

Climate and culture connections in Australia

Neville Nicholls

Bureau of Meteorology Research Centre, Melbourne, Australia

(Manuscript received February 2003; revised November 2003)

Climate and culture in Australia connect in many varied ways. Such connections are most obvious in years of extreme climate fluctuations such as 2002. However, few historians or sociologists appear to recognise the breadth of ways in which climate and culture have interacted over many years. Many meteorologists, also, seem unaware of many of the connections between climate and Australian culture. This paper documents a wide cross-section of these connections, and provides a simple categorisation of them.

Introduction

'It is interesting to note that the larger inhabited part of Australia is in those latitudes in the Southern hemisphere which in the Northern produced the great civilisations..., the latitudes between tropical luxuriance and the austerity of the north. As Ford Maddox Ford has pointed out, this belt of culture extends to the far east, along the great trade route, the belt of climate identical with that of the southern half of Australia. It is the climate in which the eye is stimulated and the body is free. When one realises that in the short time of her settlement Australia has produced such a high proportion of painters and musicians, and that she has such a fresh and enthusiastic feeling for the arts, it seems almost certain that she has before her a cultural future of amazing brilliance.' (Boyd (1953), p. 246).

Climate variations, the search for climate understanding, and the desire to dominate climate, have been the catalysts for changes in technology, engineering and economics. Not surprisingly, therefore, climate has also been a major influence on other aspects of Australian culture, and its influence has been recognised by Martin Boyd (see the quote above) and many others. Partridge (1953) even asserted that 'the different climate' had been a factor in the

development of 'the Australian language', noting that 'Climate and physical surroundings have gradually shaped Australian pronunciation into something decidedly *sui generis*, quite distinct even from South African'. The different climate has also led to a different approach to climate terms. Baker (1945) lists several indigenous Australian climate words, including 'The Dry' and 'The Wet' to describe the dry and monsoon seasons. During the 1997/98 El Niño event, the term 'El Niño' became equated to 'drought' in the media (Kestin 2000), so commentators often used 'El Niño' when they meant drought. This appears to have been a uniquely Australian twist. More generally, climate terminology is often used metaphorically in Australia, especially in politics. Thus the following headlines were all used, in political articles, on a single page of *The Australian* newspaper of 17 October 2001: 'Weathering an unseasonal damp'; 'The drought of ideas'; 'Wets freeze up in Howard's way'.

In this paper the various ways climate has connected with culture in Australia are discussed. Many of these connections have been documented elsewhere, but these discussions are spread across many fields. It seems useful to collate descriptions of these connections, to provide an overview of the way in which culture and climate interact (or have interacted) in Australia. The interactions have not been, of course, all one way. As the science historian Richard

Corresponding author address: N. Nicholls, School of Geography and Environmental Science, Building 11, Monash University, Vic. 3800, Australia.

Olsen has pointed out 'Scientific theory itself arises only out of and under the influence of its social and intellectual milieu; that is, it is a product as well as a determinant of culture' (Olsen (1991), p. 3). Similarly, certain aspects of climate theory need to be considered within the contemporary cultural milieu. Although this review of connections covers a wide range of fields, the selection included does tend to reflect the author's interests and biases, in the interests of restricting the manuscript to a reasonable length. The connections are presented in an approximately chronological order. A very broad definition of 'culture' is used here, namely 'the total range of activities and ideas of a group of people' (from the Collins English Dictionary 1979).

Climate and culture connections

The most ancient connection between climate variability and culture in Australia relates the El Niño - Southern Oscillation, the irregular non-annual 'cycle' of floods and droughts that dominates much of the country, to the ancient culture of the indigenous population. The unpredictable and long-lived droughts and wet periods make agriculture difficult, even today. Without modern technology to support the risky agriculture, adoption of a hunter-gatherer culture seems to have been a sensible choice (Nicholls 1989; Diamond 1997). As Diamond notes: 'Nomadism, the hunter-gatherer lifestyle, and minimal investment in shelter and possessions were sensible adaptations to Australia's ENSO-driven resource unpredictability.'

Indigenous accounts of major droughts and floods, now adapted into what seem like mythological stories, can be found. For instance, in a story now adapted for modern children, Tiddalick the frog drank all the water from all the rivers and billabongs, causing a major drought. Finally an eel made the frog laugh and all the waters poured out of his mouth in a great flood (Roennfeldt 1980). The concept of widespread, devastating droughts, followed by widespread flooding, is a realistic depiction of climate variability in a country dominated by the El Niño - Southern Oscillation phenomenon (Nicholls 1991).

The annual cycle was certainly well understood by Aborigines, with numerous examples of detailed calendars available. In the north, the monsoon wind reversals affected the language of the Australian inhabitants. Some of the names for the monsoonal winds were derived from Macassan-Malay words (Jones and Meehan 1997). These words were imported by Macassan sailors on seasonal visits to Arnhem Land to collect sea cucumber, prior to the British colonisation. Some Aboriginal men accompanied the

sailors back to Macassar, returning the following season, thereby demonstrating their understanding of the seasonal monsoonal reversal. The Indigenous Weather Knowledge web site (www.bom.gov.au/iwk) documents much other indigenous knowledge of climate in Australia, and how it relates to human activity and culture.

