10.1002/ace.20005
- Hobbs, R. J. (2013). Grieving for the past and hoping for the future: Balancing polarizing perspectives in conservation and restoration. *Restoration Ecology*, 21(2), 145-148. doi:10.1111/rec.12014

- Höijer, B. (2010). Emotional anchoring and objectification in the media reporting on climate change. *Public Understanding of Science, 19*(6), 717-731.
doi:10.1177/0963662509348863
- hooks, b. (1989). *Talking back: Thinking feminist, thinking black*. Boston, MA: South End Press.
- hooks, b. (1990). *Yearning: Race, gender, and cultural politics*. Boston, MA: South End Press.
- Hornsey, M. J., & Fielding, K. S. (2016). A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation. *Global Environmental Change, 39*, 26-34. doi:10.1016/j.gloenvcha.2016.04.003
- Hoyt, K. D. (2014). Ethics of network subjectivity. *Technoculture, 4*. Retrieved from <https://tcjournal.org/drupal/vol4/hoyt>
- Hu, S., & Chen, J. (2016). Place-based inter-generational communication on local climate improves adolescents' perceptions and willingness to mitigate climate change. *Climatic Change, 138*(3), 425-438. doi:10.1007/s10584-016-1746-6
- Hu, S., Jia, X., Zhang, X., Zheng, X., & Zhu, J. (2017). How political ideology affects climate perception: Moderation effects of time orientation and knowledge. *Resources, Conservation and Recycling, 127*(Supplement C), 124-131.
doi:10.1016/j.resconrec.2017.09.003
- Hudson, M. (2017). It's ten years since Rudd's "great moral challenge", and we have failed it. *The Conversation*. Retrieved from <https://theconversation.com/its-ten-years-since-rudds-great-moral-challenge-and-we-have-failed-it-75534>
- Hufnagel, E. (2017). Attending to emotional expressions about climate change: A framework for teaching and learning. In D. P. Shepardson, A. Roychoudhury, & A. S. Hirsch (Eds.), *Teaching and learning about climate change: A framework for educators* (pp. 59-71). New York, NY and Milton Park: Routledge.
- Huggan, G., & Tiffin, H. (2010). *Postcolonial ecocriticism: Literature, animals, environment*. Milton Park and New York, NY: Routledge.

- Hulme, M. (2009). *Why we disagree about climate change: Understanding controversy, inaction and opportunity*. Cambridge and New York: Cambridge University Press.
- Hulme, M. (2010). Cosmopolitan climate: Hybridity, foresight and meaning. *Theory, Culture & Society*, 27(2-3), 267-276. doi:10.1177/0263276409358730
- Hulme, M. (2015a). Climate and its changes: A cultural appraisal. *Geo: Geography and Environment*, 2(1), 1-11. doi:10.1002/geo2.5
- Hulme, M. (2015b). Editor's introduction: The cultures of climate. *Climates and cultures*: SAGE.
- Hulme, M. (2015c). Climate. *Environmental Humanities*, 6, 175-178.
- Hulme, M. (2017). *Weathered: Cultures of climate*. Los Angeles, London, New Delhi, Singapore, Washington DC, Melbourne: SAGE Publications.
- Husanovic, J. (2009). The politics of gender, witnessing, postcoloniality and trauma. *Feminist Theory*, 10(1), 99-119. doi:10.1177/1464700108100394
- Hustak, C., & Myers, N. (2012). Involutionary momentum: Affective ecologies and the sciences of plant/insect encounters. *differences*, 23(3), 74-118. doi:10.1215/10407391-1892907
- Huxster, J. K., Uribe-Zarain, X., & Kempton, W. (2015). Undergraduate understanding of climate change: The influences of college major and environmental group membership on survey knowledge scores. *The Journal of Environmental Education*, 46(3), 149-165. doi:10.1080/00958964.2015.1021661
- Hyams, K., & Fawcett, T. (2013). The ethics of carbon offsetting. *Wiley Interdisciplinary Reviews: Climate Change*, 4(2), 91-98. doi:10.1002/wcc.207
- IPCC. (2001). Chapter 1: The climate system: An overview. *Climate change 2001: The scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 85-98). Cambridge: Cambridge University Press.

- IPCC. (2007). Chapter 1. Introduction. *Climate change 2007: Mitigation of climate change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge Cambridge University Press.
- IPCC. (2013). Introduction. *Climate change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 119-158). Cambridge, United Kingdom and New York, NY: Cambridge University Press.
- IPCC. (2014a). *Climate change 2014: Synthesis report summary for policymakers*. Retrieved from <http://www.ipcc.ch/report/ar5/syr/>
- IPCC. (2014b). Human settlements, infrastructure and spatial planning. *Climate change 2014: Mitigation of climate change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom and New York, NY: Cambridge University Press.
- IPCC. (2018). *Global warming of 1.5°C: Summary for policy makers*. Retrieved from <http://www.ipcc.ch/report/sr15/>
- Israel, A. L., & Sachs, C. (2013). A climate for feminist intervention: Feminist science studies and climate change. In M. Alston & K. Whittenbury (Eds.), *Research, action and policy: Addressing the gendered impacts of climate change* (pp. 33-51). Dordrecht, Heidelberg, New York and London: Springer.
- ITHYF (Is this how you feel?). (2017). This is how scientists feel. *Is This How You Feel?* Retrieved from <https://www.isthishowyoufeel.com/this-is-how-scientists-feel.html>
- Iyengar, S., & Massey, D. S. (2018). Scientific communication in a post-truth society. *Proceedings of the National Academy of Sciences, Online first*, 1-6. doi:10.1073/pnas.1805868115
- Jackson, A. Y. (2008). “What am I doing when I speak of this present?” Voice, power and desire in truth-telling. In A. Y. Jackson & L. A. Mazzei (Eds.), *Voice in qualitative inquiry: Challenging conventional, interpretive, and critical conceptions in qualitative research* (pp. 165-174). Milton Park and New York, NY: Routledge.

- Jackson, A. Y., & Mazzei, L. A. (2008). Introduction: The limit of voice. In A. Y. Jackson & L. A. Mazzei (Eds.), *Voice in qualitative inquiry: Challenging conventional, interpretive, and critical conceptions in qualitative research* (pp. 1-13). Milton Park and New York: Routledge.
- Jacquet, J. (2017). Guilt and shame in U.S. climate change communication. *Oxford research encyclopedia of climate science*. doi:10.1093/acrefore/9780190228620.013.575
- Jaspal, R., Nerlich, B., & Cinnirella, M. (2014). Human responses to climate change: Social representation, identity and socio-psychological action. *Environmental Communication*, 8(1), 110-130. doi:10.1080/17524032.2013.846270
- Jeong, S., Britton, S., Haverkos, K., Kutner, M., Shume, T., & Tippins, D. (2017). Composing new understandings of sustainability in the Anthropocene. *Cultural Studies of Science Education*. doi:10.1007/s11422-017-9829-x
- Johansen, B. S. (2015). Locating hatred: On the materiality of emotions. *Emotion, Space and Society*, 16, 48-55. doi:10.1016/j.emospa.2015.07.002
- Johnson, D. (2011). The meditation of the red pill. *Transition Voice*. Retrieved from <http://transitionvoice.com/2011/02/the-meditation-of-the-red-pill/>
- Juelskjær, M. (2017). Atmospheric encounters: Generic competences in light of posthumanist teaching practices with/on affectivity. In E. Just & W. Grahn (Eds.), *Theories of affect and concepts in generic skills education: Adventurous encounters* (pp. 65 - 88). Newcastle upon Tyne: Cambridge Scholars Publishing.
- Kaalund, V. A. (2004). Witness to truth: Black women heeding the call for environmental justice. In R. Stein (Ed.), *New perspectives on environmental justice: Gender, sexuality and activism* (pp. 78-92). New Brunswick, New Jersey, NJ and London: Rutgers University Press.
- Kagawa, F., & Selby, D. (Eds.). (2010). *Education and climate change: Living and learning in interesting times*. New York, NY and Milton Park: Routledge.
- Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2012). The polarizing impact of science literacy and numeracy on perceived climate

change risks. *Nature Climate Change*, 2(10), 732-735.

