



Guest Editorial

## Geographical Fire Research in Australia: Review and Prospects

'You live in the bush. You live by the rules of the bush, and that's it.' These were the reflective words of Mrs Dunlop upon seeing the blackened rubble of her home, which made headline news the morning after the first, and most destructive, fire front tore through the Blue Mountains in New South Wales on 17 October 2013 (Partridge and Levy, 2013). While seemingly a simple statement, it goes right to the heart of heated public and political debates – past and present – over who belongs where and why in the fire-prone landscapes that surround Australia's cities. Bushfire is a constant and ongoing part of Australian history, ecology and culture. The love of a sunburnt country, the beauty and terror of fire, and the filmy veil of post-fire greenness described in the century-old poem 'Core of My Heart' (Mackellar, 1908) are still apt depictions of Australian identity today. Yet longer fire seasons and an increase in extreme fire weather days with climate change add both uncertainty and urgency to Australia's ability to coexist with fire in the future (Head *et al.*, 2013).

As we write this editorial, the smoke still lingers from New South Wales' October bushfires of 2013 – more than 200 homes have been lost, most of them in the Blue Mountains. In the aftermath of this recent bushfire disaster, we are struck by the enduring timeliness of the contributions in this *Geographical Research* special issue on fire. The papers seem prescient, which is attributable not to an incredible foresight by the authors but to the long-standing tradition of geographical research on which they are building and a repetitive rhythm in its findings. We explore this repetitive rhythm through a brief overview of all bushfire research published in the two main Australian geography journals, *Geographical Research* and *Australian Geographer*, since their inception (a total of 32 articles, all listed in the list of references).<sup>1</sup> This snapshot of Australian geographical fire research is entwined with short introductions to the specific contributions in this special issue.

The myriad ways in which bushfire impacts – directly or indirectly – on everyday life in Australia are reflected in the diverse topics discussed by the papers in this special issue – from insidious bushfire smoke, planning regulations as mitigation strategies and gendered dimensions of bushfire resilience to the scale politics of knowledge and the management of fire-prone vegetation. The current contributions all recognise the complexity of bushfires – the interwoven causes, the lasting effects. Changes in land use and population growth in fire-prone landscapes (particularly in peri-urban areas) combine with warming climates to increase the risk and impact of bushfires. Coexisting with fire over the coming decades will involve increasingly complex trade-offs.

Acknowledging that there is a vigorous debate about whether restricted subdivision of, if not planned retreat from, fire-prone peri-urban areas will be necessary (Mercer, 2012), the article by Bond and Mercer in this issue highlights the thousands of undeveloped lots already subdivided. They pragmatically discuss the neglected issue of subdivision design in these settings, arguing particularly for greater attention to quality of road access for evacuating residents and incoming fire crews. Such rebuilding of communities after fires provides an important opportunity to make improvements.

Previous articles authored by Mercer and colleagues (Whittaker and Mercer, 2004; Hughes and Mercer, 2005; Buxton *et al.*, 2011) in *Geographical Research* and *Australian Geographer* were also concerned with debates over land use and fire management, analysing different social constructions and understandings of nature and environmental discourse. These social constructions, Mercer and colleagues argued, have implications for the success of bushfire adaptation and mitigation strategies. In conducting this research they aimed to inform policy, particularly in regards to land use, and this work reflects the growing emphasis in human geography

scholarship more broadly since the 1990s on the indivisibility of nature and culture.

This 'cultural turn' in geography (Gill, 2006) coincided with a change in the weighting of physical and human geography articles on fire in the two Australian journals over time. While physical geography was dominant in earlier decades (see Fleeton [1980] and Adrian [1984] for exceptions), contributions from human geography became more frequent from the 1990s onwards.<sup>2,3,4</sup> Studies by Gill (1994), Cubit (1996), Crowley and Garnett (2000), Hill *et al.* (2000), Whittaker and Mercer (2004), Harte *et al.* (2009) and Eriksen *et al.* (2011) argued for the importance of engaging local communities, local knowledge and oral histories in developing sustainable contemporary land management and bushfire mitigation strategies. The study of debates surrounding fire management on public land (Gill, 1994; Whittaker and Mercer, 2004), as well as the impact of changing land use and ownership types on bushfire vulnerability, were consistent features of human geography scholarship on fire (Cochrane *et al.*, 1962; Solomon and Dell, 1967; Fleeton, 1980; Bardsley *et al.*, 1983; Hughes and Mercer, 2009; Buxton *et al.*, 2011).