Those who decided to transport convicts to Australia and to establish a European agrarian-based culture were also interested in the climate. The 1770 House of Commons Committee in its consideration of several possible sites for transportation emphasised that a 'healthy climate' was needed. Botany Bay was selected partly because of its supposedly near-tropical and healthy climate. Little clothing was provided on the First Fleet because of the expectation of a warm climate. The early settlers certainly believed the climate was healthy, and that this affected the culture in many ways. Watkin Tench, stepping ashore at Botany Bay in 1788, and others believed (Nicholls 1997) that the healthy climate was the reason for: 'The great number of births which happened, considering the age, and other circumstances, of many of the mothers. Women, who certainly would never have bred in any other circumstances, here produced as fine children as ever were born.'

For many decades after colonisation there were intense discussions about the nature of the Australian climate. In the 1840s, it was still unclear whether inland Australia was arid. Ludwig Leichhardt, in a letter to the German Professor Heinrich Dove, asserted that the remarkable hot and dry northwesterly winds affecting Sydney were a 'decisive indication of a desert in the interior of the country' (Moyal 1986). In this Leichhardt was at odds with The Rev. W.B. Clarke who concluded that the winds indicated the existence of a salt lake or extensive vegetation in the inland. Leichhardt, in his letter to Dove, asserted that Clarke's 'head is full of vortices and wind-classification, as you may well suppose from his extraordinary deductions'.

The mid-19th century saw a succession of arguments about whether the Australian climate was 'healthy' (Nicholls 1997). Just one of these debates concerned tuberculosis (then known as consumption or phthisis). As early as 1850 Australia was being promoted as having a climate beneficial to consumptives, leading to a 'rush' of consumptives to the colonies. One medical critic of this promotion was expelled from the Medical Society of Victoria for his 'heretical' views. The debate then raged between the medical profession and the Victorian Government Statist, Henry Heylyn Hayter, who used his Victorian Government Year Books to attack the belief that the climate was favourable for the cure of consumption.

The Age newspaper took Hayter's side, but the debate continued until the end of the century. Writers encouraged emigration to the colonies by stressing the quality of the climate: 'What do our struggling thousands gain by emigration to such lands as Australia and New Zealand, and what do they lose? For the foggy uncertain climate of Great Britain they will find one equally healthful and invigorating' (Heatherington 1883).

The more general debate, about whether the Australian climate was healthy, continued until the end of the 19th century. Michael Davitt, quoted in White (1981) believed that the sunnier climate and the outdoor life helped 'explain the vigorous frame, manliness of bearing, and stamp of independence of the average Australia'. On the other hand, Dr Alexander Buttner (also quoted in White (1981)) noted that 'in cases where both the parents are Australian born, the weakening effect of the climate shows itself more and more strikingly with each succeeding generation'.

Thus even before the Australian climate was documented and understood, it was considered a major player in determining the culture. By this time, the Australian annual cycle was well understood, as the anonymous poem 'The land of contrarities' indicates:

"The sun, when you to face him turn ye,
From right to left performs his journey.
The North winds scorch; but when the breeze is
Full from the South, why then it freezes.
Now of what place can such strange tales
Be told with truth, but New South Wales?"

(cited in Clarke (1977)).

Surprisingly, the Australian climate was not seen as a reason to change diet or clothing from what was suitable in England. At the end of the 19th century, Philip Muskett, Senior Resident Medical Officer at Sydney Hospital suggested (obviously in frustration at the inappropriate diet of the times) that: 'Because we had a climate far closer to that of southern Europe, notably Provence in France, we had no business stuffing ourselves with a diet that had been designed for a wet and cold England. We had no need for huge amounts of meat, enormous quantities of fats, as taken in sweet puddings and other heavy desserts. Instead we should switch to a grain and vegetable diet with large quantities of fish and sparing amounts of meat.' (Beckett 1984)

Doctors convinced the population of the necessity to continue the English practice of wearing flannel underwear, to prevent the wearer from catching a chill (Hagger 1979). This practice continued into the 20th century, despite the discomfort from working in the heat in thick flannels.

Climate was, however, going to have a revolution-

ary effect on economics. William Stanley Jevons, later to be famous as the founder of modern, mathematical economics, spent five formative years in Australia in the 1850s and prepared the first comprehensive, scientific description of the Australian climate (Nicholls 1998). He was obsessed with meteorology, and continued this interest when he returned to England. Stigler (1982) points out that Jevons's first empirical work in economics, the preparation of a time series plotting commercial events, was inspired by his interest in meteorology. Jevons even referred to his charts as being for the study of 'commercial storms'. Jevons was fascinated by the 11-year sunspot cycle, and tried, unconvincingly, to relate this cycle, through variations in the Indian monsoon, to business cycles in Europe. Stigler suggests that Jevon's background in meteorology made him susceptible to the apparent associations between sunspots and commerce. This background also made him want to apply quantitative methods to economics: 'It seems necessary, then, that all commercial fluctuations should be investigated according to the same scientific methods with which we are familiar in other complicated sciences such as meteorology' (Jevons 1862). Keynes (1936) says that Jevons 'approached the complex economic facts of the real world, both literally and metaphorically, as a meteorologist'.

About the same time, on the other side of the world, a development in climatology which would have a profound impact on the Australian economy was under way. After an injury forced him from active service, Lieutenant Matthew Maury of the US Navy in 1842 took charge of the Navy's Depot of Charts and Instruments in Washington. While in this office he compiled oceanographic data from old and current ship logs, to prepare charts of winds and currents, 'for the improvement of commerce and navigation' (Maury 1857). His published charts and books were in immediate demand from sailors, and led to a sudden reduction in the duration of voyages. Maury notes that the charts reduced the England-Australia round trip from 250 days to 160 days, saving British commerce an estimated ten million (US) dollars annually (Maury (1857), viii). The commercial importance of this increased understanding of the climate of the globe must have had marked impacts on the Australian colonies.

