Chapter 6
Towards an Archaeology of Extensive Pastoralism in the Great Artesian Basin in Australia

Tim Murray

Abstract In this essay I briefly outline the essence of a new interdisciplinary research project exploring the historical archaeology of extensive pastoralism in Australia, with a particular focus on the Western Division of New South Wales. Core elements of the project span conventional ecological history (especially the impact of sheep and cattle grazing on the rangelands of the region), as well as the history of wool as a global commodity, the impact of the dispossession of indigenous people by European settlers, and the impact of new technologies such as fencing, railways, and particularly drilling for artesian water. The research project thus considers many elements of a more general inquiry into the ecological and economic impacts of the creation of both national and imperial entities (and identities) during the nineteenth and early-twentieth centuries around the globe.

6.1 Introduction

In this essay I briefly outline the essence of a new interdisciplinary research project exploring the historical archaeology of extensive pastoralism in Australia, with a particular focus on the Western Division of New South Wales. Core elements of the project span conventional ecological history (especially the impact of sheep and cattle grazing on the rangelands of the region), as well as the history of wool as a global commodity, the impact of the dispossession of indigenous people by European settlers, and the impact of new technologies such as fencing, railways, and particularly drilling for artesian water. The research project thus considers many elements of a more general inquiry into the ecological and economic impacts of the creation of both national and imperial entities (and identities) during the nineteenth and early twentieth centuries around the globe.

T. Murray (✉)
College of Arts, Social Sciences and Commerce, La Trobe University,
Melbourne, VIC, Australia
e-mail: t.murray@latrobe.edu.au

© Springer International Publishing AG, part of Springer Nature 2018

M. A. T. de Souza, D. M. Costa (eds.), *Historical Archaeology and Environment*,
https://doi.org/10.1007/978-3-319-90857-1_6

6.2 Background

> 'Whenever the historian's sources go "beyond words", and this is the case when you adopt a transnational perspective, archaeology is a card to be counted on' (Saunier 2013: 128).

The world of the nineteenth century was the outcome of processes that had their roots in the first 300 years of European expansion, as well as forces such as industrialisation, large-scale migration, and heightened forms of colonialism that came to the fore after those years. The overarching aim of my current research is to link the historical archaeology of the earlier Atlantic world (e.g., Elliot 2006) with the archaeologies of the Indian Ocean (e.g., Parthasarathi and Riello 2014) and Pacific worlds by tracing historical continuities and discontinuities over the past 500 years. This research is founded on an interdisciplinary collaboration with economic, ecological, social, and cultural history and explicitly acknowledges that previous historical research into urbanization, migration, convictism, pastoralism, ecological transformation, and technology transfer, in Australia and elsewhere, is fundamental to the conduct of archaeological research and the analysis of material culture in these contexts (Blainey 1966; Butlin 1994; Contreras 2017; Crosby 2004; Davidson 1994; Frost 2014; Jupp 2007; Letnic 2007; Linge 1979; Robin 2009; Ville 2000).

My research into the archaeology of wool in Australia foregrounds a transnational theoretical agendum and focuses on developing an understanding of the development of the Australian wool industry as a subset of a more general inquiry into archaeologies of global commodities, the archaeology of indigenous–settler interactions, the archaeology of pastoralism in the Great Artesian Basin of Australia, and ecological transformation and technology transfer that resulted from European settlement of arid Australia.

Historical archaeology has always been concerned with transnational matters, particularly the great flows of people, material culture, technology, and, of course, capital, all of which left Europe for the peripheries in the late sixteenth century and have been washing back and forth ever since (e.g., Hall 2000; Leone and Potter 1999; Orser 1996; Williams and Voss 2008).

Over the past three centuries, people around the globe have been participating in what has been called the modern world system—comprising not only flows of people, capital, and trade, but ideas, aspirations, and, perhaps more concretely, material culture as various as locomotives and tea cups.

It is a commonplace observation that the pace and intensity of interaction between people scattered all over the globe rapidly increased during this time, and that the pace and intensity of social and cultural change has matched this. These are the centuries of mass production and consumption, and of the increasing industrialisation of all aspects of life—changes that have been understood, especially in recent times, as having the potential to create a global social and cultural uniformity (e.g., Appadurai 1996; Berger and Huntingdon 2002; Glick Schiller et al. 1992). This uniformity might have crushed the identities of those societies and cultures that, for whatever reason, have lost the capacity to generate and sustain distinctive identities. In the past decade or so these have become highly sensitive matters, because people

have been forced to contemplate the consequences of global markets and their local impacts. Equally sensitive are the challenges societies face from the movements of people—no matter whether they are referred to as economic refugees, asylum-seekers, or illegals—and from flows of culture, both to and from the countries of the West and within the West itself (see e.g., Mullins 2008).

This global perspective has powered fundamental research into the archaeology of the 'Atlantic world' since the beginning of European exploration of the New World and West Africa, and has gained particular force in the archaeology of slavery (Hall 2000; Orser 1996, 2010), capitalism (Croucher and Weiss 2011; Leone and Potter 1999), and, since the mid-1990s, the archaeology of indigenous–settler interactions in North and South America (Murray 1992, 1996; Silliman 2005). Notwithstanding this overarching context of practice, much historical archaeology still rests on small-scale, single-site research that presents challenges for global comparisons between sites of a similar antiquity and broadly similar historical contexts. This is especially the case in Australia: here, with the exception of recent work in the archaeology of the modern city (e.g., Murray 2003) and explorations in maritime archaeology (e.g., Stanniforth and Nash 2006), practitioners have tended to dispense with the original broad, comparative vision of the founders of historical archaeology (Birmingham and Jeans 1983).