As such, the work of Australian human geographers has been cutting-edge in geographical research internationally in their focus on the effect of social change on societal perceptions of bushfire risk in an everyday context. This is despite a long-standing international critique of both the dominant biophysical focus of natural hazards research (Kates, 1971; Handmer and Dovers, 2008) and the problematic tendency in behavioural models to separate knowledge and action (Torry, 1979; Watts, 1983; Burton *et al.*, 1993; Barr, 2008). The power of knowledge continues to be a recurrent fire research theme today, including in the commentaries in this special issue. The notion of knowing is explored in Howitt's meditation on what it means to live *with* fire, in pointedly asking what knowledge of adaptation failure looks like before disaster strikes. This question is particularly important in the context of Williams and Gorman-Murray's respective emphases on how knowledge is produced, valued and used by different actors – the powerful as well as the marginalised in contemporary society.

Engaging the broader community (the powerful and the marginalised) with both the tangible and intangible threats of bushfire is the focus of Eriksen's paper, which builds on her broader work on gendered dimensions of bushfire resilience (Eriksen, 2013). In this issue she concen-

trates on social norms and embedded power relations to highlight a necessary shift away from the 'boys club' engagement culture of rural fire services in order to reduce gendered patterns of vulnerability to bushfire. The benefits of hands-on experience and practice, the strength of networks and the imperative of supportive learning environments are shown as being particularly fruitful ways of engaging women with bushfire safety issues.

Enright and Fontaine discuss another aspect of risk management in this special issue, namely the complex trade-offs involved in fuel reduction burning (FRB), which are exacerbated in a warming climate. Providing a useful review of the literature, they remind us that FRB provides a poor return on investment at a broad scale. Instead it needs to be delivered strategically, for example, by concentrating on areas near human infrastructure. From an ecological point of view, however, increased frequency of FRBs and shorter fire return times tend to have negative outcomes for biodiversity in southwest Australia, particularly if followed by drought.

This discussion of the ecological role and place of fire links to a strong palaeoecological tradition in Australian physical geography. This research analyses pollen, charcoal and other remains in sedimentary cores to reconstruct vegetation and fire regimes over long time periods. It has often compared erosion, productivity, fire regimes and vegetation changes. The prehistoric timeframe of the published work in *Geographical Research* and *Australian Geographer* stretches back to 6000 BP. This large body of scholarship sought to establish the extent of human impacts on landscape – both 200 years of European occupation and the much longer period of Aboriginal occupation and land use. For Holland (1986), Head (1989), Prosser (1990), Boon and Dodson (1992), Zeng and Whelan (1993), Bowman and Panton (1994), Dodson *et al.* (1994a; 1994b), Shakesby *et al.* (2003), Black and Mooney (2007), and Wittenberg and Inbar (2009), research centred on establishing precolonisation fire regimes and assessing the impacts of fire on soil and vegetation.

These contributions in the two Australian journals are part of international debates about environmental changes associated with Aboriginal arrival and ongoing impacts. Australian palaeoecological research of this kind was world-leading from the 1970s, because Australia was one of the few places where a long-term hunter-gatherer prehistory was

preserved (e.g., Jones, 1969; Hallam, 1975; Kershaw *et al.*, 2007; Lynch *et al.*, 2007; Rule *et al.*, 2012). The work has always been controversial, and the debates around human impacts are still not resolved.

The article by Johnston and Bowman in this issue reminds us also that the social licence for planned burning is not well established, and that the smoke from both FRB and wildfires has significant but underacknowledged health impacts. As the residents of the greater Sydney region experienced during October 2013, the impact of smoke extends far beyond the areas actually burning as a drifting potent mix of toxic gases and particulate matter. Few of these residents will be aware that mortality rates may have increased by up to 5% on those smoke haze days, as is argued by Johnston and Bowman.

