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# ‘Forsaken Spot’ to ‘Classic Ground’: Geological Heritage in Australia and the Recuperative Power of the Deep Past

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## ABSTRACT

The scarcity of navigable rivers and elevated mountain ranges in Australia encourages an aesthetic fashioned by the monumental scale represented by deep-time landscapes and objects instead of geography. This study seeks to construct a theory of geological heritage and the redemptive or recuperative power of material remains of the deep past, concentrating on three landscapes. The South Australian Division of the Geological Society of Australia has played a central role in the preservation of geological heritage in that state since 1966 when the glacial pavements of Adelaide’s Hallett Cove became the movement’s flagship. The 44,800 hectare Lake Callabonna Fossil Reserve, a dry lake in the state’s arid far east, has been celebrated by vertebrate palaeontologists as a significant landscape since the 1890s. The dry Willandra Lakes of western New South Wales were inscribed on the World Heritage List in 1981 for their cultural, archaeological and geological significance. These three celebrated areas have been variously described as wasteland, desert, forsaken, degraded, unproductive and isolated. Geological perspectives provide a new lexicon for the appreciation of Australian landscapes as the deep past is mobilised to turn them into regions of ‘world renown’ or ‘classic ground’.

## KEYWORDS

Geological heritage; deep time; landscape; Hallett Cove; Lake Callabonna; Lake Mungo

The meaning of landscapes takes novel forms in Australia’s topographically understated but climatically dramatic interior. The dearth of lush valleys, navigable rivers and forested alpine scenery west of the Great Divide encourages

a landscape aesthetic shaped instead by the provision of a fourth dimension, a sense of the grand temporal scales represented by deep-time landscapes, objects and Indigenous cultures in Australia. Building on ideas about cultural and natural heritage in Australia, and taking literature on geological heritage buried in reports and in-house journals, this paper begins to construct a theory of geological heritage and of the recuperative power of the deep past. By this I mean the language of merit and significance attached to landscapes on the basis of their age, when they or their material productions are recognised as geologically or archaeologically significant. Here I have concentrated on three landscapes celebrated for their geological particularity but elsewhere categorised as waste or barren (Figure 1).

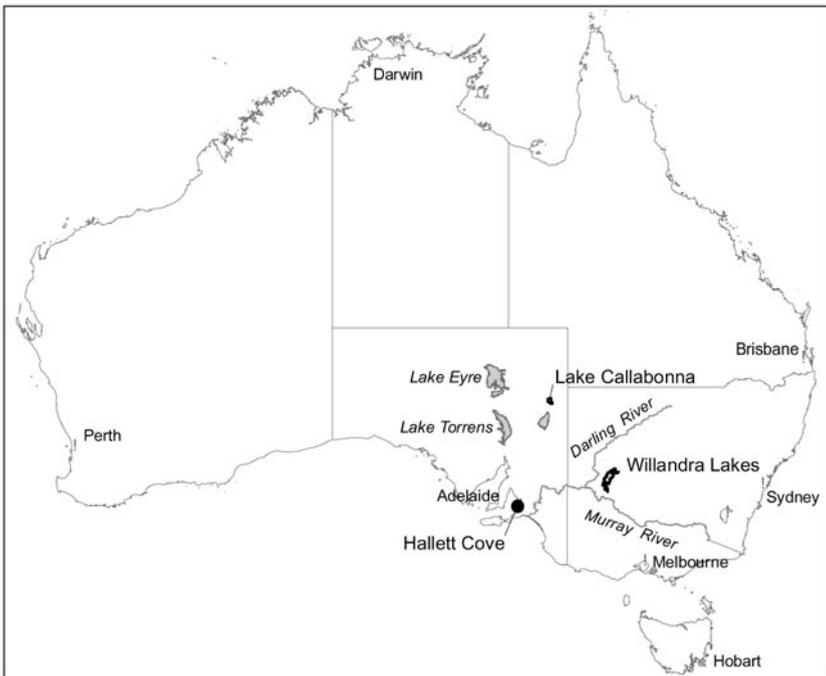


FIGURE 1. Locality map. Hallett Cove Conservation Park, Lake Callabonna Fossil Reserve (SA), Willandra Lakes World Heritage Area (NSW). (produced by Heritage Information Section, Heritage Division, Department of the Environment and Heritage, Canberra, Australia)

The Hallett Cove Conservation Park is about twenty kilometres south of Adelaide. It was preserved from encroaching suburbia in 1975, primarily because of its 280 million-year-old Permian glacial features and their contribution to

geological debates spanning one hundred years, from the possibility of southern hemisphere glaciation, which was first postulated in the 1880s, to the plate tectonic revolution of the mid-twentieth century. The second case study involves the Lake Callabonna Fossil Reserve south-east of Lake Eyre in South Australia, or more particularly, the graveyard of giant extinct marsupials first delivered to western science in 1893. It was placed on the Register for the National Estate in 1980 for the quantity of pleistocene bones eroding from its surface sediments. But it entered the canon of significant geological landscapes in the 1890s and the South Australian Government declared it the new nation's first 'Fossil Reserve' in 1901. Further to the south and east, the dry lakes of semi-arid western New South Wales' Willandra Lakes Region were inscribed on the World Heritage List in 1981 for their cultural, archaeological and geological significances. This third episode hinges around a moment in February 1968 when the Victorian geomorphologist Jim Bowler found a collection of split and charred bones protruding from a blowout on a sand dune bordering Lake Mungo. This bundle of bones, identified as a Pleistocene human cremation, is known colloquially as Lake Mungo 1 or Mungo Lady.<sup>2</sup>

Earth scientists and others involved in the classification of geological heritage have written extensively on how to identify, protect and define it, but as yet, the practice of geological heritage remains largely untheorised in Australia, in contrast to other sorts of cultural and natural heritage.<sup>3</sup> It is not my purpose to negotiate the complexities of modern heritage discourse and method. Nor have I attempted to plot a path between the often-conflicting requirements of State and Commonwealth heritage legislation. Instead this paper is a first step towards a theory of geological heritage in Australia through an examination of ways in which three landscapes can be described as having been, in a sense, 'saved', or recuperated via the discovery and articulation of a deep past. Value in a landscape is negotiated at the boundaries of the sometimes incompatible sacralisations of science versus heritage, education and training versus preservation, indigenous and other patrimonies and the requirements of tourism or industry.

## WHAT IS GEOLOGICAL HERITAGE?

Australian geologists, vertebrate palaeontologists and archaeologists regard each of these three areas as more or less canonical in the annals of their respective disciplines. They form part of the ill-defined, expanding catalogue of sites or features which make up the nation's geological heritage. The human geographer Graeme Aplin, reflecting on the nature of heritage management in the late twentieth and early twenty-first centuries, declined to prescribe a definitive answer to the question he posed, 'What is "heritage"?''. Graeme Davison refused a simple answer to a similar question in *The Use and Abuse of Australian History*. David Lowenthal described 'the cult of heritage' as 'a newly popular

faith ... a self-conscious creed, whose shrines and icons daily multiply and whose prose suffuses public discourse'. As such, a broad, all-weather definition may be futile, because nothing about the word is definitive: according to Lowenthal, 'heritage relies on revealed faith rather than rational proof'. Even a discussion of its plurality of meanings and origins will not satisfy everyone. Still it is worthwhile briefly to consider some antecedents and counterparts to the practice of geological heritage in Australia.<sup>4</sup>