6.3 Transnational Archaeologies

Given its genesis as the archaeology of the European colonization of North America, historical archaeology at its core has sought to address two major issues. The first is the need to build concepts that demonstrate the importance of archaeological data (and the material culture that lies at its core) to the writing of social and economic history. The second is the need to articulate local, regional, national, and global scales in interpretation and analysis. Historical archaeology has the demonstrated capacity to track material culture in circulation from the point of production to the many points of consumption, revealing the connections and different sense of duration that have frequently gone unremarked by document-based historians. This circulation of material culture in archaeological contexts has long encouraged an understanding that a multiscalar approach to problem selection and analysis should be a major goal for the discipline (e.g., Orser 2010). The interplay of global and local frames of reference, and the challenges faced when both archaeologists and historians seek to integrate archaeological and written documentary information, have driven historical archaeologist to look much more closely at core processes such as migration, colonization, and ethnogenesis (particularly in societies where 'hybrid', creole, or 'subaltern' societies have been created through colonialism). The current research program will target key issues and contexts for modern scholars and readers: indigenous–settler relations; the transfer of agricultural, manufacturing, and managerial technologies; the movements of people and material culture; and the transformation of indigenous ecologies as a result of colonisation.

Over the past 40 years, historical archaeologists have sought to contribute to a broader understanding of how new societies were created from old (either emigrant or indigenous), and of how class, ethnicity, and gender have played out in the nations created out of imperialism and colonialism. However, while these are to an extent local and unique phenomena, they have taken place within the broader context of global modernity. Significant flows of capital, technology, consumer goods, and people were encouraged both within and outside the British Empire, especially into the United States. Between 1815 and 1914, a total of 22.6 million people left Britain for settlements and colonies spread out across the world, as did hundreds of millions of pounds worth of capital that was invested in railways, ports, cities, ships, agricultural and pastoral enterprises, and the building of modern infrastructure such as courts, schools, and universities.

This was a century of astounding global mobility. Research into the broader contexts of the archaeology of wool in Australia program explores some of the archaeological contexts within which settler colonies, such as those in Australia, became established and then transformed into nations, during a period of intensifying globalisation. However, as I remarked in my edited book *The Archaeology of Contact in Settler Societies* (Murray 2004), exploring the archaeology of nation-building during this period, in the early twenty-first century, largely subverts the pre-eminence of the narratives that have told the national story by uncovering the 'hidden histories' of the marginalised and oppressed. These historical archaeologies of transformation, diaspora, and globalisation are also about frontiers, blurred boundaries, the refashioning of ethnicities and identities, and the survival of core elements of indigenous ethnicities (Croucher and Weiss 2011; Parker and Rodseth 2006). The political context of transnational historical archaeologies is undeniable and pervasive, since postcolonial societies simultaneously celebrate diversity and cultural and social possibilities from an extraordinarily eclectic sampling of global cultural capital, while seeking to retain identities that have created the cohesion of nations.

The core of the current research program will link the analysis of archaeological data, material culture, and historical documents to a close examination of life in the Western Division of New South Wales, Australia, in the nineteenth and twentieth centuries. This program will continue to explore issues of scale, particularly the interaction of the local and the global (Murray and Crook 2005; Orser 2010). This continues to be one of the most deeply contested aspects of the archaeology of the modern world, both in sixteenth- to eighteenth-century contexts as well as those of the nineteenth and twentieth centuries. Indeed, significant reexaminations of the already highly disputed role of migration as an explanation for culture change in archaeology have reignited debates about archaeological characterisations of the processes of social and cultural change resulting from the mobility of people and material culture, and the creation of the colonial and postcolonial worlds. These debates centre on how an increasingly globalised and homogenous material culture could be interpreted by its consumers in culturally heterogeneous ways across the world. This has led to a focus on the complexities of material culture as a marker of relationships and identities (some linked to ethnicities and others not). Yet scale can be approached as a way of gaining a clearer picture of archaeological phenomena as they appear at the level of the household, the community, the region, or even the globe.

6.4 The Archaeology of Wool in Australia

Ongoing research adds significantly to our understanding of the material culture of wool production and the social history of large-scale sheep grazing. It will achieve this through the documentation of the physical infrastructure, such as buildings, fences, yards, bores, and tanks found at those existing documentation of important sheep stations held in state and federal heritage registers, allowing a more extensive survey of sites spanning the entire history of the Australian wool industry. Further intensive recording will take place at Toorale Station on the Darling River near Louth, NSW, in preparation for excavations that will be undertaken over the next five years, and will link with earlier archaeological research at Kinchega Station further down the Darling River (Allison 2003), and on pastoral properties elsewhere in the Great Artesian Basin (e.g., Godwin and L'Oste-Brown 2012). Research at Toorale, which had a long and diverse history (Jack 2008), exemplifies the creative tensions between local and global perspectives on historical archaeology, while adding much to the heritage of the nation; at the same time, the project acknowledges the power of nostalgia for a 'lost world' when Australia was thought to have ridden on the sheep's back (Bean 1910). Linking global to local in the archaeology of wool in Australia directly connects material culture (particularly technology) with less tangible forces such as the global price of wool, the cost of capital, the development of managerial technologies that supported pastoral activities, frequently on a massive scale, and the development of transportation technologies. At places such as Toorale these tangible and intangible elements coalesce in the occupation history of the site and the material culture that remains abandoned in a landscape shaped by the often catastrophic interactions of nature and the European occupants.

Given the density of activity present on the site it is imperative that we also recognise that these were and remain intense indigenous landscapes as well. My research into the historical archaeology of Aboriginal Australia interacting with the research of others has set out a clear methodological and theoretical agenda for those aspects of the archaeology of wool in Australia, where the lives and destinies of pastoralists and Aboriginal people became so closely entwined. The broader concerns of that project, particularly the focus on 'commodity histories' that link material culture with documentary history, will focus on the material culture of wool production and distribution, significantly expanding the successful approach taken by researchers such as Giorgio Riello to the history of cotton, particularly the focus on the interrelationships between resources (the breeding of sheep in Australia), exchange (transport and trade) and production and consumption (technologies, organisations, institutions, and the 'culture' of pastoral Australia) (e.g., Riello 2013).