Other aspects of social structure have been blamed on the climate. The first game of Aussie Rules football took place in 1858. Blainey (1990) suggests that climate explains why Sydney, with its wetter climate at the start of the football season (and thus softer parks) coped better with the 'more physical Rugby game' (p. 84-85) than did Melbourne, where the grounds at the start of the football season are often very hard. Blainey

also notes that 'Australian football in its opening year was also influenced by a very dry winter. The hard playing surface of 1858 probably helped to accelerate a trend away from the severe physical contact of Rugby' (p. 94). Recent work (Orchard et al. 1999) has demonstrated that cruciate ligament injuries in Australian football are more likely in dry conditions. Thus there was a five-fold increase in non-contact anterior cruciate ligament injuries in Melbourne during the El Niño year of 1997.

In the mid-19th century *The Argus* (21 April 1856) used the climate as an argument for the introduction of an eight-hour working day: 'We think eight hours in a climate like this is sufficient for any ordinary man' (cited in Clark (1977), p. 736). *The Bulletin* (8 January 1881) was even willing to blame larrikinism on the climate: 'Under the mild skies of Australia little is needed in the way of house-shelter'. That is, the mildness of the climate did not encourage people to work consistently to pay for quality shelter (cited in Clark (1977), p. 687).

A major advance in communications between Australia and the rest of the world occurred when Charles Todd, the Superintendent of Telegraphs of South Australia, supervised the building of the overland telegraph from Port Augusta to Darwin. The line was completed on 22 August 1872, and the honour fell to Todd to send the first telegraphic message over the line. He tapped out the message: 'We have this day, within two years, completed a line of communications two thousand miles long through the very centre of Australia, until a few years ago a *terra incognita* believed to be a desert.'

Apart from the 'desert' reference, there were other connections with the climate. Todd was also South Australian Government Meteorologist, and used his position as Superintendent of Telegraphs to 'place weather stations in the hands of country postmasters and outlying telegraphists' (Moyal 1986). By 1874, all Overland Telegraph repeater stations provided meteorological observations which were coordinated with observations from the astronomers in other colonies. Todd (1875, quoted in Moyal (1976)) noted that 'stations on the Overland Telegraph are especially serviceable in determining the southerly march of the northwest monsoon, and the rainfall in the interior, which, it is believed, largely influence the seasons in South Australia and Victoria'. In 1877 a severe drought and famine afflicted India, and Henry Blanford, the Imperial Meteorological Reporter to the Government of India, noting that atmospheric pressures had been unusually high over India during the drought, asked his colleagues throughout the Empire for information about pressures in their regions. Todd realised pressures had been high over Australia, and

that Australia had suffered a drought in 1877. He also recognised that previous Australian and Indian droughts had coincided. This relationship, now known as a 'teleconnection', forms part of what we now call the El Niño - Southern Oscillation. The telegraph played an important role in communicating climate data across the globe, increasing the ability of scientists to search for such teleconnections. Todd (1893, quoted in Home and Livingston (1994)) noted that the telegraph was 'to the meteorologist what the telescope is to the astronomer, in extending his field of view over large areas of the earth's surface'.

Todd reported this relationship between Indian and Australian droughts in an article in the *Australasian* on 29 December 1888, in the middle of a severe, El Niño-related drought. Henry Lawson visited the drought-stricken parts of New South Wales that year, and the experience left a lasting impression on him. In the *The Bulletin* of the same date as Todd's article, Lawson published a new poem 'Beaten Back':

'Beaten back in sad dejection,
After years of weary toil
On that burning hot selection
Where the drought has gorged his spoil.'

The severe El Niño-related droughts of the late 19th century prompted a flood of similarly depressing poems. The highly variable climate has prompted a greater emphasis in Australian literature on 'droughts and flooding rains', in comparison with mid-latitude northern hemisphere countries. Japan, for instance, has a poetry form, haiku, focussed on the seasons. A major determinant of whether a poem is a haiku is the use of a season word (*kigo*). In Australia, especially since Lawson, the focus has been on the hard times associated with drought (i.e., deviations from the expected annual cycle), rather than the well-defined seasonal cycle evident in haiku:

'An' half our bullocks perished when the drought
was on the land,
An' the burnin' heat that dazzles as it dances on the
sand;
When the sun-baked clay an' gravel paves for
miles the burnin' creeks,
An' at ev'ry step yer travel there a rottin' carcase
reeks...'

(from *The Song of Old Joe Swallow*, Henry Lawson).

The nature of climate in inland Australia was a major point of contention in the literary debate between Banjo Paterson and Henry Lawson carried out in *The Bulletin* in 1892 (Horgan and Sharkey 1996). Lawson's 'In answer to Banjo and otherwise' was published in *The Bulletin* of 6 August 1892, and illustrates his challenge to bush writers to maintain artistic integrity:

'And the "rise and fall of seasons" suits the rise

and fall of rhyme,
 But we know that western seasons do not run on
 "schedule time",
 For the drought will go on drying while there's
 anything to dry,
 Then it rains until you'd fancy it would bleach the
 "sunny sky" –
 Then it pelters out of reason, for the downpour day
 and night
 Nearly sweeps the population to the Great
 Australian Bight.
 It is up in Northern Queensland that the "seasons"
 do their best,
 But it's doubtful if you ever saw a season in the
 west,
 There are years without an autumn or a winter or a
 spring,
 There are broiling Junes – and summers when it
 rains like anything.'