In 1985 the Australian archaeologist Isabel McBryde wrote in an introduction to a collection of essays about the control of cultural heritage that the site as 'national symbol' emerged in the nineteenth century 'as part of the historical self-consciousness of a number of European states'. Demands for guidelines for the protection of this national heritage were framed 'in terms of the site as both symbol and patrimony'. Sites and artefacts physically and metaphysically linked the past with the present. States thereby re-invented both past and present to serve national and political agendas in the pursuit of 'collective self-conscious identity'. Ten years later Denis Byrne, an archaeologist, connected 'the concept of heritage' inextricably to the practice of archaeology in Australia 'since at least the 1970s'. In keeping with McBryde's argument, Byrne wrote that 'archaeology and cultural nationalism march hand in hand in virtually every country in the world'. The historian Tim Bonyhady mused on the 'forgotten' pre-Federation antecedents of the 'preservationist usage' of heritage by the Whitlam Government a century later. He provided a contemporary legal definition of its bedmate, the National Estate, 'defined in the Australian Heritage Commission Act as those parts of the natural or cultural environment that "have aesthetic, historic, scientific, or social significance or other special value for future generations as well as for the present community"'. Section 2 of the new Australian Heritage Council Act (2003), which replaced the earlier Act, retains the same phrase.<sup>5</sup>

This list of prerequisites from a small sample of available literature foregrounds attributes considered important by people involved in the identification, interpretation and conservation of geological heritage, but it also highlights an important difference between the articulation of geological and mainstream heritage values. The custodians of geological heritage such as the Geological Society of Australia (GSA) find particular resonance in references to scientific value, 'other special value' and the allusion to posterity in the phrase 'future generations'.<sup>6</sup> They regard aesthetic significance, given priority in the Australian Heritage Council (AHC) Act, as marginal, although recently the GSA has considered the ill-defined 'aesthetic values' as an 'avenue for further research', not to mention financial support.<sup>7</sup> Furthermore, there are several recent examples of close collaboration between tourism boards, local people and museum and geological workers. National Parks and Wildlife Services (NPWS) and scientists at the Naracoorte Caves World Heritage Fossil Site in south-eastern South Australia have worked fruitfully together to build ties with the South Australian Tourism Commission, better to integrate scientific and aesthetic values in marketing the

site and to position the state as 'a unique and diverse tourist destination'. At 'Kronosaurus Korner', the Richmond Marine Fossil Museum in central Queensland, palaeontologists and curators work with people in the region to promote fossil conservation, research and commercial tourist potential, while encouraging local employment. The Queensland Museum also attempts to foster such links. However, for all their focus on community involvement and the marketing of geo-heritage, these collaborative exercises still emphasise function, in the sense of geological processes, training and preservation, over form.<sup>8</sup>

In contrast in the United Kingdom, building on thirty years of work through the Geological Conservation Review begun in the late 1970s, the 'Regionally Important Geological-geomorphological Sites', or 'RIGS' programs involve local organisations and people with site protection and management, including the assessment, maintenance and promotion of 'aesthetic character'. The former convenor of the GSA's standing committee on geological heritage, Bernie Joyce, noted that in Australia, 'Pioneering work on the assessment of aesthetic values was carried out during the Central Highlands study', which was the second Australian Heritage Commission joint assessment of National Estate values. There is space between the AHC criteria and the pragmatic, scientific approach of the GSA to harness geological heritage and notions of deep time to landscape aesthetics, thereby fostering a broader, geologically informed appreciation of both geology and landscape in the general public.<sup>9</sup>

Geological heritage identification and management is an evolving methodology with a corpus of literature often buried in reports and submissions by the various bodies associated with its articulation and implementation. The movement has to some extent (reciprocally) adopted the rhetoric of the United Nations Organization for Education, Science and Culture's (UNESCO) World Heritage Convention with its ranking of 'significance' into local, regional, national and international categories and the apparent contradiction of 'uniqueness' or 'outstanding value' tempered by 'representativeness'. Joyce described the two approaches in the following terms, as located along a 'spectrum of importance' whereby 'at the rare end of the scale we may have a *unique* site. At the *common* end we may have a group of features, from which a *representative* example could be selected'. He justified representation as allowing 'a significance to be attached to one or several features which can best represent a group of similar features'. Such an example 'need not be outstanding or striking, but need only be typical of the group it is to represent'. Other assessment criteria include educational potential, historical significance and importance for ongoing research or reference.<sup>10</sup> Despite the shared language, only around 20 sites inscribed on the World Heritage List are there primarily because of their geological interest, from a total of 690 sites worldwide of which 138 are natural, 23 mixed and 529 cultural.<sup>11</sup>

Geological heritage may be embodied in a 'site' or a 'feature'. A site is an area of land of geological interest, like the Hallett Cove Conservation Park or

the Lake Mungo National Park (Figure 2). A feature shows an aspect of geology or geomorphology which does not necessarily have a 'particular extent': it may be a process such as erosion or a discrete site, exposure or object like a type section or a fossil locality. For example, the park boundaries at Hallett Cove protect exposed objects such as Tate's Rock and processes such as the badlands erosion of the Amphitheatre (Figure 2). The Lake Callabonna and Lake Eyre basin fossil localities separately constitute 'features', although they can also be described as 'sites'. The terminology, like much about geological heritage, reflecting the discipline from which it takes its name, is both specific and slippery. Earth scientists have used the term 'geological monument' to embody sites or features of geological heritage significance, or, to quote Bernie Joyce again, 'those features of a region which form the essential basis of geological education, research and reference'.<sup>12</sup> Control of meaning is as important to the community of earth scientists as to other heritage practitioners.

Partly an attempt to rectify the perceived low public profile of sites of geological heritage, the institution of a system of Global Geoparks is another



FIGURE 2. Hallett Cove Conservation Park. View of the Amphitheatre from the south.  
(Photograph K. Douglas)

initiative encouraged by those such as UNESCO involved in geological heritage and geoscience education world-wide. It is further regarded as a complement to eco-tourism, preserving global 'Geo-diversity' by making it economically sustainable. The official web-site of the China-based Office of the World Geopark Network explains the Geopark philosophy as

educating the general public in environmental matters. They also serve as tools for demonstrating sustainable development and for illustrating methods of site conservation as well as remembering that rocks, minerals, fossils, soils, landforms and landscapes are both the products and record of the evolution of our planet Earth and, as such, form an integral part of the natural world.<sup>13</sup>

The first International Geopark Conference was held in Beijing in late June, 2004. Through its Earth Sciences Division (now subsumed within the Ecology and Earth Sciences Division), UNESCO set up an Advisory Board for Geoparks in 2001. There are now 33 UNESCO-accredited Global Geoparks. Of these, 12 are in China, from a total of 85 Chinese National Geoparks. The rest are in Europe. The proposal for acceptance into the Global Network of the first Iranian national Geopark, on Qeshm Island in the Persian Gulf, has just been assessed (June 2005).<sup>14</sup> UNESCO's support is underpinned by the Geopark Network's undertaking to promote geo-heritage for the purposes of preservation (of sites, objects and processes), education, tourism, sustainable development and the creation of jobs for local people. Since 2002, Dr Sue Turner, Australia's lone Geopark advocate and a vigorous proponent of Geo-tourism, has been building an Australian-Pacific Network, in the interests of obtaining UNESCO assistance and accreditation.<sup>15</sup> Despite its philosophical links to eco-tourism and World Heritage, the language of Geoparks, at least in Australia, is still notably utilitarian, again focussed on finance, education, training and sustainability rather than aesthetics. Turner has noted by way of contrast that in her talks in Beijing and Paris, she is encouraged to emphasise 'links to landscape for cultural reasons and human resonance'. Instead in Australia, the funding bodies she approaches require 'practical finance-based facts'.<sup>16</sup>