'Commodity histories' lie at the core of the transnational historical agendum, given that the creation of world markets in commodities such as wool, cotton, coffee, tea, and sugar spawned production systems as various as plantations and large-scale grazing of sheep and cattle (e.g., Riello 2013). Notwithstanding this transnational focus, the history of wool in Australia has been the subject of intense

historical research (Butlin 1962a, b; Barnard 1962; Davidson 1994; Hancock 1972; Hume 1962) that clearly acknowledges the shifting fortunes of wool production and its significant impact on Indigenous communities of inland Australia and (perhaps just as great) its impact on rangeland ecologies (Blake and Cook 2006; Bonyhady 2000; Griffiths and Robin 1997; Robin 2007; Robin et al. 2010). Yet it is widely acknowledged that the social history and social archaeology of wool in Australia has not been nearly so comprehensively researched (Merritt 1998; Mitchell 1998), although the publications of historians such as Alan Mayne on life in the bush), and the indigenous historical archaeologies of Harrison (2004), Murray (1992, 1996), and Paterson (2005, 2010), have added valuable perspectives. The Australian Agricultural Company has received significant archaeological attention (Bairstow 2003). The other great nineteenth-century investment enterprise in wool growing, the Van Diemen's Land Company, has been the focus of smaller-scale archaeological research (Murray 2000).

The most significant recent discussion of the history of pastoralism in Australia (Pearson and Lennon 2010; see also Walker and Forrest 1995) speaks eloquently to a lack of knowledge about pastoral places of real heritage significance, and of the great diversity of material culture associated with wool production and distribution—other than homesteads and woolsheds that have for the most part gone undocumented. They conclude their book with a plea: 'It is hoped that the present study will help inform a re-assessment of the heritage values of our pastoral industry, and lead to a more encompassing representation of pastoral heritage places on both the National Heritage List and the state and territory heritage registers' (p. 180).

6.5 The Settlement of the Western Division of New South Wales

The Western Division of New South Wales (Fig. 6.1) comprises over 42% of the total land area of the state; the vast majority of its 32.5 million hectares are owned by the Crown, and administered under the Western Lands Act 1901. European settlement, primarily by sheep pastoralists or 'squatters', began shortly after initial explorations by Mitchell and Sturt in the early 1840s, and sheep populations rapidly expanded out from reliable water sources such as the Darling River (see Gorman 2012) (Fig. 6.2). Conflict with and dispossession of the indigenous population rapidly followed, although significant numbers remained on their lands while acting as servants or stockmen in the pastoral industry (Fig. 6.3). This trend was to continue until the 1960s, when the requirement to pay indigenous workers a wage equal to those paid to non-Aboriginals led pastoralists to cease employment except for seasonal work and resulted in a significant number of indigenous people moving to local towns such as Bourke and Wilcannia. Nonetheless, connections to country clearly remained strong (see, e.g., Bates and Martin 2012).

Fig. 6.1 Map of the Western Division of New South Wales, Australia. (Map drawn by Wei Ming, Department of Archaeology and History, La Trobe University)

Fig. 6.2 Blade shearing of sheep, western NSW c.1870. (Photographer unknown; open source)

Fig. 6.3 Group of Aborigines at Dunlop Station. (Photographer Charles Bayliss 1886; public domain)

Currently about 31 million hectares are held by pastoralists under perpetual leasehold title from the Crown. This form of land tenure is fundamentally the result of the settlement history of the semi-arid rangelands that largely characterise the ecology of the area. The Western Division experiences very high summer temperatures, low and erratic rainfalls (with an average of some 200 mm per year), and very high evaporation rates. A further climatic constant is the regularity of severe drought, occurring on an average of one in every nine years. Since first settlement by pastoralists severe droughts have been experienced in 1845, 1864, 1895–1905, 1911–1917, 1928–1930, 1940–1946, 1965–1967, 1978–1985, 1993–1994, and 2001–2009.

This erratic climate has posed significant challenges to the state government, primarily because the region has (in the past) played a major role in building the economy of New South Wales (and Australia) economy through the production of wool. Condon (2002) and Barnes and Wise (2003) provide excellent summaries of the myriad of government inquiries and changes to management legislation that have occurred since 1901. Most important was the recognition (at the end of the nineteenth century) by the government, that unregulated pastoral enterprise in the Western Division was simply unsustainable. The major drought (caused by a

Fig. 6.4 Rabbits around a water trough. (Photographer M.W. Miles 1938; attributed to CSIRO Creative Commons)

combination of low rainfall and a major infestation of rabbits (Fig. 6.4) of the 1890 saw millions of sheep die of starvation and the government create some of the first legislation designed to achieve ecological stability. Critically, this legislation (which remains in force) has focused long-term attention on the consequences of pastoralism for the rangelands of the region—particularly on the degradation of the regions pastures (see especially McKeon et al. 2004). Since 1901 a vast literature has been built up exploring the consequences of extensive grazing on fragile rangelands. Both state and federal governments have committed significant funds to this research and while it is fair to say that we are some way from scientific consensus (see, e.g., Butzer and Helgren 2005 versus Gill 2005), there is little doubt that both governments and the pastoralists they manage are much better informed than in the past. Certainly the days of unregulated stocking are long gone, as the pastoralists themselves have come to recognise that the booms and busts of the past are no longer a viable economic model.