doi:<http://www.nature.com/nclimate/journal/v2/n10/abs/nclimate1547.html#supplementary-information>

- Kaijser, A., & Kronsell, A. (2014). Climate change through the lens of intersectionality. *Environmental Politics*, 23(3), 417-433. doi:10.1080/09644016.2013.835203
- Kaiser, B. M., & Thiele, K. (2014). Diffraction: Onto-epistemology, quantum physics and the critical humanities. *Parallax*, 20(3), 165-167. doi:10.1080/13534645.2014.927621
- Karpudewan, M., & Mohd Ali Khan, N. S. (2017). Experiential-based climate change education: Fostering students' knowledge and motivation towards the environment. *International Research in Geographical and Environmental Education*, 26(3), 207-222. doi:10.1080/10382046.2017.1330037
- Kato, Y. (2011). Coming of age in the bubble: Suburban adolescents' use of a spatial metaphor as a symbolic boundary. *Symbolic Interaction*, 34(2), 244-264. doi:10.1525/si.2011.34.2.244
- Katona, J. (2015). *Australia refuses to join the world: Human rights denial*. Paper presented at the The Ethics of Hope? Posthumanism, Life, and Climate Change conference, 25-26 November 2015, La Trobe University.
- Kavanagh, R., Waldron, F., Ruane, B., & Oberman, R. (2012). *Education, climate change and climate justice Irish perspectives*. Paper presented at the American Educational Research Conference.
- Kelly, A. (2017). *Eco-anxiety at university: Student experiences and academic perspectives on cultivating healthy emotional responses to the climate crisis*. (SIT Study Abroad program), University of Colorado at Boulder. Retrieved from http://digitalcollections.sit.edu/isp_collection/2642
- Kelsey, E. (2017). Propagating collective hope in the midst of environmental doom and gloom. *Canadian Journal of Environmental Education (CJEE)*, 21, 23-40.
- Kenner, A. (2018). *Breathtaking: Asthma care in a time of climate change*. Minneapolis, MN: University of Minnesota Press.

- Kenny, M. (2017, February 9). Turnbull government sharpens attack on Labor's clean energy. *The Sydney Morning Herald*. Retrieved from <http://www.smh.com.au/federal-politics/political-news/turnbull-government-sharpens-attack-on-labors-clean-energy-20170209-gu9h5l.html>
- Kirksey, S. E., & Helmreich, S. (2010). The emergence of multispecies ethnography. *Cultural Anthropology*, 25(4), 545-576. doi:10.1111/j.1548-1360.2010.01069.x
- Klein, N. (2014). *This changes everything: Capitalism vs. the climate*. New York, NY: Simon & Schuster.
- Kleres, J., & Wettergren, Å. (2017). Fear, hope, anger, and guilt in climate activism. *Social Movement Studies*, 16(5), 507-519. doi:10.1080/14742837.2017.1344546
- Knox, H. (2015). Thinking like a climate. *Distinktion: Journal of Social Theory*, 16(1), 91-109. doi:10.1080/1600910X.2015.1022565
- Knudsen, B. T., & Stage, C. (2012). Contagious bodies. An investigation of affective and discursive strategies in contemporary online activism. *Emotion, Space and Society*, 5(3), 148-155. doi:10.1016/j.emospa.2011.08.004
- Kohn, E. (2018). What kind of world can what kind of we world? Staying with Donna Haraway's Staying with the Trouble. *Dialogues in Human Geography*, 8(1), 99-101. doi:10.1177/2043820617739206
- Kristin, H., & Dilshani, S. (2018). Climate change skepticism as a psychological coping strategy. *Sociology Compass*, 12(6), 1-10. doi:10.1111/soc4.12586
- Krueger, B. M. (2014). *Climate change virtue ethics and ecocriticism in undergraduate education*. (Master of Arts), Prescott College.
- Kuby, C. R. (2016). Emotions as situated, embodied, and fissured: Methodological implications of thinking with theories. In M. Zembylas & A. P. Schutz (Eds.), *Methodological advances in research on emotion and education* (pp. 125-136). Cham: Springer International Publishing.
- Kuby, C. R., & Christ, R. C. (2018). An ethico-onto-epistemological pedagogy of qualitative research: Knowing/being/doing in the neoliberal academy In V. Bozalek, R. Braidotti,

- T. Shefer, & M. Zembylas (Eds.), *Socially just pedagogies: Posthumanist, feminist and materialist perspectives in higher education* (pp. 131-147). London: Bloomsbury Academic.
- Laloe, J.-O., Cozens, J., Renom, B., Taxonera, A., & Hays, G. C. (2014). Effects of rising temperature on the viability of an important sea turtle rookery. *Nature Climate Change*, 4(6), 513-518. doi:10.1038/nclimate2236
- Lather, P. (2016). Top ten+ list (re) thinking ontology in (post) qualitative research. *Cultural Studies↔ Critical Methodologies*, 16(2), 125-131. doi:10.1177/1532708616634734
- Latour, B. (2004). How to talk about the body? The normative dimension of science studies. *Body and Society*, 10(2-3), 205-229. doi:10.1177/1357034X04042943
- Law, J. (2004). *After method: Mess in social science research*. London and New York: Routledge.
- Lazarus, R. J. (2008). Super wicked problems and climate change: Restraining the present to liberate the future. *Cornell Law Review*, 94, 1153-1234.
- Leduc, T. B. (2007). Sila dialogues on climate change: Inuit wisdom for a cross-cultural interdisciplinarity. *Climatic Change*, 85(3-4), 237. doi:10.1007/s10584-006-9187-2
- Leduc, T. B., & Crate, S. A. (2013). Reflexive shifts in climate research and education: Toward relocalizing our lives. *Nature and Culture*, 8(2), 134-161. doi:10.3167/nc.2013.080202
- Lee, C. E. (2013). *The energies of activism: Rethinking agency in contemporary climate change activism*. Durham University, Durham.
- Leibowitz, B., & Naidoo, K. (2017). The potential for posthuman insights to effect socially just pedagogies. *Education as Change*, 21(2), 149-164. doi:10.17159/1947-9417/2017/2020
- Lenz Taguchi, H. (2010). *Going beyond the theory/practice divide in early childhood education: Introducing an intra-active pedagogy*. Milton Park and New York, NY: Routledge.

- Lenz Taguchi, H. (2012). A diffractive and Deleuzian approach to analysing interview data. *Feminist Theory, 13*(3), 265-281. doi:10.1177/1464700112456001
- Lenzen, M., Dey, C., & Murray, J. (2002). A personal approach to teaching about climate change. *Australian Journal of Environmental Education, 18*, 35-45. doi:10.1017/S0814062600001105
- Leyshon, C. (2014). Critical issues in social science climate change research. *Contemporary Social Science, 9*(4), 359-373. doi:10.1080/21582041.2014.974890
- Li, C., & Monroe, M. C. (2017). Development and validation of the climate change hope scale for high school students. *Environment and Behavior, 50*(4), 454-479. doi:10.1177/0013916517708325
- Living Safe Together. (2015). *Preventing violent extremism and radicalisation in Australia*. Retrieved from <https://www.livingsafetogether.gov.au/informationadvice/Pages/what-is-radicalisation/what-is-radicalisation.aspx>
- Lloro-Bidart, T., & Semenko, K. (2017). Toward a feminist ethic of self-care for environmental educators. *The Journal of Environmental Education, 48*(1), 18-25. doi:10.1080/00958964.2016.1249324
- Lolavar, A., & Wyneken, J. (2015). Effect of rainfall on loggerhead turtle nest temperatures, sand temperatures and hatchling sex. *Endangered Species Research, 28*(3), 235-247. doi:10.3354/esr00684
- Lomas, C. (2014, August 14). Group therapy tackles climate change anxiety. *DW*. Retrieved from <http://www.dw.com/en/group-therapy-tackles-climate-change-anxiety/a-17853991>
- Lombardi, D., & Sinatra, G. M. (2013). Emotions about teaching about human-induced climate change. *International Journal of Science Education, 35*(1), 167-191. doi:10.1080/09500693.2012.738372
- Loomba, A. (2005). *Colonialism-postcolonialism* (2nd ed.). New York, NY: Routledge.
- Lorde, A. (1984). *Sister outsider: Essays and speeches*. Berkeley, CA: The Crossing Press.

