



TALES FROM THE FRONTLINE

Jo Chandler

Melbourne: 31 August 2020

Covid cases: Australia 25,746; [i] World 25,162,019[ii]

Atmospheric carbon dioxide: 414.48 ppm[iii]

LIKE PRETTY MUCH everyone lucky enough to be working as the pandemic rages, we're doing so from home. Him downstairs, me upstairs, yoked to our devices and summoning up spectral colleagues like a pair of sideshow psychics: *'Can you hear me? I can hear you.'*

The provenance of our terrace house suggests we may well share it with a ghost or two. I imagine them shaken out of their crannies by all the Covid carry-on, materialising cranky and befuddled in a Zoom room. The Gallipoli veteran. The mistress of the ladies' college. The family who sheltered here through the Spanish flu, perhaps with some tips on running up a face mask from remnant fabric. My body may be locked down, but my mind is tripping.

I'm kicking this notion (this paragraph!) around when there's a knock at the door. A masked man, a local historian, scurries out of the radar boundaries of social distance. He's brought a recently unearthed photograph of our house circa 1890. An elegant figure in a long white dress poses on the upstairs verandah. A stout woman in an apron stands below, hovering over four small children, three girls and a boy, trussed in Sunday best. All stare grimly into the camera. I sit with them a while by one of the fireplaces where they once warmed themselves. It's still functional, but is rarely lit these days. *'Can you see me? I can see you.'*

Inside coronavirus confinement, with all else spinning beyond control, the worldly concerns of my reporting life are miniaturised to scale. I become preoccupied with matters of domestic resources and resilience, health and history (that little boy in the photograph? Killed on the Western Front). Obsessed, it might – has – been said. I enlist this cataclysm as a warm-up for the next. Flowerbeds are replaced with crops of edible greens. There is an actual hill of beans (tinned) in the cellar. Then there's the spiralling anxiety over the winter gas bill that, due to round-the-clock occupancy, is eye-watering. It's not about the money.

Most mornings I run in the vanishing dark for the permitted recreational hour. Returning as light flushes the face of the old church across the way, I'm on my knees in the garden, genuflecting before the gas meter. A new ritual, yet familiar. Oh yes, the nuns did quite the job.

I tap the reading into my phone, comparing consumption to yesterday, last week. *Bless me Father, for I have sinned.* For our comfort, we cast three billion blameless creatures on the pyre this past summer. I fashion bolts of cheap velvet into drapes and tuck towels under doors and wean us off the heating at least until 6 pm, when the next struggle of conscience is with the bottle: *'Is it Friday? Is it nearly Friday?'*

Stir-crazy and anxious about parents, kids, jobs, students: certainly. Distraught about what the virus means for the most vulnerable in our community, our world: utterly. By no measure are we 'all in this together'. My house on the hill overlooks housing commission towers where 3,000 of my neighbours were locked in by government order. Income and geography are powerfully insulating, as they are in that other emergency, the one that consumes me even in the depths of Melbourne's lockdown winter. I track the creep of atmospheric parts per million as religiously as the daily case tally, but on the former, there is never good news.

'To have eyes wide open is to hold a broken heart every day,' observes American climate activist Katharine Wilkinson. 'It's a grief that I rarely speak.'

I'm fretting about next summer and all the summers through to 2100, the horizon of imagination and so many rising temperature scenarios: *Here Be Dragons*. I'm impatient to be done with this crisis so we can go back to the urgent business of confronting the other one. For a minute there, in the aftermath of Black Summer, it seemed maybe that was possible.

Throughout long weeks of lockdown, unable to venture out as a reporter, I spirit into my home some of the nation's most distinguished climate experts. People who grasp the fearsome power of an unfriendly Earth and our vulnerability as we wilfully, greedily, insanely tip it out of the sweet equilibrium that nurtured us and our ancestors. We speak of our distress and our anger and our strategies for keeping, reviving, practising hope. Mostly that hope is that the path out of this pandemic crisis might empower us to confront and contain the larger, fast-looming planetary one.

'Like trees extending their root system,' says eco-philosopher and 'active hope evangelist' Joanna Macy, 'we can grow in connection, thus allowing ourselves to draw from a deeper pool of strength, accessing the courage and intelligence we so greatly need right now.' [iv]

The scientists Zoom in from their homes, interrupted by pets and children, in rooms festooned with laundry, wearing boots muddy from the garden, breaking off to let in the plumber or change the guard on the kids. It is a moment for raw conversations. Stripped of our workaday performative costume and manners, we sit by my empty hearth, absorbed by the shattering spectacle of global, catastrophic events banging up against each other. Is this, again borrowing from Macy, the Great Unravelling, humanity's undoing as a consequence of rapacious industrial growth, or the Great Turning, to a life-sustaining civilisation?

'Can you see me? I can hear you.'

Townsville: 2 April 2020**Covid cases: Australia: 5,108; World: 896,475 [v]****Atmospheric carbon dioxide: 413.42 ppm**

ON 26 MARCH, marine biologist Terry Hughes interrupts the firehose of international COVID-19 coverage with news from the other cataclysm. He posts a twenty-two-second film clip on Twitter, the shadow of a small aircraft passing over opalescent waters and, in the shallows, ghostly coral reefs blanketed by drifts of seaweed.

'It's been a shitty, exhausting day on the #GreatBarrierReef. I feel like an art lover wandering through the Louvre...as it burns to the ground.'