The severe droughts of the late 1890s and early 20th century probably supported Lawson's bleak view, rather than Paterson's rosier picture. The droughts peaked in 1902. Nellie Melba was, at the time, making a triumphal tour, and she was horrified by the impact of the drought: 'While travelling through Australia by rail,' she said, 'I have seen heartrending proofs of the misery caused by the drought. I have seen with my own eyes the brown, burnt paddocks extending for hundreds of miles, with no vestige of grass left upon them. I have seen starving sheep leaning against the fences too weak to move...I have seen the skeletons of cattle and sheep dotting the paddocks, and the signs of desolation and starvation everywhere. It is simply appalling.' (quoted in *The Argus*, 3 November, 1902).

Melba launched a drought appeal amongst her rich friends in England, but withdrew when she faced bitter criticism at home. The idea that civilised Australia might, like more primitive countries, need to rely on overseas charity, was repugnant to the locals (Keating 1992).

Many of the poems of the 1890s and early 20th century depict settlers struggling with the variable climate. The well-known story of Goyder's Line in the Flinders Ranges illustrates how settlement, the variable climate and politics interacted through Australian history. Goyder had, in 1857, surveyed parts of the Flinders Ranges and estimated the carrying capacities of pastoral runs. He saw the land at a favourable time, and made optimistic estimates. The fees incurred by pastoralists were levied on the basis of the estimated stock-carrying capacity, so when the runs could not support the number of sheep Goyder had estimated, the pastoralists faced ruin, and attacked Goyder. In 1865, in the middle of a devastating drought, Goyder again was sent north to 'lay down as nearly as practi-

cable, the line of demarcation between the portion of the state where rainfall has extended and where the drought prevails'. Goyder used the state of the vegetation to decide where useful rainfall had fallen through the drought. By now he recognised the variability and unreliability of the climate but again he was abused by politicians and settlers, this time for being unduly pessimistic, in the good seasons that followed the 1860s drought. Within a decade, wheat farmers had advanced far north of Goyder's Line, sustained by the belief in 'the rain-making qualities of the plough' (Mincham 1983), only to leave the land as droughts returned in 1888 and through the 1890s.

The 'rain follows the plough' theory was widespread in the late 19th and early 20th century, especially in Australia and the USA. It was not until the dust-bowl 1930s that the theory was put to rest in the USA. In Australia a particular concern was whether forests could ameliorate the climate of the inland. Comments on this topic were included in Australian Year Books right up until 1963, with little change in the text from the early 20th century editions. The advice provided in these articles was that it was a 'debatable question'.

One person whose career was initiated by the frequent droughts of inland Australia was the polar explorer Sir Hubert Wilkins whose achievements are summarised in Swan (1990). He was a lad on his family farm in northern South Australia during the severe droughts around the start of the 20th century, and noted that this experience was one reason why he went on to explore difficult environments. The following description and quote from Wilkins come from a web site devoted to his early life and accomplishments (users.chariot.net.au/~lenshome/ghw/ghw_map_mtbryanmap.htm).

'This land and its hardships shaped Sir Hubert from his very earliest days. "Several times while I was a boy my father was broken by droughts. It seemed that no sooner did we recover from one dry year, pay our debts and begin to prosper, than another merciless drought seared the land once more."

Grierson's biography is equally emphatic - 'During his childhood, a deep impression was made on the young Wilkins by the terrible effects of drought. This was an unprecedented catastrophe.... Ruin faced the farmers - (his father lost) 90,000 sheep.... He reasoned the only possible form of protection against similar occurrences could be given by accurate long-term weather forecasting.'

One of Wilkins' many explorations was the first attempt to reach the North Pole in a submarine. In this 1931 expedition he took Harald Sverdrup, the noted oceanographer, as his Chief Scientist.

A recurring theme in Australian climate theories is

the idea that flooding the inland, by establishing large inland lakes, would lead to a widespread increase in rainfall, and lessen the effect of droughts such as those that affected Wilkins. The best developed of the many schemes of this type was devised by J.J.C. Bradfield in the late 1930s, a time of widespread drought. A review committee was established by the Director of Meteorological Services and reported that there 'appears no clear prospect of the enormous benefits to rainfall and climate envisaged by Dr Bradfield' (Warren 1945). However, there was a minority, dissenting report from one member of the Committee, E.T. Quayle. Quayle, a government meteorologist, had earlier published papers supporting the contention that rainfall is increased to the lee of inland water surfaces, thus providing the scientific underpinning for the Bradfield Scheme. Similar schemes continue to appear at times, despite repeated scientific opinions that such schemes would affect climate only in the immediate surrounds of the water storages. But flooding the inland is less surprising, and worrying, than some other ideas that have been advanced to overcome Australian droughts. Shortly after the first atomic bombs were dropped on Japan the Sun newspaper reported that British meteorologists were discussing 'whether atomic energy may be used for breaking up drought in Australia... They say that atomic bombs fired into the lower layers of the troposphere would affect the weather and cause showers over limited areas.' (*The Sun*, 18 August, 1945, quoted in Keating (1992)).

A similar fate to Goyder's befell Griffith Taylor, the head of the Department of Physical Geography at Sydney University in the 1920s. Taylor wrote books, scientific papers and newspaper articles on the climate of Australia pointing out, *inter alia*, that much of central and northwest Australia was arid desert unsuitable for settlement. This was unpopular, especially with politicians, and he was attacked in the press and parliaments (Powell 1979). Sydney newspapers ran a steady campaign against him – 'arguing that, since Professor Taylor did not seem to like Australia, they wondered why he stayed' (Sanderson 1988). By the end of the 1920s he had left Australia, taking an appointment at the University of Chicago where he continued his illustrious career.

