

Creators *or* Destroyers?

The Burning Questions of Human Impact in Ancient Aboriginal Australia

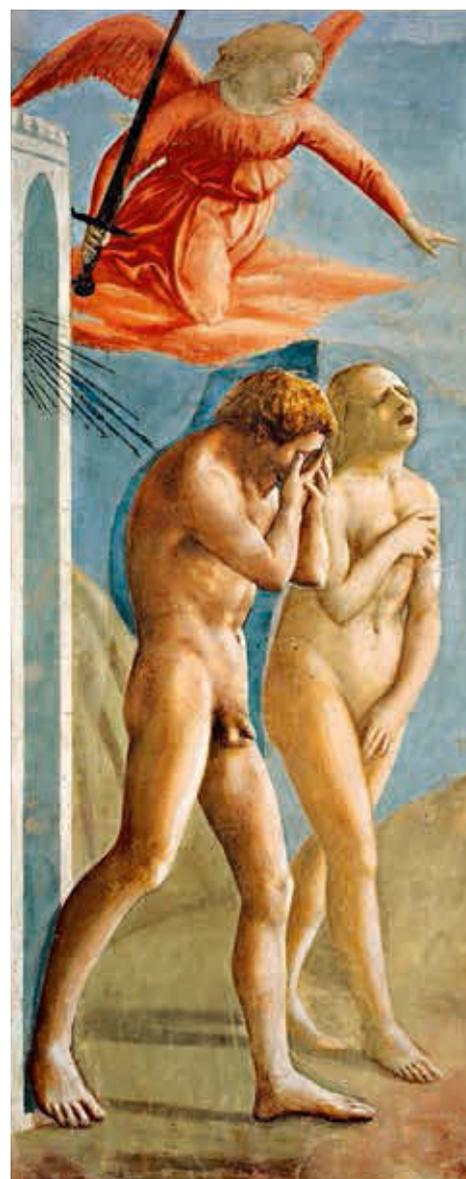
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INTRODUCTION: QUESTIONS OF HOW AND WHY

*T*he Fall of Humanity depicted in the Book of Genesis portrays traumas associated with the transition from foraging to farming. That transformation of human social and economic life is depicted negatively, and is associated with both suffering and shame. While in the Garden of Eden, Adam and Eve had an abundance of fruits to pick, but after the Fall they and their descendants had to sweat and labour to farm the land for a living. The transformation from a life of ease to one of labour was accompanied by momentous cultural shifts, such as the transformation from peace to murder as Cain slaughtered Abel, a shift requiring the development of elaborate social processes to regulate conflict. This Old Testament narrative illustrates, actually epitomises, long-standing imagery of hunter-gatherers conjured by agriculturalists. Biblical visions of lost Edens emerge in many modern Western stories about the distant past and about the lives of foragers. The story of the Fall provides one fundamental element in the conceptual background of current debates about human impacts on the environment. It is a narrative explored in visions about the nature of life and wilderness at earlier times: either before the coming of humans or before the coming of agriculturalists to the Australian landscape.

(above)
Bush fire at Captain Creek, Central Queensland, Australia.

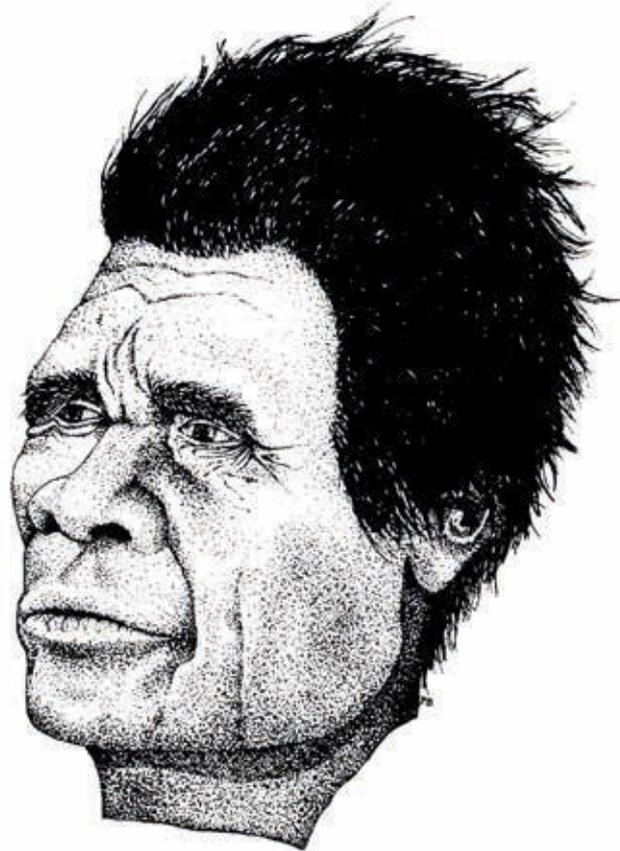
SOURCE: 80 TRADING 24 (OWN WORK) [CC-BY-SA-3.0 (HTTP://CREATIVECOMMONS.ORG/LICENSES/BY-SA/3.0)]. VIA WIKIMEDIA COMMONS



Here I examine recent arguments by historians and natural scientists, as well as archaeologists, who have discussed the transformation of nature after hunter-gatherers and/or agriculturalists arrived in Australia. I focus on human use of fire and its articulation to society and belief. For reasons of time I will not deal with the ongoing debate on extinction of megafaunal taxa and whether it was a consequence of human over-predation.