By then, he and his colleague, James Kerry, had been flying surveys for a week, from the Torres Strait to the Tropic of Capricorn. Every day cruising as slowly as possible without stalling and as low as is permitted: '150 metres, a safety thing, about hitting birds.'

Some days the reefs unfurl below thick and fast, up to 150 a day, Hughes and Kerry with barely time to draw breath, recording a running commentary of observations over the thrum of the engines. They're well practised, having refined this routine in 2016, 2017 and now 2020. On a good day, 'you don't find a single reef that is bleached', says Hughes. 'Unfortunately that has rarely happened in the three times we've done it.'

By 26 March they've seen enough for Hughes to confirm that the Great Barrier Reef has, as forecast given the too-warm waters, suffered its third mass bleaching event in five years. Landing in a world seized and distracted by a fever of human anxiety, the news reverberates nonetheless. It's immediately reported by the BBC, *The New York Times*, CNN, *The Guardian* and, locally, *The Age* and *The Sydney Morning Herald*, but not by Rupert Murdoch's *Australian* until well over a week later, true to form.

Wrapping up the surveys on 2 April, Hughes posts an update. Not all the bleached corals are doomed. Some will 'regain their colour and survive, because some species are tougher than others'. Worldwide, as Covid fatalities mount and the raw calculus of lives versus economy begins to gain traction, the fates of susceptible corals and vulnerable humans seem grimly aligned, and similarly viewed in some quarters as collateral damage. The coral death toll won't be known for months, until Hughes gets in the water to do the mortality surveys.

'I'm not sure I have the fortitude to do this again.'

ZOOMING INTO MY house from Townsville months later, Hughes is back from a short holiday and appears restored. But his anguish is undimmed. 'Four hundred million people depend on coral reefs for their livelihood,' he says. 'How do I feel personally about the tragedy of coral bleaching? It is not something I like to dwell on.'

Nature has declared Hughes a 'reef sentinel'. He wears his keening Irish heart on his sleeve as he wades into the treacherous waters of social media to defend the oceans, the planet. Witness his clarion 2016 tweet: 'I showed the results of aerial surveys of #bleaching on the #GreatBarrierReef to my students. And then we wept.'

Not long ago, serious scientists kept their tears and fears to themselves, constrained by the conventions of so-called 'scientific reticence', and by the risk of merciless retribution in the loss of research grants. But with no time left to waste, Hughes uses platforms such as Twitter and The Conversation to broadcast raw observations of the climate emergency in real time, even as his analyses grind through the processes of peer review and publication.

The pandemic very nearly obscured timely evidence of this latest bleaching, as water temperatures spiked while fears about Covid spiralled. Hughes 'could see the gate was closing' and scrambled to get his team airborne. All over the country – the world – scientists were tearing up fieldwork plans years in the making. COVID-19 will be memorialised by gaping holes in climate databanks for posterity.

Hughes is less worried about that than by the puncturing of momentum in the global climate movement – the powerful school strikes and Extinction Rebellion. And he's angry, albeit unsurprised, by the Australian government's disinterest in following the lead of 'more enlightened countries, particularly [in] the EU, looking for a green recovery. This is an opportunity to change and deal with greenhouse gas emissions and all those structural issues.'

With the Great Barrier Reef having lost more than half its corals even before the 2020 bleaching, [vi] a key mission of this year's survey was to check areas identified as refugia, hiding places for species to cling on and, someday, seed renewal. 'The only remaining unbleached reefs are in the far south, far offshore,' says Hughes. 'They are not good candidates for helping reseed the rest of the Great Barrier Reef...and there's too few of them to make a significant difference.'

For humans seeking refuge from the horrors of coronavirus and climate change, there's been the odd glimpse of loveliness in the return of wild creatures during what some scientists have dubbed the 'anthropause', this unprecedented global slowing of human activities due to the pandemic. Hughes judges some of the rhetoric optimistic, possibly misguided. But it does, he observes, spotlight the critical, core connection between the COVID-19 and climate emergencies: habitat destruction.

Human decimation and occupation of ecosystems created the conditions that allow diseases like this new coronavirus to cross from animals into human societies. 'And you can argue it's because of our disregard for the destruction of those ecosystems that we actually made ourselves more vulnerable.'

Hughes forwards me a cartoon, a city about to be hit by a wave labelled 'COVID-19', a larger 'RECESSION' wave looming behind, both dwarfed by a towering third wave: 'CLIMATE CHANGE'. 'Things like clearing forests, which releases huge amounts of greenhouse gases and forest fires, which destroys habitat, they're all interlinked,' says Hughes. 'So that cartoon is quite misleading to the extent that they're not separate waves; they are all very much interrelated.'

Casey Station, Antarctica: 22 January 2008
Atmospheric carbon dioxide: 385.28 ppm

SHARON ROBINSON, plant biologist, picks her way past a couple of Adelie penguins on the East Antarctic coast. Tussocks of startlingly green velvety moss cling to bare rock: they send up little bubbles of oxygen, finding sunshine after as much as ten months of the year smothered by ice. Biology 'right on the edge of existence', Robinson says.

In five visits over ten years, Robinson has monitored the effect of changing climate on the moss. Some of these thin crusts of green have been growing for one hundred years, their progress easy to plot courtesy of markers trapping radioactive isotopes left by nuclear bomb tests in the 1950s and '60s. Things are not looking good for poor *Schistidium antarctici*. What does it mean, the potential loss of this little plant? It will barely be noticed, Robinson concedes. The moss sustains only its own near-invisible, thriving community of invertebrates and crustaceans, a world within a world. 'It's a sentinel of change, really,' she says. 'It's a loss of...something we don't know enough about yet.'