Notwithstanding a shared vocabulary, shared legislation and some shared sites, geological heritage is distinct from other types of natural and cultural heritage, with different emphases. Landscapes embody it as *earth history*, revealed like the cyclical climate change evident in the Lake Mungo badlands stratigraphy; and as the *history of a discipline in Australia*, illustrated by certain landforms or material remains, for instance Tate's Rock or the site of the 1893 South Australian Museum campsite at Lake Callabonna. Earth scientists therefore value a geological monument for its physical qualities or for the stories it tells about the development of their discipline. The GSA terms the latter 'classic sites'.<sup>17</sup> The distinction converges with Graeme Aplin's umbrella notion of heritage, as, in an Australian context at least, 'Two sets of ideas – heritage as a set of ideals, and heritage as things – merged in the 1960s so that heritage now refers to things

that represent ideals'. The recognition of geologically significant sites and their ongoing protection help to ensure the continuity and integrity of earth science research in Australia. The landforms, as receptacles in which scientists locate geological knowledge, keep the history and the future of the discipline.<sup>18</sup>

The performance of geological heritage also differs from broad ideas of cultural and natural heritage because of its emphasis on practical research over patrimony (with the possible exception of Geoparks, whose rhetoric implies a notion of global patrimony). Barry Cooper and Maud McBriar, both past-convenors of the Sub-committee on Geological Conservation of the South Australian branch of the GSA, and Bernie Joyce, have all stressed the importance and difficulty of finding a balance between the incompatible requirements of conservation and of industry. The GSA as a national body representing a membership drawn from among Australian earth scientists in industry and academia is uniquely and tenuously poised. It has been slow to adopt Geoparks discourse.<sup>19</sup> The needs of extractive sciences and earth heritage are often in conflict. Extraction is anathema to many National Parks representatives who share the custodianship of geological monuments within national park boundaries. Conversely, in the eyes of many geologists the point of geological conservation is to aid present and future geological research, which is sometimes necessarily destructive. Some members of the GSA perceive a potential and irreconcilable conflict of interest for the society between the requirements of the extractive industries and the requirements of conservation. They anticipate that the protection of sites and features on the grounds of geological significance will set a precedent with potentially awkward ramifications for the mining industry.<sup>20</sup>

On the other hand, sites of geological heritage form part of the national estate. With respect to cultural heritage, Isabel McBryde wrote that 'New visions of the past, or new versions of the past, may serve social and political ends'. This applies equally to natural and geological heritage. The site or feature becomes a symbol of national unity. The GSA regards geological heritage as patrimony of a different kind, ostensibly harnessed not in the interests of fortifying collective national identity but pragmatically, as a scientific or educational resource.<sup>21</sup> But in a nation like Australia which has not reconciled its precolonial and colonial pasts with its 'post'-colonial present, 'geological patrimony' is conveniently located in a prehuman past that can be made national and international. Non-Indigenous Australians, accused by cultural historians like Paul Carter of co-opting landscape history and Aboriginal heritage as a sort of prosthetic past to compensate for our shallow roots, can embrace the superlatives 'oldest', 'largest', 'outstanding', 'world-class', freed from the burden of someone else's history. Lake Callabonna, we are told, 'represents a unique accumulation': there is 'no other site like it in the world'. Hallett Cove achieves, as the South Australian Science Teachers' Association put it, 'world-wide significance' because of its links to other Gondwanan sites across the globe.<sup>22</sup>

In this context any notion of archaeological patrimony is immediately problematic. Some archaeologists argue (from a sound genetic basis, according to modern scientific orthodoxy) that Pleistocene human remains like those at Lake Mungo transcend race and ownership because of their great age (upward of 45,000 years B.P), the impossibility of tracing modern affiliations or of gauging the wishes of the long dead, and their impact on debates about the origin and geographic radiation of modern human beings. The eminent Australian historian and archaeologist John Mulvaney has convincingly made such arguments regarding the 'handback' of Kow Swamp burial remains in the 1990s.<sup>23</sup> Professor Mulvaney is an impassioned advocate for the protection of heritage as 'a national possession' vital for the construction of collective identity. Furthermore, as the British archaeologist Colin Renfrew expressed it, 'The world archaeology is something in which we can all share': this is justification by globalisation.<sup>24</sup> Some Indigenous Australians argue that the remains are the ancestors of the traditional custodians of the region and therefore constitute Indigenous cultural property and should be 'returned' to the Indigenous 'owners' for appropriate disposition.<sup>25</sup> On the one hand is the assumption of the 'universality of [archaeological] values' and the importance of cultural heritage to national collective self-perception, as Mulvaney has argued.<sup>26</sup> On the other are the unassailable moral claims of dispossessed people to what they perceive as their cultural property and the assumption of a homogeneous community of Aboriginal meaning and culture through time. These debates are of course not restricted to Australian archaeology. The predicament of many North American archaeologists is characterised by situations like the ongoing, often acrimonious debate surrounding the discovery, acquisition, investigation and disposition of the so-called 'Kennewick Man', found in 1996 in eastern Washington State, one of the most complete and oldest skeletons excavated in North America. Questions of its 'cultural and genetic affiliations' are balanced by questions about the nature of the truth claims of Western science versus those of indigenous traditions and the ownership of pre-Columbian material culture.<sup>27</sup>

Philosophical issues attached to the notion of geological heritage are at first glance less thorny than those linked to the material remains of the human past. The questions of 'who owns the past?' – its physical remains – and 'who controls the past?' – or perceptions of the past – are clearly less sensitive when dealing with 280 million-year-old glacial deposits at Hallett Cove or the fossil traces of Precambrian 'jellyfish' at Ediacara in the Flinders Ranges of South Australia, as opposed to the remains of somebody's meal or great aunt in the human past. Geological heritage operates very differently at the archaeological sites of the Willandra Lakes compared to Hallett Cove and Lake Callabonna. But the issues become hazier when dealing with material that might have informed Aboriginal understanding of their own pasts. Is there such a thing as non-cultural heritage in country as saturated with meaning as Australia?

I do not necessarily mean, with this question, to conflate geological heritage and indigenous cultural heritage, but they are clearly sometimes mutually referable, as in the examples which follow. Nineteenth-century naturalists and their informants reported many Aboriginal accounts which linked megafaunal bone accumulations such as Callabonna's with ancestral figures and the formation of the land and its features. In 1996, fossil poachers removed some 120 million-year-old dinosaur footprints from Crab Creek, near Broome, Western Australia. Among other stakeholders, the ensuing media and scientific attention focussed on the Rubibi people, to whom the trackways were a sacred link to ancestors.<sup>28</sup> Furthermore, it is naïve to assume that debates about 'ownership' are somehow answered by encouraging indigenous people to manage 'their own' sites (as Geoparks regulations require), as witnessed by ongoing challenges to Anangu management of the Uluru-Kata Tjuta National Park in central Australia. Governed by the precedent-setting Northern Territory Aboriginal Sacred Sites Act, 1989, the World Heritage Area is a model for Indigenous/government co-management. Nonetheless, many issues undermine efforts by Anangu to preserve and manage the site, and the cultural and spiritual heritage there embodied.<sup>29</sup> Such legislation does little to settle challenges by non-Aboriginal tour and resort operators who claim that 'Ayers Rock' is a national 'icon' and therefore belongs to all Australians, or by the many visitors who assert their right to climb 'the Rock', against the wishes of the Anangu owners.