The propositions that have been advanced range from an argument that Aboriginal people created an Eden-like estate to the view that they destroyed the delicately balanced natural ecosystem they found in Australia. Intriguingly, both arguments adopt the narrative arc of Genesis; they both assert that Australia was once a bountiful, diverse and desirable place before the intrusion of humans. The arguments differ in their assigning of culpability for the Fall. The first reading, that Aboriginal Australia remained an Edenic place until the coming of Europeans, depicts foragers living harmoniously within the limits of their environment, most likely recognising its character and enhancing it, until the intrusion of agriculturalists destroyed the balance and created the Fall. The second reading, that the arrival of humans in Australia led to the extinction of megafauna and subsequent impacts on small fauna and flora, implies that Adam and Eve's self-interest meant they would inevitably violate the rule of the Garden, and that humans are inherently destroyers of their own environments.

These biblical parallels might seem incidental and accidental except that almost twenty years ago Carolyn Merchant, then professor of environmental history, philosophy and ethics at the University of California Berkeley, argued robustly that much Western history about the colonisation of the New World can be coherently read as 'recovery narratives'.¹ That is, as stories of decline from a golden age that finish with hope of redemption in the form of some return to the original Edenic state or at least a reorientation of current environmental relationships to create some simulacra of that state. This narrative arc occurs in some prominent recent Australian publications; indeed it is so explicit



in a few that they are undoubtedly recovery narratives played out in purportedly historical interpretations. I will illustrate this shortly.

A related issue is the constraints on historical interpretations created by imposing vivid images from the historical record upon the distant past. As an archaeologist I explore the immense span of time in which humans have occupied Australia and the rapidity and frequency of social and economic changes that took place during that period. Recognition of substantial change in the cultures that lived across Australia underpins my conclusions, especially those that have proved challenging. Conclusions such as my argument that, obviously, Aboriginal people did not colonise Australia. We know that Australia was colonised by populations of modern humans descended from Africans who had migrated out-of-Africa, moved across South Asia and eventually crossed the water barriers separating the Pleistocene continent of Australia (Sahul) from the Pleistocene continent located in Southeast Asia. These humans were the distant ancestors of Aboriginal people; but as far as we know they would *not* have been recognisably Aboriginal, physically or culturally. Their

(above)
Fig. 1. Peter Brown's evocative artistic depiction of a man from the terminal Pleistocene period, based on Coobool Creek skeletons.
COURTESY PETER BROWN

(opposite)
The Expulsion Of Adam and Eve from Eden. Fresco by Masaccio. 1426-27, Cappella Brancacci, Santa Maria del Carmine, Florence.
SOURCE: WIKIMEDIA COMMONS, PUBLIC DOMAIN (PD-ART).

descendants *became* Aboriginal as they evolved, adapting to the continent they inhabited. When confronted with scientific interpretations of the African origins of humans Aboriginal people sometimes object, insisting they came from Australia. In many ways they are right. While their immensely distant ancestors came from Africa, people who were physically and culturally Aboriginal evolved here.

This evolution of Aboriginal life may not technically have been continuous, in the sense that change happened at a constant rate, but the indications in the archaeological record suggest changes occurred repeatedly and sometimes frequently throughout the last 50,000 years. The resolution on cultural change is far higher in recent millennia as a result of the better preservation and easier discovery of archaeological materials. So I will simply give examples from the last ten millennia, the final fifth of the time people have been in this continent.²

At the start of this period in the south-east some populations were still deforming the skulls of their infants so that adults of their group were visibly distinct and distinguishable from members of other groups (fig. 1). This form of public signalling vanished around 9000 years ago and was never again used in Australia.³

Although linguists have struggled to define the date precisely, they argue that the Pama-Nyungan language family spread from somewhere near the Gulf of Carpentaria across the southern 70 percent of Australia, perhaps between 5000 and 10,000 years ago. The precise direction and mode of dispersal is still being investigated, but it is reasonable to consider the impact of this major language replacement on the way people named and thought of their world. I would expect that mythologies, cosmologies and ontologies were substantially reworked, not simply maintained and accurately translated. The alternative possibility is that there may have been dispersals of people, invasions/replacements perhaps, creating cultural disconformities.

Substantial shifts in technology occur in this time period. Ground-edge axes, which had been used in northern Australia for tens of millennia, began being used across much of central and south-eastern Australia for the first

time around 3000 to 4000 years ago. Possibly these diffused in parallel with the Pama-Nyungan spread, but that is not yet established. In roughly the same period some specific implement forms such as microlithic backed artefacts began being produced in vast numbers for a comparatively short time. Around the coastal plains of southern Australia, where they were used as craft tools to work skin, bone and wood, they proliferated between about 3500 to 2000 years ago.⁴ They were manufactured and used in great numbers for about 500 to 1000 years in each region, and then the technology was, gradually, entirely abandoned.

In Northern Australia Paul Taçon and his colleagues have shown that the imagery used in the nineteenth century to represent the Rainbow Serpent, a significant figure in post-contact cosmology, could be traced in the sequence of rock art in Arnhem Land. Versions of the image first appear in the Yam phase, which might be something like 4000 to 6000 years ago, and the images began to look like those used historically probably in the last two or three thousand years.⁵ Rock art from earlier time periods depicts the world in very different ways, with images of half-animal/half-human beings roaming the world with humans, sometimes attacking them. This seems an archaeological signal of a *fundamental* change in world view, including a significant change in religious expression.

In the last 1000 to 3000 years there are notable economic reorganisations in a number of regions. For instance, the intensified earth mound building in Victorian wetlands probably represents not only greater emphasis on exploitation of wetland resources but also increased sedentism. Meanwhile across almost the entire northern coastline, the system of intensive exploitation of rich mollusc beds by moderately large sedentary groups, leading to the creation of large mounds of shell, collapsed as mangroves colonised previously open beaches. The point of my two examples is to emphasise regional differentiation: as one settlement system becomes sedentary another becomes more residentially mobile and diffuse.