Similarly, the management of feral animals and their impact on the biomass of the region (both flora and fauna) has been required to deal with the infestation of imported animals such as wild cats and dogs, pigs, donkeys, goats, camels, foxes and particularly rabbits (see e.g., Coman 1999). The destruction wrought by rabbit

plagues is well documented and governments have devoted significant research funds to creating biological controls that have helped control population growth. While rabbits and drought have had much to do with past busts, they alone have not been the cause. The long-tern decline of wool production in the region has also been the result of sliding wool prices since the end of the Korean War. The causes of this change in fortunes for wool (and for its producers) are well known and show few signs of reversal (at least in the short term) (Hume 1962; Ville and Withers 2015). The great boom in prices that occurred prior to the 1960s is unlikely to return. The collapse in the global price of wool (and indeed previous fluctuations) also had profound impacts on the pattern of investment in the regional wool industry. As we will see in the case of Toorale, grazing in these landscapes required significant acreages and the application of new technologies to allow sheep to be shorn and the fleeces prepared for market. It is no wonder that the first mechanised sheep shearing in the world occurred at the nearby station 'Dunlop', and that much ingenuity was involved in using scarce water resources to clean the fleeces (see Cumins 1989; Godwin and L'Oste Brown 2012; Pearson 1982; Pearson and Lennon 2010). It is also little wonder that much attention had been given to improving access to sub-artesian water since the 1860s, and to the use of wire fencing to manage stock since 1900. These are all important elements for explaining the massive expansion of pastoralism in the region that took place in the 50 years after first settlement. However, they were never as important as the development of technologies related to drilling for artesian water.

6.6 The Great Artesian Basin (GAB) and Its Consequences

The Great Artesian Basin (GAB) is the largest and deepest groundwater basin in the world, storing an estimated 8.7 billion mega-litres (or 64,900 cubic kilometres) of underground water, mostly beneath an arid ground surface. The amount of water is equivalent to three times the volume of the Great Lakes. That is enough to submerge all land on the planet a foot and a half deep. The basin covers 1.7 million square kilometres or around 22% of the Australian continent (Fig. 6.5), including most of Queensland (excluding the eastern parts), the southeast corner of the Northern Territory, the northeastern part of South Australia, and northern New South Wales. The GAB lies under parts of four major river catchment divisions: Lake Eyre, Murray-Darling, the northeast Coast, and the Gulf of Carpentaria, and provides the only reliable source of freshwater throughout much of arid and semi-arid inland Australia. Artesian water is not high in salt content; however, the high volume delivered to the surface and not used (wastage) adds about 150,000 tonnes of salt to the NSW landscape alone each year. This salt eventually ends up in the Murray-Darling drainage system, contributing to its salinity problems.

Waters of the GAB feed springs and wetlands that support a rich aquatic life, although many of these have been severely affected since European settlement. Plants, animals, and people have adapted to this landscape over many thousands of years with permanent waterholes (also referred to in the literature as springs, mound

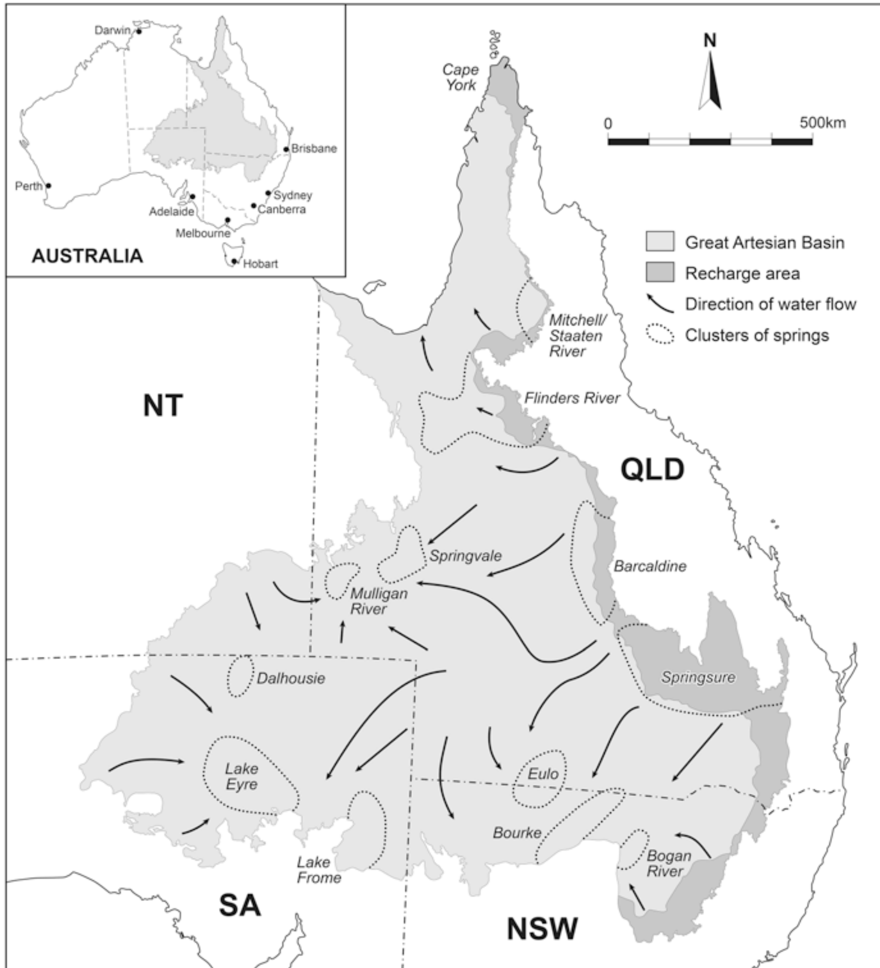

Fig. 6.5 The extent of the Great Artesian Basin in Central and Eastern Australia

springs, mud springs, water springs, and artesian springs) serving as semi-permanent oases or refuges in the arid and semi-arid zones during periods of prolonged drought and frequent fire events. Many springs have a distinctive mound, and these are often referred to as mound springs. These permanent springs have important biological values, with many wetland endemic species recorded. Spring wetlands come in a variety of forms, from desert ponds around Lake Eyre to tropical rainforest on Cape York Peninsula, each form supporting hundreds of specialised invertebrates, rare fish, and plant species. The presence of endemic species and large peat mounds shows that some springs are of considerable age.