#### HALLETT COVE AS 'CLASSIC GROUND': GEOLOGICAL HERITAGE AND THE BATTLE FOR MEANING

The South Australian division of the GSA has played a central role in the preservation of geological heritage in that state since 1966 when the glacial pavements of Hallett Cove became the movement's flagship.<sup>30</sup> To date its Geological Heritage Subcommittee has collated over 400 geological monuments in the state into the eight-volume *Geological Monuments in South Australia* (The 44,800 hectare Lake Callabonna Fossil Reserve also numbers among these). From 1958 to 1975 campaigners fought to prevent housing developers from building over coastal landforms and geological exposures with historical and educational significance at the cove. The society declared the glacial landforms a geological monument in the 1960s and the 50 hectare park, opened in 1976, was placed on the Register for the National Estate in 1981. The perceived danger to Hallett Cove's geological 'integrity' posed by the proposed suburban developments mobilised academic geologists, teachers and those concerned more generally with lack of public consultation and the state's natural heritage. The material remnants of its deep past elevated the site from a somewhat degraded coastal landscape to a geological feather in South Australia's heritage cap.<sup>31</sup>

## 'FORSAKEN SPOT' TO 'CLASSIC GROUND'

Many of the Hallett Cove campaigners continue to represent their victory as the vindication of a geological awareness of landscape. By invoking the fourth dimension, they effected a local appreciation of places worth saving in the state in counterpoint to the monumentalism sometimes associated with the establishment of national parks in, for instance, North America and New Zealand or on the east coast of Australia. But their declarations were no less hyperbolic. The campaign literature of Hallett Cove insisted on the need to preserve the site, with its 'almost unbelievable glimpses of the past', for 'the future'. If South Australia's geographical 'circumstances' required a 'system that could overcome the paucity of snow-clad mountain-top scenery' then the grandeur of deep time in the intimate setting of Hallett Cove provided just that. For example, the GSA(SA)'s nomination of Hallett Cove to the Register for the National Estate in 1977 describes the glacial features as the 'best of the (late Palaeozoic) Australian glacial pavements... amongst the best in the world'. The park boundaries protect a 'world renowned area of geology' preserving the glacial pavements 'in relation to older and younger rocks' thus revealing aspects of 'the geological history over the last 600 million years'. Not only qualitatively the 'best in the world', the cove rocks tell a story of South Australia spanning the top eighth of earth history.<sup>32</sup>

Conservationists and developers faced each other across front page headlines in the Adelaide *Advertiser* in a battle to determine the shape of meaning and to control landscape aesthetics at the cove. The literature of the conservationists likened processes of urbanisation to the spread of a disease or an alien terror, employing such images as the 'tentacles of urban sprawl', 'menacing encroachment', 'developer's devouring teeth' and 'senselessly scraped off the map'. Pre-'development' Hallett Cove was, somewhat misleadingly, a botanical refuge, 'close to its natural condition', 'nature in its untamed state', 'magnificent and unspoiled', 'a beauty spot', 'a picturesque landscape', 'a source of beauty and pleasure', and 'St Vincent Gulf's most beautiful natural cove'.<sup>33</sup>

This is patently at odds with the reality of a landscape which had been grazed, mined and farmed for well over one hundred years, as pointed out by spokesmen for the development companies who declared that 'there has been some emotional thinking on the subject'.<sup>34</sup> It was disingenuously heedless of evidence for pre-European modification of the landscape in the form of Aboriginal 'tool factories' and fires which, as related in the conservationists' own literature, Matthew Flinders reported in 1802. But the campaigners' rhetoric is tempered by real grief at the perceived or imminent loss to the South Australian public of 'yet another unique landmark' and anger at the bureaucratic opacity, hypocrisy and lack of consultation that leads to such 'decay'. As an editorial in the *Advertiser* claimed in September 1971, 'the best of the environment cannot be left to the hands of local government'. In contrast, the vocabulary of would-be developers, while acknowledging the 'magnificence' of the 'outlook' and the 'panoramic views', stressed the 'deficiency' of the beach, the lack of scenic

attraction of the 'steep and broken landform', the 'rapid degeneration' of the area which has been 'defaced', 'denuded' and 'degraded', not by subdivision but by agriculture and by 'uncontrolled public access' resulting from the site's 'isolation'. This could best be countered with judicious application of the town planner's salve.<sup>35</sup>

Hallett Cove is an equivocal success. Some geologists and members of the National Trust maintain that the scientific value of the park and reserve is compromised because potentially important sites whose geology has not been investigated were and continue to be lost to housing.<sup>36</sup> Nevertheless, some gains were made in the interests of education, research and the history of the discipline. The GSA successfully and opportunistically mobilised South Australia's deep past, its material remains and intellectual legacy, public opinion and landscape aesthetics in the interests of geological heritage and the establishment of a collective national treasure chest of places worth saving. The stories of Hallett Cove thus begin to demonstrate the capacity of deep time to salvage and recuperate a threatened, degraded, domesticated landscape.

#### LAKE CALLABONNA: A 'MOST UNEXPECTED LOCATION'

The sediments of Lake Callabonna preserve the largest assemblage of diprotodon remains yet discovered (Figure 3). These rhinoceros-sized marsupials were mired in the drying lake and died of thirst up to 100,000 years ago. While the fight for Hallett Cove was a test case for the geological heritage movement in South Australia and has become in a sense emblematic of a perceived paradigmatic shift in environmental policy in the state during the 1960s and 1970s, public contest has not marred the frosted gypsum surface of Callabonna for a hundred years. Its desiccated landscape illustrates a redemptive aspect to deep time objects and palaeoenvironmental reconstruction in a different way from Hallett Cove. In its evocation of dying diprotodons in a dying lake, the standard palaeontological *Just So* story refreshes the trope of the watered inland in a Cainozoic land of plenty, reiterated later in the Willandra Lakes-Lake Mungo story.<sup>37</sup> The material remains of Callabonna's Pleistocene past and their interpretation gives the modern landscape layers of meaning otherwise unintelligible and unimaginable.

Before the revelation of its palaeontological wealth in 1892, Lake Mulligan as it was then known was chiefly renowned as the easternmost shore of Edward John Eyre's great 'horseshoe lake' of impassable salt flats and mud, which supposedly curved northward around the Flinders Ranges, stretching from Lake Torrens in the west, Lakes Eyre and Gregory in the north to the south-eastern Lake Frome. Successive expeditions by B.H. Babbage, P.E. Warburton, John McDouall Stuart and A.C. Gregory during the 1850s shattered the horseshoe as pastoralism 'opened up' the interior of South Australia. Gregory, the leader of the first European expedition to pass between Lakes Blanche and Callabonna

