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## In the breach: feeling the heat of climate change

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### ABSTRACT

The increased likelihood of extreme heat events is a profoundly important aspect of our global climate emergency, and yet the link between weather and climate remains a difficult subject to communicate. Here, I focus on a graphic that is on its way to becoming viral: Warming Stripes. Warming Stripes use a simple two-colour spectral palette – tints of blue and red, long a feature of weather maps – to signal relative yearly temperatures. Eschewing the argument that such hues have a universal affective capacity, and reflecting on its designer's comments on the potential introduction of a new colour, purple, to indicate extreme heat, I argue that it is as a constructed, learned association between temperature and colour that there is further potential for this visual to intimate a warning. That is, while the potential introduction of purple signals a breach regarding accustomed climatic conditions, what is also breached is our capacity to maintain a standard of measurement by which to capture such conditions. I expand on this argument via reference to a prior of just such a breach, as a forecasted heatwave prompted the Australian Bureau of Meteorology to introduce a new colour to the hot end of its temperature scale: purple.

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## Introduction

How do we register the heat of climate change? What signs and signals are, could and perhaps should be used to describe the conditions we live in, the challenges we face, the futures we want, and the futures we find ourselves in? Are there 'intuitive' signs and signals that can be used to communicate a danger and emergency, and persuade behaviours – a universal 'warning lexicon' one might say? Or, might we look to well entrenched, constructed tropes on weather and climate, and consider how these might be usefully 'breached', such that it is the breakdown of the ordinary, the disruption of the expected, that becomes part of an effective response to our diverse Anthropocene challenges and the vulnerabilities these attenuate?

Here, I focus on a viral visual – variously called 'Warming Stripes', or 'Climate Stripes' – in order to explore these questions. This visual has been proffered as just such an intuitive warning, acting as a sign that reaches straight into the eye and cortex to simply and effectively communicate danger. First presented on 29 May 2018, by Prof, Ed Hawkins,

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these stripes would, Hawkins hoped, signal the accelerating rate of global warming. Presented with no additional detail, the computer-generated graphic relies on the colour of each stripe to represent the relative temperature of a single year when measured against a 'baseline', which could be a specific year or an average from across a time period. While the data used can vary across scale and space what is consistent is the use of a 'spectral' colour scale to indicate temperature: tints of blue for colder-than-baseline, and tints of red for warmer-than-baseline. The increased redness of these stripes can also be used to portray the warmth of future earth management scenarios. As such, they can be used as a caution and warning regarding current social processes and actions. And, they can be used to indicate the 'baked in' anthropogenically forced processes that will continue to change climatic conditions. For Hawkins, however, the extreme heat of global warming might well require a third colour: purple.

Yet, this association between colour and temperature – red for warmth, blue for cold – is a contingent one, rather than a universally received understanding. I make this argument below via reference to research on a history of colour and temperature from the arts and humanities that amply demonstrates that there is no 'intuitive' understanding of the meaning of colour. My aim in doing so, however, is not to undercut the signalling capacity of Hawkins' visual, for a learned response to an association between colour and meaning – the red-amber-green of traffic lights being an example – can certainly have impact. Rather, what I want to do is argue that it is as a constructed association between temperature and colour that there is further potential for this visual to intimate a warning. That is, I want to emphasise how such a visual can signify a 'breach' of what is considered normal climate conditions, but can also have affect as a breach of our capacity to maintain a standard of measurement by which to capture such conditions. That is, there is a potential breach of the work of signification, and it is this breach that can also work as a warning.

The introduction of purple would be profound breach of the two-colour aesthetic of Warming Stripes; and was too much of a disruption for some, perhaps because of its presumed artificiality compared with the 'intuitive' work of blue and red. Yet, the affective potential for such a breach of signification itself can be gleaned from a recent precedent, one that works on the scale of weather rather than climate. As I go on to explain below, in January, 2013, the Australian Bureau of Meteorology introduced to its weather forecast a new colour – incandescent purple. Outside of the spectral palette of the temperature scale, this purple undercut the logic of the same insofar as it repeats a hue already in use to denote degrees of coldness. As purple shifts the ground it covers from regional weather to global climate this affective breach opens ever wider. Learning from the prior breach enacted by the Bureau, we can think about the ways in which such an apparently banal act – going into a software programme and selecting from an automated palette – can itself become a visceral event, as well as a prompt for thoughtful, critical engagement with the science of global climate change.