After a six-year absence, Robinson, these days executive director of the Global Challenges Program at the University of Wollongong, was due to fly south to her beloved moss beds in February 2020. Then in late January, the Australian Antarctic Division cancelled all scientific field trips rather than risk coronavirus finding its way into polar research stations. The call came 'a week before our flight, after six months of planning', says Robinson, Zooming in from her home in Wollongong. Hers was just one among many Antarctic summer projects derailed by the pandemic, most concerned one way or other with understanding climate impacts on the ice and in the Southern Ocean, changes with urgent global implications for sea levels, weather patterns and marine biodiversity.

Robinson's research includes extracting histories buried in the moss beds to bring more rigour to the climate models forecasting our future. 'We can record what the climate has been doing going back fifty, one hundred and more years; we've now got mosses that are 500 years old at Casey.' Because of the close entanglement of Antarctic and Australian weather systems, this information helps predict future rainfall patterns. As she hunkered down on the NSW coast, encircled by the 2019–20 megafires fuelled by record temperatures and drought, Robinson was keeping a weather eye on the distant ice.

From Davis Station came word that it was so warm it was raining rather than snowing. The moss beds were growing lush on meltwater. Robinson set to work with colleagues in Antarctica, Wollongong, Hobart and Santiago in Chile, piecing together fragments to reveal a shocking whole. As Australia burned through January and February, Antarctica experienced a heatwave unprecedented in the observed record. Strong warming of the stratosphere had shrunk the ozone hole that had moderated temperatures on the continent's east. Global media interest in this discovery, published just days after Terry Hughes' alert on the reef bleaching, was huge, a distraction from coronavirus, albeit not a happy one. The East Antarctic Ice Sheet locks up 80 per cent of the planet's ice, and this heatwave followed disturbing new clues about its vulnerability to warming.[vii] From this angle, it looked an awful lot like the third wave in Terry Hughes' cartoon.

I recall Robinson, when we met at Casey a dozen years ago, as a sunny, vivacious spirit who cooed as besottedly over her mosses as the penguin specialist over her fluffy chicks. Reaching out now I'm wondering about her state of hope, and whether she still has any.

It was touch and go for a while there, it emerges. 'I think I have had an underlying optimism; I have faith that humans can do things,' she explains. But 'it has been sorely tested'. Giving lectures to biology students, she felt 'like either crying or apologising...how did we get to this?' It became an existential grappling around her life's work: 'What was the point of science if it was ignored?' She struggled to reconcile her analytical, dispassionate scientific voice with distress over where the planet was heading. While proudly born into a long line of activists – 'I have pictures of myself in the pram on Ban the Bomb marches' – she is not disposed to hand-to-hand combat with deniers and obfuscators à la Terry Hughes.

She found resolution on a voyage to Antarctica in early 2019 with seventy other female scientists and Christiana Figueres, former executive secretary of the United Nations Framework Convention on Climate Change. Despite years pushing shit uphill in global climate negotiations, securing the 2015 Paris Agreement only to have the US pledge out, Figueres was, Robinson recalls, 'stubbornly optimistic that we can still do something' to avoid the worst. By the time she disembarked Robinson felt armed. She invokes stubborn hope strategically and defensively. Without it, 'you're not actually able to do anything that might help. And it's not positive for you either. So that's about self-preservation as well.'

It wasn't enough to stay in her lane as a plant biologist. 'You just had to keep saying it: that if we don't do something about climate change, we're going to lose all this. And you know, I'm worried about my moss beds, but I'm also worried about Antarctica, about sea-level rise, about people losing their homes because of flooding, and you have to make those connections.'

In January 2020 she co-authored a provocative journal editorial[viii] in *Global Change Biology* measuring, recognising and endorsing the power of the student and Extinction Rebellion movements in raising awareness of the emergency. The piece came out of a 'quite heated discussion' at a bar in Oxford a few months earlier, where Robinson and other leading climate change biologists wondered out loud if they were just wasting their time. 'We were basically saying that you need to have activism in order to see political change.' She marched with her students on the climate strikes, citizen-self and scientist-self now inhabiting the same skin.

Lately, maybe perversely, Robinson's felt some resurgence of hope out of the back-to-back horrors of Black Summer and coronavirus. One of the powerful things about working in Antarctica, she explains, is that you can't unsee what is in plain sight. Like watching rain falling at Davis, the summer inferno blew immediate, urgent reality into households across Australia, 'and it seemed to me that everybody was impacted by that, whether you were sitting in Sydney getting smoke inhalation or actually in an area that was being burned... surely this has to be the tipping point.'

Brisbane: 5 June 2019

Atmospheric carbon dioxide: 411.53 ppm

SOME 800 CLIMATE-ANXIOUS citizens settle into their seats. There's a buzz: former US Vice-President Al Gore is due on stage.

A month before, I'd listened to US journalist David Wallace-Wells talk about his blockbuster book, *The Uninhabitable Earth*. 'It is worse, much worse, than you think,' is his opening gambit, and then he lets rip. Explaining his no-holds-barred approach in a *Longform* podcast interview, he recalled how, as a latecomer to the climate story, he was shocked to discover the raw science was far scarier than mainstream reporting. He accused journalists of tiptoeing around the findings, of being so concerned by accusations of alarmism that they – we – buried the lead. 'If you are terrified of these facts, you should be... And if previous climate writing allowed you to not be terrified of these facts, or enabled your own impulses toward complacency and denial...then it was irresponsible. Because the science is really clear, and it is inescapable.'