Archaeological research provides evidence for long-term use by Aboriginal people of GAB springs, wetlands, and surrounding landscapes. In the late nineteenth

century, the same springs, wetlands, and Aboriginal trade routes became essential resources used in the early development of European trade routes, early pastoralism and facilitated permanent settlement of inland or outback Australia. Today, the water resources provided by the GAB continue to be the lifeblood of many rural communities and associated pastoral/agricultural, mining, cultural and tourism activities. The total value of all production supported by GAB water was estimated in 2007 at $3.5 billion per year (www.environment.gov.au).

Archaeological and anthropological evidence as well as documented oral history and ethnohistory show that many GAB springs were once water sources that had strong cultural and spiritual values attached to them, as well as to the surrounding landscapes. Early European explorers, for example, John Oxley (1818) and Thomas Mitchell (1846), travelled in the GAB region along the Macquarie, Balonne, and Warrego river systems and noted the presence of springs and marshes as features on the landscape. Edward John Eyre (1939) and John McDouall Stuart (1859) relied on spring-fed water to journey into the interior of Australia. Early European use of GAB spring water includes the development of travel routes and the alignment of the Overland Telegraph. The narrow-gauge Ghan railway between Marree and Oodnadatta followed the line of GAB springs and early pastoral stations were also centred on spring locations.

The great transformation occurred in 1878 when a bore was sunk at 'Kallara' a station on the Darling River near Louth, which produced flowing water. Prior to that point pastoral settlement was generally confined along rivers such as the Darling, Warrego and Paroo (see Fig. 6.1). During the 1850s and 1860s settlement along the well-watered Darling River gradually expanded. Up to that point the management of surface water largely involved the excavation of ground tanks. Interest in drilling for artesian water rapidly expanded in the Western Division and reached its peak in the central west of Queensland. Flowing water was found at Back Creek east of Barcaldine in 1886 and at Thurrulgoonia near Cunnamulla in 1887. Pastoralists believed that this new, completely reliable source of water would effectively drought-proof their activities; and the population of sheep in the region exploded in the 1880s. The extensive system of travelling stock routes in western Queensland and New South Wales was thus made feasible by the discovery of the Great Artesian basin and the sinking of hundreds of government-funded bores to tap it. The complex relationship between stock movement, the artificial provision of water, and the development of the transport routes and settlement patterns is an important element of the overall inquiry.

6.7 Historical Archaeology in the GAB

Notwithstanding the reliance placed on sheep husbandry and the production of wool in the Australian economy, the technology associated with the early phase of the wool industry across the GAB has attracted relatively little interest from Australian historical archaeologists (Godwin and L'Oste-Brown 2012). Exceptions include

Pearson (1982), who reported on an excavation of the wool washing and scouring facility at Tibooburra in northern NSW. In central Queensland, the mechanical wool scour in Blackall (home of famous shearer Jacky Howe) has attracted research interest as well as funding for its conservation (Godwin and L'Oste-Brown 2012). The Blackall wool scour, along with a further 51 others, were established in the Central West Queensland region, operating as commercial operations (Cummins 1989).

The drilling of artesian bores in Australia was first made possible with American steam technology. The Wee Wattah bore on Kallara Station was dug during a drought, using a cable-tool rig in the bottom of a previously hand dug well, which intercepted seepage water from the Paroo River overflow. Artesian water was encountered at a depth of 53 metres. By 1910, there were 364 artesian bores in NSW. Bores were being constructed not only for the growing pastoral industry, but also for town water supplies and mining activities. Of the 1400 bores tapping the deeper aquifers of the GAB in NSW, around half have stopped flowing. About one-third of the mound springs have dried up.

The first bore drilled to tap the water of the GAB in South Australia was at Tarkannina in 1883. The bore was similarly drilled in the bottom of a well, which penetrated to a total depth of 373.4 metres. In Queensland, investigations headed by Dr. R.L. Jack (Government Geologist) and Mr. J.B. Henderson (Hydraulic Engineer) led to the first artesian water bore drilling at Blackall in 1885, using a Pennsylvanian Walking Beam Oil Rig. The first artesian flow to be obtained was on Thurrulgoonia Station near Cunnamulla and Barcaldine in 1887, using a Canadian Pole Tool Rig. In the Northern Territory, the Anacoora bore was sunk by the South Australian Government in 1898. The bore was an experiment to test the country for artesian water, with a view to providing a stock route to Queensland. The bore was drilled with a rig constructed on site with parts being carried in by camel, completed using casing delivered from England. Artesian water was struck at 346 metres. The extent of artesian conditions was reasonably defined by the end of the nineteenth century, and the early twentieth century saw the development and rapid expansion of the pastoral industry into more remote areas. Development of artesian bores slowed down due to WW1 around 1915 and it is sometime after this date that the total flow from GAB bores began to rapidly decrease, despite new bores being drilled. By 1952, around 2800 bores had been drilled, approximately 2300 in Queensland. There are currently 3300 artesian bores within the GAB.

The exploitation of GAB water for agricultural purposes was first used in central western Queensland in 1887 (Godwin and O'Oste-Brown 2012: 56). In Queensland, the first artesian bores were sunk at Thurulgoonia in 1886, followed by huge successes at Barcaldine, Blackall, and Charleville. The success of the Blackall bore led to a period of 'artesian mania', with pastoralists everywhere across west Queensland investigating how to sink bores on their properties; and by the end of 1899, a total of 524 bores had been sunk, of which 505 had been successful. (Blake and Cook 2006: 16). Artesian water was extensively tapped into to water stock routes across inland Australia, in early mining development, railway development, and for general domestic uses. Soon after the discovery of artesian water, the question of how to best harness the water for irrigation purposes arose. Sir Thomas McIlwraith was

an early advocate for using artesian water for irrigation purposes in Queensland (Blake and Cook 2006: 45) and Walter Gibbons Cox devoted a chapter 'Irrigation from Artesian Bores' in his treatise *Artesian Wells* as a means of water supply (1895). However, despite the early success of tapping into artesian water supplies, concerns were raised. Most notably, J.B. Henderson expressed concern that the flow was diminishing and suggested that controls on how the water should be used be put in place. In 1954, a report on artesian water supplies in Queensland concluded that artesian water was generally unsuitable for irrigation purposes (Blake and Cook 2006: 46).