Politicians and bureaucrats were eager to deny the image of Australia as drought-prone, lest this deter immigrants. H.S. Gullett, the Commonwealth Superintendent of Immigration, was quoted as saying: 'Many thousands of Australians go abroad every year on business or pleasure. The Commonwealth Immigration Office appeals to every one of them to embark with the resolve that he will on all possible occasions speak well of Australia. Let none of them speak evil. Such words as "drought"...should be

thrown overboard as the vessels put out to sea.' (*Sydney Morning Herald*, 6 June 1921, cited in Keating (1992)).

At the time, however, many scientists were raising doubts about transplanting European culture into the Australian climate. Francis Ratcliffe, a young English biologist employed in the 1930s to report on the problem of Australian erosion and sand drift, was convinced that the culture imported from Europe was inappropriate to the Australian climate: 'The essential features of white pastoral settlement – a stable home, a circumscribed area of land, and a flock or herd maintained on this land year-in and year-out – are a heritage of life in the reliable kindly climate of Europe. In the drought-risky semi-desert Australian inland they tend to make settlement self-destructive.' (Ratcliffe (1947), p. 323).

Ratcliffe's first impression of Australia was: 'Why misguided humans have attempted to make their homes in it is more than I can comprehend' (quoted by Powell (2001)). Griffith Taylor was convinced that tropical Australia was unsuitable for 'close' settlement, at least by whites: "Referring to U.S.A. it is seen that the line 68°F passes just north of New Orleans and Florida. It will be admitted that these districts are not well suited for continuous out-of-door white labour, or at any rate British labour; and the white Australia policy at present does not favour "dago" immigration from Southern Europe. In Australia this isotherm of 68° passes south of the Tropic of Capricorn, so that one may safely take the latter as the northern limit of the most favourable areas for closer settlement in Australia.' (Taylor (1915), 245-246).

Taylor supported the immigration of Chinese into Australia, believing that they were the one race that seemed able to thrive in both temperate and tropical regions (Oldroyd 1994), and advocated inter-racial marriage. Smith's Weekly, and many other newspapers and politicians, attacked Taylor as a victim of what it derided as the 'recent fad of climatology' (Walker 1998), in an article entitled 'Counsel for the Yellow Streak: Australia's Taylor-made future' (14 July 1923).

It is not surprising, given his interest in climate-culture linkages, that Taylor was drawn into supporting 'climate determinism', a field dominated by Ellsworth Huntington in the early decades of the 20th century. Huntington, in *Civilization and Climate*, asserted (Huntington 1915) that: 'The climate of many countries seems to be one of the great reasons why idleness, dishonesty, immorality, stupidity, and weakness of will prevail. If we can conquer climate, the whole world will become stronger and nobler.'

Huntington again, from the same source: '...when

the great countries of antiquity rose to eminence they enjoyed a climatic stimulus comparable with that existing today where the leading nations now dwell. In other words, wherever civilization has risen to a high level, the climate appears to have possessed the qualities which today are most stimulating.'

Huntington visited Australia in 1923 and concluded that although the general level of civilisation was higher than could be expected on the basis of climate alone (Walker 1998): '...there is no denying that in North Queensland, more than in other parts of Australia, one meets a certain number of people who are either listless, inattentive, and unwilling to do a stroke more work than is necessary, or else are irritable and quick-tempered'.

But this was probably understandable given that (Huntington (1925), p 309): 'In no other equal area is the white man trying to adjust himself to a climate so extreme in three important aspects; namely, its tropical or semitropical quality, its dryness, and its great variability from year to year.'

Women had even more trouble, apparently, coping with the climate, although Huntington (1925, p 346) 'understood' the reasons for their difficulties: 'Perhaps one reason why women in general dislike the [tropical Australian] climate, and why women of the upper classes are especially strong in this dislike, is that women as a rule have less to occupy their minds than have men.'

The argument about whether tropical Australia was suitable for settlement by whites was, in fact, already under way before Taylor got involved. Matthew Macfie, in a paper read to the Australasian Association for the Advancement of Science, in Adelaide in January 1907, asserted that there was little hope of successful European settlement in the tropics (Harloe 1987). These arguments provided the background to the establishment of the Australian Institute of Tropical Medicine, in Townsville. Anton Breinl, its first Director, surveyed wharf labourers in Townsville and found little appreciable difference to indicate that the tropical environment was producing 'measurable changes in the white race' (Harloe 1987). The Institute used a large cabinet to conduct tests of men reacting to hot, moist environments, and reported to Parliament (Breinl 1920) and the medical profession that whites could work and live in the tropics, without physiological damage. This argument was important to avoid arguments against the 'White Australia Policy'. If whites could not live and work in the tropics of Australia, then non-European immigration would need to be allowed, to provide a workforce for developing the north (Kennedy 1990). The conclusion that whites could work in the tropics meant that the racially-based immigration policy could be supported.

By the middle of the 20th century the warmth of

tropical and subtropical climates had become an attraction. 'Follow the Sun. Australian travel posters 1930s-1950s', a National Library of Australia touring exhibition on display through 2001, exhibited many examples of posters using warmth as a lure for tourists to travel north. A 1938 example by Percy Trompf, 'Off to the North for Warmth', had two penguins (with packed suitcases) standing on a map of Queensland. This emphasis on warmth as an attraction for vacations was a major change from the 19th century, when cool places such as the hills, or even Tasmania, were seen as attractive places to avoid the summer heat (Nicholls 1997). Most settlers thought Melbourne or Adelaide too hot at the height of summer, and fear of heat stroke was widespread (probably reasonably so).