## **Viral colours**

Prof. Ed Hawkins, climate scientist and a lead author of the Sixth Assessment Report produced by the UN's Intergovernmental Panel on Climate Change (IPCC), presented at the 2018 Hay Festival a chronologically ordered series of Warming Stripes that, he hoped,

would communicate simply and effectively to this literary audience the accelerating rate of global warming. As Hawkins noted, ‘there’s been a whole community of people knitting scarves to represent climate data for decades – no one had quite put this together with computer-generated graphics. As with everything, you’re always building on the shoulders of others and the Stripes are very much in that vein’.<sup>1</sup> Inspired particularly by Prof. of Climate Physics Ellie Highwood’s crotched, multi-coloured temperature blanket,<sup>2</sup> the graphic relies on a two-colour aesthetic. As such, it echoes data analyst and estuarine specialist Prof. Joan Sheldon’s (2015) ‘globally warm scarf’, featuring red, blue and purple. As Sheldon writes, ‘I decided to use data describing the average surface temperature of Earth each year and colour code it to create a scarf pattern. The colour code uses shades of blue for cooler-than-normal, shades of red for warmer-than-normal, and purple for normal ...’<sup>3</sup>

Drawn from two of the ColorBrewer single-hue palettes – named after geographer and map colour specialist Prof. Cynthia Brewer – the increasing presence of redder tints in Hawkins’ graphic is intended to communicate, viscerally, dangerous conditions. As Hawkins reflected on the impact of his Hay presentations: ‘I could instantly see that members of the audience realised that something was happening and they could instantly visualise the fact that the planet was warming and that was affecting Hay itself’.<sup>4</sup> Where words and numbers – long the standard aesthetic and means of articulation of scientific research – need to be actively cognised, the visual reception of colour is proffered as producing a particular embodied feeling of apprehension. ‘I wanted to communicate temperature changes in a way that was simple and intuitive’ Hawkins observed in an interview, ‘... Our visual system will do the interpretation of the stripes without us even thinking about it’.<sup>5</sup> What is more, such an intuitive signal eschews misinterpretation: ‘All other superfluous information is removed,’ Hawkins notes, ‘so that the changes in temperature are seen simply and undeniably.’<sup>6</sup>

Since their introduction in 2018 these Warming Stripes have proliferated. Hawkins released the graphic on a Creative Commons (CC) licence, which allows not only sharing and copying, but also remixing and transformation. They now appear at the end of academics’ emails; they appear on buses and clothing; and they appear in the urban infrastructure as painted or illuminated backdrops to special and everyday events.<sup>7</sup> Warming Stripes are used on the website of the UK’s Met Office to help explain ‘what is climate change’<sup>8</sup>, and are in the logo of the U.S. House Select Committee on the Climate Crisis.<sup>9</sup> In 2019 Hawkins introduced a website<sup>10</sup> that allows users to create Warming Stripes for countries and cities that have temperature data held by Berkeley Earth and the University of Reading, alongside several national meteorological agencies (the National Oceanic and Atmospheric Administration, the UK Met Office, MeteoSwiss, Deutscher Wetterdienst, the Swedish Meteorological and Hydrological Institute, Meteo France, and the Zentralanstalt für Meteorologie und Geodynamik). It is not too surprising, then, to find the Warming Stripes very much in evidence at the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow, Scotland, held 31 October to 13 November 2021. Indeed, Hawkins spoke at the pre-COP26 gala event, which also featured singer Emeli Sandé wearing a bespoke Tammam Warming Stripes dress.<sup>11</sup> There is no doubting their impact as a means of communicating the science on global warming. What I want to pursue in the following sections, however, is the continuing potential for such a visual to signal a climate emergency.