Some researchers argue that the last few thousand years is a period of substantial population increase, with associated growth

in the identity and territorial boundedness of groups, eventually leading to some of the patterns seen historically. Certainly, occupation in desert landscapes studied by Peter Veth,⁶ Mike Smith,⁷ myself⁸ and others produced higher amplitude signals that are consistent with more people or more occupation or significantly different modes of occupation in recent millennia.

Reconfiguration of mythology and ritual practice are well documented in the last millennium. In the north east of Australia Bruno David has neatly documented the creation of a mythology that described one landscape feature as dangerous, as revealed by the abandonment of uplands about 700 to 800 years ago.⁹ And in the Torres Strait, David, Ian McNiven, Duncan Wright and others have built a detailed picture of a system of ritual sites being constructed roughly 500 years ago.¹⁰

Culture contact in the period of historical records yields many dramatic examples of social, economic and religious changes, some happening remarkably rapidly. As Scott Mitchell demonstrated, Trepang fisherman from Maccassar and other nearby ports introduced metal tools to Aboriginal groups living on the northwest coast, allowing Aboriginal people to make dugout canoes for the first time and to harpoon marine mammals, so transforming economies and settlement patterns.¹¹ The cultural 'trauma' of this ongoing contact was reflected in language and belief, and was embedded in myths. Notoriously, smallpox, a disease that probably killed far in excess of 70 percent of Aboriginal people in the late eighteenth and early nineteenth centuries, resulted in territorial reconfigurations, shifts in gender roles, and even transformations of rituals such as the instances documented by Dick Kimber.¹² There are even cogent arguments that many myths recorded in and after the mid-nineteenth century dealing with floods and the spread of illnesses were expressions of Aboriginal encounters with Christianity and Old World diseases—transformed into stories that had meaning in Aboriginal terms.¹³

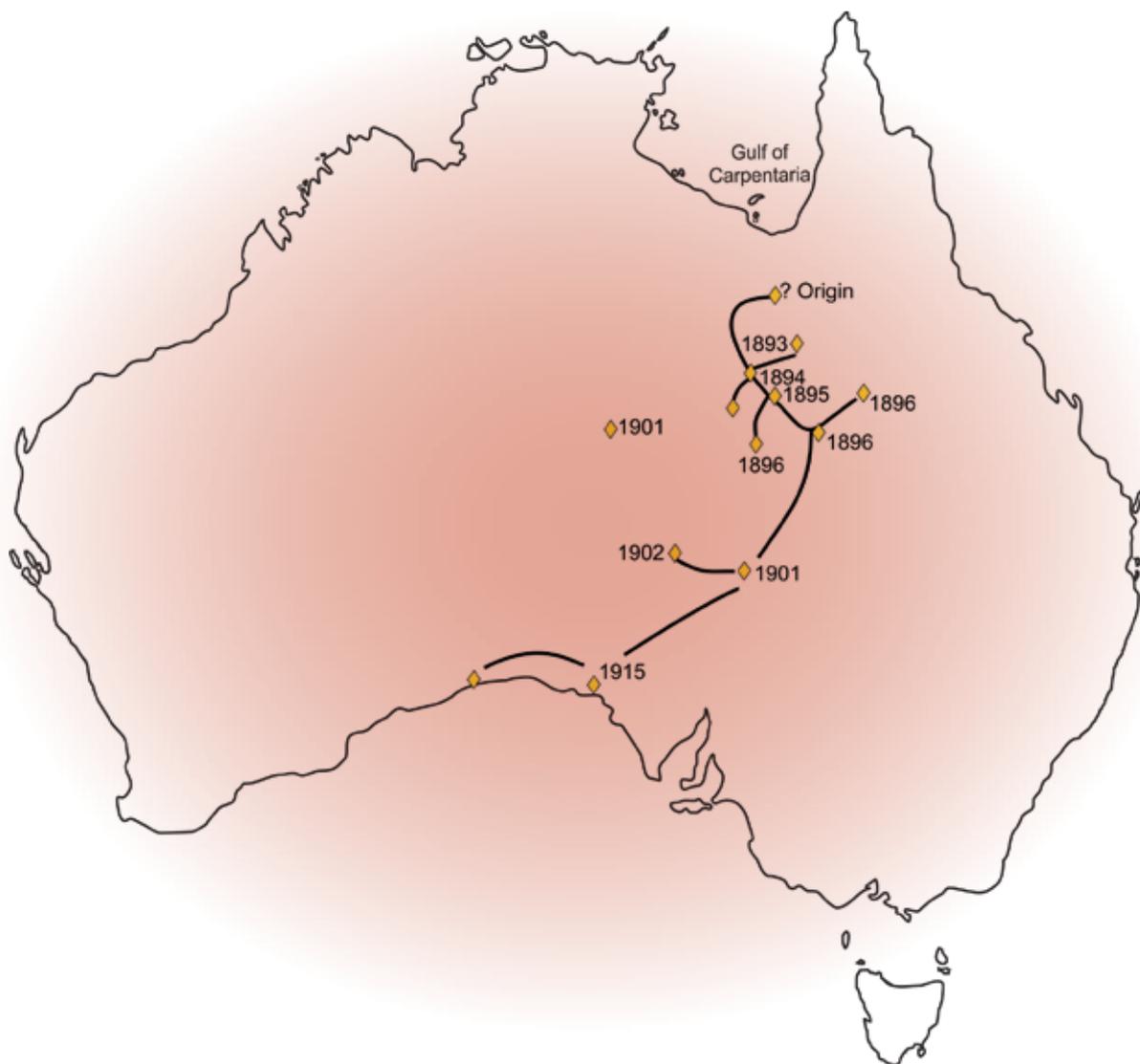
A sketch of one such transformation can give a sense of changes in Aboriginal world views. At the core of Aboriginal religion in