- Lorimer, J. (2007). Nonhuman charisma. *Environment and Planning D: Society and Space*, 25(5), 911-932.
- Lorimer, J. (2010). Elephants as companion species: The lively biogeographies of Asian elephant conservation in Sri Lanka. *Transactions of the Institute of British Geographers*, 35(4), 491-506. doi:10.1111/j.1475-5661.2010.00395.x
- Lucy, M. (2018). How clouds complicate global warming. *Cosmos*. Retrieved from <https://cosmosmagazine.com/climate/how-clouds-complicate-global-warming>
- Lupton, D. (2017). How does health feel? Towards research on the affective atmospheres of digital health. *Digital Health*, 3, 1-11. doi:10.1177/2055207617701276
- Lykke, N. (2010). *Feminist studies: A guide to intersectional theory, methodology and writing*. New York, NY and Milton Park: Taylor & Francis.
- MacGregor, S. (2010). A stranger silence still: The need for feminist social research on climate change. *The Sociological Review*, 57(2), 124-140. doi:10.1111/j.1467-954X.2010.01889.x
- MacLure, M. (2008). Broken voices, dirty words: On the productive insufficiency of voice. In A. Y. Jackson & L. A. Mazzei (Eds.), *Voice in qualitative inquiry: Challenging conventional, interpretive, and critical conceptions in qualitative research* (pp. 97-115). Milton Park and New York: Routledge.
- MacLure, M. (2013). Researching without representation? Language and materiality in post-qualitative methodology. *International Journal of Qualitative Studies in Education*, 26(6), 658-667. doi:10.1080/09518398.2013.788755
- Manning, C., & Clayton, S. (2018). Threats to mental health and wellbeing associated with climate change. In S. Clayton & C. Manning (Eds.), *Psychology and climate change* (pp. 217-244). London, San Diego CA, Cambridge MA and Oxford: Academic Press.
- March for Science Australia. (2017). Retrieved from <https://marchforscienceaustralia.org/>
- Markowitz, E. M. (2012). Is climate change an ethical issue? Examining young adults' beliefs about climate and morality. *Climatic Change*, 114(3), 479-495. doi:10.1007/s10584-012-0422-8

- Markowitz, E. M., & Shariff, A. F. (2012). Climate change and moral judgement. *Nature Climate Change*, 2(4), 243-247. doi:10.1038/nclimate1378
- Marshall, G. (2014). *Don't even think about it: Why our brains are wired to ignore climate change*. Broadway, NY and London: Bloomsbury Publishing.
- Marshall, J. (2011). Climate change movements and psycho-social disorder. *The Australian Journal of Anthropology*, 22(2), 265-269. doi:10.1111/j.1757-6547.2011.00131.x
- Massola, J., Ker, P., & Cox, L. (2014, October 13). Coal is “good for humanity”, says Tony Abbott at mine opening. *The Sydney Morning Herald*. Retrieved from <http://www.smh.com.au/federal-politics/political-news/coal-is-good-for-humanity-says-tony-abbott-at-mine-opening-20141013-115bgs.html>
- Mastrandrea, M. D., Field, C. B., Stocker, T. F., Edenhofer, O., Ebi, K. L., Frame, D. J., . . . Zwiers, F. W. (2010). *Guidance note for lead authors of the IPCC Fifth Assessment Report on consistent treatment of uncertainties*. Retrieved from <http://www.ipcc.ch/>
- Mathews, F. (2003). *For love of matter: A contemporary panpsychism*. Albany, NY: Suny Press.
- Mathews, F. (2006). *The ecological self*. London: Taylor & Francis.
- Mathews, F. (2011). Planet beehive. *Australian Humanities Review*, 50, 159-178.
- Maxwell, C., & Aggleton, P. (2010). The bubble of privilege. Young, privately educated women talk about social class. *British Journal of Sociology of Education*, 31(1), 3-15. doi:10.1080/01425690903385329
- Mazzei, L. A. (2013a). Materialist mappings of knowing in being: Researchers constituted in the production of knowledge. *Gender and Education*, 25(6), 776-785. doi:10.1080/09540253.2013.824072
- Mazzei, L. A. (2013b). A voice without organs: Interviewing in posthumanist research. *International Journal of Qualitative Studies in Education*, 26(6), 732-740. doi:10.1080/09518398.2013.788761

- Mazzei, L. A. (2014). Beyond an easy sense: A diffractive analysis. *Qualitative Inquiry*, 20(6), 742-746. doi:10.1177/1077800414530257
- Mazzei, L. A. (2016). Voice without a subject. *Cultural Studies ↔ Critical Methodologies*, 16(2), 151-161. doi:10.1177/1532708616636893
- Mazzei, L. A., & Jackson, A. Y. (2016). Voice in the agentic assemblage. *Educational Philosophy and Theory*, 49(11), 1090-1098. doi:10.1080/00131857.2016.1159176
- McCormack, D.P. (2008). Engineering affective atmospheres on the moving geographies of the 1897 Andrée expedition. *Cultural Geographies*, 15(4), 413-430. doi:10.1177/1474474008094314
- McCright, A. (2010). The effects of gender on climate change knowledge and concern in the American public. *Population and Environment*, 32(1), 66-87. doi:10.1007/s11111-010-0113-1
- McKenzie, M. (2008). The places of pedagogy: or, what we can do with culture through intersubjective experiences. *Environmental Education Research*, 14(3), 361-373. doi:10.1080/13504620802194208
- McKenzie, M., & Bieler, A. (2016). *Critical education and sociomaterial practice: Narration, place, and the social*. New York, Bern, Berlin, Bruxelles, Frankfurt am Main, Oxford, Wien: Peter Lang.
- McKenzie, M., Hart, P., Bai, H., & Jickling, B. (2009). Introduction: Educational fields and cultural imaginaries. In M. McKenzie, P. Hart, H. Bai, & B. Jickling (Eds.), *Fields of green: Restorying culture, environment, and education* (pp. 1-10). Cresskill, NJ: Hampton Press.
- McKinnon, C. (2014). Climate change: Against despair. *Ethics & the Environment*, 19(1), 31-48. doi:10.2979/ethicsenviro.19.1.31
- McKnight, L. (2016). Meet the phallic teacher: Designing curriculum and identity in a neoliberal imaginary. *The Australian Educational Researcher*, 43(4), 473-486. doi:10.1007/s13384-016-0210-y

- McKnight, L., & Whitburn, B. (2017). The fetish of the lens: Persistent sexist and ableist metaphor in education research. *International Journal of Qualitative Studies in Education*, 30(9), 821-831. doi:10.1080/09518398.2017.1286407
- Meadows, D., Sweeney, L. B., & Mehers, G. M. (2016). *The climate change playbook: 22 systems thinking games for more effective communication about climate change*. White River Junction, VT: Chelsea Green Publishing.
- Mellander, E., & Wiszmeg, A. (2016). Interfering with others—re-configuring ethnography as a diffractive practice. *Kulturstudier*, 7(1), 93-115. doi:10.7146/ks.v7i1.24056
- Michaels, J. (n.d.). How can psychotherapy help to stop climate change? Twenty therapists answer *Psyched in San Francisco*. Retrieved from <http://www.psychedinsanfrancisco.com/how-can-psychotherapy-can-help-stop-climate-change/>
- Michels, C. (2015). Researching affective atmospheres. *Geographica Helvetica*, 70(4), 255. doi:10.5194/gh-70-255-2015
- Michels, C., & Steyaert, C. (2017). By accident and by design: Composing affective atmospheres in an urban art intervention. *Organization*, 24(1), 79-104. doi:10.1177/1350508416668190
- Miller-Struttman, N. E., Geib, J. C., Franklin, J. D., Kevan, P. G., Holdo, R. M., Ebert-May, D., . . . Galen, C. (2015). Functional mismatch in a bumble bee pollination mutualism under climate change. *Science*, 349(6255), 1541-1544. doi:10.1126/science.aab0868
- Moloney, S., & Horne, R. (2015). Low carbon urban transition: From local experimentation to urban transformation? *Sustainability*, 7(3), 2437-2453. doi:10.3390/su7032437
- Monroe, M. C., Plate, R. R., Oxarart, A., Bowers, A., & Chaves, W. A. (2017). Identifying effective climate change education strategies: A systematic review of the research. *Environmental Education Research, Online first*, 1-22. doi:10.1080/13504622.2017.1360842
- Morton, A. (2018, September 17). Australia has no climate-change policy—again. *Nature*.