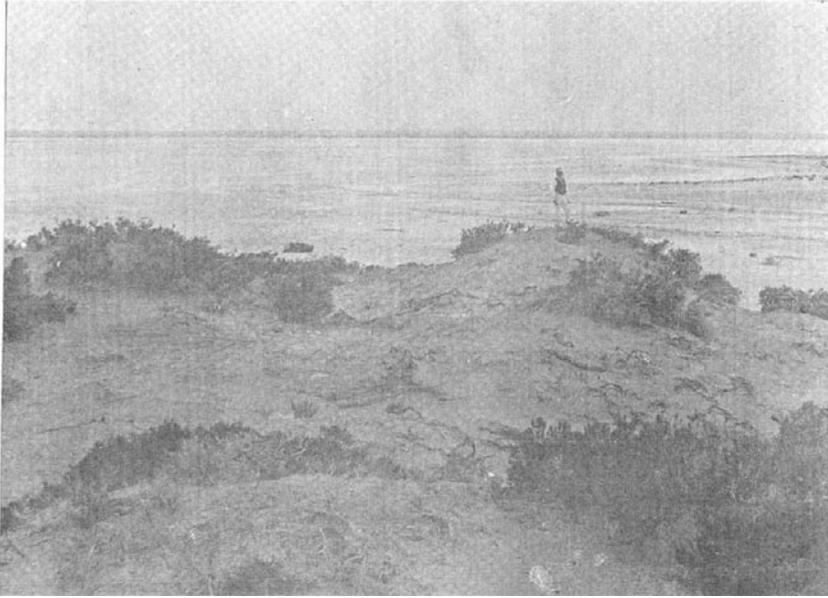


FIGURE 3. South Australian Museum expedition to Lake Callabonna in 1893, looking south-west. (Photograph from E.C. Stirling and A.H.C Zietz 1899. 'Fossil remains of Lake Callabonna, Part I...'. *Memoirs of the Royal Society of South Australia* 1[1]).

in search of the lost Ludwig Leichhardt, dismissed this country to the north of the Flinders Ranges with devastating brevity as 'sterile and of little practical value'.<sup>38</sup>

Creek beds and clay pans tell of other hydrological regimes when rivers flow and the dust turns to mire. An eyewitness, Harold Fletcher of the Australian Museum, described an enigmatic, provocative landscape stretching 'away to the north', 'completely devoid of vegetation', producing feelings 'of gloom and loneliness' in the viewer:

Even bird life was practically non-existent, and this introduced a hushed stillness adding an aura of mystery to the desolate countryside... Away in the distance, towards the centre of the lake, a cluster of vegetation was miraged up, seemingly to float in the air.<sup>39</sup>

The lake is overwritten by another emerging from Fletcher's understanding, as a natural historian, of an 'empty' landscape and a deeper palaeontological past. But before it was a graveyard there were other lakes there: inland sea, horseshoe lake, saltbush plain, swamp, desert, too boggy, too dry, wasteland, midden, ref-

uge, larder. These stories intersect with the lake's geological heritage. Meaning is as unstable as the lake surface.

The *South Australian Register* earlier adopted a similarly cabbalistic voice after John Meldrum, a well digger from Callabonna Station, brought the first collection of bones to Adelaide from Lake Mulligan. In August 1893 the newspaper linked the 'sterile' landscape to the wonder of the deep past: 'the gigantic creatures of a bygone age whose relics are embedded in the hardened mud and débris of what were once the huge swamps of the Far North-East'.<sup>40</sup> Another anonymous source in the *Register* described the Callabonna site in 1894 as located in 'a series of "claypans" in the vast desert north-east of Farina. It is a "lake" only in flood times – an arid waterless region of sand and salt pools'. Ornamenting this scene are 'the bones of these monsters' which lie as they died, by the hundreds. But far from contributing to the Hadean character of the site, the bones raised questions which began to recuperate the environment of Callabonna:

On what did they feed? Why were they made so enormously strong?... What astonishing changes in the climate and rainfall must have occurred since these beasts roamed in the jungle as the rhinoceros, or in swamps as the hippopotamus?... These things are among the buried secrets of the great past, which secrets science is unlocking.<sup>41</sup>

Again in the *Register*, in May 1893, the bleakness of Callabonna as 'a more apparently uninteresting and forsaken spot' than which 'could not be found in the whole of Australia' is juxtaposed with a fulsome account of its glorious deep past, as revealed once again by heavily reified Science :

What a different picture of the past history of this country is brought to light by the new discoveries! [Nearby] Mount Searle... was probably at the period of which we speak fully twice [its present] elevation. On its sides grew huge trees, and all around was a dense tropical growth, exceeding in luxuriance the forests of the eastern slopes of the Andes in South America. Every form of life on the whole earth was at that time huge and uncouth... [These skeletons] are a magnificent treasure in the interests of science... Of very far-reaching significance is the story which is told by these mute relics of a remote age.<sup>42</sup>

The discovery 'in the most unexpected' location, 'of incalculable value to science', went some way to redeeming the lake as a functional colonial landscape.<sup>43</sup> At first glance, the story reads as degeneration from a Pleistocene Eden to a modern desert. Closer reading shows that value in the modern landscape is clearly attached to the wealth of meaning the bones provide. E.C. Stirling, as Director of the South Australian Museum, visited the museum's campsite in 1894 and worked on the fossil material from 1893-1913, with his assistant Amandus Zietz. In an article in the journal *Nature* in 1894, Stirling dismissed the scenic merits of the lake in unflattering terms as 'Almost unsurpassable for barrenness and utter desolation'. Names 'such as Mount Hopeless, Dreary Point, Illusion Plains, Mount Deception, Mirage Creek' invoked the 'character of the

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surrounding country' in which 'Scarcely any vegetation relieves the prevailing desolation'. As for the lake itself, 'not a bush relieves the unbroken monotony of the level, white crystalline surface'. But he tempered his criticism of the region's sparse severity considerably with his statement that 'There is compensation for the uncompromising physical features' of the lake 'in the fact that its bed has lately been shown to be a veritable necropolis of gigantic extinct Marsupials and Birds, which have apparently died where they lie, literally in hundreds'.<sup>44</sup>

Sixty years later, the lake was a successful port of call for the Berkeley palaeontologist and Fulbright Scholar Ruben Stirton and his graduate student Dick Tedford on their first trip to Australia in 1953. Stirton, whose name is inextricably linked to Callabonna in the annals of South Australian science, is credited by many of his students with inspiring a renaissance in the study of mammalian palaeontology in Australia in the 1950s.<sup>45</sup> By the time he first set eyes on the lake in May 1953, rediscovering the museum's 1893 camp, the desolation of the landscape barely warranted comment. The laconic Texan explorer-geologist with an eye for detail was making science instead.

I finally wandered back on the lake floor and came into the high dune ... I could see saline flats island-ward from the dune before I reached it ... Off to my left I saw an object that looked like a box-board. So I strolled over that way ... I then came upon a kangaroo skeleton that commanded my attention for a few minutes as I looked for the cranium and mandibles. We have been picking up the best ones ... Next I saw some forked posts about half buried that seemed to form the uprights for a shelter. All this and other objects about rather convinced me that I had found Zietz' camp site. Then I thought, '[Diprotodon] must be about'. In the water and at the edges of the water were objects that could be what we had been looking for, within 5 minutes I had located the weathered remains of 9 Diprotodon skeletons.<sup>46</sup>

The landscape only intruded into Stirton's account negatively when he headed 'the long distance back to the car'. Perhaps his equanimity derived partly from the expedition's mode of transport, by Land Rover and truck instead of camel, and partly from the difficulties of field work in his arid Texan home state, but the rigours of a one-month journey were still considerable. The landscape provided compensation as much as tribulation. He had rediscovered a site of great contemporary significance and palaeontological wealth, against the predictions of his colleagues at the museum.<sup>47</sup>

Although he was in Australia principally to search for older fossils than the Pleistocene Callabonna remains, Stirton's joy in discovery, even of these 'young' fossils, is palpable. On 1 June, after their first full day working on the Callabonna fossils, he wrote: 'we hit bone ... It is a pleasure to give a field number to a fossil'.<sup>48</sup> The landscape featured only in so far as it thwarted or facilitated science. It intruded as a mild inconvenience, a recalcitrant container unwilling to relinquish palaeontological knowledge: 'The mud is so sticky it is a fight to get it off the shovel ... we were standing in slush and water half

way up our shoes ... It is difficult to get close to the water because of the soft mud'. The fossils and the traces of past scientific endeavour are both *features* of the landscape – for example, Stirton recorded that his 'favorite place is on the femur of a partly eroded Diprotodon exposed at the water's edge' – and *measures* of its stability – 'It was in a mound like this that I found one of the whiskey jars indicating [the] stability [of the mounds] for as long as 50 years'. So taken together fossils and the history of vertebrate palaeontology can form the connecting threads in an investigation of the power of deep time to replenish and recuperate country which, like Lake Callabonna, has been in other contexts deemed useless or barren.