the nineteenth century was the formation and expansion of cults, displayed through ceremonies that were the culmination and focus of social gatherings, often accompanied by stories or mythologies and associated with initiations and the sanctioning of and orchestration of social actions by 'clever men'. This religious process of frequent cultic changes, through the invention of new cults dreamed of by clever men, was well recorded and wonderfully described in the twentieth century by anthropologists such as William Stanner.¹⁴ The capacity of Aboriginal religious frameworks to adopt, integrate and modify new cults, as a normal functioning of religious life, has two meanings.

The changing series of cults and mythological stories that were the basis of religious theatre provided for constant ideological readjustment to circumstances. It is likely that cults were regularly invented and/or adopted, and in the process religious belief was regularly renewed. Consequently, when the environment or economy or social practices changed, those alterations might be reflected in the new religious narratives and rituals. This process would 'renovate' religious life in the sense that cults and mythologies were updated to refer to recent events and social concerns rather than preserving ancient stories intact.

Hence the ritual focus of people typically reflected current concerns rather than presenting stories about events in the distant past. It therefore seems to me that notions that Aboriginal myths faithfully record events from the Ice Ages—say 20,000 years ago—come more from expectations that Aboriginal stories and myth were somehow unchanging, than from ethnographic evidence of cult dynamism.

Take, for example, the spread of the Mulunga cult, visibly expressed through the elaborate and lengthy Mulunga ceremony, which itself was the conclusion of prolonged rehearsals and preparation of ritual paraphernalia. The set for the ceremony included the construction of a two-metre high beehive hut to be occupied by a grandmother spirit, one of the key characters in the narrative. The most detailed description of the ceremony comes from the missionary Otto Siebert who observed it several times at the dawn of the twentieth century in the



lands north of Port Augusta.¹⁵ A central part of the ceremony involved characters holding forked sticks, symbolising white men with guns killing Aboriginal people. In the finale of the performance a hidden and elaborately adorned performer emerged from behind the hut, representing a water-spirit surfacing from a water body, and ferociously attacked the white men in revenge.

This complex and costly ceremony originated somewhere on the Barkly Tablelands, probably at the beginnings of the 1890s. I am persuaded by Tony Swain's suggestion that the massacre theme is a reference to the conflict in the Mount Isa region on what is locally called Battle Mountain where, in 1884, hundreds of Kalkadoon warriors came out of cover, formed ranks and attacked and/or marched towards a contingent of Native Police who shot almost all of them with their carbines. The reverberation within

regional Aboriginal society of this exceptional event found one expression in the creation of the Mulunga ritual/cult.

The cult spread with remarkable speed, transmitted along river corridors and stock routes from near the Gulf of Carpentaria to the southern coastline and thence to Eucla in little more than twenty years, as documented by both John Mulvaney¹⁶ and Tony Swain (fig. 2). The spread was assisted by the relevance of the culture-contact theme to Aboriginal peoples becoming part of the expanding pastoral industry, as well as by the accompanying threat of death, illness or rape to those who did not accept the cult or who wrongly performed the ceremony. While acknowledging that the origins and expansion of the Mulunga cult came from aspirational re-imaginings of intercultural relationships in the complex and disrupted colonial context, I also think this illustrates the *process* of religious

(above)
Fig. 2. Map showing the dispersal of the Mulunga cult, based on information from John Mulvaney and Tony Swain.

COURTESY
 PETER HISCOCK

transformation that prevailed before the arrival of Europeans.

What does all this mean? And how does this relate to my theme of environmental impacts by ancient humans? I offer these examples to emphasise my vision of the dynamism of Aboriginal social and economic systems, probably throughout the entire occupation of Australia. Archaeological and historical evidence indicates frequent social, economic and ideological reorganisation. Aboriginal social systems were extremely capable of change, displaying dynamism that I suspect is probably typical of all the modern humans who emerged from Africa.

What I am emphasising is that the history of humanity in this continent has been dynamic and evolving, and we must appreciate it as such. We should not hide this remarkable record of adaptation and evolution behind slogans such as 'Aboriginal culture is the longest continuing culture in the world', a slogan that implies a lack of cultural change, a Western myth of an ethnographic present stretching back fifty thousand years. This is *not* an issue of cultural authenticity. We do not need to authenticate Aboriginal culture by insisting, like nineteenth-century cultural evolutionists, that it was frozen in time. We can and should hold a view of the history of Aboriginal culture as impressively transformative. I am therefore perplexed by histories that present a fixed, unchanging Aboriginal way of life.

THE GAMMAGE ARGUMENT

In *The Biggest Estate on Earth* historian Bill Gammage has presented an Edenic vision of human-landscape relationships in pre-contact Australia.¹⁷ I discuss his book as an example of current views on Aboriginal history and environmental relationships because its publicity and prizes have made it a powerful influence on popular thinking. Of course, as many of you will know, Gammage's thesis revolves around the practice of eighteenth- and nineteenth-century Aborigines setting fires in strategic ways that sometimes enhanced their foraging economy. Now there is no doubt about the reality that underpins that statement; it has been well observed and discussed by

archaeologists and environmental scientists for much of the last fifty years. Gammage argues that extensive and regular use of limited, low intensity fires by Aboriginal people reduced tree coverage, encouraged patches of grass, and created parkland-like landscapes across Australia. His evidence for this comes from two sources: recorded images of landscapes and written impressions of fire in the land.