Retrieved from <https://www.nature.com/articles/d41586-018-06675-9>

- Moser, S. C. (2010). Communicating climate change: History, challenges, process and future directions. *Wiley Interdisciplinary Reviews: Climate Change*, 1(1), 31-53.
doi:10.1002/wcc.11
- Moser, S. C. (2016). Reflections on climate change communication research and practice in the second decade of the 21st century: What more is there to say? *Wiley Interdisciplinary Reviews: Climate Change*, 7(3), 345-369. doi:10.1002/wcc.403
- Moser, S. C., & Dilling, L. (2007). Toward the social tipping point: Creating a climate for change. In S. C. Moser & L. Dilling (Eds.), *Creating a climate for change* (pp. 491-516). Cambridge: Cambridge University Press.
- Mowaljarlai, D., & Malnic, J. (2015). *Yorro Yorro. Everything standing up alive: Spirit of the Kimberley*. Broome: Magabala Books.
- Mulcahy, D. (2012). Affective assemblages: Body matters in the pedagogic practices of contemporary school classrooms. *Pedagogy, Culture & Society*, 20(1), 9-27.
doi:10.1080/14681366.2012.649413
- Murphy, P. (2010). Tilting for windmills: Climate change, websites, and ecocritical pedagogy. *Ecozon@: European Journal of Literature, Culture and Environment*, 1(1), 35-40.
- Neely, A. H., & Nguse, T. (2015). Relationships and research methods: Entanglements, interactions, and diffraction. In T. Perreault, G. Bridge, & J. McCarthy (Eds.), *The Routledge Handbook of Political Ecology* (pp. 140-149). Milton Park and New York, NY: Routledge.
- Neimanis, A. (2015). Weather writing: A feminist materialist practice for (getting outside) the classroom. In P. Hinton & P. Treusch (Eds.), *Teaching with feminist materialisms* (pp. 141-157). Utrecht: ATGENDER.
- Neimanis, A. (2017). *Bodies of water: Posthuman feminist phenomenology*. London: Bloomsbury Academic.

- Neimanis, A. (2018). Posthuman phenomenologies for planetary bodies of water. In C. Åsberg & R. Braidotti (Eds.), *A feminist companion to the posthumanities* (pp. 55-66). Cham: Springer.
- Neimanis, A., Åsberg, C., & Hedrén, J. (2015). Four problems, four directions for environmental humanities: Toward critical posthumanities for the Anthropocene. *Ethics and the Environment*, 20(1), 67-97. doi:10.2979/ethicsenviro.20.1.67
- Neimanis, A., & Hamilton, J. M. (2018). Weathering. *Feminist Review*, 118(1), 80-84.
- Neimanis, A., & Walker, R. L. (2013). Weathering: Climate change and the “thick time” of transcorporeality. *Hypatia*, 29(3), 558-575. doi:10.1111/hypa.12064
- Niebert, K., & Gropengiesser, H. (2013). Understanding and communicating climate change in metaphors. *Environmental Education Research*, 19(3), 282-302. doi:10.1080/13504622.2012.690855
- Nolt, J. (2011). Nonanthropocentric climate ethics. *Wiley Interdisciplinary Reviews: Climate Change*, 2(5), 701-711. doi:10.1002/wcc.131
- Norgaard, K. M. (2011a). Climate denial: Emotion, psychology, culture, and political economy. In J. S. Dryzek, R. B. Norgaard, & D. Schlosberg (Eds.), *The Oxford handbook of climate change and society* (pp. 399-413). New York, NY: Oxford University Press.
- Norgaard, K. M. (2011b). *Living in denial: Climate change, emotions, and everyday life*. Cambridge, MA and London: MIT Press.
- Nuccitelli, D. (2017, July 19). Climate denial is like The Matrix; more Republicans are choosing the red pill. *The Guardian*. Retrieved from <https://www.theguardian.com/environment/climate-consensus-97-percent/2017/jul/19/climate-denial-is-like-the-matrix-more-republicans-are-choosing-the-red-pill>
- Nxumalo, F. (2017). Stories for living on a damaged planet: Environmental education in a preschool classroom. *Journal of Early Childhood Research*, 16(2), 148-159. doi:10.1177/1476718X17715499

- Nyberg, D., & Wright, C. (2012). Justifying business responses to climate change: Discursive strategies of similarity and difference. *Environment and Planning A*, 44(8), 1819-1835. doi:10.1068/a44565
- Obradovich, N., & Guenther, S. M. (2016). Collective responsibility amplifies mitigation behaviors. *Climatic Change*, 137(1), 307-319. doi:10.1007/s10584-016-1670-9
- O'Brien, K. (2010, February 2). Tony Abbott joins The 7.30 Report. *The 7:30 Report*. Retrieved from <http://www.abc.net.au/7.30/content/2010/s2808321.htm>
- O'Brien, K. L. (2016). Climate change and social transformations: Is it time for a quantum leap? *Wiley Interdisciplinary Reviews: Climate Change*, 7, 618-626. doi:10.1002/wcc.413
- O'Neill, S., & Nicholson-Cole, S. (2009). "Fear won't do it": Promoting positive engagement with climate change through visual and iconic representations. *Science Communication*, 30(3), 355-379. doi:10.1177/1075547008329201
- Ojala, M. (2012). Hope and climate change: The importance of hope for environmental engagement among young people. *Environmental Education Research*, 18(5), 625-642. doi:10.1080/13504622.2011.637157
- Ojala, M. (2016). Facing anxiety in climate change education: From therapeutic practice to hopeful transgressive learning. *Canadian Journal of Environmental Education*, 21, 41-56.
- Orlander, A. A., & Ståhl, M. (2018). Towards an understanding of diffractive readings of narratives in the field of science education. In K. Otrell-Cass, M. K. Sillasen, & A. A. Orlander (Eds.), *Cultural, social, and political perspectives in science education: A Nordic view* (pp. 139-152). Cham: Springer International Publishing.
- Ostrom, E. (2010). A multi-scale approach to coping with climate change and other collective action problems. *Solutions*, 1(2), 27-36.
- Panno, A., Giacomantonio, M., Carrus, G., Maricchiolo, F., Pirchio, S., & Mannetti, L. (2017). Mindfulness, pro-environmental behavior, and belief in climate change: The

mediating role of social dominance. *Environment and Behavior*, 50(8), 864-888
doi:10.1177/0013916517718887

Pearce, F. (2005, February 9). Climate change: Act now, before it is too late. *New Scientist*.
Retrieved from <https://www.newscientist.com/article/mg18524864-300-climate-change-act-now-before-it-is-too-late/>

Pearse, R. (2017). Gender and climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 8(2), 1-16. doi:10.1002/wcc.451

Pedersen, H. (2010). Is “the posthuman” educable? On the convergence of educational philosophy, animal studies, and posthumanist theory. *Discourse: Studies in the Cultural Politics of Education*, 31(2), 237-250. doi:10.1080/01596301003679750

Pedersen, H., & Pini, B. (2017). Educational epistemologies and methods in a more-than-human world. *Educational Philosophy and Theory*, 49(11), 1051-1054.
doi:10.1080/00131857.2016.1199925

Perry, F., Henry, S., Perry, M., & MacArthur, L. (2015). *Green innovation index*. California: Next 10 and Collaborative Economics.

Perry, M., & Medina, C. (2011). Embodiment and performance in pedagogy research: Investigating the possibility of the body in curriculum experience. *Journal of Curriculum Theorizing*, 27(3), 62-75.

Phillips, D. K., & Larson, M. L. (2012). The teacher-student writing conference entangled: Thinking data with material feminisms. *Cultural Studies ↔ Critical Methodologies*, 12(3), 225-234. doi:10.1177/1532708612440256

Pickering, A. (1995). *The mangle of practice: Time, agency, and science*. Chicago and London: University of Chicago Press.

Plumwood, V. (1993). *Feminism and the mastery of nature*. London: Routledge.