Fossils are to some extent moveable heritage. The South Australian Museum and other collections in Queensland and New South Wales stand in for and replace the physical site at Callabonna. The pragmatics of climate, distance, collection and preparation ensure that it remains a lode to be mined or left in place, not a museum or teaching resource in its own right, as is Hallett Cove. The lake itself, in its distance from scientific institutions, and its bones, in their fragility and extraordinary preservation, have a mystique and morbid fascination lacking in the everyday utilitarianism of Hallett Cove's readily accessible 'outdoor laboratory'. This mystique, unrelated to conventional Western evaluations of landscape beauty, cannot be divorced from its scientific value and interpretation, showing that geological heritage can be harnessed in the development of a landscape aesthetic appropriate to the 'arid', 'flat', 'monotonous', 'barren' country of north-eastern South Australia.

#### LAKE MUNGO: 'FORSAKEN SPOT' TO 'LAND OF LAKES'

During the 1880s, surveyors' reports in western New South Wales noted the presence of collections of bivalve shells and fish bones around the rims and on the surfaces of broad dry ovoid saltbush plains. As early as 1838, Major Thomas Mitchell identified these plains with their leeward arcuate dunes as dry lakes, by analogy with extant salt lakes.<sup>49</sup> The scientific salvation of the Willandra Lakes Region lies in the more recent past. It was not until the 1940s that geologists described the formation of these crescent-shaped leeward dunes, or *lunettes*, as being driven by cycles of aridity and humidity and prevailing south-westerly winds during the last ice age (Figure 4).<sup>50</sup>

Still characterised as poor grazing country, semiarid, fringe, degraded, the lakes landscapes nonetheless began to be redeemed by the 'unparalleled record' of Quaternary climate change revealed in their sediments. But they remained marginal landscapes. Then Jim Bowler's discovery of ancient human remains in 1968 coming as it did at a time when John Mulvaney and certain other Australian archaeologists had begun to insist on a Pleistocene antiquity for Aboriginal Australians, catapulted Lake Mungo and the rest of the lakes into the global

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archaeological canon. The cultural significance attached to the burials attracted World Heritage classification. Without the concomitant funding and publicity, the lakes region would still be a mere geomorphologic footnote, the abode of goats and emus. As a World Heritage Area, it offers instead global standing, national significance, shared heritage and an incomparable timescale.

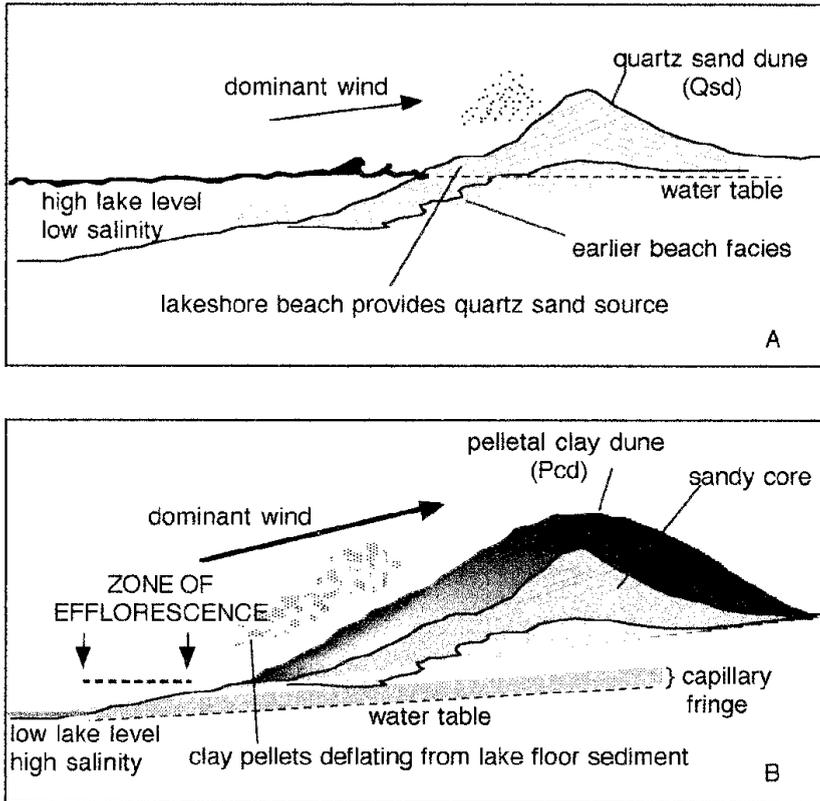


FIGURE 4. Lunette formation. A. Formation of a typical quartz sand lunette. B. Formation of a typical clay lunette. Modified after J.M. Bowler 1986. 'Quaternary landform evolution', in *The Natural Environment*, ed. D.N. Jeans. Sydney: Sydney University Press.

In *The Custodians*, Nicholas Jose's epic meditation on Australian identity, 'Ralph Kincaid', a Welsh archaeologist (and thinly disguised proxy for the late Rhys Jones) argued that archaeology's 'real treasure was not gold or silver,

but time itself ... And the latest arrivals ... wove themselves into the story as excavators and articulators ... Australian prehistory was an essential nation-forming discipline'.<sup>51</sup> The mystery and the monumentalism of the deep past evoke reverence in the Willandra Lakes as at Callabonna, but with this human past comes wider recognition and celebration. Lake Mungo has become a tourist site of pious pilgrimage. Despite its World Heritage classification under both natural and cultural criteria, it is for illumination of the human past that the area is chiefly and popularly celebrated, even by geomorphologists, as this quote from Bowler, a geologist, demonstrates:

The association here of complex burial ritual (Mungo III) involving anointing with ochre at this time presents one of the dramatic mysteries of ancient human cultural development. In death, the story of that person illuminates our understanding of those ancient occupants and the Ice Age environments that supported them.<sup>52</sup>

This is problematic. Western science requires that knowledge be shared and global (notwithstanding the demands of institutional brinkmanship, market forces and intellectual copyright). Consequently, antique human remains, even those that have already been studied, must be stored against the possibility of new insights into human descent, demographics, diversity and disease. On the other hand, Aboriginal people of Mutthi Mutthi, Paakintji and Nyiampa descent claim custodianship of the land and human remains, severely limiting the freedom of scientific research there. Such issues of the 'ownership' or 'custody' of material remains of the past have not yet clouded non-archaeological localities such as Callabonna and Hallett Cove, except where they overlap with cultural or archaeological sites. But geological and national heritage are perceived by some as being under siege by a 'non-scientific', 'anti-scientific' or 'creationist' indigenous activism.<sup>53</sup>

In a twist on the nineteenth-century vision of cultivation rejuvenating marginal country, palaeobotanist and science writer Mary E. White cited Lake Mungo as an example of a degraded landscape, ruined by pastoralism.<sup>54</sup> She attributed the mobility of the landscape to overstocking, which threatens its aesthetic and scientific value. But it is in this badlands erosion that geologists read cycles of climate change and discover archaeological material. In a landscape with as little natural exposure as western New South Wales, and indeed much of the Australian continent, geological researchers rely to some extent on human intervention. More recent scientific accounts of the Willandra Lakes landscapes suggest that even these erosional patterns – which facilitated geological understanding – are evidence of older climatic cycles at work. Sheep and goats have undermined the stability of the lunettes, but in a repeat of patterns found deeper in the stratigraphic record.<sup>55</sup> What level of pastoralism is acceptable in a World Heritage area? With particular regard to the establishment of Lake Mungo National Park, Jim Bowler recently acknowledged the Barnes families, pastoralists on the former Mungo and Joulni Stations who, as he explained,

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'endured the climatic and economic vicissitudes of life in the Western Division of NSW, lives frequently compounded by the complexities that followed on the heels of scientific discoveries and subsequent heritage complications'. He insisted that 'the nation in general [owes] a profound debt' to Albert and Vanda Barnes who 'forfeited their heritage, Mungo Station, to permit the investment of that region's scientific treasures in the national interest'.<sup>56</sup> The deep past and geological heritage thus redeem human failing in the recent past.