The expansive compilation of historical references to burning that Gammage has created displays abundant evidence for strategic, planned burning of vegetation by Aboriginal people two and a half centuries ago. And yet there is little in those historical observations that demonstrate his claims for universality of a particular human relationship with fire or a singular social context of burning. It is worth noting that while Gammage has developed his argument from numerous historical texts he does not give similar emphasis to anthropological descriptions of Aboriginal burning, to modelling and fire experiments by natural scientists, to vegetation history reconstructions, or to archaeological data. Instead, his image is carefully crafted to represent the state of human-environmental interactions in 1788 and surrounding decades. But his vision is not simply about the nature of Aboriginal life only in 1788. Gammage implies the nineteenth-century use of fire had a deep history, writing that 'an ancient philosophy was destroyed by the completely unexpected, an invasion of new people and ideas'.¹⁸

In one sense Gammage combines/reconciles the elements of that Genesis origin story, by having the leisurely life of foraging abundance created by the foragers through farming/land management. Gammage expresses this in various ways; he depicts Aboriginal peoples as affluent foragers with abundant food from few hours of labour, even as he presents them as farming the land with fire, leading him to conclude that 'in 1788 people assumed abundance, and so did Genesis'.¹⁹ Gammage interprets Aboriginal fire management as 'farming', an imagery that evokes Alistair Paterson's recent observation that such views imply 'fire was used as a tool—like a farmer's spade'.²⁰ In fact 'farming' is one of many terms Gammage uses to conjure a vision of Aboriginal

people as counterparts to landed gentry in Britain; his claim is that Aboriginal burning created 'estates' comparable to the parklands of rural Britain and that the complexity of social life revealed their 'civilisation'.

My first comment is that such phrasing invokes diverse Eurocentric associations and invites re-evaluation of Aboriginal actions and goals as functionally similar to those in historical Europe. The implication that such a comparison elevates Aboriginal society in our view is a distinctly colonial approach to cultural comparisons. Yet even this characterisation of Aboriginal interactions with the environment in inherently European terms, suggesting that they farmed the land and made it 'civilised', is not the most radical element in the argument Gammage offers us.

His core proposition is that Aboriginal people were inexorably committed to a specific physical and spiritual bond with the environment that was and could only be

that is immensely environmentally varied and has been subject to dramatic environmental shifts during the last glacial, that is Ice-Age, cycle, I find the notion that Aboriginal society persisted through the use of a single, inflexible, unchanging adaptation to be extremely puzzling. It creates a proposition that is difficult to reconcile with the accompanying claim that Aboriginal people were optimally adapted to the landscape, because in an optimal relationship to land that is constantly changing any forager will be required constantly to modify their economic practices. Changes in economy would flow through the interconnected web of social practices and understandings, creating constantly changing cultural systems. From an evolutionary viewpoint, and in such a dynamic land, rigid unchanging societies are simply an implausible fiction.

The value of any 'contract' with fire must have varied geographically and chronologically. We can identify times and places in which fire

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mediated through fire. This bond compelled people to be devoted to the process of fire. In Gammage's view fire provided people with abundant resources and a life of ease, but it also bound them to lives of mobility as they were required to regularly tend all portions of their territory with their firesticks. This pattern was, for Gammage, exacerbated by his view that population size was everywhere maintained well below carrying capacity, obliging groups to forage/firestick across territories much larger than they actually required. His conclusion was therefore that 'It imposed a strict and rigid society, but it was an immense gain'.²¹

Beyond the claims that Aboriginals were universally, constantly and optimally 'farming' their estates with fire, it is this conclusion that Aboriginal society was strict and rigid that most intrigues me as an archaeologist. Such claims have repeatedly been made, and the imagined rigidity implies a fixedness of cultural institutions and social actions that prevents or minimises cultural change. Now, in a continent

cannot have operated in the way Gammage describes. The use of landscape burning at the last glacial maximum, at the peak of the last Ice Age some 25,000 to 18,000 years ago when average temperatures were roughly nine degrees centigrade below today's, is difficult to conceive. During the last glacial maximum, dune systems in the deserts were mobile sand sheets with little vegetation to restrict sand movement or to be burned. Upland Tasmania contained alpine meadows with a mosaic of grasses so fragile and unused to fire that they might easily be damaged. These were environments unlike any in historical Australia and the value of firesticks in them is likely to have been low. Of course the people at those times and places may have operated in ways unlike those in the historic period, creating adaptations that suited their circumstances, but if that were the case such a conclusion contradicts notions of a universal and long-lived 'contract' between fire and a rigid society.

The cultural rigidity Gammage claims in his hypothesis is underpinned by his static and

deterministic vision of Aboriginal society. He builds a story of an articulation between people and environment based on his notion that Aboriginal treatment of land and landscape was a sacred dictate, shaped by the requirements of a Dreamtime law that obliged them to act as they did. Gammage presents fire as the instrument for creating Eden, saying 'It made the land comfortable, comforting, bountiful and beautiful'.²² He also imagines fires as a commandment, saying that 'The Law—an ecological philosophy enforced by religious sanction—compelled people to care for all their country'.²³ This proposition not only misreads the complex cultural dynamic that underpins the construction of and continual transformation of mythology, cosmology and social practice in Aboriginal society, it also effectively dehumanises Aboriginal people and the culture within which they operated by removing any suggestion that they were active agents in their own fate. His statements avoid mentioning the constant debate that would have taken place between individuals about where and when and *how much* to burn, about priorities in a landscape that cannot be everywhere occupied at the same time, about the evaluation of opportunities in an ever changing landscape (such as in a dry year or a wet year). Consequently his discussion does not consider the plausible alternative, which is that the cultural pronouncements about burning he calls the 'law' only exist because people were using fire. Social conventions were constructed to reflect social practice. Fire-lighting strategies did not exist because an abstracted 'law' controlled people; rather the social norms and expectations existed because people employed fires, reflecting the use of fire.