## Colouring temperature

For COP26, Hawkins chose to retain the two-colour scheme, wherein a blackening red signals a deepening climate emergency. But, for Hawkins, purple is a contender for indicating the new extremes of climate change. As [Figure 1](#) – which brings together three of Hawkins’ pre-event tweets – demonstrates, in the run up to COP26 Hawkins considered the extra colours he might need to draw upon as warming continued, and the hue of red reached its apogee. Might he use shades of black, he wondered? Or, might he bring in what he termed ‘an inferno scenario’ – a scenario that turns to an incandescent purple? In the event, and responding to feedback from some of his Twitter followers, he favoured the red into black option. Yet, Hawkins remains interested in how colour could and should be used to communicate a warning of things to come: as a 2021 BBC interview noted, ‘The man behind a global warming stripe graphic said he’s going to need more colours to represent future years in a warmer world’.<sup>12</sup>

For Hawkins, the introduction of purple to his colour palette would be a highly significant move. Purple would signal not just a relative temperature but also a fundamental ‘breach’ of climate norms. Yet purple, as some Twitter respondents pointed out, nevertheless fits with the remit of the Warming Stripes graphic because of a modern association with heat. Rare in nature, with hues difficult to pull apart, purple is increasingly to be ‘seen’ as part of infrared heat maps, which have a scale that runs from purple through orange to white. Infrared hinges on the fact that colours themselves have temperatures – that is, they reflect, refract and transmit electromagnetic waves across a spectrum, only some of which is visible to the human eye. Infrared means ‘below’ the visible range. Because all objects – including bodies – emit infrared waves when near room temperature, sensitive imaging technologies can pick up on the presence of these objects that are otherwise invisible because of a lack of sun, or artificial, light and assign them a visible hue in order to construct a scale.

The purple-orange-white palette that Hawkins terms the ‘inferno scenario’ intimates this infrared link between temperature and colour. This is by no means an ‘intuitive’ connection, however, in the sense that Hawkins’ uses this term, insofar as it emerges from the realm of the invisible. And perhaps this is why the Twitter response was largely not in favour of such a use of purple. Yet, this use of intuitive is, I want to argue at this point, a restricting consideration with regard to the potential impact of this visual.

So much of the work undertaken on the effect and impact of scientific visualisations draws from the cognitive and psychological sciences, which address *how* people comprehend written and visual information. And there is much to be gained from this, such as the injunction to reduce visual complexity by using, for example, a simple colour palette. Furthermore, it is generally with regard to visual comprehension that colour choices for visualisations including maps have been examined (Cramer et al., 2020; Green & Horbach, 1998; Kaye et al., 2012; Kovesi, 2015; Light & Bartlein, 2004; Moreland, 2009). Such insights, however, also include an emphasis on how meaning is created via the interplay between visual processing and prior knowledge and expectations (Harold et al., 2016). A key recommendation is thus that visualisations are designed with the input of the communities they are intended to address (Grainger et al., 2016; Wibeck, 2014). And, an attentiveness to local understandings of particular temperatures as usual or unusual, and the bespoke production of a temperature scale is also advocated (Sharpe, 2022).



**Figure 1.** Tweets from Prof. Ed Hawkins on the possibility of changing the two-colour format for Warming Stripes. Reproduced with permission from the author, and in accord with Twitter rules of use and access.