Plumwood, V. (2002). *Environmental culture: The ecological crisis of reason*. New York: Routledge.

- Plutzer, E., McCaffrey, M., Hannah, A. L., Rosenau, J., Berbeco, M., & Reid, A. H. (2016). Climate confusion among U.S. teachers. *Science*, 351(6274), 664-665. doi:10.1126/science.aab3907
- Postma, D. (2012). Education as sociomaterial critique. *Pedagogy, Culture & Society*, 20(1), 137-156. doi:10.1080/14681366.2012.649419
- Potter, E. (2009). Climate change and the problem of representation. *Australian Humanities Review*, 46, 69-79.
- Prasad, A. (2008). Science in motion: What postcolonial science studies can offer. *Receis*, 2(2), 35-47. doi:10.3395/receis.v2i2.187en
- Prudham, S. (2009). Pimping climate change: Richard Branson, global warming, and the performance of green capitalism. *Environment and Planning A*, 41(7), 1594. doi:10.1068/a4071
- Pruneau, D., Khattabi, A., & Demers, M. (2010). Challenges and possibilities in climate change education. *US-China Education Review*, 7(9), 15-24.
- Qitsualik, R. A. (2013). Inummarik: Self-sovereignty in classic Inuit thought. *Nilliajut: Inuit Perspectives on Security, Patriotism and Sovereignty* (pp. 23-34). Ottawa: Inuit Qaujisarvingat.
- Quinn, J. (2013). Theorising learning and nature: Post-human possibilities and problems. *Gender and Education*, 25(6), 738-753. doi:10.1080/09540253.2013.831811
- Radomska, M. (2013). Posthumanist pedagogies: Toward an ethics of the non/living. *Journal of Curriculum and Pedagogy*, 10(1), 28-31. doi:10.1080/15505170.2013.789999
- Ralago, J. (2016, December 19). Landslide sweeps Dreketi Village. *Fiji Sun*. Retrieved from <http://fijisun.com.fj/2016/12/19/landslide-sweeps-dreketi-village/>
- Randall, R. (2005). A new climate for psychotherapy? *Psychotherapy and Politics International*, 3(3), 165-179. doi:10.1002/ppi.7
- Randall, R. (2009). Loss and climate change: The cost of parallel narratives. *Ecopsychology*, 1(3), 118-129. doi:10.1089/eco.2009.0034

- Reinert, H. (2016). About a stone: Some notes on geologic conviviality. *Environmental Humanities*, 8(1), 95-117. doi:10.1215/22011919-3527740
- Remeikis, A. (2018, September 30). PM claims Australia will meet Paris target 'in a canter' despite emissions climbing *The Guardian*. Retrieved from <https://www.theguardian.com/australia-news/2018/sep/30/pm-claims-australia-will-meet-paris-target-in-a-canter-despite-emissions-climbing>
- Reynolds, T. W., Bostrom, A., Read, D., & Morgan, M. G. (2010). Now what do people know about global climate change? Survey studies of educated laypeople. *Risk Analysis*, 30(10), 1520-1538. doi:10.1111/j.1539-6924.2010.01448.x
- Richardson, M. (2018). Climate trauma, or the affects of the catastrophe to come. *Environmental Humanities*, 10(1), 1-19. doi:10.1215/22011919-4385444
- Rickards, L. (2015). Critiquing, mining and engaging Anthropocene science. *Dialogues in Human Geography*, 5(3), 337-342. doi:10.1177/2043820615613263
- Rickards, L. (forthcoming). Thinking environmentally about cities to recognize urban-made climates. In J. van der Heijden, H. Bulkeley, & C. Certomà (Eds.), *Urban climate politics: Agency and empowerment*: Routledge.
- Rickards, L., & Oppermann, E. (2018). Battling the tropics to settle a nation: Negotiating multiple energies, frontiers and feedback loops in Australia. *Energy Research & Social Science*, 41, 97-108. doi: 10.1016/j.erss.2018.04.038
- Rickards, L., Wiseman, J., & Kashima, Y. (2014). Barriers to effective climate change mitigation: The case of senior government and business decision makers. *Wiley Interdisciplinary Reviews: Climate Change*, 5(6), 753-773. doi:10.1002/wcc.305
- Rigby, K. (2009). Writing in the Anthropocene: Idle chatter or ecoprophetic witness? *Australian Humanities Review*, 47, 173-187.
- RMIT. (2018a). About RMIT. Retrieved from <https://www.rmit.edu.au/about>
- RMIT. (2018b). Sustainability. Retrieved from <https://www.rmit.edu.au/about/our-values/sustainability>

- Robbins, P., & Moore, S. A. (2013). Ecological anxiety disorder: Diagnosing the politics of the Anthropocene. *Cultural Geographies*, 20(1), 3-19.
doi:10.1177/1474474012469887
- Roberts, D. (2017). Did that New York Magazine climate story freak you out? Good. *Vox*. Retrieved from <https://www.vox.com/energy-and-environment/2017/7/11/15950966/climate-change-doom-journalism>
- Roe, P., & Muecke, S. (1983). *Gularabulu: Stories from the West Kimberley*. Fremantle: Fremantle Arts Centre Press.
- Roelvink, G. (2010). Collective action and the politics of affect. *Emotion, Space and Society*, 3(2), 111-118. doi:10.1016/j.emospa.2009.10.004
- Roelvink, G., & Zolkos, M. (2011). Climate change as experience of affect. *Angelaki*, 16(4), 43-57. doi:10.1080/0969725X.2011.641344
- Roelvink, G., & Zolkos, M. (2015). Affective ontologies: Post-humanist perspectives on the self, feeling and intersubjectivity. *Emotion, Space and Society*, 14, 47-49.
- Rooney, T. (2018a). Weather worlding: Learning with the elements in early childhood. *Environmental Education Research*, 24(1), 1-12.
doi:10.1080/13504622.2016.1217398
- Rooney, T. (2018b). Weathering time: Walking with young children in a changing climate. *Children's Geographies, Online first*, 1-13. doi:10.1080/14733285.2018.1474172
- Rose, D. B. (1996). *Nourishing terrains: Australian Aboriginal views of landscape and wilderness*. Canberra: Australian Heritage Commission.
- Rose, D. B. (2004). *Reports from a wild Country: Ethics for decolonisation*. Sydney: UNSW Press.
- Rose, D. B. (2013). *Anthropocene noir*. Paper presented at the People and the Planet 2013: Transforming the Future Conference, 2-4 July, RMIT University, Melbourne.
- Rose, D. B. (2015a). Becoming-witness. In D. Peterson & M. Bekoff (Eds.), *The Jane effect: Celebrating Jane Goodall* (pp. 231-232). San Antonio, TX: Trinity University Press.

- Rose, D. B. (2015b). *Hope after hubris: Kinship and witness*. Paper presented at the The Ethics of Hope? Posthumanism, Life, and Climate Change conference, 25-26 November 2015, La Trobe University.
- Rousell, D., Cutter-Mackenzie, A., & Foster, J. (2017). Children of an Earth to come: Speculative fiction, geophilosophy and climate change education research. *Educational Studies*, 53(6), 654-669. doi:10.1080/00131946.2017.1369086
- Rowson, J. (2013). A new agenda on climate change: Facing up to stealth denial and winding down on fossil fuels. *RSA (Royal Society for the Encouragement of Arts, Manufactures and Commerce)*.
- Ruddick, S. M. (2017). Rethinking the subject, reimagining worlds. *Dialogues in Human Geography*, 7(2), 119-139. doi:10.1177/2043820617717847
- Rumore, D., Schenk, T., & Susskind, L. (2016). Role-play simulations for climate change adaptation education and engagement. *Nature Climate Change*, 6(8), 745-750. doi:10.1038/nclimate3084
- Russell, C., & Oakley, J. (2016). Engaging the emotional dimensions of environmental education. *Canadian Journal of Environmental Education*, 21, 13-22.
- Ryan, K. (2016). Incorporating emotional geography into climate change research: A case study in Londonderry, Vermont, USA. *Emotion, Space and Society*, 19, 5-12. doi:10.1016/j.emospa.2016.02.006
- Sachdeva, S. (2016). Religious identity, beliefs, and views about climate change. *Climate science: Oxford research encyclopedias*. doi:10.1093/acrefore/9780190228620.013.335
- Sadker, M., & Sadker, D. (2010). *Failing at fairness: How America's schools cheat girls*. New York, NY: Scribner.
- Salama, S., & Aboukoura, K. (2018). Role of emotions in climate change communication. In W. Leal Filho, E. Manolas, A. M. Azul, U. M. Azeiteiro, & H. McGhie (Eds.), *Handbook of climate change communication: Vol. 1: Theory of climate change communication* (Vol. 1, pp. 137-150). Cham: Springer International Publishing.