Gammage represents Aboriginal people as having been without choice, obligated to follow a fixed set of actions as their ancestors always had and as their belief system dictated. Curiously, his advocacy of a cultural system compelled to a specific ecological relationship by its own internal rules, creates logical difficulties with the moral point he wants to make. He argues that Aboriginal peoples held a near-perfect ecological position and non-Aboriginal people cannot conceptualise themselves as Australians unless they come

to terms with their relationship to the land in some similar fashion. Leaving aside the obvious point that the concept of being Australian is itself a colonial imposition, there is the more fundamental paradox that Gammage wants to congratulate or applaud Aboriginal people for their fire-farming covenant with the land whilst simultaneously denying them any choice in the matter. We are left with an idolising, actually fetishising, of Aboriginal culture as inherently conservation-minded. This certainly weakens to breaking point Gammage's negative comparison with modern non-Aboriginal society, which does have choice of action and is actively debating how to reduce its environmental footprint. His denial of choice in the matter for Aboriginal Australians threatens to invert the moral that Gammage advocates.

In the end the story Gammage offers, including his assessment of our current position and his call for future reconciliation with Aboriginal views and practices, is a Christian/Enlightenment recovery narrative, in the phrase of Carolyn Merchant. It is a desire for redemption. Gammage constructs the Fall of our land, from pure, productive and well-managed, as occurring when Europeans entered this Eden and failed to nurture it through a disregard for the Edenic rules (which Gammage claims are encoded as Dreamtime laws). He calls on us to rethink our destruction of the Edenic estate and as far as possible return to an innocuous interaction with the environment. This proposition displays remarkable parallels with the version of Genesis (Genesis 1) that advocates that only human labour and stewardship can restore Eden, through tilling the garden and in the process redeeming our souls, or at least moral authority.

FIRE AND SCALE: THE LESSON FROM ARCHAEOLOGY

As an archaeologist I receive a different image of the operation and consequences of anthropogenic fire, because human-environmental interactions are visible at a different temporal scale. In Holocene Australia archaeological and environmental records often have a minimum resolution of hundreds

of years, but we track trends over a very long time, often thousands of years. What we witness is a disjunction between the decision-making of humans for their short-term self-interest and the consequences of their actions for environments and their descendants in the long term. To see this we need to escape from the ethnographic scale and the intuitive understandings of things we bring to short-term events.

My old colleague Phillip Hughes, a geomorphologist turned archaeologist, would always ask people ‘why are the caves archaeologists dig filled with sediment?’. His point was that in valleys and along some cliff lines across Australia there are numerous caves or overhanging shelters that formed long before humans appeared in this land. Many such concavities are probably hundreds of thousands of years old. Typically they are filled with sediment. But the surprising observation is that those sediments often contain artefacts at all levels—there are artefacts at or near the very bottom of most deposits. How can this be? The shelters/caves were largely bare for perhaps several hundred-thousand years, reflecting a rough balance between the input of sediment and the rate at which it was naturally moving out of the shelter (under the influence of gravity or water).

But then humans arrived and two things happened. They occupied the shelters and dropped things on the floor, thereby trapping sediment and beginning the cycle of deposit formation, while at the same time they increased the rate of sediment deposition by changing the environment. Within shelters their hearths created a pattern of fluctuating temperatures while they brushed against, sometimes painted or engraved, the walls, creating increased roof fall. Outside those shelters, in the surrounding landscape, people reduced vegetation, intentionally or unintentionally, creating a vast pool of exposed sediment that could be washed to different places, including into archaeological sites. Hughes showed that archaeological sites recorded the increased mobilisation of sediments in the presence of humans, documenting clear relationships between sedimentation rates and rates of artefact accumulation in both shelters and open sites.

Hughes extended this work in the scarps of Western Arnhem Land where, with Geoff Hope and Jeremy Russell-Smith, he showed that when human occupation began, the floor of valleys in the Arnhem Land Escarpment, such as Deaf Adder George, were thinly veneered with sand.²⁴ Sediments sat on the face and top of the escarpment, providing niches for plant communities which in turn held the sand in place. After humans arrived large quantities of sand were shed from the escarpment, filling the valley floors with sand more than three to four metres deep. Again it was disturbance of vegetation that released the sediment, and the evidence of relic vegetation communities in fire-shadow locations implicates fire. Since the timing coincided with the appearance of archaeological artefacts it is human firing that is implicated.

This is merely one example of the kind of evidence that continues to emerge, as archaeologists dig down through great depths of sediment that contain artefacts, and ask why it is that all this sediment has accumulated since humans arrived? The implications are worth spelling out. In some, perhaps many, landscapes the burning of vegetation had consequences that were not anticipated by the humans who did the burning, consequences that took hundreds or thousands of years to eventuate, and which affected the resources that were subsequently available. In this sense firing of the landscape to obtain short-term benefits in hunting, harvesting or travel was simply an act of self-interest, an act which everywhere altered natural biological niches and which in some times and places created transformations of the land itself. While in some localities the introduction of human fires might have set up new and balanced ecological systems, in others there were progressive long-term transformations as positive feedback cycles were launched. Degradation of soil nutrients, local extinctions of species, and massive erosion and reshaping of the country all occurred, as well as the creation of grassy patches that were bountiful and convenient. The impacts of humans on Australia’s environments were complex and varied. There was transformation, but it was not always Eden that was wrought.