He struck a nerve, nudging me further down a track I'd been disconsolately exploring for a while. Mindful of the cracks in that fraught construct of journalistic objectivity, I've nonetheless strived throughout my reporting life to apply objective method to news gathering. So it is that I understand climate change is real, human-caused, urgent and fucking terrifying, and that the media has failed catastrophically to tell that story. Without wishing to over-egg my contribution, I am part of that failure.

Which brings me to Gore's Climate Reality leadership program, in search of new strategies. And to a position emboldened by the former *Guardian* editor-in-chief Alan Rusbridger's argument that journalists covering the climate emergency 'have a duty not to be impartial'. As a citizen of burning Earth, I have skin in this game.

Our table hails from construction, communications, the arts, finance, footy, faith, retailing. We're surrounded by unlikely conspiracies of school principals and investment managers, tech heads and artists, Indigenous leaders and old white men, wild-haired activists and slick entrepreneurs.

Here we sit, gathered in hope. Clinging to our keepcups as the Adani mine gets sign-off and atmospheric carbon spikes over 415 parts per million for the first time in three million years,[ix] galloping north at a rate unseen in sixty-five million years of geological record. 'Hope' in such a context should come with a trigger warning. Listening to my circle espousing variations of the same vision – a habitable world for themselves, their families, newborns, communities – roiling grief rises so violently that my skin pulses and my head spins and I wonder if I might be having a stroke. I start to cry.

A decade ago I wrote a book about what I learned trailing climate scientists deep into their research, from the Antarctic to the tropics. I dedicated it to my kids, 'with hope that you may dwell in an enlightened future, on a friendly earth'. That wasn't a cavalier line. Now, hope appears to have left me.

When the session breaks I spot David Karoly, one of Australia's most eminent climate experts and explainers. In the many times I've interviewed him, I can't recall asking this one consuming question: 'How do you carry this knowledge? How do you bear it?'

'Oh that?' he says, nodding to the latest iteration of Gore's *Inconvenient Truth* slideshow. That ain't the half of it, he says. The stuff that's 'really interesting' – as in, really worrying – didn't get a mention. He and Mr Gore had decided not to go there. It would have blown up hope.

Karoly, leader of the Earth Systems and Climate Change Hub at the Australian Government National Environmental Science Program, is a glass-half-full kind of guy. Honestly, he assures me, dropping into my lockdown in 2020, there is cause for hope. But first we go back to what wasn't in Gore's 2019 presentation. Hang on tight.

On the Paris global emissions ambitions, 'it's completely silly to talk about a 1.5 degree target – we have way overshoot that'. Two degrees, perhaps, 'but I would argue it is virtually impossible,' he says, 'because of the locked-in existing infrastructure and the growth in emissions in developing countries'. The best estimate with current commitments is 3 to 4 degrees.

'The world supposedly was seeking to reduce emissions,' Karoly says. Since Paris, 'they've grown every year except in 2020', when a virus put a spanner in the works.

That leaves us 'locked in most of the way to a "hothouse Earth", even with dramatic emission reductions', he says. 'Hothouse Earth' is an epoch described by some of the world's most eminent climate scientists as an 'uncontrollable and dangerous' planet of cascading tipping points – melting permafrost, rising seas, burning forests – presenting 'serious challenges for the viability of human societies'.^[x] At a 4 degree rise – and it doesn't stop there – experts theorise the global sustainable population will collapse to about one billion. 'In other words,' Karoly elaborates, '90 per cent of the population is lost.'

Sometime well before that, Karoly anticipates that the major powers and markets – the US, Russia, China and Europe – 'will argue that the economies of the developed world cannot flourish without continued use of coal, oil and natural gas...the only way to do that and not have hothouse Earth, or the same level of global warming, is to increase aerosols.' That means deploying countermeasures into the atmosphere, or the oceans, to try to haul back temperatures. 'There are a number of scientists advocating that the only way to live through global warming is to invest in geoengineering, and particularly that the only way to do it quickly is through injection of aerosols into the atmosphere.'

They will argue, says Karoly, that this might be done safely if interference occurs high in the stratosphere. 'The tricky part is it changes rainfall patterns, and changes stratospheric ozone. And it's likely that the planet, or should I say the economy, might become addicted to it.' Even if it provokes what are euphemistically labelled 'adverse impacts', we can't pull the switch without the warming shooting back.

Karoly expects that the wealthy north will deploy the geoengineering heavy lifting across the Southern Hemisphere and the tropics, a hunch informed by the dynamics of power and history. Witness the atomic testing programs, and their lingering signature in the Casey mosses. It will mean our part of the planet will cop the worst of the fallout, again rebounding on vulnerable citizens who have done the least to contribute to this shitstorm.

Karoly finds no comfort in the pandemic ‘anthropause’, which, as we speak, has caused an abrupt drop in global carbon dioxide emissions – a whopping 8.8 per cent in the first half of 2020 compared to the same period in 2019, according to a *Nature Communications* paper published in October.[xi] He’s concerned that given the associated hit to global industry and economy, it will be argued that this demonstrates the price of lower emissions is just too high, buttressing the case for geoengineering and ignoring the profound differences between a managed transition and a pandemic shock.

There is an alternative. ‘There’s going to be massive investment in rebuilding the economies around the world, and much of that investment could be pointing to zero-carbon economy and infrastructure.’ This is the reset urged by so many economists and experts to use the opportunity of the Covid crisis to build a sustainable future. Which brings us back to that four-letter word.