Elsewhere in *The Custodians*, Jose shifted the barely disguised 'Lake Moorna' to west of the New South Wales border. He evoked 'Lake Moorna' with an archaeologically informed sense of majesty, age and mystery, but one which was intrinsic to this landscape, independent of the works of humanity:

without breaking into features of even the simplest narrative, the country went on for miles. The dry sunken bed of Lake Moorna, when at last she reached it, was the dominant feature only because it was even more minimal than the surrounding plain... the irony of a grandiose name from elsewhere, the Walls of China ... The negation of landscape as conceived in the pictorial tradition: no alps, no crags, no ruined towers, no nestling hamlets; in that lay its teasing eloquence.<sup>57</sup>

For Jose and his protagonists, geology provided meaning, a new way of 'seeing' a landscape in the fourth dimension. Jose's geomorphologist Fritz Vogel 'had seen through the surface of the land with his X-ray eyes to pictures of time beneath'.<sup>58</sup> The mystical experience was vindicated, not created by 'Moorna Woman's' discovery.

Meaning is established neither by physical geography nor palaeontology nor archaeology nor fiction nor heritage guidelines alone. Cultural and intellectual overburden distinguishes the Willandra Lakes World Heritage site, as it is viewed and imagined, from broad ovoid saltbush plains fringed by eroding dune deposits. Lake Mungo's deep-time overburden imbues it with a grandeur or spectacle at odds with its flat, dry landscape. The power of deep time to add contour and colour to 'dead' country is akin to the transformative effect of Technicolor on Dorothy's experience of the shift from Kansas to Oz, as we move from the eroding Mungo lunette, via the fourth dimension, to a fully treed and watered landscape: the Pleistocene land of lakes.<sup>59</sup>

## CONCLUSION

Geological heritage resists simple definition. Indeed, part of its value to this study rests in its flexibility. It has not proved easy for earth scientists to divorce geological heritage from 'non-scientific' agenda like tourism, politics and nationalism. The celebration of landscapes on the basis of their geological significance alone is often not enough. The Hallett Cove campaigners found it necessary to harness archaeology, social history, botany, entomology, the history of science, notions

of egalitarianism, government corruption and non-consultation to ensure the preservation of some of the cove's geologically important features. The success of the Willandra Lakes World Heritage nomination can be linked to patrimony, landscape aesthetics and cultural heritage as well as the significant archaeology and geology of the region. Lake Callabonna's geological significance has long been linked to South Australian parochialism and institutional rivalry, although the Stirton and Tedford expeditions appear to have been rather successful exercises in cross-institutional and international cooperation. The material landscape as a repository of 'knowledge about the past' is a national resource, inseparable from ideas about patrimony. It should be possible to embrace the aesthetics agenda of heritage rhetoric and the popular appeal of the deep past and deep-time objects to create the space in which new notions of geological heritage and landscape aesthetics begin to be articulated.<sup>60</sup>

## NOTES

<sup>1</sup> I would like to thank the History Program, RSSH, ANU and my colleagues therein for financial, collegial and intellectual support during my PhD, from which some of this material is drawn. For comments on drafts and discussion of related issues, I am particularly grateful to Tom Griffiths, Libby Robin, Bronwen Douglas, Richard Baker, Chris Ballard, Jane Carruthers, Bernie Joyce, Maud McBriar, Joy McCann, Lawrence Niewojt, Emily O'Gorman, Stephen Pyne, Tim Rowse, Barry Smith, Sue Turner, Rod Wells, participants in the inaugural postgraduate Environmental History Workshop, 2002 (sponsored by the Centre for Resource and Environmental Studies (CRES), the History Program RSSH and the National Institute for the Environment [ANU]), the audience at a seminar which I delivered to the History Program Seminar Series in May 2003, and two anonymous referees.

<sup>2</sup> Howchin 1895, 61; McBriar 2000; Pledge 1994; Bowler et al 1970, Bowler 2002. See also Douglas 2004 for further development of the ideas in this paper.

<sup>3</sup> See for example Joyce and King 1980; Joyce 1995; and IUCN 2004, for evaluation of geological and geomorphological values within the World Heritage Convention. But it should be noted that the wonderfully versatile historian of science, environmental historian and geologist, George Seddon, has written extensively on the culture of geology in Australia, and on changing attitudes toward landscapes. For example see Seddon 1996; Seddon 1997, 7–14, 64–72, 109–12.

<sup>4</sup> Aplin 2002, 7–15; Davison 2001, 123–30; Lowenthal 1997, 1, 2.

<sup>5</sup> McBryde 1985, 2, 7; Byrne 1996, 82; *Australian Heritage Commission Act 1975* (Cth), s. 4(1), quoted in Bonyhady 1996, 147. For new Acts, see Environment Protection and Biodiversity Conservation Act 1999 (*EPBC Act*), Section 528, at <http://scaleplus.law.gov.au/html/pasteact/3/3295/top.htm>, and the Australian Heritage Council Act 2003 No. 85, an Act to establish the Australian Heritage Council, and for related purposes, at <http://scaleplus.law.gov.au/html/comact/browse/TOCN.htm>. The other document recognised Australia-wide as a guide to heritage principles is the *Australia ICOMOS Burra Charter, 1999*, for the conservation of cultural heritage. It uses similar language to the EPBC Act

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to define heritage values, and has been an important tool for the promotion of multiple values (Kerr 1983; see also [http://www.icomos.org/docs/burra\\_charter.html](http://www.icomos.org/docs/burra_charter.html)).

<sup>6</sup> The history of science and its relationship to a site and to past workers (scientists or collectors) is also regarded as important for heritage value. The GSA has a History of Geological Science Group (ESHG) that works closely with the heritage committees and holds joint meetings at biannual conferences. Similarly the International Union of Geological Sciences (IUGS) has INHIGEO (the International Commission on the History of Geological Sciences) (Susan Turner, pers. comm. 2 July 2005).

<sup>7</sup> Joyce 1995, 15.

<sup>8</sup> Bourne 2005; Clark and Wells 2000; Hocknull 2005; Morrell 2005; Reed and Bourne 2000, 61–90; Reed et al 2005; Wells 1996.

<sup>9</sup> See Harley 1994, 313–17 for discussion of RIGS. See Joyce 1995, 19 for assessment on aesthetic values in the Central Highlands study.

<sup>10</sup> Joyce 1995, 4–5, 7.

<sup>11</sup> Office of the World Geopark Network, <http://www.worldgeopark.org/chi-geointro/list.htm>.

<sup>12</sup> Joyce and King 1980, 156.