The cutting-edge research presented in this special issue and the lessons learnt from a strong tradition of geographical research on bushfire provide much food for thought in times of uncertainty and urgency. We still have much to learn. Yet geographical fire research in Australia has greatly informed the choices we face as individuals and as a nation in terms of mitigating and adapting to a changing climate.

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#### ACKNOWLEDGEMENTS

Sincere thanks to Carrie Wilkinson for assistance with the historical literature analysis.

#### NOTES

1. We compiled an annotated bibliography of all papers relating to bushfire published in *Geographical Research* (formerly known as *Australian Geographical Studies*) and *Australian Geographer* since their inceptions. Our literature review examined key themes, arguments, research methods and paradigms, identifiable changes over time and links to major bushfires to create a representative sample of the types of geographical research being undertaken on fire in Australia over the last 50 years or so.
2. Neither journal distinguished between or favoured the publishing of articles from human or physical geography. A number of studies combined methods from both human and physical geography to compare traditional, 'prehistoric' Aboriginal and 'historic' non-Aboriginal cultural approaches to strategic burning. This comparison was based on assessment of the physical impacts of these practices (their continuation and cessation) on vegetation regimes (see, for example, Clark and

- McLoughlin, 1986; Head, 1989; Crowley and Garnett, 2000; Hill *et al.*, 2000; Vigilante, 2001).
3. Broadly speaking, the body of scholarship in the two journals dealt with long-term issues rather than focusing on particular events. The scope of the research published has only recently broadened to encompass studies of fire on an international scale – and even then only in *Geographical Research* (Pyne 2001 [international review]; Harte *et al.* 2009 [South Africa]; Wittenberg and Inbar 2009 [northern Israel]; Galiana-Martin and Karlsson 2012 [Spanish Mediterranean coast]). This arguably reflects the online presence of the journal and its increasing international audience and is in contrast to the significant contributions by Australian geographers of regional or local studies published in international journals.
  4. While many of the early studies contributed to methodological development and innovation along the way, the past few years have seen a number of explicitly methodological papers. Muller (2006) proposed a method of constructing chronological fire histories using flowering 'scars' on Austral Grasstrees. Mooney *et al.* (2007) argued for the value of palaeoecology in providing practical information for the contemporary management of fire-prone landscapes. Eriksen *et al.* (2011) advocated a mixed-methods approach to provide insight into complex factors that influence bushfire preparedness that have both tangible policy relevance and analytical depth. Galiana-Martin and Karlsson (2012) proposed a methodology for assessing vulnerability of a landscape to bushfire using a synthetic index of vulnerability with cartographical representations and multicriterion evaluation.

#### REFERENCES

- Adrian, C., 1984: Institutional constraints on the post-war provision of fire services in Sydney. *Australian Geographer* 16, 38–50.
- Bardsley, K.L., Fraser, A.S. and Heathcote, R.L., 1983: The second Ash Wednesday: 16 February 1983. *Australian Geographical Studies* 21, 129–141.
- Barr, S., 2008: *Environment and Society: Sustainability, Policy and the Citizen*. Ashgate, Aldershot.
- Black, M.P. and Mooney, S.D., 2007: The response of Aboriginal burning practices to population levels and El Niño–Southern Oscillation events during the mid- to late-Holocene: a case study from the Sydney Basin using charcoal and pollen analysis. *Australian Geographer* 38, 37–52.
- Boon, S. and Dodson, J.R., 1992: Environmental response to land use at Lake Curlip, East Gippsland, Victoria. *Australian Geographical Studies* 30, 206–221.
- Bowman, D.M.J. and Panton, W.J., 1994: Fire and cyclone damage to woody vegetation on the north coast of the Northern Territory, Australia. *Australian Geographer* 25, 32–35.
- Burton, I., Kates, R.W. and White, G.F., 1993: *The Environment as Hazard*. Guildford Press, New York.
- Buxton, M., Haynes, R., Mercer, D. and Butt, A., 2011: Vulnerability to bushfire risk at Melbourne's urban fringe: the failure of regulatory land use planning. *Geographical Research* 49, 1–12.
- Clark, S.S. and McLoughlin, L.C., 1986: Historical and biological evidence for fire regimes in the Sydney region prior to the arrival of Europeans: implications for future bushland management. *Australian Geographer* 17, 101–112.