The assumption that artesian water would drought-proof pastoralism in the region was very quickly shown to be false. While the first well was dug at the beginning of the great drought of the late 1880s, providing permanent drinking water did not overcome the effects of drought. Sheep could not eat water and they died by the millions. It was very much an illusion of riches. This lesson took some time for pastoralists to learn, their traditional response being to overstock when wool prices boomed and seasons were good. However as McKeon et al. (2004) and many others have noted, this translated to the long-term degradation of the very pastures they depended on and set the scene for the creation of the Western Lands Commission as the primary vehicle for government management of the region.

6.8 A Finer Scale: Toorale Station

Toorale station was established in 1857 and represents in material form many of the themes I have been discussing. The station is situated located on the Darling River (on its confluence with the Warrego) and at its height comprised 500,000 acres. Throughout its history Toorale has been far too big to operate as a family enterprise, having been established by groups of investors who traded the property until it was finally purchased by the Australian government in 2008. Toorale (and its owners) were always at the whim of the commodity markets and the fortunes of the property rose and fell with the wool price set in London, thousands of kilometres away.

Significantly, pastoral operations on Toorale changed in the interim, most recently with a large portion of its river frontage being set aside for growing and irrigating cotton. There was a long history of controlling and impounding water at Toorale, at the beginning to try to create more stable water supplies for stock; but at the end the farming model diversified into agriculture as well as pastoralism. All of the investment in technology that we see in other pastoral enterprises can be found on the site, with additional structures and works associated with using paddle streamers on the Darling to transport wool. Research will focus on linking the extensive archives of the various companies that owned the station over the course of its history with precise documentation of the material culture of pastoralism located on the site—ranging from buildings, to yards, gardens, and workshops.

The history of Toorale gains additional significance in two ways. First, in 2008 it was purchased by the Federal and New South Wales governments for $24 million Australian dollars. The purpose of the purchase was to 'buy back' the allocation of

water drawn from the Darling to Toorale, effectively releasing hundreds of thousands of mega-litres from impoundment on the property back into the Darling. This action was a direct response to widespread fears for the continuation of environmental flows on the river, which were the result of increasing use of river water for agriculture rather than pastoralism. In this sense the end of pastoralism at Toorale (it is now a National Park) is a symbol of the profound changes that have taken place in the Western Division of New South Wales. It has also provided an opportunity for local indigenous groups to reassert their connection to the place and to tell their stories to the many visitors to the park. The second point of significance extends from the first. Toorale fosters a contemplation of the lives of those who lived and worked there, both black and white. Toorale was a place of loneliness and hardship, where life was fundamentally different to that in the city and where dreams of home could sometimes obscure clear vision. How else would one of the early workers at the station, T.A. Matthews originally from the verdant valleys of County Louth, give this name to the nearest town—which he founded! Why else as a strong Republican would he name the local pub the Dan O'Connell, after the great Irish patriot.

6.9 Concluding Remarks

In this short essay I have sketched the some of the dimensions of long-term multidisciplinary research into the historical archaeology of extensive pastoralism in the arid zone of Australia. Core elements of the research design include a multi-scalar approach that reveals significant data at the level of the individual pastoral enterprise, the region, the nation of Australia, and more general the global trade in wool. This multi-scalar approach allows us to knit together data from a wide variety of sources—climate, the impact of hard-hoofed animals on the rangelands of Australia, the impact of technologies related to the provision of water and the large-scale management of sheep and the wool they produce (including transportation technologies such as river boats and railways), the impact of the introduction of feral animals from Europe, and the influx of significant populations of migrants from as far afield as Afghanistan and Ireland.

While it is self-evident that the introduction of extensive pastoralism to the Western Division of New South Wales from the mid-nineteenth century had serious and long-lasting impacts on the fragile ecology of the region, it is even more obvious that that same process completely recast the lives of its indigenous inhabitants. The fates of these original inhabitants (whose descendants have maintained their culture and ties to their ancestral lands) mattered little to most pastoralists, who dispossessed them to acquire and use vast tracts of land to amass significant wealth.

But these truly fundamental transformations do not completely encompass the impact of the process of settlement in this remote and fragile landscape. It was well understood in the nineteenth century (as can be seen through the poetry of such as Henry Lawson (1896) and Banjo Patterson, and the journalism of C.E.W. Bean and others, see e.g., Grattan 2004) that the people of the Western Division had acquired an aura of toughness, commitment, and single-mindedness that was popularly

thought to define the Australian character. Certainly Bean, whose 1910 ode to the wool industry of the Darling River might be regarded as a foundational text in this regard, went on to make it abundantly clear in his official history of Australia in the First World War that the fighting spirit of the Australian soldier was born in the adversity of the Outback (Bean 1940).

On the other hand, many pastoralists developed a lasting antiquarian interest in indigenous material culture, assiduously collecting objects to be displayed in their houses, but also gifted to major metropolitan museums (and through them being circulated to museums as far afield as the United States and Russia). Quite a lot has been written about such collecting and its motivation (see, e.g., Griffiths 1994)—it can, indeed, be seen as a continuing act of dispossession, erasing the past as well as the present and the future of indigenous societies in the region. Nonetheless the passage of time has made several facts very clear—no such permanent erasure has taken place and the survival of indigenous communities has fundamentally altered the calculus of identity here.