‘I’m feeling better now than in 2019 because there’s been investment of money, there’s new opportunity,’ says Karoly. There’s the momentum and perspective on the urgency of action coming out of Black Summer. There’s also ‘young people getting active and involved, not just Greta Thunberg’ and ‘the rapidly declining costs of renewables and the positive signs from all the states’. Australian state governments, Labor and Liberal, are all committed to zero-net emissions by 2050.

‘I am still convinced that concerted action can make it less bad. And that is why I keep [talking about it,]’ booms Karoly. ‘And I’m not willing to give up.’

Melbourne: 25 February 2020
Covid cases: Australia: 22; China: 77,780
Atmospheric carbon dioxide: 413.26 ppm

We are witnessing grief, existential dread, ecological anxiety and white-hot anger, in both public and private spheres. These emotions are opening up new spaces and forms of conversation about climate change, and constraints on such conversation appear to be shifting. Masculine norms of 'positive talk' increasingly look out of touch, and cultural pressure to be optimistic with children has been shifted by kids themselves, taking to the streets to demand action on climate change... The summer has given us an expanded repertoire of permissible feelings, articulated a torrent of writing and discussion, that collectively resist the new normal.

Lesley Head, *Nature Climate Change* (February 2020)[xii]

THERE IS DEEP cultural pressure in the West not to be a 'doom and gloom' merchant, observes Lesley Head in her 2016 book *Hope and Grief in the Anthropocene*. But, she argues, relentlessly accentuating the positive 'is itself a kind of denial'. We must bear, and bear witness to, the pain of losing what we understood as our future, and the world we knew as our past.

'The news is not good,' writes Head, a professor who runs the School of Geography at the University of Melbourne. 'It feels as though we are hurtling down a hill without any brakes, through an unfamiliar landscape, to an uncertain destination... We need to deal with at least the possibility of catastrophe.'

This reflection applies equally to the pandemic moment in which we materialise inside one another's Melbourne confinement. There is 'this little weight in everybody's heart,' she observes as we compare notes on our lockdown lives. 'That "oh God this is horrible", the dread when you hear the [case] numbers every day', she says of the pall over our ghost city.

Teasing out some of the connective threads between the Covid and climate crises, she reflects that 'this precarity, this sense of being rather unmoored, is going to be with us for ages and is probably quite a precursor of how climate change will increasingly feel'. Or how it already feels, she immediately self-corrects. We glimpse ourselves in our Zoom lenses, middle-aged, middle-class white women marooned in the iso-comfort of our homes. With Covid, says Head, 'affluent white people are feeling what it is like to live a precarious existence for the first time'. As Gorrie writer Melissa Lucashenko succinctly put it, 'so cry me a river, bitches.' [xiii]

We reflect on the tentacles of this disruption, of living mundanity *in extremis* – something Head has written of often as the 'double reality' of the climate realm in which we accept the science, yet keep showing up for our part in a collectively constructed normality. In the pandemic's undoing of this normality, in her role as a senior university academic, Head's lockdown is consumed with the shocking mission of downsizing for institutional survival. Off the clock, she's knitting up a storm.

I wonder what the 'anthropause', having lured wild creatures back into open spaces, might have unleashed inside our homes and our hearts. Will any of it reverberate: the toilet paper embarrassment, the sourdough moment, the months of not spending, of out-of-control hair? Will we snap back, as our Prime Minister urges, or be reset by this rupture?

'We're all part of very connected and deeply entangled systems, combinations of social and ecological systems that include global-scale things, but we're not actually in control,' says Head. 'So there's this tiny little virus that is shaping social life at the moment, and that is one of the dilemmas with the Anthropocene as well, of climate change: once things take hold in complex systems, there are limits on your ability to control it.'

As part of her work, Head has surveyed climate experts on that question I've poked around rather less scientifically: what can they teach the rest of us about hope, fear and responding to the climate emergency?

Many of them painstakingly distance the professional from the personal, she discovered. They don't talk to their kids about climate. Or to taxi drivers. They steer clear of places where they might get caught in the crossfire of the climate wars. They reassure themselves and anyone who asks that we have the technology and capacity to respond, to avoid the worst. When they allow themselves to see the bleakness of it all and push on regardless, they are, Head argues, performing 'hope as practice', which is the ritual she imagines will sustain the community of the next Earth, the Anthropocenes.

Many cling to the notion of dispassion as critical to their authority, of keeping 'the heart a long way from the brain', as Sharon Robinson once did. But the dispassionate scientist is a myth, Head argues, citing recent studies exploring how emotions are pervasive in science. And this myth is dangerous, she continues, perpetuating a culture of restraint and caution that skews the message to understatement when declaring something dramatic may be entirely appropriate. This echoes the 2007 appeal by NASA's top climate scientist, James Hansen: 'We may rue reticence if it means no action is taken until it is too late to prevent future disasters.'

It strikes me that for all these years, journalists aspiring to objectivity have looked to scientific method for guidance. And yet in both pursuits we are only the best we might wrangle in the context of our human fears, hopes, passions. We all have skin in the game.

'Various analyses would say that the thing that is happening before our eyes is the death throes of capitalism,' says Head, after some musing around what Covid has exposed of the limitations of globalisation and the risk of that spiralling into nasty nationalism. 'The question is whether it will die quickly enough... The death throes could go on for decades, and we might be just going straight into survival mode rather than [finding] the wherewithal to create those new green systems.'