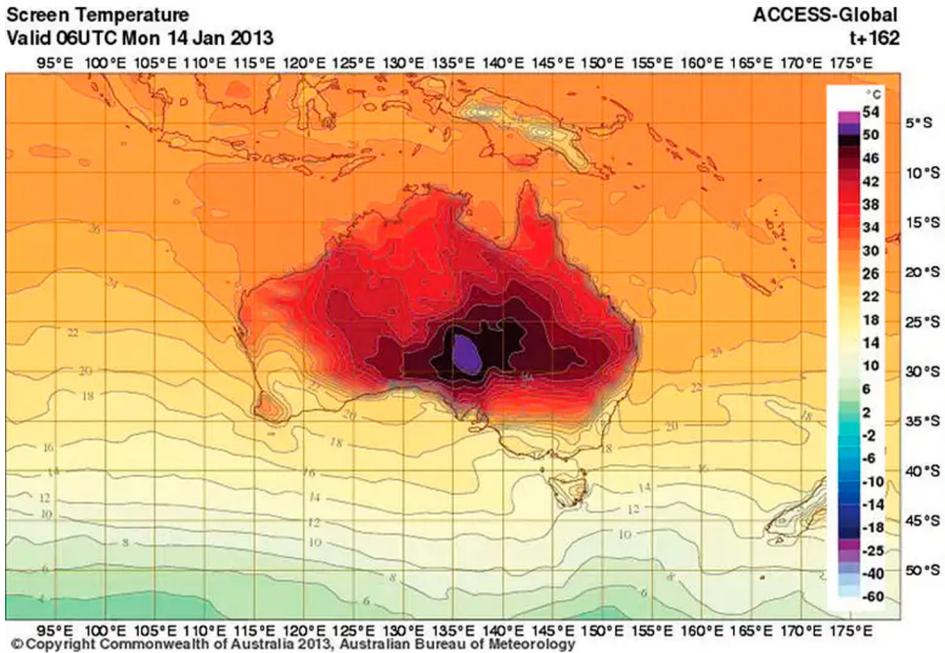
At a broader scale, however, what this focus on prior knowledge and expectations indicates is the *contingency* of an association between colour and the signalling of temperature. It is this contingency of perception that is very much foregrounded in arts and humanities research, exemplified by the work of history and culture of colour specialist Prof. John Gage. Gage (1999, 2012) alerts us to the great variety of colour-usages, and the paradoxically universal urge to associate affective characters to colours (1993). ‘[W]riters on the elements,’ he observes, ‘were far from unanimous about which colours were appropriate to which elements. In ancient Greek thought, for example, we find fire as white (Empedocles), as red (Democritus and Plato), and as “golden” (Pseudo-Aristotle On Colours); water as black (Empedocles) or white (Pseudo-Aristotle)’ (2008, p. 92). Of particular relevance to Warming Stripes is Gage’s (2008) argument that the blue-cool/red-warm association emerged from Western painting – and in particular in 18th and early 19th English colour theory for painters, which included instructional ‘colour-circles’. It is in the first half of the twentieth century, Gage goes on to argue, that this association between colour and temperature became an object of study for psychologists, as well as being thoroughly entrenched in the theory of art.

Indeed, there is a relatively small but significant body of work on these broader cultural histories and geographies of what different colours signify for different peoples in different times and places (for example Edensor, 2020; Smith, 2019). And, there is work on the use of colour for affect, particularly in the urban environment (for example, Huang and Jen, 2020; Motamed and Tucker, 2018; Xu and Zheng, 2021). Indeed, in 1926 Vaughan Cornish makes the argument for how the atmospheric geographies of place impact upon how colour is itself apprehended and felt (Cornish, 1926).

If we take the two-colour spectral palette of Warming Stripes as a learned construct then disordering this scheme by introducing purple does not undercut its ‘intuitive’ function. Rather, purple – potentially, if introduced – would work as a breach of what by now is the expected aesthetic of Warming Stripes. And as such, I want to argue, its presence would work as a breach not only regarding accustomed climatic conditions, but also of our capacity to maintain a standard of measurement by which to capture such conditions. I make this argument because such a move has precedent. We have been here before – and recently. The spectral colour scheme that Hawkins draws on – the coolness of blue hues, the warmth of red hues – has been used in weather maps since the 1980s. And it is this traditional weather map that has already felt the heat.

### Breaching the temperature scale

As an angry summer pitched up over the Australian landmass in January, 2013, the Australian Bureau of Meteorology released a forecast for Monday, 14th (Figure 2), based on one of its models, that would take temperatures above 48–50 degrees Celsius. This top band had long been denoted by a crisp, burnt black. To accommodate the possible, unprecedented, temperature, the Bureau added a new colour to the top of its scale. This was what might be termed a ‘Violet Purple’ that marks 50–52 degrees Celsius. Emerging from the burnt black, this Violet Purple is incandescent, denoting a future land luminous with intense heat. To the right, in the colour bar, the purple grows even brighter, providing a glimpse of a colour that might be termed ‘Vivid Purple.’



**Figure 2.** Forecast produced by the Australian Bureau of Meteorology (BOM) for 14 January 2013. The original image was produced and released by the BOM, and has been reproduced in media reports and across Twitter. This reproduction is copied from the *Guardian* report ‘Australia adds new colour to temperature maps as heat soars’, 8 Jan 2013, with text by Carrington (2013). The original copyright is held by the Commonwealth of Australia, 2013, Australian Bureau of Meteorology.