As you can see I am in complete agreement with Bill Gammage that the ancestors of contemporary Aboriginal people transformed the Australian landscape long before 1788. That transformation was in many parts of the continent probably far more dramatic and less predictable than Gammage has depicted. It was also certainly patchier than his story presents. Each kind of landscape would have responded differently to the activities of humans, and the actions of humans would have been different in each environment.

One of the newest archaeological findings in a number of arid and semi-arid landscapes is that even in the last few thousand years people abandoned areas for prolonged periods. The rightfully famous example of this is Simon Holdaway and Patricia Fanning's studies of valleys in western New South Wales.²⁵

change through pollen and plant fossils, and many other techniques. These are valuable but challenging datasets to add to those more familiar to researchers working in the humanities. I will examine just two studies. In the first, published in 2011 in *Quaternary Science Reviews*, Scott Mooney and his colleagues synthesised sedimentary charcoal records from around Australia to characterise the changes in fire regimes over the last 70,000 years.²⁶ Interpreting charcoal fluctuations as a measure of biomass burning, they have documented that the levels of burning in the Australian landscape fluctuated over time in rough synchronicity with the glacial cycle: less burning during cold stages and more during warm stages. They do not see people as responsible, claiming that 'Although there are marked changes in fire activity during

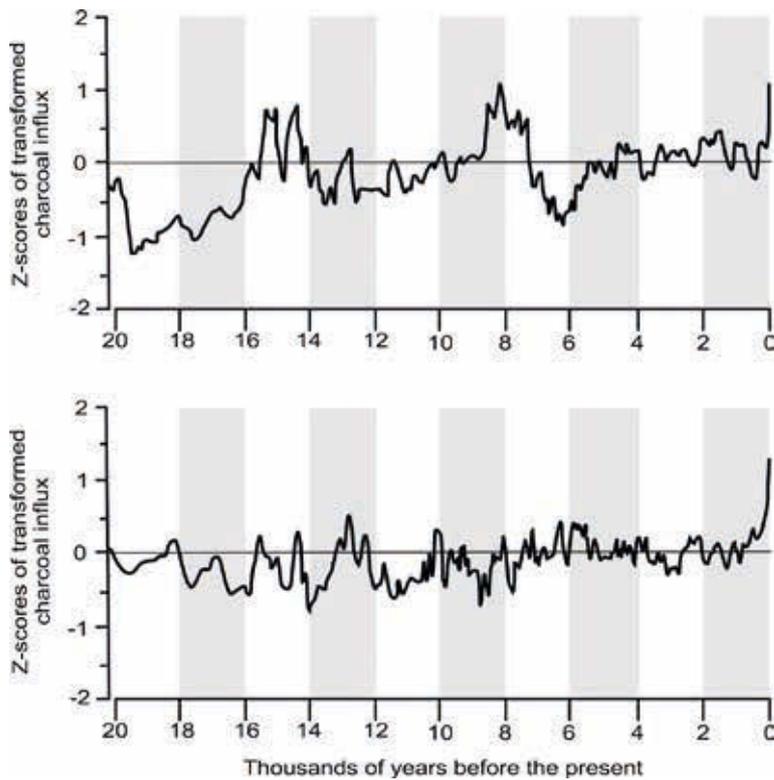
... THE BURNING OF VEGETATION HAD CONSEQUENCES THAT WERE NOT ANTICIPATED BY THE HUMANS WHO DID THE BURNING, CONSEQUENCES THAT TOOK HUNDREDS OR THOUSANDS OF YEARS TO EVENTUATE ...

Dating stone hearths, they established a record of human occupation throughout the last 2500 years. But their study also showed cycles of occupation and abandonment. For instance, it is likely that between 900 and 1150 years ago no hearths were constructed in the region. This was an unusual climatic period, the Medieval Climatic Anomaly, and environmental changes at the time appear to have triggered changes in human settlement. In this case they involved exploiting different territory for a couple of centuries. This is an example of the archaeological evidence that reveals Aboriginal occupation, even in recent centuries, was complex, surprising to people who expected to find a resident group permanently occupying and uniformly exploiting well-defined territories. Territoriality and land use was much more fluid and dynamically changing than Western concepts of residency and use have anticipated.

With this in mind I turn now to the evidence offered by environmental scientists. A wealth of data is becoming available on fire history in Australia, acquired from sedimentary records containing charcoal, studies of vegetation

MIS 3 [...] there is no fundamental shift in the composite charcoal record that could be associated with the colonisation of Australia by Aboriginal people'.²⁷ This statement misses the opportunity to discuss what their evidence may actually show: when humans arrive they do not increase the magnitude of biomass burning. But if humans are burning soon after they arrived, this evidence means they changed the nature rather than magnitude of the burning.

An early change in fire regimes following the arrival of humans in the Australian landscape is suggested in a study published in *Science* in 2012 by Susan Rule and her colleagues.²⁸ They re-examined the famous upper five metres of the deep column of sediment from Lynch's Crater in North Queensland and showed that *Sporomiella*, a fungi found in the dung of herbivores as recognised from spores found in the sediment, largely ceased 39,000 to 43,000 years ago, at the same time as the signal of micro-charcoal magnified. They interpret this as evidence that megafaunal extinction, or at least substantial reductions in numbers of large herbivores, occurred at that time, and that locally high levels of natural



(above)
Fig. 3. Calculated continental biomass burning trends for Australia. Top = Tropical regions, Bottom = Temperate regions. Taken from fig. 4 in Scott Mooney et al., p. 37. Line represents standardised charcoal influx trends smoothed with a 400-year line.