More recently, there have been suggestions that a warmer, tropical climate may predispose people to authoritarianism and conservatism. Ray (1982) found that Brisbane residents were more conservative than were Sydney residents, apparently associated with a lower rate of tertiary education, and speculated 'that the enervating effect of a warmer climate makes the motivation and dedication needed for undertaking higher levels of education harder to sustain'.

It is intriguing that though they thought the tropics were uninhabitable by 'whites', race theorists also contended that because the necessities of life were provided in abundance in tropics, this led to the 'ingrained languor and a child-like inability to plan for the future' of 'tropical races' (Walker 1998). Among the criticisms of the tropics was the inevitable 'surexcitation of the sexual organs'. The racist nature of climate determinism, and its link with racial cleansing, led to the role of climate in society or history being played down. Most Australian history texts published since the early 20th century do not even mention the short-term influences of droughts, even on the economy, let alone consider climate as a force that could shape society. It is difficult to find a modern history text with 'drought' or 'climate' even in the index, let alone a discussion of the connection between history and climate events (Blainey and Clark are the notable exceptions). This is a situation not unique to Australia. As Felipe Fernandez-Armesto (2001) said, most accounts of history include 'too much hot air and not enough wind', i.e. play down the role of climate on society and history.

Yet climate's influence has been clear to many people through this period. In November 1944 Russell Drysdale accompanied a special reporter for the *Sydney Morning Herald* to cover the drought that was devastating much of New South Wales. Drysdale's drawings of the drought were published along with the reporter's descriptions. Later Drysdale

painted a series of canvases based on these drawings. These paintings match the reporter's descriptions: 'To drive into this country in a dust storm...is like driving into a lost world. The dust-laden air plays eerie tricks with light. The sky appears leaden, like a snow sky in Europe, or is crossed by great bands of black, red and grey... The sun is entirely obscured, or shows like a wan full moon. Dead trees, a tragic number, loom through the hot murk in a variety of fantastic shapes as though they died in agony beneath the axe or tortured by thirst as the wind blew the soil from their roots... Worse than the skeletons of animals and trees are the skeletons of homes.' (Keith Newman, An artist's journey into Australia's 'lost world', *Sydney Morning Herald*, 16 December 1944, p. 5)

Drysdale's 'The Crucifixion' (1945), and the others in his drought series, caused a political storm (Bonyhady 1997). According to Hal Missingham, the Director of the Art Gallery of New South Wales of the time, the painting represented 'the soil of Australia crucified on the cross of erosion'. The New South Wales Minister for Conservation, W. F. Dunn, argued that exhibition of the painting overseas would create a false impression of the State. There is a consistent theme through Australian history of politicians choosing to ignore (and even to mock) the realities of the climate as diagnosed by scientists or portrayed by artists, whether it be the work of Hayter, Goyder, Taylor or Drysdale.

There had been severe widespread drought in the 1930s and 1940s, and overstocking through these droughts led to considerable degradation and erosion. But the rabbit also contributed, until the heavy and widespread rains and flooding of 1950 led to the successful establishment of myxomatosis (Ratcliffe et al. 1952). Earlier test releases of the disease in semiarid areas had not led to widespread establishment, presumably because these releases had been made during dry conditions. The wet conditions of the 1950 La Niña episode provided ideal breeding conditions for the insects spreading the disease (Nicholls 1991). Thus the climate contributed to the destruction of rabbits, and the rabbit as a way of life. Another of Drysdale's famous paintings, 'The Rabbiters', painted in 1947, shows this way of life, before myxomatosis.

The stark Drysdale paintings contrast with the far rosier depiction of the Australian climate in the 'Golden Summer' paintings of the Heidelberg School late in the 19th century. These, however, were painted in the more benign climate on the outskirts of Melbourne, rather than in western New South Wales where Drysdale had toured (as had Lawson in the late 19th century).

Although climate has been a major theme in literature, and a substantial influence in visual art, it seems to have had less obvious influence on

Australian music, although Percy Grainger thought that he had been influenced by the climate: 'I come from a warm climate. Physically I'm drawn to the Italian tune colours' (quoted in Covell (1967), p. 95). Grainger also thought that the sentimentality of some Australian music, and his own Colonial Song in particular, was climate-influenced: 'Perhaps it is not unnatural that people living more or less lonely in vast virgin countries and struggling against natural and climatic hardships...should run largely to that patiently yearning, inactive sentimental wistfulness that we find so touchingly expressed in much American art' (quoted in Covell (1967), p. 95).

Perhaps the work most obviously climate-related is Sculthorpe's *Sun Music I* which '...proclaims in its title an inescapable factor of the Australian environment; and its concentration on these aspects of sunlight represented by glaring desert and menacing power could hardly have been matched by a composer living in a country where the sun is less in evidence.' (Covell (1967), p. 202).

Covell (1967, p. 208) notes that 'This is music which suggests the irresistible tidal swell of heat and the numbing glare of space and distance'. It is ironic then that the first performance was on a wet night in the Royal Festival Hall, London (Sculthorpe (1999), p. 76).