The temperature scale deployed by the Australian Bureau of Meteorology is already a mix of colour schemes – the use of use tints of a single-hue, the use of different hues in the same part of the colour wheel, and the use of divergent hues to indicate sliding up and down a scale. The introduction of purple was a significant breach, however, insofar as it undermined the colour order of the temperature scale by repeating a hue from the frozen end. The relationship between hue and temperature is muddled, and so the temperature scale in and of itself no longer works quite as intended. Is this a warm purple? A cool purple? To be sure, when looked at on a map the purple is effectively ‘grounded’; this iconography is readable because it is tied to a landscape. And it is in this grounded context that purple – burning incandescently in the heart of the Australian continent amidst burnt black embers – takes on a new meaning. This is heat beyond the ordinary; heat that blisters in the world like a live welt. To look at purple in this way is to read it not through abstraction – as one might note purple as part of a palette that separates yet unifies colours to perform a measuring device – but in a thoroughly earthly way.

While the introduction of two new colours to the temperature scale was a banal act, in the sense of being undertaken by Bureau staff members as part of their everyday job, the unprecedented, disordering, disturbing nature of this act was very much noted by national and international news media. A banal scale – part and parcel of an everyday assessment of weather – had been breached. And, the affect of this was felt globally, at least in the media. As the *Sydney Morning Herald* related events,



AUSTRALIA'S "dome of heat" is becoming so intense, temperatures are off the charts – literally... When the weather bureau's model started churning out predictions for next Sunday and Monday of more than 50 degrees, chart producers quietly extended the scale beyond the level previously used... "It's because we've been going off the scale," said David Jones, head of the bureau's climate monitoring and prediction unit. (in Hannam, 9 January 2013<sup>13</sup>)

The *Sydney Morning Herald's* focus on records was reiterated in the *ABC News* report of the same day, though an added element of unease appears here:

Paul Lainio from the bureau says the colours were introduced after temperatures climbed above 47C in parts of South Australia. "We noticed over the last couple of days that those charts were indicating temperatures in excess of 50 degrees and our colour scale we had didn't match that," he said. "We added the new colours so we could highlight where those extremely hot temperatures were predicted by the computer model. Forecasters use a whole range of computer models, the observations we receive and they come up with the most likely forecast and that could be different to those, and in fact is different at the moment to those maps." He says he hopes the new colours are rarely called into play. "It's certainly a worrying sign when we see day after day after day of temperatures in the mid-40s". (posted 9 January 2013<sup>14</sup>)

Both *The Guardian* and the *Independent* firmly situated the introduction of purple, and the forecasted heat it denoted, in the context of climate change. Posted at around the same time as the Australian outlets (bearing in mind the time difference), *The Guardian* reported that, 'Forecast temperatures are so extreme that the Bureau of Meteorology has had to add a new colour to its scale. It is a sign of things to come' (in Carrington, 8 January 2013). Noting prior extreme heat events, and the IPCC finding that heatwaves will become more likely, the report concludes,

The scientists are turning up the volume of their warnings, but whether this leads to loud and clear political action to curb emissions or more shouting from sceptics and the vested fossil fuel interests that support them remains to be seen. (in Carrington, 8 January 2013<sup>15</sup>)

Under the headline 'Purple alert! Australian heatwave forces climate experts to use new colour to represent extreme temperatures', the *Independent* situated the weather forecast in images of scorched earth and kangaroos in distress (in McCarthy & Marks, 8 January 2013<sup>16</sup>). And, it is in this report that we can find evidence of staff at the Australian Bureau of Meteorology also linking extreme weather events to climate change:

This is thought to be the first time that any country in the world has actually redrawn its charts to take account of temperatures which are thought likely to go off the scale which had been previously applied, and climate scientists indicated it was a warning for the future. "The current heatwave – in terms of its duration, its intensity and its extent – is unprecedented in our records," said the Bureau of Meteorology's manager of climate monitoring and prediction, David Jones. 'Clearly, the climate system is responding to the background warming trend. Everything that happens in the climate system now is taking place on a planet which is a degree hotter than it used to be'. (in McCarthy & Marks, 8 January 2013<sup>17</sup>)

The link between weather extremes and global warming was foregrounded by Australia's then prime minister Julia Gillard on visiting Tasmanian communities devastated by fires during this same heatwave. She said: '... we do know over time that as a result of

climate change we are going to see more extreme weather events and conditions' (in Darby, 7 January 2013<sup>18</sup>).