She breaks off, looking someplace past me. 'God, this is depressing...' Apart and together, we inhabit the doom and gloom. I'm so grateful for the company.

'I can see you. Can you hear me?'

Casey Station, Antarctica: 21 December 2009
Atmospheric carbon dioxide: 388.23 ppm

THE BAR AT the bottom of the world is convivial, stocked with bottles of spirits with the owners' names scrawled on the labels and a fridge full of meticulously crafted home-brew. Perched here, this night, grounded by poor weather, is a flying squad that's conducting an epic multi-year survey, Operation ICECAP, or Investigating the Cryospheric Evolution of the Central Antarctic Plate. Their mission is to map the bedrock buried under thousands of metres of ice and determine how vulnerable it is to warming. They are at the business end of the most contested scientific question on our heating planet: how much and how quickly sea levels will rise.

Obliging my curiosity, glaciologist Duncan Young unfurls a fat roll of readings along a table, pinning it down with beer glasses. The squad's core ambition is to get a fix on how vulnerable the monster Totten Glacier – which locks up six metres of potential sea-level rise – might be, but it's just too early to say. Young points to tracings from another glacier, the Denman. 'It looks like there is ice three kilometres thick pretty close to where the glacier feeds into the ocean. So that's kind of the ideal situation for this marine ice-sheet instability.' Which rather depends on your definition of 'ideal'.

Earlier ICECAP surveys caused a sensation when they revealed a vast, deep basin dipping below sea level, making the East Antarctic Ice Sheet infinitely more vulnerable than previously supposed. If the bedrock around the Denman connects back to that basin, it could 'potentially collapse back into this huge hole and undermine this whole sector of the ice sheet', says Young, rolling up his data and heading back to a lively darts game. Or not. 'The Denman is also a fairly narrow glacier, so the effects might not be that dramatic.'

When everyone else has gone to bed, I surf the digital juke box. REM: 'It's the End of the World as We Know It (And I Feel Fine).'

'SEA LEVEL IS still, from an Antarctic climate science perspective, the real biggie,' says Tas van Ommen, program leader of the Australian Antarctic Division and one of the leaders of the ICECAP collaboration, beaming in from Hobart. We've spoken many times over the years as researchers have made breakthroughs and provoked new questions around what might happen to polar ice as the world and its waters warm. Van Ommen – a self-described 'scientific centrist...partly out of a sense of optimism and hope, it's just my nature' – is a carefully calibrated voice on the slippery, seismic business of ice-sheet dynamics, but it's nonetheless always a shattering conversation.

In 2014, scientists declared the disintegration of the West Antarctic Ice Sheet's 'unstoppable': three metres of rising tides, likely over centuries. What else is in the pipeline – and when it will arrive – turns on 'known unknowns', such as what might happen as a consequence of disturbing the layers of temperature, density and freshwater balance in the ocean that shape global weather; and the Antarctic coast's vulnerability to the recently recognised phenomenon of hydrofracture, where surface meltwater seeps deep into fissures and cracks the ice like a splitter through timber.

'There is still a lot of fundamental stuff that we only know about quite poorly,' says van Ommen. 'How rapidly we could see the Totten or the Denman or certainly West Antarctica deliver large sea-level rise is still an open question. There is a certain consensus emerging that it is more like one metre than two this century, but the fact that we've got large uncertainties still existing is in itself a real worry.'

Looking beyond the horizon of 2100, a paper published in *Nature* in September declared we are on track for rises of about 2.5 metres even if the Paris Agreement goals are met. [xiv] The Antarctic ice sheet has endured for about thirty-four million years, but its future will be decided in our lifetime, one of the paper's co-authors Anders Levermann told *The Guardian*. [xv] 'We will be renowned in future as the people who flooded New York City.' Landscapes occupied by some 630 million people are expected to be inundated by 2100 if high emissions continue; 190 million are adrift even if we manage to haul them back. [xvi]

The cascading questions around the fate of these people chip away at van Ommen's innate optimistic default setting, 'not exactly keeping me up at night, but making me think: what are our priorities? What are we going to get answers for? They're the things that are massively going to change the planet.'

Van Ommen's hopefulness is charged with a grim pragmatism these days. 'Technological change is bringing an inevitability to renewables. It could be so much faster and so much cleaner and so much better if we had the right policy settings, and at the end of the day that's a massive political problem. But I am optimistic in the sense that 2 degrees is better than 2.5, and 2.5, God forbid, is better than 3.'

But to stay this side of 'God forbid' requires negative emissions, and 'we're not just standing still, we're heading in the wrong direction'. In common with all the other experts I speak to, he sees a game-changing opportunity in the pandemic recovery to build a green, sustainable future, but little prospect of Canberra seizing it, 'because that is this whole vested-interest problem we've had with climate change action and fossil fuels all along.'

Silver Spring, Maryland, US: 27 September 1962
Atmospheric carbon dioxide: 319.17

We stand now where two roads diverge. But unlike the roads in Robert Frost's familiar poem, they are not equally fair. The road we have long been travelling is deceptively easy, a smoother superhighway on which we progress with great speed, but at its end lies disaster. The other fork in the road – the one 'less travelled by' offers our last, our only chance to reach a destination that assures the preservation of our earth. The choice, after all, is ours to make.