Artistic and media representations of Australian drought, through at least the past century, have exhibited considerable consistency. Droughts 'are consistently defined as unexpectedly severe in their intensity or duration' (West and Smith 1996). This allows each drought to be represented as a 'super-natural' threat to society, rather than as an aspect of routine climate. Paul Keating was roundly condemned in the early 1990s for saying that drought is a natural recurring phenomenon. Representations of drought often link it to a 'litany of indicators of wider moral anomie and structural collapse: the end of the rural "Australian way of life", farm bankruptcy, rural suicide, domestic violence, massive stock depletion, rural juvenile crime etc.' (West and Smith 1996). Drought then, is portrayed as an alien force against which society must unite. The concept of 'drought' operates 'much like crime to sharpen the collective conscience and remind "upright citizens" of their sociality', highlighting the 'need to reaffirm social morality and solidarity in the face of an unexpected and unprecedented challenge from nature' (West and Smith 1996). Drought, more than other natural disasters, works in this way because droughts are typically long-lived (thereby providing plenty of opportunity to be converted into a 'symbolic enemy') and cover large areas (increasing the likelihood of the disaster being considered as affecting the entire nation).

Drought has been a topic of interest to the com-

munity and to scientists, for a long time. A more recent concern has been climate change and the possibility that this is being caused by an enhanced atmospheric concentration of greenhouse gases. This has brought climate scientists back into the public arena, for the first time since the attacks on Taylor and the various proposals in the mid-20th century (e.g. the Bradfield Scheme) to create large lakes in the inland to ameliorate the climate. Some commentators (Funtowicz and Ravetz 1993; Bray and von Storch 1999; Saloranta 2001) have observed that greenhouse science has become an example of 'postnormal science'. In such situations, the facts are uncertain, values in dispute, stakes high and decisions urgent. This is a reasonable characterisation of the climate change issue, where 'far-reaching societal policies will be decided on the basis of scientific information that is inherently uncertain to an extreme degree' (Funtowicz and Ravetz 1993). As Bray and von Storch (1999) note, '...incompatibility between the state of knowledge and the calls for action suggests that, to some degree at least, scientific advice is a product of both scientific knowledge and normative judgement, suggesting a socioeconomic construction of the climate change issue'. Certainly, the politics of the enhanced greenhouse effect has been as important as the science in recent years (Hamilton 2001). An examination of the history of climate-culture interactions in Australia makes clear, however, that the greenhouse effect issue is just the most recent example of climatology as 'postnormal science'. Public arguments about the influence of climate on health, the 'rain follows the plough' controversy, the Paterson-Lawson debate, and the ameliorating influence of inland lakes all fit the definition of 'postnormal science' – although in eras other than our own.

Conclusions

Although the connections between climate and culture are pervasive, it would seem that it is not simply a case of climate determining culture. The variety of interactions suggests that there are four distinct ways in which climate connects with culture:

1. Climate affects culture (e.g., drought leads to poems entitled 'Drought'; climate variability favours hunter-gathering culture)
2. Climate theories affect culture (e.g., climate 'determinism' can lead to racism; belief that hot climates are unhealthy leads to vacations in the hills; using wind charts to reduce sailing times encourages commerce)
3. Culture affects climate (e.g., urbanisation and

enhanced greenhouse effect lead to local or global warming)

4. Culture affects climate theories (e.g., telegraph allows exchange of climate data, leading to better understanding of climate; existence of computers allows modelling of climate).

The wide variety of these various interactions demonstrates the pervasive nature of the influence of climate on Australian society and culture. It is intriguing, to a climatologist, that despite these clear links between climate and Australian culture most standard descriptions of Australian climate ignore the possible links between climate and the Australian 'way of life'. Perusal of a standard Australian history text, or any sociological text considering the Australian 'character' or society, is unlikely to reveal any entries under 'climate', 'drought', or similar meteorological terms. There are exceptions to this – Geoffrey Blainey is the obvious stand out (e.g., Blainey (2003) devotes eight pages to the interactions between the Australian climate and society). The general lack of recognition of the part the climate has played, and continues to play, in Australian society and history is especially difficult to comprehend in a severe drought year such as 2002, when the media was dominated by articles about all aspects of the climate and its influence on individuals, the economy, politics, and society. This lack of recognition is perhaps understandable given the undue influence that environmental determinism gained during the first half of the 20th century. But to deny any influence of climate on Australian culture and history seems an extreme reaction. Perhaps in the future a more moderate role of climate on Australian society and culture and history, and likewise the role of these on our understanding of the Australian climate, might be more widely recognised. Again, reflecting on this during a severe drought, one wonders if the 2002 drought will produce another Hubert Wilkins, or a new Russell Drysdale, or a second Henry Lawson?

Acknowledgments

Tim Sherratt, Libby Robin and Tom Griffiths inspired me to look more widely at the interaction between climate and culture in Australia, partly by organising a conference on the subject in September 2002. Libby and Mary Voice kindly provided reviews of earlier versions of the manuscript. Ian Coates (National Museum of Australia) showed me the cabinet used to test the effect of the tropical climate on whites, and gave me access to Lorraine Harloe's thesis on Anton Breinl.