Of course, this is just one of the lessons of history—power relations between community members, both black and white, change. But there are other profound lessons that are yet to be learned. The most obvious of these is the difficult business of learning to live with the environmental constraints of the region and to adopt sustainable land use strategies. There is a difference between living in and living with Australia. Historical archaeology has much to contribute to this process.

References

Allison, P. M. (2003). The Old Kinchega Homestead. Doing Household Archaeology in Outback NSW, Australia. *International Journal of Historical Archaeology, 7*, 161–194.

Appadurai, A. (1996). *Modernity at large: Cultural dimensions of globalization*. Minneapolis: University of Minnesota Press.

Bairstow, D. (2003). *A million pounds, a million acres: The pioneer settlement of the Australian agricultural company*. Cremorne: The author.

Barnard, A. (Ed.). (1962). *The simple fleece: Studies in the Australian Wool Industry*. Carlton: Melbourne University Press.

Barnes, M., & Wise, G. (2003). *100 years: Celebrating 100 years of natural resource progress in the western division of New South Wales: Learning from the past and planning for the future*. Dubbo: Department of Sustainable Natural Resources.

Bates, B., & Martin, S. (2012). *Following Granny Moysey: Kurnu-Paakantyi stories from the Darling, Warego and Paroo*. Canberra: AIATSIS.

Bean, C. E. W. (1910). *On the wool track*. Sydney: Angus and Robertson.

Bean, C. E. W. (1940). *The story of ANZAC*. Sydney: Angus and Robertson.

Berger, P. L., & Huntingdon, S. P. (2002). *Many globalizations: Cultural diversity in the contemporary world*. Oxford: Oxford University Press.

Birmingham, J., & Jeans, D. (1983). The Swiss Family Robinson and the archaeology of colonisation. *Australian Journal of Historical Archaeology, 1*, 3–14.

Blainey, G. (1966). *The tyranny of distance. How distance shaped Australia's history*. Melbourne: Sun Books.

Blake, T., & Cook, M. (2006). *Great Artesian Basin: An historical overview*. Brisbane: Department of Natural Resources and Mines.
Bonyhady, T. (2000). *The colonial earth*. Carlton: Miegunyah Press.
Butlin, N. G. (1962a). The growth of rural capital 1860–1890. In A. Barnard (Ed.), *The simple fleece* (pp. 322–339). Carlton: Melbourne University Press.
Butlin, N. G. (1962b). Pastoral finance and capital requirements. 1860–1890. In A. Barnard (Ed.), *The simple fleece* (pp. 383–407). Carlton: Melbourne University Press.
Butlin, N. G. (1994). *Forming a colonial economy, Australia 1810–1850*. Melbourne: Cambridge University Press.
Butzer, K., & Helgren, D. (2005). Livestock, land cover and environmental history: The tablelands of New South Wales, Australia, 1820–1920. *Annals of the Association of American Geographers, 95*, 80–111.
Coman, B. (1999). *Tooth and nail: The story of the rabbit in Australia*. Melbourne: Text.
Condon, D. (2002). *Out of the west: Historical perspectives on the western division of New South Wales*. Yowie Bay: Rangeland Management Action Plan.
Contreras, D. (Ed.). (2017). *The archaeology of human environment interaction*. London: Routledge.
Crosby, A. W. (2004). *Ecological imperialism: The biological expansion of Europe 900–1900* (2nd ed.). Cambridge: Cambridge University Press.
Croucher, S., & Weiss, L. (Eds.). (2011). *The archaeology of capitalism in colonial contexts*. New York: Springer.
Cumins, R. (1989). Scouring the clip. Boom and burn on woolscour lane. *Australian Historical Archaeology, 7*, 23–28.
Davidson, B. R. (1994). The development of the pastoral industry in Australia during the 19th century. In C. Chang & H. A. Koster (Eds.), *Pastoralists at the periphery. Herders in a capitalist world* (pp. 79–102). Tucson: University of Arizona Press.
Elliot, J. H. (2006). *Empires of the Atlantic World: Britain and Spain in America 1492–1830*. New Haven: Yale University Press.
Frost, L. (2014). Urbanisation. In S.Ville and G. Withers (eds.) (2015). The Cambridge Economic History of Australia. Melbourne: Cambridge University Press.
Gill, N. (2005). Life and death in the Australian 'heartlands': Pastoralism, ecology and rethinking the outback. *Journal of Rural Studies, 21*, 39–53.
Glick Schiller, N., Basch, L., & Blanc-Szanton, C. (Eds.). (1992). *Towards a transnational perspective on migration: Race, class, ethnicity, and nationalism considered*. New York: New York Academy of Sciences.
Godwin, L., & L'Oste-Brown, S. (2012). 'Water water everywhere': Attempts at drought-proofing properties using surface water indrastructure in central West Queensland in the early 1880s. *Australian Archaeology, 74*, 55–70.
Gorman, E. (2012). *Flood Country: An environmental history of the Murray-Darling Basin*. Canberra: CSIRO.
Grattan, M. (2004). *Back on the wool track*. Milsons Point: Vantage.
Griffiths, T. (1994). *Hunters and collectors*. Melbourne: Cambridge University Press.
Griffiths, T., & Robin, L. (Eds.). (1997). *Ecology and empire: Environmental histories of settler societies*. Melbourne: Melbourne University Press.
Hall, M. (2000). *Archaeology and the modern world: Colonial transcripts from South Africa and the Chesapeake*. New York: Routledge.
Hancock, W. K. (1972). *Discovering Monaro: A study of man's impact on his environment*. Cambridge: Cambridge University Press.
Harrison, R. (2004). *Shared landscapes: Archaeologies of attachment and the pastoral industry in New South Wales*. Sydney: UNSW Press.
Hume, L. J. (1962). Wool in the Australian economy 1946-1958. In A. Barnard (Ed.), *The simple fleece* (pp. 615–627). Carlton: Melbourne University Press.
Jack, R. I. (2008). Heritage in a historic landscape, the case of Toorale Station. *History, 98*, 2–3.