Rachel Carson, *Silent Spring*

THREE YEARS AGO, in between journal papers trawling the deep past to forecast future heatwaves, bushfires, droughts and floods, Sophie Lewis, the ACT Commissioner for Sustainability and the Environment, penned an intimate piece for *The Sydney Morning Herald* about the shattering burden of her scientific knowledge. She desperately wanted a child – children. But 'among my friends and colleagues, such ordinary desires are increasingly accompanied by long, complex conversations about the ethics of such aspirations'.

She wrestled with her conscience, described why this planet doesn't need another baby and why no baby should be condemned to this planet, then revealed that her daughter was on her way:

Our much longed-for child will both exacerbate climate change and will have to fix the problems set in motion by its parents and grandparents. In essence, this burden is the choice I have made for my child. Having made the decision to multiply my own carbon footprint in perpetuity and to inflict an extreme climate future on my daughter, the question becomes – what now?

When we Zoom, she's in her Canberra home, a clothes horse draped with tiny garments propped behind her. I think about that painstaking detachment between home and work Lesley Head found among senior climate scientists, about their erosion in the pandemic. I doubt Lewis' generation will ever know that luxury.

'Certainly that kind of sense of grief and loss has permeated a lot of my career,' she says. 'It's certainly ebbed and flowed.' This past Black Summer, one she had long seen coming through her modelling, 'was just a period of profound grief. I don't think I experienced it in any way as a scientist'.

The months of smoke that blanketed Canberra were indescribable, she says. Sometimes it would hang around all day, sometimes it came with the evening wind change and 'looked like a dust storm blowing in... And it's not just the smell. It had this profound, visceral effect, that this was something I should be fundamentally concerned about. There is a panic associated with it. Smoke indicates danger: this is not safe. I don't know anyone who got a proper night's sleep for months...the added layer of knowing that smell isn't just smoke: it's houses, and trees and animals burning. That was just absolutely horrific.'

She flew to her brother's place in Hobart, spending the days looking after her daughter and nephew and the nights crying. Then she crunched gears into hope as practice: *What now?* 'I emailed everyone who I thought had some influence on discourse or public life or leadership...offering briefings or advice or scientific information.' She started work on a submission to the Senate bushfire inquiry.

Watching the pandemic play out, Lewis was initially buoyed by the visibility of experts leading the policy response, of people listening to specialists like our lives depended on it. She hoped that public engagement with the mantras of flattening the curve, of acting early to stop runaway consequences, of enlisting models to guide interventions in the pandemic response – a kind of scale version of thirty-something years of argument for environmental action – might continue into the climate realm. Then she began to see darker synergies: the devaluing of expertise, campaigns undermining and eroding trust.

And yet, coming out of the fires and the pandemic, Lewis sees a seismic ‘what now’ opportunity: ‘As a person hopeful of a future for my kiddo and wanting more children, that is, not a return to 2019.’ Building a sustainable future provides a path to recovery from the pandemic and for the planet.

Melbourne: 7 November 2020

Covid cases: Australia: 27,652; [xvii] World 49,195,865 [xviii]

Atmospheric carbon dioxide: 412.32 ppm

DRAGGING THE DOG to the park through the umpteenth stinking dawn back in the pre-pandemic's hellfire summer, I recall watching a teenage boy and his little brother going tree to tree, gently scooping up and bagging the possums that had dropped down dead. This would be their future, cleaning up the mess. Other walkers tugged small children from my path as I vented profanities at the voices of delay and denial echoing in my head, my earphones. Powerless; hopeless. Yet to lose hope was to capitulate to doomism, too-lateism, do-nothingism, just as the puppeteers decreed, those diabolical 'FUCKERS!'. I was, by now, deep in a pitiful, private Great Unravelling.

I've only once before tripped into such wretched despair. The troubles that sent me there look so pint-sized from this distance, but the lessons have proved instructive. I climbed out then – eventually, literally – over a weekend at Mount Arapiles swinging from belay ropes. Find a secure handhold. A toehold. Another, and another. And up you go.

Hence the rituals of the gas meter, meditation, a checklist of divestment, a dip into activism. I join a dozen strangers for civil-disobedience training with Extinction Rebellion. We take turns shouting abuse in one another's faces and turning the other cheek: me, a tattooed youth from the far-flung suburbs, a gentlelady from Kew with a neat grey bob. We practise falling down with jelly limbs, all the harder to be pulled upright by police. I research strategies, spiritual and professional, to navigate the mess we're in. Clinging on by the fingernails, jamming in the boots wherever they find purchase. Striving for the courage to cease the performance of 'business as usual/what's for dinner' as it all goes to hell.

One of the privileges of a reporting life is to encounter courage. A mighty nun from Ohio who spent decades in the PNG highlands caring for HIV/AIDS casualties, digging holes to bury them when no one else would; a trio of women from the village of Kup, also in the highlands, who broke every cultural taboo to rise up and save their children from endless tribal warfare. All those mothers sitting in the dust of the 2005 Malawi famine, cradling their doomed babies. I didn't set out to list women here. Yet when I trawl my memory for courage, up they come.

Is it in me? Several years back I was working on a story in remote Papua New Guinea, where Malaysian land grabbers were clear-felling forests and pirating the timber out. Driving across the splintered landscape with dispossessed landowners, we encountered a crew of loggers with a fearsome reputation. As their vehicle approached and slowed, I wondered: would I speak up for the activists risking themselves to expose this atrocity? Would I seek to save myself? The truck drove on by. I was not tested then, but I am now. Facing the climate emergency demands the courage of my convictions and I feel as nauseous as I did on that godforsaken track.