- Salazar, J. F. (2017). Speculative fabulation: Researching worlds to come in Antarctica. In J. F. Salazar, S. Pink, A. Irving, & J. Sjöberg (Eds.), *Anthropologies and futures: Researching emerging and uncertain worlds* (pp. 151-170). New York, NY and London: Bloomsbury Academic.
- Sandler, B. R. (1996). *The chilly classroom climate: A guide to improve the education of women*.
- Sasser, J. S. (2016). Population, climate change, and the embodiment of environmental crisis. In P. Godfrey & D. Torres (Eds.), *Systemic crises of global climate change: Intersections of race, class and gender*. Milton Park and New York, NY: Taylor & Francis.
- Saunders, C. (2008). Double-edged swords? Collective identity and solidarity in the environment movement. *The British Journal of Sociology*, 59(2), 227-253. doi:10.1111/j.1468-4446.2008.00191.x
- Schaeffer, F. A. (2018). Spirit matters: Gloria Anzaldúa's cosmic becoming across human/nonhuman borderlands. *Signs: Journal of Women in Culture and Society*, 43(4), 1005-1029. doi:10.1086/696630
- Schnabel, L. (2014). The question of subjectivity in three emerging feminist science studies frameworks: Feminist postcolonial science studies, new feminist materialisms, and queer ecologies. *Women's Studies International Forum*, 44, 10-16. doi:10.1016/j.wsif.2014.02.011
- Schneider, J. (2002). Reflexive/diffractive ethnography. *Cultural Studies ↔ Critical Methodologies*, 2(4), 460-482. doi:10.1177/153270860200200402
- Schwartz, J. B. (2015, November 18). Bearing witness: Feminists must step up for climate justice. *Feministing*. Retrieved from <http://feministing.com/2015/11/18/bearing-witness-feminists-must-step-up-for-climate-justice/>
- Scott, W. (2002). Minds, gaps, models, and behaviours. *Environmental Education Research*, 8(3), 237-238. doi:10.1080/1350462022000009871

- Seaman, L. (2016). *Climate change on the therapist's couch: How mental health clinicians receive and respond to indirect psychological impacts of climate change in the therapeutic setting*. (Masters of Social Work), Smith College School for Social Work.
- Serrao-Neumann, S., Crick, F., Harman, B., Schuch, G., & Choy, D. L. (2015). Maximising synergies between disaster risk reduction and climate change adaptation: Potential enablers for improved planning outcomes. *Environmental Science & Policy*, 50, 46-61. doi:10.1016/j.envsci.2015.01.017
- Seth, S. (2009). Putting knowledge in its place: Science, colonialism, and the postcolonial. *Postcolonial Studies*, 12(4), 373-388. doi:10.1080/13688790903350633
- Sharp, H. (2017). Spinoza and the possibilities for radical climate ethics. *Dialogues in Human Geography*, 7(2), 156-160. doi:10.1177/2043820617720063
- Shaw, R. (2014). Beyond night-time economy: Affective atmospheres of the urban night. *Geoforum*, 51(Supplement C), 87-95. doi:10.1016/j.geoforum.2013.10.005
- Shepardson, D. P., Niyogi, D., Roychoudhury, A., & Hirsch, A. (2012). Conceptualizing climate change in the context of a climate system: Implications for climate and environmental education. *Environmental Education Research*, 18(3), 323-352. doi:10.1080/13504622.2011.622839
- Singh, N. M. (2013). The affective labor of growing forests and the becoming of environmental subjects: Rethinking environmentality in Odisha, India. *Geoforum*, 47, 189-198. doi:10.1016/j.geoforum.2013.01.010
- Sjögren, H. (2014). Educable futures?: Managing epistemological uncertainties in sustainability education. *Resilience: A Journal of the Environmental Humanities*, 1(2), 1-14. doi:10.5250/resilience.1.2.005
- Skamp, K., Boyes, E., & Stanisstreet, M. (2013). Beliefs and willingness to act about global warming: Where to focus science pedagogy? *Science Education*, 97(2), 191-217. doi:10.1002/sce.21050
- Smith, M. (2013). Earthly passion(s): Essays towards an emotional ecology. *Emotion, Space and Society*, 6, 1-3. doi:10.1016/j.emospa.2012.12.002

- Smith, R. (2018, June 26). Inquest into deaths of 10 Victorians from thunderstorm asthma hears common theme. *news.com.au*. Retrieved from <https://www.news.com.au/lifestyle/health/inquest-into-deaths-of-10-victorians-from-thunderstorm-asthma-hears-common-theme/news-story/0588b4a870d625bae5f984ca5a86b79b>
- Snaza, N. (2013). Bewildering education. *Journal of Curriculum and Pedagogy*, 10(1), 38-54. doi:10.1080/15505170.2013.783889
- Snaza, N. (2015). Toward a genealogy of educational humanism. In N. Snaza & J. Weaver (Eds.), *Posthumanism and educational research* (pp. 17-29). New York, NY and Milton Park: Routledge.
- Snaza, N., Sonu, D., Truman, S. E., & Zaliwska, Z. (2016). Introduction: Re-attuning to the materiality of education In N. Snaza, D. Sonu, S. E. Truman, & Z. Zaliwska (Eds.), *Pedagogical matters: New materialisms and curriculum studies* (pp. xv-xxxi). New York, NY: Peter Lang Publishing, Inc.
- Somerville, M. (2017). The Anthropocene's call to educational research. In K. Malone, S. Truong, & T. Gray (Eds.), *Reimagining sustainability in precarious times* (pp. 17-28). Singapore: Springer Singapore.
- Somerville, M. (2010). A place pedagogy for "global contemporaneity". *Educational Philosophy and Theory*, 42(3), 326-344. doi:10.1111/j.1469-5812.2008.00423.x
- Sonu, D., & Snaza, N. (2015). The fragility of ecological pedagogy: Elementary social studies standards and possibilities of new materialism. *Journal of Curriculum and Pedagogy*, 12(3), 258-277. doi:10.1080/15505170.2015.1103671
- Spector, K. (2015). Meeting pedagogical encounters halfway. *Journal of Adolescent & Adult Literacy*, 58(6), 447-450. doi:10.1002/jaal.382
- Spivak, G. C. (1988). Can the subaltern speak? In R. C. Morris (Ed.), *Can the subaltern speak? Reflections on the history of an idea* (pp. 21-78). New York, NY: Columbia University Press.

- St. Pierre, E. A. (2008). Decentering voice in qualitative enquiry. In A. Y. Jackson & L. A. Mazzei (Eds.), *Voice in qualitative inquiry: Challenging conventional, interpretive, and critical conceptions in qualitative research* (pp. 221-236). Milton Park and New York, NY: Routledge.
- St. Pierre, E. A. (2013a). The appearance of data. *Cultural Studies ↔ Critical Methodologies*, 13(4), 223-227. doi:10.1177/1532708613487862
- St. Pierre, E. A. (2013b). The posts continue: Becoming. *International Journal of Qualitative Studies in Education*, 26(6), 646-657. doi:10.1080/09518398.2013.788754
- Stapleton, S. R. (2018). A case for climate justice education: American youth connecting to intragenerational climate injustice in Bangladesh. *Environmental Education Research, Online first*, 1-19. doi:10.1080/13504622.2018.1472220
- Stevenson, K., Peterson, M. N., Bondell, H. D., Moore, S. E., & Carrier, S. J. (2014). Overcoming skepticism with education: Interacting influences of worldview and climate change knowledge on perceived climate change risk among adolescents. *Climatic Change*, 126(3), 293-304. doi:10.1007/s10584-014-1228-7
- Stevenson, K., & Peterson, N. (2016). Motivating action through fostering climate change hope and concern and avoiding despair among adolescents. *Sustainability*, 8(1), 6.
- Stevenson, R., Nicholls, J., & Whitehouse, H. (2017). What is climate change education? *Curriculum Perspectives*, 37(1), 67-71. doi:10.1007/s41297-017-0015-9
- Stewart, K. (2011). Atmospheric attunements. *Environment and Planning D: Society and Space*, 29(3), 445-453. doi:10.1068/d9109
- Sturmer, J., & Conifer, D. (2015, August 19). Adani coal mine: Crackdown on green ‘sabotage’ could result in more time in courts, legal experts say. *ABC News*. Retrieved from <http://www.abc.net.au/news/2015-08-19/legal-experts-weigh-in-on-coal-mine-laws/6707170>
- Sundberg, J. (2015). Ethics, entanglement, and political ecology. In T. Perreault, G. Bridge, & J. McCarthy (Eds.), *The Routledge handbook of political ecology* (pp. 117-126). New York, NY and Milton Park: Routledge.