Jupp, J. (2007). *From White Australia to Woomera: the story of Australian immigration* (2nd ed.). New York: Cambridge University Press.
Lawson, H. (1896). *In the days when the world was wide and other verses*. Sydney: Angus and Robertson.
Leone, M., & Potter, P., Jr. (Eds.). (1999). *Historical archaeologies of capitalism*. New York: Plenum.
Letnic, M. (2007). The impacts of pastoralism on the fauna of arid Australia. In C. R. Dickman, D. Lunney, & S. Burgin (Eds.), *Animals of arid Australia: Out on their own* (pp. 65–76). Mosman: Royal Zoological Society of New South Wales.
Linge, G. J. R. (1979). *Industrial awakening: A geography of Australian manufacturing 1788–1890*. Canberra: ANU Press.
McKeon, G., Hall, W., Henry, B., Stone, G., & Watson, I. (Eds.). (2004). *Pasture degradation and recovery in Australia's rangelands. Learning from history*. Indooroopilly: Natural Resource Sciences, Queensland Government.
Merritt, J. (1998). Wool. In G. Davison, J. Hirst, & S. Macintyre (Eds.), *The Oxford companion to Australian history* (pp. 690–691). Melbourne: Oxford University Press.
Mitchell, B. (1998). Pastoral history. In G. Davison, J. Hirst, & S. Macintyre (Eds.), *The Oxford companion to Australian history* (pp. 499–501). Melbourne: Oxford University Press.
Mullins, P. (2008). 'The strange and unusual': Material and social dimensions of Chinese identity. *Historical Archaeology, 42*(3), 152–157.
Murray, T. (1992). The discourse of Australian prehistoric archaeology. In B. Attwood (Ed.), *Power knowledge, and Aborigines* (pp. 1–19. A special issue of the Journal of Australian Studies). Melbourne: La Trobe University Press.
Murray, T. (1996). Towards a post-Mabo archaeology of Australia. In B. Attwood (Ed.), *In the age of Mabo* (pp. 73–87). Sydney: Allen and Unwin.
Murray, T. (2000). Digging with documents. Understanding intention and outcome in Northwest Tasmania 1825–1835. In A. Anderson & T. Murray (Eds.), *Australian Archaeologist. Collected papers in honour of Jim Allen* (pp. 145–160). Canberra: Coombs Academic Publishing.
Murray, T. (2004). The archaeology of contact in settler societies: An introduction. In T. Murray (ed.), *The archaeology of contact in settler societies* (pp. 1–18). Cambridge: Cambridge University Press.
Murray, T., & Crook, P. (2005). Exploring the archaeology of the modern city: Melbourne, Sydney and London in the 19th century. *International Journal of Historical Archaeology, 9*(2), 89–109.
Murray, T., Crook, P., & Ellmoos, L. (2003). Understanding the archaeology of the modern city. In T. Murray (Ed.), *Exploring the history and archaeology of the modern city* (pp. 113–136). Sydney: Historic Houses Trust of NSW.
Orser, C., Jr. (2010). Twenty-first-century historical archaeology. *Journal of Archaeological Research, 18*, 111–150.
Orser, C., Jr. (1996). *A historical archaeology of the modern world*. New York: Plenum.
Parker, B. J., & Rodseth, L. (2006). *Untaming the frontier in anthropology, archaeology and history*. Tucson: University of Arizona Press.
Parthasarathi, P., & Riello, G. (2014). The Indian Ocean in the long eighteenth century. *Eighteenth Century Studies, 48*(1), 1–19.
Paterson, A. G. (2005). Early pastoral landscapes and culture contact in Central Australia. *Historical Archaeology, 39*(3), 28–48.
Paterson, A. G. (2010). The archaeology of historical indigenous Australia. In J. Lydon & U. Rizvi (Eds.), *The handbook of postcolonialism and archaeology* (pp. 165–184). Walnut Creek: Left Coast Press.
Pearson, M. J. (1982). The excavation of the Mount Wood Woolscour, Tiboobura, New South Wales. *Australian Journal of Historical Archaeology, 2*, 38–50.
Pearson, M., & Lennon, J. (2010). *Pastoral Australia. Fortunes, failures and hard yakka. A historical overview 1788–1967*. Canberra: CSIRO Publishing.

Riello, G. (2013). *Cotton. The fabric that made the modern world*. Cambridge: Cambridge University Press.

Robin, L. (2007). *How a continent created a nation*. Sydney: UNSW Press.

Robin, L. (2009). Fleecing the nation. *Journal of Australian Studies, 23*, 150–158.

Robin, L., Dickman, C. R., & Martin, M. (2010). *Desert channels: The impulse to conserve*. Canberra: CSIRO.

Saunier, P.-Y. (2013). *Transnational history*. New York: Palgrave.

Silliman, S. (2005). Culture contact or colonialism? Changes in the archaeology of native North America. *American Antiquity, 70*(1), 55–74.

Stanniforth, M., & Nash, M. (Eds.). (2006). *Maritime archaeology: Australian approaches*. New York: Springer.

Ville, S. (2000). *The rural entrepreneurs: A history of the stock and station agent industry in Australia and New Zealand*. Melbourne: Cambridge University Press.

Ville, S., & Withers, G. (Eds.). (2015). *The Cambridge economic history of Australia*. Melbourne: Cambridge University Press.

Walker, M., & Forrest, P. (1995). Pastoral technology and the National Estate. Australia ICOMOS.

Williams, B., & Voss, B. (2008). The archaeology of Chinese immigrant and Chinese American Communities. *Historical Archaeology, 42*(3), 1–4.