Sprung from 112 days of Covid confinement in our house, many of them consumed with reading, listening, speaking, thinking about this crisis and the next, I am blinking in the light of a so-far benign Melbourne spring. In captivity, I've been working out with my hope, flexing and exercising it. It feels rehabilitated, muscular, strong. I reframe that image from last summer, the boys in the park. The children of the Anthropocene, the Pyrocene, don't have the luxury of indulgent grief. They practise hope, and so must I.

Despite everything, I catch a whiff of optimism. Not for a restored future, but maybe David Karoly's less worse one. Trump is defeated. Momentum toward net zero by 2050 is spiralling – China, Japan and South Korea all making the pledge. The smart money is pouring that way. A tweet lands with news that a giant superannuation fund has been compelled to the same target by a millennial who sued over climate risks. Might we see cascading economic and social tipping points, delivering us into a stabilised Earth instead of the hothouse one? As one of the hothouse modellers, Earth systems specialist Professor Will Steffen is fond of observing, the Stone Age didn't end because they ran out of stones.

Then there is the lesson of this pandemic. As I write, Australia has heeded the science, flattened the curve and, for now, contained the virus. This required leadership that stared down the science deniers and the Murdoch media, that valued humanity over economy, that navigated and communicated complexity. The bug will return, and if it is allowed to run with a vengeance, that will be our choice. The parable of the pandemic is that we can cure what ails us. As Tas van Ommen said, 'COVID-19 exposes the flaws of ideology. While we do live in a post-rational age in some ways, we can demonstrate what a stupid and dangerous approach that is.'

And there are my ghosts. They are not the undead, but the unborn. I conjure them in my imagination and they are powerfully fortifying.

The woman in white on the verandah 130 years ago I know now was called Kitty. Custodians of the same house, mothers up and down the same stairs a dozen times a day, trailing our hands on the same balustrade, Kitty and I are citizens of a different planet. In hers, horses pull the passing traffic, electric light is a couple of years away and the atmospheric carbon dioxide is 294.4 parts per million. She died at about my age, before her son was killed in France, before the Spanish flu.

Kitty is not among my ghosts. We've not crossed on the stairs. She never did show up in a Zoom room. But I did happen on her spirit, her great-great-granddaughter on an ancestry site. Four generations and counting.

Back in the hellfire summer, in that haze in which we inhaled three billion blameless creatures, I couldn't see a generation beyond my own children. And there's the change.

'I can see you. Can you see me?'

5 November 2020

References

[i] <https://www.health.gov.au/resources/publications/coronavirus-covid-19-at-a-glance-31-august-2020>

[ii] https://covid19.who.int/?gclid=Cj0KCQiA48j9BRC-ARIsAMQu3WTRCKN-2A2zn2jQErGvjBMqYkibki0-eS5lQVCFR0pfpXDvjDmCpDYaAmtNEALw_wcB

[iii] The atmospheric CO₂ readings used in this story are, with one exception, the deseasonalised monthly averages collected by the US National Oceanic and Atmospheric Administration Earth System Research Laboratories (or NOAA-ESRL) and available here: <https://www.co2.earth/daily-co2>. The figure for 7 November 2020 is the daily average.

[iv] Macy's Active Hope, page 31.
https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200402-sitrep-73-covid-19.pdf?sfvrsn=5ae25bc7_6

[vi] <https://www.smh.com.au/environment/climate-change/there-is-no-time-to-lose-great-barrier-reef-has-lost-half-its-corals-20201013-p564tx.html>

[vii] <https://www.nationalgeographic.com/science/2020/07/east-antarctic-ice-sheet-more-vulnerable-to-melting-than-thought/>

[viii] <https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.14978>

[ix] <https://www.scientificamerican.com/article/co2-levels-just-hit-another-record-heres-why-it-matters/>

[x] <https://www.pnas.org/content/115/33/8252>

[xi] <https://www.nature.com/articles/s41467-020-18922-7>

[xii] <https://www.nature.com/articles/s41558-020-0712-5>

[xiii] <https://www.theguardian.com/australia-news/2020/jul/23/its-no-accident-that-blak-australia-has-survived-the-pandemic-so-well-survival-is-what-we-do>

[xiv] <https://www.nature.com/articles/s41586-020-2727-5>

[xv] <https://www.theguardian.com/environment/2020/sep/23/melting-antarctic-ice-will-raise-sea-level-by-25-metres-even-if-paris-climate-goals-are-met-study-finds>

[xvi] <https://www.nature.com/articles/s41467-019-12808-z>

[xvii] <https://www.health.gov.au/resources/publications/coronavirus-covid-19-at-a-glance-7-november-2020>

[xviii] https://covid19.who.int/?gclid=Cj0KCQiAwMP9BRCzARIsAPWTJ_GNXEv8rtnVkJQej0SjalbuBPWYhZCTIUgTrCLGnnspC9TB8u6CIB0IaAt0fEALw_wcB

This work originally appeared in 2021 in *Griffith Review 71: Remaking the Balance*. It was selected for inclusion in the 2021 *Best Australian Science Writing* (edited by Dyani Lewis), and was a runner-up for that year's Bragg/UNSW Press Prize for Science Writing. It is reproduced on the Climate Justice Observatory with permission of the author and thanks to Griffith Review.

Jo Chandler is a Walkley-Award winning freelance journalist and winner of the inaugural 2012 UNSW Bragg Prize for Science Writing.

She focuses on climate science, environment and health issues, as well as the aid and development sector.

She is the author of an acclaimed book on climate science, *Feeling the Heat* (MUP, 2011).