- Svensson, J., Neumayer, C., Banfield-Mumb, A., & Schossböck, J. (2015). Identity negotiation in activist participation. *Communication, Culture & Critique*, 8(1), 144-162. doi:10.1111/cccr.12073
- Swanson, H., Tsing, A., Bubandt, N., & Gan, E. (2017). Introduction: Bodies tumbled into bodies. In A. L. Tsing, H. A. Swanson, E. Gan, & N. Bubandt (Eds.), *Arts of living on a damaged planet: Ghosts and monsters of the Anthropocene* (pp. 1-13). Minneapolis, MN: University of Minnesota Press.
- Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., . . . Weber, E. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. A report by the American Psychological Association's Task Force on the Interface Between Psychology and Global Climate Change*. Washington: American Psychological Association.
- Szszynski, B. (2010). Reading and writing the weather: Climate technics and the moment of responsibility. *Theory, Culture & Society*, 27(2-3), 9-30. doi:10.1177/0263276409361915
- Taddei, R. (2013). Anthropologies of the future: On the social performativity of (climate) forecasts. In H. Kopnina & E. Shoreman-Ouimet (Eds.), *Environmental Anthropology: Future Directions*. New York, NY and Milton Park: Taylor & Francis.
- Taylor, A. (2017a). Beyond stewardship: Common world pedagogies for the Anthropocene. *Environmental Education Research*, 23(10), 1448-1461. doi:10.1080/13504622.2017.1325452
- Taylor, A. (2017b). Romancing or re-configuring nature in the Anthropocene? Towards common worlding pedagogies. In K. Malone, S. Truong, & T. Gray (Eds.), *Reimagining Sustainability in Precarious Times* (pp. 61-75). Singapore: Springer Singapore.
- Taylor, A., & Blaise, M. (2014). Queer worlding childhood. *Discourse: Studies in the Cultural Politics of Education*, 35(3), 377-392. doi:10.1080/01596306.2014.888842

- Taylor, A., & Giugni, M. (2012). Common worlds: Reconceptualising inclusion in early childhood communities. *Contemporary Issues in Early Childhood*, 13(2), 108-119. doi:10.2304/ciec.2012.13.2.108
- Taylor, A., & Pacini-Ketchabaw, V. (2015). Learning with children, ants, and worms in the Anthropocene: Towards a common world pedagogy of multispecies vulnerability. *Pedagogy, Culture & Society*, 23(4), 507-529. doi:10.1080/14681366.2015.1039050
- Taylor, A., & Pacini-Ketchabaw, V. (2017). Kids, raccoons, and roos: Awkward encounters and mixed affects. *Children's Geographies*, 15(2), 131-145. doi:10.1080/14733285.2016.1199849
- Taylor, C. (2013). Objects, bodies and space: Gender and embodied practices of mattering in the classroom. *Gender and Education*, 25(6), 688-703. doi:10.1080/09540253.2013.834864
- Taylor, C., & Hughes, C. (2016). Introduction. In C. Taylor & C. Hughes (Eds.), *Posthuman research practices in education* (pp. 1-4). London: Palgrave Macmillan UK.
- Taylor, C., & Ivinson, G. (2013). Material feminisms: New directions for education. *Gender and Education*, 25(6), 665-670. doi:10.1080/09540253.2013.834617
- Te Punga Somerville, A. (2016). *Somewhere the sea*. Paper presented at the Global Ecologies - Local Impacts, The Sixth Biennial Conference of the Association for the Study of Literature, Environment & Culture, Australia & New Zealand (ASLEC-ANZ) in collaboration with the Sydney Environment Institute (SEI), 23-25 November, University of Sydney.
- The Cloud Appreciation Society. (2016). Manifesto. Retrieved from <https://cloudappreciationsociety.org/manifesto/>
- The Leap Manifesto. (n.d.). The Leap Manifesto. Retrieved from <https://leapmanifesto.org/en/the-leap-manifesto/#manifesto-content>
- Thornhill, T. (2013). "It may be too late": Reducing greenhouse gas emissions might not stop global warming, claims climate scientist. *Daily Mail Australia*. Retrieved from

<http://www.dailymail.co.uk/sciencetech/article-2513936/It-late-Reducing-greenhouse-gas-emissions-stop-global-warming-claims-climate-scientist.html>

- Thoyre, A. (2015). Constructing environmentalist identities through green neoliberal identity work. *Journal of Political Ecology*, 22(1), 146-163.
- Tilley, C., & Leslie, T. (2018). Paradise goes up in flames. *ABC News*. Retrieved from <https://www.abc.net.au/news/2018-11-21/paradise-california-fires-before-after/10514972>
- Todd, Z. (2016). An Indigenous feminist's take on the ontological turn: 'Ontology' is just another word for colonialism. *Journal of Historical Sociology*, 29(1), 4-22. doi:10.1111/johs.12124
- Tosun, J., & Schoenefeld, J. J. (2017). Collective climate action and networked climate governance. *Wiley Interdisciplinary Reviews: Climate Change*, 8(1), 1-17. doi:10.1002/wcc.440
- Tranter, B., & Booth, K. (2015). Scepticism in a changing climate: A cross-national study. *Global Environmental Change*, 33, 154-164. doi:10.1016/j.gloenvcha.2015.05.003
- Tschakert, P., Tutu, R., & Alcaro, A. (2013). Embodied experiences of environmental and climatic changes in landscapes of everyday life in Ghana. *Emotion, Space and Society*, 7, 13-25. doi:10.1016/j.emospa.2011.11.001
- Tuana, N. (2008). Viscous porosity: Witnessing Katrina. In S. Alaimo & S. J. Hekman (Eds.), *Material feminisms* (pp. 188-213). Bloomington, IN: Indiana University Press.
- Tuana, N. (2013). Gendering climate knowledge for justice: Catalyzing a new research agenda. In M. Alston & K. Whittenbury (Eds.), *Research, action and policy: Addressing the gendered impacts of climate change* (pp. 17-31). Dordrecht, Heidelberg, New York and London: Springer.
- Tuana, N., & Cuomo, C. J. (2014). Climate change—editors' introduction. *Hypatia*, 29(3), 533-540. doi:10.1111/hypa.12088
- Tuck, E., & McKenzie, M. (2014). *Place in research: Theory, methodology, and methods*. New York, NY and London: Taylor & Francis.