- Cochrane, G.R., Burnard, S. and Philpott, J.M., 1962: Land use and forest fires in the Mount Lofty Ranges, South Australia. *Australian Geographer* 8, 143–160.
- Crowley, G.M. and Garnett, S.T., 2000: Changing fire management in the pastoral lands of Cape York Peninsula of northeast Australia, 1623–1996. *Australian Geographical Studies* 38, 10–26.
- Cubit, S., 1996: 'Burning back with the snow': traditional approaches to grassland management in Tasmania. *Australian Geographical Studies* 34, 216–224.
- Dodson, J.R., De Salis, T., Myers, C.A. and Sharp, A.J., 1994a: A thousand years of environmental change and human impact in the alpine zone at Mt Kosciusko, New South Wales. *Australian Geographer* 25, 77–87.
- Dodson, J.R., Frank, K., Fromme, M., Hickson, D., McRae, V., Mooney, S. and Smith, J.D., 1994b: Environmental systems and human impact at Cobrico Crater, south-western Victoria. *Australian Geographical Studies* 32, 27–40.
- Eriksen, C., 2013: *Gender and Wildfire: Landscapes of Uncertainty*. Routledge, New York and London.
- Eriksen, C., Gill, N. and Bradstock, R., 2011: Trial by fire: natural hazards, mixed-methods and cultural research. *Australian Geographer* 42, 19–40.
- Fleeton, M.W., 1980: Public and private adjustment to the bush fire hazard in Australia: empirical evidence from New South Wales. *Australian Geographer* 14, 350–359.
- Galiana-Martin, L. and Karlsson, O., 2012: Development of a methodology for the assessment of vulnerability related to wildland fires using a multi-criteria evaluation. *Geographical Research* 50, 304–319.
- Gill, N., 1994: The cultural politics of resource management: the case of bushfires in a conservation reserve. *Australian Geographical Studies* 32, 224–240.
- Gill, N., 2006: What is the problem? Usefulness, the cultural turn, and social research for natural resource management. *Australian Geographer* 37, 5–17.
- Hallam, S.J., 1975: *Fire and Hearth: A Study of Aboriginal Usage and European Usurpation in South-Western Australia*. Australian Institute of Aboriginal Studies, Canberra.
- Handmer, J. and Dovers, S., 2008: *Handbook of Disaster and Emergency Policies and Institutions*. Earthscan, London.
- Harte, E.W., Childs, I.R.W. and Hastings, P.A., 2009: Imizamo Yethu: a case study of community resilience to fire hazard in an informal settlement, Cape Town, South Africa. *Geographical Research* 47, 142–154.
- Head, L., 1989: Prehistoric aboriginal impacts on Australian vegetation: an assessment of the evidence. *Australian Geographer* 20, 37–46.
- Head, L., Adams, M., McGregor, H. and Toole, S., 2013: Australia and climate change. *WIREs Climate Change* doi:1002/wcc.255 (Published Online: 9 October 2013).
- Hill, R., Griggs, P. and Bamangabubungadimunku Incorporated, 2000: Rainforests, agriculture and Aboriginal fire-regimes in wet tropical Queensland, Australia. *Australian Geographical Studies* 38, 138–138.
- Holland, P.G., 1986: Mallee vegetation: steady state or successional? *Australian Geographer* 17, 113–120.
- Hughes, R. and Mercer, D., 2009: Planning to reduce risk: the wildfire management overlay in Victoria, Australia. *Geographical Research* 47, 124–141.
- Jones, R., 1969: Fire-stick farming. *Australian Natural History* 16, 224–228.
- Kates, R.W., 1971: Natural hazard in human ecological perspective: hypotheses and models. *Economic Geography* 47, 438–451.
- Kelly, M. and Mercer, D., 2005: Australia's box-ironbark forests and woodlands: saving the fragments of a threatened ecosystem. *Australian Geographer* 36, 19–37.