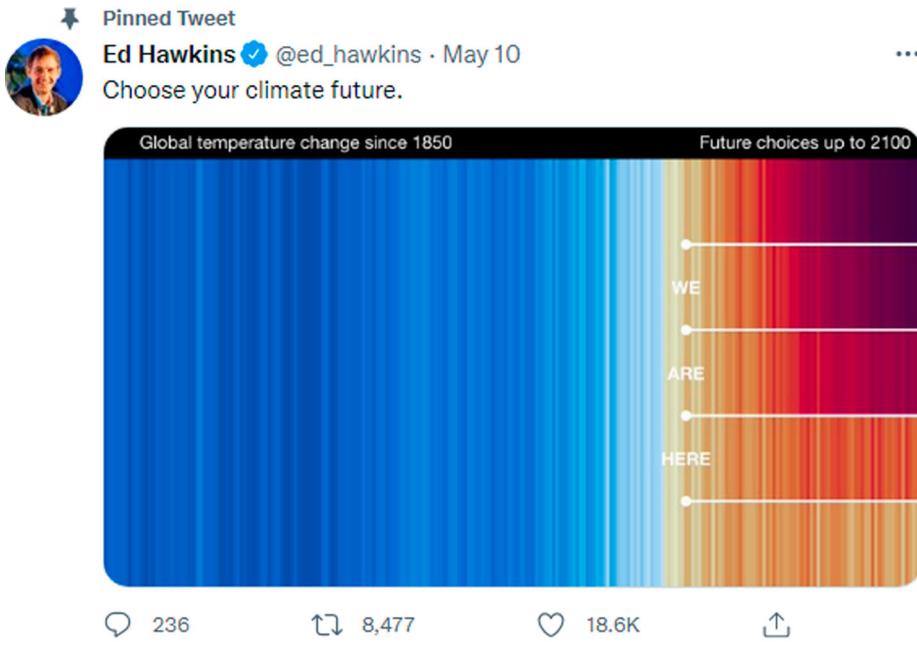
Considering the work of purple here – wherein the sign indicating breached weather conditions is itself breached – what kinds of warning are being enacted? Perhaps most obviously there is the idea of warning as *cautionary advice*, aimed at changing actions in the present. This is the purple of Julia Gillard. The insertion of Vivid Purple in the temperature forecast acts as a deterrent – it serves to discourage, inhibit, and perhaps even prevent. And it acts as an exhortation – to encourage, to persuade, to plead we might say for change. Vivid Purple – anticipated in the temperature scale but not yet used – is an anticipatory mapping of global warming, to be sure. But it is also an anticipatory mapping for futures built around acknowledging and addressing global warming. A call to action if you will.

Yet, we might consider this warning as an *advanced notification* – a tangible, sensible notice of what will intensify and proliferate. This notice is itself embedded in the present – it is experienced, felt, in the now – and as such has a history as well as geography. What is the nature of this warning, this notice? The colour and placement of a Violet Purple is there to be seen, and was seen, to be sure; but this Violet Purple crystallises a radiation sensible in the air massing just above the land surface, a sensible radiation both elemental and forced. This notice, this warning, does a different kind of work; one that does not offer a map of things to come, or seek to stir passions toward the future. Rather, this warning evokes, somewhat in the vein of Italo Calvino's (2009) short story collection (published in Italian and English) *Cosmicomics*, a planetary history that winds its way tightly into the lives of people who have faced, and will face, unsettling losses, and who have generated, and will generate, new forms of solidarity and community. What survives an emergency? What emotional, psychical, and physical, traces remain? What does it feel like to anticipate a global calamity? And to experience the falling apart of words and images – of temperature scales – that can no longer situate and orientate us?