<sup>13</sup> Office of the World Geopark Network, <http://www.worldgeopark.org/chi-geointro/list.htm>.

<sup>14</sup> Susan Turner, pers. comm. 2 July 2005.

<sup>15</sup> Office of the World Geopark Network, <http://www.worldgeopark.org/chi-geointro/list.htm>; Turner 2004a, 37–8; Turner 2004b, 173 (see 182–90 for an appendix of potential Australasian and Pacific Geoparks); Turner 2005.

<sup>16</sup> Susan Turner, pers. comm. 2 July 2005.

<sup>17</sup> Bernie Joyce, pers. comm. 23 Feb. 2000. Contrast this to Geoparks, which, especially in China, emphasise cultural associations (Susan Turner, pers. comm. 2 July 2005).

<sup>18</sup> For quote, see Aplin 2002, 15. Also see Aplin 2002, 1–2 and Thorsell 1995, 8–11, for the argument that it is often not appropriate to divide heritage into separate 'natural' and 'cultural' realms. To this end, Sarah M. Titchen (1996, 235–42) has indicated that a future challenge for the World Heritage Committee 'will be to ensure a seamless approach to heritage previously categorized and separated as being either natural or cultural, and to adopt an inclusive plurality in the identification and assessment' (240). It recently began this process with new legislation, reclassifying World Heritage sites such as Uluru, which formerly qualified under both natural and cultural criteria as 'cultural landscapes'.

<sup>19</sup> Turner 2004a, 37–38; Susan Turner, pers. comm. 2 July 2005.

<sup>20</sup> Bernie Joyce, pers. comm., 23 February 2000; Barry Cooper, pers. comm., 26 January 2000; Maud McBriar, pers. comm., 30 January 2000. See also Swart 1992.

<sup>21</sup> Sue Turner has emphasised differences here between GSA notions of geological heritage and those espoused by Geoparks UNESCO, which are more in line with conventional heritage discourse (Susan Turner, pers. comm. 2 July 2005).

<sup>22</sup> For quotes see McBryde 1985, 7; Wells and Tedford 1995, 3, Tedford 1973, 354; South Australian Science Teachers Association 1971, 3. For the accusation of appropriation of Aboriginal pasts, see for example Carter 1992, Introduction.

<sup>23</sup> Mulvaney 1990, 104–5; Mulvaney 1991, 12–21.

<sup>24</sup> Renfrew and Bahn 1991, 483. It is worth noting that over the past two decades, the views of Mulvaney and those of Renfrew have been and continue to be contested by many archaeologists.

<sup>25</sup> Jopson 1999.

<sup>26</sup> McBryde 1996, 66–7.

<sup>27</sup> See for example, Johnson 1996; Wilford 1999; Egan 2000.

<sup>28</sup> For some accounts of megafaunal bone accumulations like Callabonna, which were assimilated into Aboriginal understanding of landscape change, see Howitt and Siebert 1902, 525–32; Gregory 1906, 3–9. For reports of the Broome theft and the distress of local Aboriginal people, see Reynolds, 1999. A detailed account of the incident, and the hunt to recover the footprints, appears in Long 2002. The theft was reported on the front page of the *Australian* on 16 October 1996. Dr Sue Turner, Australian representative on the International Advisory Group for Geoparks, had this to say about Lake Callabonna's Geo-heritage credentials: 'This is perfect Geopark! ... The Broome stories of the dinosaur footprints also add to the scientific interest and in Carnarvon it is clear some past Aboriginal people could differentiate between dinosaur and emu footprints even if they were not aware that dinosaurs were extinct. We need to learn much more about Aboriginal "scientific" perceptions and their interpretations – others are using them to investigate volcanoes and tsunamis in the past in Australia – all potential Geopark material' (Susan Turner, pers. comm. 2 July 2005).

<sup>29</sup> For example, see Uluru-Kata Tjuta Board of Management and Parks Australia 2000, 28–9, 152–61.

<sup>30</sup> Hutton and Connors 1999, 109.

<sup>31</sup> Douglas 2004, 75–83.

<sup>32</sup> For quotes see Caldicott and Geering 1974, 20; Hall 1992, 128; GSA(SA) 1977.

<sup>33</sup> Quotes from miscellaneous correspondence (Hallett Cove Papers, private collection of E.M. McBriar) and Adelaide's *Advertiser* and *Sunday Mail* from 1965–71.

<sup>34</sup> Chapman 1971; see Martin and Associates 1971 for Kadima and Silesia Development Companies' comments on the degradation of the land due to clearing and farming.

<sup>35</sup> Martin and Associates 1971; Nancarrow 1971, 8.

<sup>36</sup> Barry Cooper, pers. comm. 26 Jan. 2000; Harris 1971.

<sup>37</sup> A number of authors has discussed the expectation of many early European settlers and explorers that the centre of Australia contained an inland sea or giant freshwater lake (see for instance Black 1962–3; Cumpston 1971; Douglas 2002). Explorers John Oxley, Thomas Mitchell, Charles Sturt and Edward Eyre, among others, all expected or hoped to find an inland sea, lake or trans-continental navigable river. Not until John McDouall Stuart finally reached the point he determined as the centre of Australia in 1860 was this particular misconception shaken. Dreams of inland seas live on in Lake Eyre's sporadic flooding, and in geologists' and palaeoclimatologists' reconstructions of former climates and geographies, when 'Australia' *avant la lettre* was more humid.

<sup>38</sup> Memorandum by A.C. Gregory on the provincial division of the northern portion of the Australian continent, from *Votes and Proceedings of the Queensland Parliament*, 1861. Quoted in Cumpston 1971, 117.

<sup>39</sup> Fletcher 1996, 150–2.

<sup>40</sup> Anon. 1893a, 4.

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- <sup>41</sup> Anon. 1894, 5.
- <sup>42</sup> Anon. 1893b, 4–5.
- <sup>43</sup> Anon. 1893b, 5.
- <sup>44</sup> Stirling 1894, 185–6.
- <sup>45</sup> Tedford 1985, 39–59.
- <sup>46</sup> Stirton 1953, 31 May 1953.
- <sup>47</sup> For example, see Stirton 1953, 1 June 1953.
- <sup>48</sup> Stirton 1953, 1 June 1953.
- <sup>49</sup> Mitchell 1839 [1838], 373. (See 268 for description of lakes).
- <sup>50</sup> Hills 1940, 15–21; Stephens and Crocker 1946, 302–12.
- <sup>51</sup> Jose 1997, 354.
- <sup>52</sup> Bowler 1998, 120.
- <sup>53</sup> For opposing views see Jopson 1999 and Johnson 1996.
- <sup>54</sup> White 1997, 91.
- <sup>55</sup> Douglas 1996, 30; Jim Bowler, pers. comm. 25 July 2002.
- <sup>56</sup> Bowler 1998, 154.
- <sup>57</sup> Jose 1997, 348.
- <sup>58</sup> Jose 1997, 250–2.
- <sup>59</sup> Bowler and Jones 1979.
- <sup>60</sup> Turner has also noted that ‘My colleague the former Director General of the Geological Survey of Iran in promoting the new Qeshm Geopark has emphasised that such landscapes are also “recuperative” in the medical sense and provide havens for relieving stress of the modern world. They take this literally too as the Geopark is linked to the Persian Gulf Biotechnology Research Centre which seeks medicines etc from natural products and also from the cultural history of the islanders who have used the geology and landscape intimately for thousands of years to harvest freshwater (rainfall).’ (Susan Turner, pers. comm. 2 July 2005).

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