- Kershaw, A.P., Bretherton, S.C. and van der Kaars, S., 2007: A complete pollen record of the last 230 ka from Lynch's Crater, north-eastern Australia. *Palaeogeography, Palaeoclimatology, Palaeoecology* 251, 23–45.
- Lockwood, M., Davidson, J., Curtis, A., Stratford, E. and Griffith, R., 2009: Multi-level environmental governance: lessons from Australian natural resource management. *Australian Geographer* 40, 169–186.
- Lynch, A.H., Beringer, J., Kershaw, P., Marshall, A., Mooney, S., Tapper, N., Turney, C. and van der Kaars, S., 2007: Using the paleorecord to evaluate climate and fire interactions in Australia. *Annual Review of Earth and Planetary Sciences* 35, 215–239.
- Mackellar, D., 1908: 'Core of My Heart'. *The Spectator*. London.
- Mercer, D., 2012: Catastrophic bushfires, politics and the public interest. In Crowley, K. and Walker, K.J. (eds) *Environmental Policy Failure: Learning from Australian States*. Tilde University Press, Melbourne, 131–145.
- Mooney, S.D., Webb, M. and Attenbrow, V., 2007: A comparison of charcoal and archaeological information to address the influences on Holocene fire activity in the Sydney basin. *Australian Geographer* 38, 177–194.
- Muller, G., 2006: A new frequency analysis method for constructing fire histories from flowering events in Austral Grass-trees (*Xanthorrhoea australis*) from southern Victoria. *Geographical Research* 44, 339–347.
- Oliver, J., 1987: Yet another look at natural disasters in Australia. *Australian Geographical Studies* 25, 105–116.
- Partridge, E. and Levy, M., 2013: Bushfire survivors in Blue Mountains tell of losing homes. *The Sydney Morning Herald*, Retrieved: 18 October 2013 from <<http://www.smh.com.au/nsw/bushfire-survivors-in-blue-mountains-tell-of-losing-homes-20131018-2vqxg.html>>.
- Prosser, I., 1990: Fire, humans and denudation at Wangrah Creek, Southern Tablelands, N.S.W. *Australian Geographical Studies* 28, 77–95.
- Pyne, S.J., 2001: An exchange for all things? An inquiry into the scholarship of fire. *Australian Geographical Studies* 39, 1–16.
- Rule, S., Brook, B.W., Haberle, S.G., Turney, C.S., Kershaw, A.P. and Johnson, C.N., 2012: The aftermath of megafaunal extinction: ecosystem transformation in Pleistocene Australia. *Science* 335, 1483–1486.
- Shakesby, R.A., Chafer, C.J., Doerr, S.H., Blake, W.H., Wallbrink, P., Humphreys, G.S. and Harrington, B.A., 2003: Fire severity, water repellency characteristics and hydrogeomorphological changes following the Christmas 2001 Sydney forest fires. *Australian Geographer* 34, 147–175.
- Solomon, R.J. and Dell, A.R., 1967: The Hobart bushfires of February, 1967. *Australian Geographer* 10, 306–308.
- Torry, W.I., 1979: Hazards, hazes, holes: a critique of the environment as hazard and general reflections on hazards research. *Canadian Geographer* 23, 368–383.
- Vigilante, T., 2001: Analysis of explorers' records of Aboriginal landscape burning in the Kimberley region of Western Australia. *Australian Geographical Studies* 39, 135–155.
- Watts, M., 1983: On the poverty of theory: natural hazards research in context. In Hewitt, K. (ed.) *Interpretations of Calamity*. Allen and Unwin, Boston, 231–262.

- Whittaker, J. and Mercer, D., 2004: The Victorian bushfires of 2002-03 and the politics of blame: a discourse analysis. *Australian Geographer* 35, 259–287.
- Wittenberg, L.E.A. and Inbar, M., 2009: The role of fire disturbance on runoff and erosion processes – a long-term approach, Mt. Carmel case study, Israel. *Geographical Research* 47, 46–56.
- Zeng, L. and Whelan, R.J., 1993: Natural reforestation of abandoned farmland: the role of soils. *Australian Geographer* 24, 14–25.