## Heat lexicons

A growing environmental arts and humanities literature and practice has emphasised the emotional, psychological and physical impacts of an Anthropocene that foregrounds a series of endings – from the extinction of species to the curtailing of life on Earth – as well as a series of futures, from survival to flourishing. I asked at the outset of this article what words, and what images, are, could and perhaps should be used to describe the conditions we live in, the challenges we face, the futures we want, and the futures we find ourselves in? More pertinently for Warming Stripes as *Warning Stripes*, what are our heat wave lexicons of word, image, colour, shape, sound and feel? What dangers do they narrate and how?

For Hawkins, musing on colour in the aftermath of COP26, purple is perhaps now the future (Figure 3). The colour purple has more diversity within its hue and intensities than black. It allows us to see the more detailed impacts of different real-world strategies to mitigate global warming, but also to see what might well be in store for us if we do not. As with the Australian Bureau of Meteorology, purple is the cautionary warning, but also marks the presence – here in the now – of conditions that are radically transforming life on Earth. Given Hawkins' current preoccupation with a substantial redesign



**Figure 3.** Hawkins pinned Tweet as of 8 August 2022. Reproduced with permission from the author, and in accord with Twitter rules of use and access.

of Warming Stripes – the potential introduction of purple to indicate extreme heat conditions – now is an opportune moment to consider the extant and future work of such a viral visual. But also, such considerations have relevance for debates on science communication *per se*, and warning systems, as well as the productive interplay between art and science, and in particular the vital role of the arts and humanities in providing a response to the climate emergency.

It might be said that I am reading too much into purple; adding an interpretive layer onto an action driven by someone in the Australian Bureau of Meteorology tasked with adding two more colour categories and selecting quickly from the software generated colour options. Yet, we can see in such a banal act how a localised ‘breach’ of what is imaginable for weather becomes the precursor for a globalised, viral breach of what is imaginable for climate. This argument can be taken much further, noting how these aesthetics of the breach – the off the scale purple forecast, the purple notice that sears itself into the present – themselves dip into narratives such as the Gothic and the sublime that are yet tentatively addressed in climate science and science communication. Such entrenched, pervasive, mutable narratives – animated in large part by colonialism and lurking at the heart of modern-day racial capitalism – are important, I want to emphasise in closing, because they have affective capacities, shaping our imaginaries of the world, and our own and others place within it. As such the analyses that address them have import for understanding the nature of viral visuals as a means of communication, certainly, but also how these can work as signifiers for solidarity and care, and as touchstones for future practice.

## Notes

1. See Show Your Stripes: the artwork that made climate change data go viral | Art UK.
2. See #climatechangecrochet – The global warming blanket. | elliehighwood.
3. See The Globally Warm Scarf | Sheldon Fiber Designs.
4. See COP26: Climate change graph 'needs more colours' as world gets hotter – BBC News.
5. See This Climate Visualization Belongs in a Damn Museum (gizmodo.com).
6. See Warming stripes | Climate Lab Book (climate-lab-book.ac.uk).
7. See Warming stripes | Climate Lab Book (climate-lab-book.ac.uk).
8. See What is climate change? – Met Office.
9. See Select Committee on Climate Crisis | (house.gov).
10. See #ShowYourStripes.
11. See COP26 Event: Style Your Stripes – Keeping Up With Kay Flawless.
12. See COP26: Climate change graph 'needs more colours' as world gets hotter – BBC News.
13. See Scorching temperatures go off the colour scale (smh.com.au)).
14. See Heat drives bureau back to the drawing board – ABC News.
15. See Australia adds new colour to temperature maps as heat soars | Environment | The Guardian.
16. See Purple alert! Australian heatwave forces climate experts to use new colour to represent extreme temperatures | The Independent | The Independent.
17. See Purple alert! Australian heatwave forces climate experts to use new colour to represent extreme temperatures | The Independent | The Independent.
18. See Tasmanian fires prompt PM's grim climate warning (smh.com.au).