COURTESY
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fires were a consequence of the extinction of large herbivores increasing fuel load in the environment and so creating preconditions for wildfires.

This interpretation brings us back to considerations of the complex intertwining of humans with the Australian landscape. In an ongoing debate some researchers argue that humans created the situation because extinctions were a consequence of human hunting. The evidence presented by Rule does not test the role of hunting in the extinction events, but a sequence of increased burning following rather than preceding large marsupial extinctions is consistent with the hypothesis of Tim Flannery, that extinction of megafauna created conditions favouring intensive fire-management regimes amongst people living in some parts of Australia in order to reduce the dangers of uncontrolled bushfires that intensified after the large herbivores disappeared from the environment.

However we can also infer from the new biomass burning data that the pattern and intensity of any human burning activities would have changed repeatedly over time and across space, mirroring the archaeological

evidence of repeated cultural change. For instance, the evidence clearly shows dramatically less burning during MIS2, the peak of the last glacial cycle. In the reduced vegetation cover of that period humans may have been lighting very few fires compared to the level of fire-lighting in the early historic period. This is a clear indicator that the pattern and extent of environmental manipulation in the distant past was almost certainly different to that in the immediate past.

The magnitude of change in burning is indicated by the charcoal influx evidence for recent millennia (fig. 3). Biomass burning inferred from standardised measures of charcoal abundance in dated sediments shows that the burning histories of tropical and subtropical Australia are distinctly different. In the tropics, burning was much less frequent than today during the last glacial maximum, until 16,000 years ago, and again from 7000 to 5000 years ago. There were also periods with burning distinctly higher than the long-term average, such as about 15,500 to 14,000 years ago and 9000 to 7500 years ago. And for the last 4000 to 5000 years burning levels have varied around the long-term mean. Subtropical burning histories display a more subtle variability, but it is still obvious that from 20,000 until about 7500 years ago biomass burning levels were typically less than the long-term average, and from 7500 until the historic period levels resemble the long-term average.

These patterns in biomass burning records suggest, as we should expect, that i) burning in tropical and subtropical landscapes was different, ii) the burning histories of different regions are dissimilar, and iii) the historic patterns of anthropogenic burning are unlikely to be more than a few thousand years old, and may well be substantially younger.

The biomass burning records measure natural as well as humanly light fires, and the composite burning record is primarily a reflection of environmental fluctuations, of fuel load and dryness, as Mooney has shown. However climate cannot have been the only factor involved, and rates of human burning are likely to have varied in response to other factors. For example, the intensity and nature of land management of all kinds,

and certainly fire-lighting, was probably driven by demographic conditions. At low population densities there is neither the need nor the capacity for foragers to undertake intensive management, nor would the returns warrant the investment. At higher population densities the calculation would be different: there might well be the capacity to spend substantial labour in management schemes that would give a worthwhile return on the social investment. That demographic context alone ensures that there will have been transformations of environmental relationships, including the use of fire, over time as human population sizes/densities altered in response to changing environmental productivity.

CONCLUSION

The story of fire is clearly an important one in human history; in Australia we have a particular interest in the role fire played in our environments, and the role humans played in that fire lighting. Fire and land were manipulated, exploited and tended by humans. But humans were the agents that made decisions in that nexus. In responding to changes in circumstance, whether driven by climate or by social life, humans altered the decisions they made.

To understand this long record of human decision-making we need all the evidential strands I have reviewed here. Historians such as Gammage and many others have documented how in the eighteenth and nineteenth centuries fire was habitually employed by Aboriginal people in many areas. Palaeo-environmental reconstructions reinforce our understanding that human society operated within and varied in response to the long cycles of our globe. Archaeological evidence reveals something of the frequent and rapid transformations of economic and social strategies involved in land use, as well as the transformations in stories and religious beliefs that emerged from those changing social experiences. Archaeology reveals occupation of landscapes, abandonment of landscapes, fundamental changes in the way people moved through, made use of and thought about their environment. It records that, in actively creating a niche for themselves,

people modified and perhaps enhanced their environment, especially in the short term. It also records that the actions of foragers triggered the release of sediments that flooded valleys and created plains, and filled rock shelters, changing the nature of the land. The ancestors of historical Aboriginal people were simultaneously creators and destroyers, as they, and we, must be.

There is still much to be studied. We do not have a robust record of the history of Aboriginal burning or the way changing burning regimes articulated with changing economies, social worlds, or even the sense of place. But I think what we do know is that the history/prehistory of human life in Australia is a history of transformation—of not only the landscape but also the people who lived within it. The human occupation of Australia is an ongoing and multidimensional cultural evolution. To suggest Aborigines were contracted to a single way of life, that there was but one obligatory ecological relationship which specified the details of daily life and was ruled by an invariant Law, is to ignore the reality of that evolutionary process. The rich conceptual worlds of historical Aboriginal societies, placed in a sense of an abiding existence often called the ‘Dreaming’, were a part of the continuing evolution of Aboriginal life. While the sense of abiding might remain, the concepts of the world could and did readily change. So while there would always have been views of the appropriate treatment of the land, the foods that were accessible and desirable, the identity of potential marriage partners, the stories of how humans came to be and should operate socially, all of these have been transformed time and time again. The study of human evolution is a pursuit to understand change, and the burning question in studying the Aboriginal past is how to shed images of stability and comprehend the processes by which constant cultural evolution occurred.

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