- Tuck, E., McKenzie, M., & McCoy, K. (2014). Land education: Indigenous, post-colonial, and decolonizing perspectives on place and environmental education research. *Environmental Education Research*, 20(1), 1-23. doi:10.1080/13504622.2013.877708
- Uggla, Y. (2010). What is this thing called “natural”? The nature-culture divide in climate change and biodiversity policy. *Journal of Political Ecology*, 17(1), 79-91. doi: 10.2458/v17i1.21701
- UNEP. (2018). *Emissions gap report 2018*. Nairobi: United Nations Environment Program.
- Valdez, R. X., Peterson, M. N., & Stevenson, K. T. (2017). How communication with teachers, family and friends contributes to predicting climate change behaviour among adolescents. *Environmental Conservation*, 45(2), 183-191. doi:10.1017/S0376892917000443
- van der Tuin, I. (2014). Diffraction as a methodology for feminist onto-epistemology: On encountering Chantal Chawaf and posthuman interpellation. *Parallax*, 20(3), 231-244. doi:10.1080/13534645.2014.927631
- van Dooren, T. (2014). *Flight ways: Life and loss at the edge of extinction*. New York, NY: Columbia University Press.
- van Dooren, T., Kirksey, E., & Münster, U. (2016). Multispecies studies: Cultivating arts of attentiveness. *Environmental Humanities*, 8(1), 1-23. doi:10.1215/22011919-3527695
- van Dooren, T., & Rose, D. B. (2016). Lively ethography: Storying animist worlds. *Environmental Humanities*, 8(1), 77-94. doi:10.1215/22011919-3527731
- Veland, S., Scoville-Simonds, M., Gram-Hanssen, I., Schorre, A. K., El Khoury, A., Nordbø, M. J., . . . Bjørkan, M. (2018). Narrative matters for sustainability: The transformative role of storytelling in realizing 1.5°C futures. *Current Opinion in Environmental Sustainability*, 31, 41-47. doi:10.1016/j.cosust.2017.12.005
- Verlie, B., & CCR15. (2018). From action to intra-action? Agency, identity and “goals” in a relational approach to climate change education. *Environmental Education Research*, Online first, 1-15. doi:10.1080/13504622.2018.1497147

- Vermeulen, P. (2014). Posthuman affect. *European Journal of English Studies*, 18(2), 121-134. doi:10.1080/13825577.2014.917001
- Wachholz, S., Artz, N., & Chene, D. (2014). Warming to the idea: University students' knowledge and attitudes about climate change. *International Journal of Sustainability in Higher Education*, 15(2), 128-141. doi:10.1108/IJSHE-03-2012-0025
- Wachowski Brothers (Writer). (1999). *The Matrix* [Motion picture]. In J. Silver (Producer). United States of America: Warner Bros.
- Waldron, F., Ruane, B., Oberman, R., & Morris, S. (2016). Geographical process or global injustice? Contrasting educational perspectives on climate change. *Environmental Education Research, Online first*, 1-17. doi:10.1080/13504622.2016.1255876
- Walker, R. L. (2013). Environment imagining otherwise. *Journal of Curriculum and Pedagogy*, 10(1), 34-37. doi:10.1080/15505170.2013.790001
- Wamsler, C., & Brink, E. (2018). Mindsets for sustainability: Exploring the link between mindfulness and sustainable climate adaptation. *Ecological Economics*, 151, 55-61. doi:10.1016/j.ecolecon.2018.04.029
- Wang, J., Geng, L., Schultz, P. W., & Zhou, K. (2017). Mindfulness increases the belief in climate change: The mediating role of connectedness with nature. *Environment and Behavior*. doi:10.1177/0013916517738036
- Wang, X., & Lin, L. (2018). How climate change risk perceptions are related to moral judgment and guilt in China. *Climate Risk Management*, 20, 155-164. doi:https://doi.org/10.1016/j.crm.2018.02.005
- Watkins, M. (2016). Gauging the affective: Becoming attuned to its impact in education. In M. Zembylas & A. P. Schutz (Eds.), *Methodological advances in research on emotion and education* (pp. 71-81). Cham: Springer International Publishing.
- Weaver, J. A., & Snaza, N. (2016). Against methodocentrism in educational research. *Educational Philosophy and Theory*, 49(11), 1055-1065. doi:10.1080/00131857.2016.1140015

- Webber, S. (2013). Performative vulnerability: Climate change adaptation policies and financing in Kiribati. *Environment and Planning A*, 45(11), 2717-2733.
doi:10.1068/a45311
- Weber, E. U. (2010). What shapes perceptions of climate change? *Wiley Interdisciplinary Reviews: Climate Change*, 1(3), 332-342. doi:10.1002/wcc.41
- Weintrobe, S. (2013). The difficult problem of anxiety in thinking about climate change. In S. Weintrobe (Ed.), *Engaging with climate change: Psychoanalytic and interdisciplinary perspectives* (pp. 33-47). Sussex and New York: Routledge.
- Whatmore, S. (2002). *Hybrid geographies: Natures, cultures, spaces*. London; Thousand Oaks, CA.: SAGE.
- Whatmore, S. (2006). Materialist returns: Practising cultural geography in and for a more-than-human world. *Cultural Geographies*, 13(4), 600-609.
doi:10.1191/1474474006cgj377oa
- Whitmarsh, L. (2011). Scepticism and uncertainty about climate change: Dimensions, determinants and change over time. *Global Environmental Change*, 21(2), 690-700.
doi:10.1016/j.gloenvcha.2011.01.016
- Wibeck, V. (2014). Enhancing learning, communication and public engagement about climate change—some lessons from recent literature. *Environmental Education Research*, 20(3), 387-411. doi:10.1080/13504622.2013.812720
- Wilson, G. (2012). The lived experience of climate change: Expanding the knowledge base through collaborative Master's curriculum in the European Union. *International Journal of Innovation and Sustainable Development*, 6(1), 43-52.
doi:10.1504/IJISD.2012.046052
- Winn, M. (2014, June 18). Will you take the red pill? *The view inside me*. Retrieved from <http://theviewinside.me/will-you-take-the-red-pill/>
- WMO (World Meteorological Organization). (2008). Guide to meteorological instruments and methods of observation (7th ed.): World Meteorological Organization.

- Wodika, A., & Schoof, J. (2017). Assessing climate change education on a Midwestern college campus. *Applied Environmental Education & Communication, 16*(4), 262-275. doi:10.1080/1533015X.2017.1348268
- Wolbring, G., & Leopatra, V. (2012). Climate change, water, sanitation and energy insecurity: Invisibility of people with disabilities. *Canadian Journal of Disability Studies, 1*(3), 66-90. doi:10.15353/cjds.v1i3.58
- Wolfe, M. J. (2017). Refracting schoolgirls: Pedagogical intra-actions producing shame. *Discourse: Studies in the Cultural Politics of Education, 38*(5), 727-739. doi:10.1080/01596306.2016.1143451
- Wooltorton, S., Collard, L., & Horwitz, P. (2017). The land still speaks: Ni, Katitj! *PAN: Philosophy Activism Nature, 13*, 57-67.
- Wright, A. (2011). Deep weather. *Meanjin, 2*, 70-82.
- Wright, C., & Nyberg, D. (2012). Working with passion: Emotionology, corporate environmentalism and climate change. *Human Relations, 65*(12), 1561-1587. doi:10.1177/0018726712457698
- Wright, K. (2014). Becoming-with. *Environmental Humanities, 5*(1), 277-281. doi:10.1215/22011919-3615514
- Wright, S., Lloyd, K., Suchet-Pearson, S., Burarrwanga, L., Tofa, M., & Country, B. (2012). Telling stories in, through and with Country: Engaging with Indigenous and more-than-human methodologies at Bawaka, NE Australia. *Journal of Cultural Geography, 29*(1), 39-60. doi:10.1080/08873631.2012.646890
- Wu, J. S., & Lee, J. J. (2015). Climate change games as tools for education and engagement. *Nature Climate Change, 5*(5), 413-418. doi:10.1038/nclimate2566
- Young, R. (2001). *Postcolonialism: An historical introduction*. Oxford: Blackwell.
- Yusoff, K. (2012). Aesthetics of loss: Biodiversity, banal violence and biotic subjects. *Transactions of the Institute of British Geographers, 37*(4), 578-592. doi:10.1111/j.1475-5661.2011.00486.x

Zamasiya, B., Nyikahadzoi, K., & Mukamuri, B. B. (2017). Factors influencing smallholder farmers' behavioural intention towards adaptation to climate change in transitional climatic zones: A case study of Hwedza District in Zimbabwe. *Journal of Environmental Management*, 198(Part 1), 233-239.

doi:10.1016/j.jenvman.2017.04.073

Zembylas, M. (2006). Witnessing in the classroom: The ethics and politics of affect. *Educational Theory*, 56(3), 305-324. doi:10.1111/j.1741-5446.2006.00228.x

Zembylas, M. (2016). Affect theory and Judith Butler: Methodological implications for educational research. In M. Zembylas & A. P. Schutz (Eds.), *Methodological advances in research on emotion and education* (pp. 203-214). Cham: Springer International Publishing.