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## References

- Calvino, I. (2009). *The complete cosmicomics* (M. McLaughlin, T. Parks, & W. Weaver, Trans.).
- Carrington, D. (2013, January 8). Australia adds new colour to temperature maps as heat soars. *The Guardian*.
- Cornish, V. (1926). Harmonies of tone and colour in scenery determined by light and atmosphere. *The Geographical Journal*, 67(6), 506–524. <https://doi.org/10.2307/1782640>
- Cramer, F., Oh, J.-M., Venters, C. C., Di, C., Pinto, A. M., Wan, L., Younis, I., Cai, Z., Arai, C., So, B. R., Duan, J., & Dreyfuss, G. (2020). U1 snRNP regulates cancer cell migration and invasion in vitro. *Nature Communications*, 11(1), 1–10. <https://doi.org/10.1038/s41467-019-13993-7>
- Edensor, T. (2020). *Stone*. Palgrave Macmillan.

- Gage, J. (1993). *Color and culture: Practice and meaning from antiquity to abstraction*. Thames and Hudson.
- Gage, J. (1999). *Color and meaning: Art, science, and symbolism*. Univ of California Press.
- Gage, J. (2008). When warm was cool: on the history of colour-temperature. In W. Busch (Ed.), *Verfeinertes Sehen: Optik und Farbe im 18. und frühen 19. Jahrhundert. Schriften des Historischen Kollegs, Kolloquien 67*. Oldenbourg, Munich (pp. 91–99). <https://doi.org/10.1515/9783110446388-009>
- Gage, J. (2012). Colour ordered and disordered. In F. G. Barth et al. (Eds.), *Sensory perception* (pp. 299–311). Springer.
- Grainger, S., Mao, F., & Buytaert, W. (2016). Environmental data visualisation for non-scientific contexts: Literature review and design framework. *Environmental Modelling & Software*, 85, 299–318. <https://doi.org/10.1016/j.envsoft.2016.09.004>
- Green, D. R., & Horbach, S. (1998). Colour – Difficult to both choose and use in practice. *The Cartographic Journal*, 35(2), 169–180. <https://doi.org/10.1179/caj.1998.35.2.169>
- Harold, J., Lorenzoni, I., Shipley, T. F., & Coventry, K. R. (2016). Cognitive and psychological science insights to improve climate change data visualization. *Nature Climate Change*, 6(12), 1080–1089. <https://doi.org/10.1038/nclimate3162>
- Huang, W., & Jen, L. (2020). Color place marketing—The role of atmospheric colors on place product association and consumer choices in Luoyang, China. *Sustainability*, 12(23), 9902. <https://doi.org/10.3390/su12239902>
- Kaye, N. R., Hartley, A., & Hemming, D. (2012). Mapping the climate: Guidance on appropriate techniques to map climate variables and their uncertainty. *Geoscientific Model Development*, 5(1), 245–256. <https://doi.org/10.5194/gmd-5-245-2012>
- Kovesi, P. (2015). Good colour maps: How to design them. *arXiv preprint arXiv:1509.03700*.
- Light, A., & Bartlein, P. J. (2004). The end of the rainbow? Color schemes for improved data graphics. *Eos, Transactions American Geophysical Union*, 85(40), 385–391. <https://doi.org/10.1029/2004EO400002>
- Moreland, K. (2009). Diverging color maps for scientific visualization (expanded). *Proceedings in ISVC*, 9.
- Motamed, B., & Tucker, R. (2018). Colourful practice: Is design education informing architects' use of colour? *International Journal of Technology and Design Education*, 28(4), 1001–1017. <https://doi.org/10.1007/s10798-017-9426-z>
- Sharpe, M. (2022). A colourful world of weather: Representing local climatology in forecasts. *Weather*, 77(3), 83–87. <https://doi.org/10.1002/wea.3901>
- Smith, D. (2019). Colourful questions of an Indian village. *Color Research & Application*, 44(4), 581–594. <https://doi.org/10.1002/col.22364>
- Wibeck, V. (2014). Enhancing learning, communication and public engagement about climate change – Some lessons from recent literature. *Environmental Education Research*, 20(3), 387–411. <https://doi.org/10.1080/13504622.2013.812720>
- Xu, Z., & Zheng, X. (2021). Roadmap of moving urban colour toward cultural sustainability in China. *Color Research & Application*, 46(1), 222–239. doi:10.1002/col.22578