References

- Baker, S.J. 1945. *The Australian language*. Angus and Robertson, Sydney, 425 pp.
- Beckett, R. 1984. *Convicted tastes. Food in Australia*. George Allen and Unwin, Sydney.
- Blainey, G. 1990. *A game of our own*. Information Australia, Melbourne, 111 pp.
- Blainey, G. 2003. *Black kettle and full moon: daily life in a vanished Australia*. Penguin, 484 pp.
- Bonyhady, T. 1997. Crucifying the land. *The Republican*, March 28, 1997, p 13.
- Boyd, M. 1953. Their link with Britain. In: *The sunburnt country. Profile of Australia*, I. Bevan (ed.), Collins, London, p 256.
- Bray, D. and von Storch, H. 1999. Climate science: An empirical example of postnormal science. *Bull. Am. Met. Soc.*, 80, 439-55.
- Breiln, A. 1920. Discussion on Tropical Australia. *Commonwealth Parliamentary Papers*, 972.
- Clark, C.M.H. 1977. *Select documents in Australian history 1851-1900*. Angus and Robertson, Sydney, 866 pp.
- Clarke, F.G. 1977. *The land of contrarities. British attitudes to the Australian colonies 1828-1855*. Melbourne University Press, 223 pp.
- Covell, R. 1967. *Australia's music. Themes of a new society*. Sun Books, Melbourne, 356 pp.
- Diamond, J. 1997. *Guns, germs, and steel*. Norton, New York, 480 pp.
- Fernandez-Armesto, F. 2001. *Civilizations: Culture, ambition and the transformation of nature*. Free Press, 416 pp.
- Funtowicz, S. and Ravetz, J. 1993. Science for the post-normal age. *Futures*, September 1993, 739-55.
- Hagger, J. T. 1979. *Australian colonial medicine*. Rigby, Adelaide.
- Hamilton, C. 2001. *Running from the storm. The development of climate change policy in Australia*. UNSW Press, Sydney, 178 pp.
- Harloe, L.J. 1987. White man in tropical Australia: Anton Breiln and the Australian Institute of Tropical medicine. Honours Thesis, Dept of History, James Cook University of North Queensland, 148 pp.
- Heatherington, F.W. 1883. *Useful handbook for intending emigrants*, London. (cited in Clark (1977)).
- Home, R.W. and Livingston, K.T. 1994. Science and technology in the story of Australian Federation: The case of meteorology, 1876-1908. *Historical Records of Australian Science*, 10, 109-27.
- Horgan, M. and Sharkey, M. 1996. Vision Splendid or Sandy Blight? The Paterson-Lawson debate. Pages 66-94 in: *The 1890s*, K. Stewart (ed.), Univ. of Qld. Press, St. Lucia, 379 pp.
- Huntington, E. 1915. *Civilization and climate*, New Haven, Yale University Press, 333 pp.
- Huntington, E. 1925. *West of the Pacific*, Charles Scribner's Sons, New York, 453 pp.
- Jevons, W.S. 1862. "On the study of periodic commercial fluctuations, with five diagrams". Paper read at British Association, Cambridge.
- Jones, R. and Meehan, B. 1997. Balmark wana: big winds of Arnhem Land. In *Windows on meteorology*, E. K. Webb (ed.), CSIRO, Collingwood, 342 pp.
- Keating, J. 1992. *The drought walked through. A history of water shortage in Victoria*. Department of Water Resources, Melbourne, 304 pp.
- Kennedy, D. 1990. The perils of the midday sun: climatic anxieties in the colonial tropics. Pages 118-140 in: *Imperialism and the natural world*, J.M. MacKenzie, ed., Manchester Univ. Press, 216 pp.
- Kestin, T.S. 2000. Variations of Australian climate and extremes. Unpublished PhD Thesis, Monash University, 234 pp.
- Keynes, J.M. 1936. "William Stanley Jevons 1835-1882. A centenary allocation on his life and work as economist and statistician". *J. Royal Statistical Society*, 99, 516-48.
- Maury, M.F. 1857. *The physical geography of the sea*. Sampson Low, London, 370 pp.
- Mincham, H. 1983. *The story of the Flinders Ranges*. Rigby, Adelaide, 3rd ed., 251 pp.
- Moyal, A. 1976. *Scientists in nineteenth century Australia: A documentary history*. Cassell, Stanmore.
- Moyal, A. 1986. 'A bright and savage land': *Scientists in colonial Australia*. Collins.
- Nicholls, N. 1989. How old is ENSO? *Proc. Third Symposium on the Late Quaternary Climatic History of Australasia*, Melbourne University, 28-29 November 1987, T. H. Donnelly & R. J. Wasson (eds.), CSIRO Institute of Natural Resources and Environment, October 1989, pp 42-48.
- Nicholls, N. 1991. The El Niño - Southern Oscillation and Australian vegetation. *Vegetation*, 91, 23-36.
- Nicholls, N. 1997. "A healthy climate". Chapter 15 (pp. 105-117) in: *Windows on Meteorology*, E. K. Webb (ed.), CSIRO, Melbourne, 342 pp.
- Nicholls, N. 1998. William Stanley Jevons and the climate of Australia. *Aust. Met. Mag.*, 47, 285-93.
- Oldroyd, D.R. 1994. Griffith Taylor and his views on race, environment, and settlement, and the peopling of Australia. Pp. 251-274 in: *Useful and curious geological enquiries beyond the world. Pacific-Asia historical themes*, D. F. Branagan and G. H. McNally (eds.), Conference Publications, Springwood.
- Olsen, R. 1991. *Science defied and science defied: The historical significance of science in Western Culture from the early modern age through the early romantic era, ca. 1640 to 1820*. Univ. Calif. Press, Berkeley.
- Orchard, J., Seward, H., McGivern, J. and Hood, S. 1999. Rainfall, evaporation and the risk of non-contact anterior cruciate ligament injury in the Australian Football League. *The Medical J. of Australia*, 170, 304-6.
- Partridge, E. 1953. Their language. In: *The sunburnt country. Profile of Australia*, I. Bevan (ed.), Collins, London, pp 256.
- Powell, J.M. 1979. Thomas Griffith Taylor 1880-1963. *Geographers: bibliographic studies*, 3, 141-53.
- Powell, S. 2001. Francis Ratcliffe's first impressions of Australia. ERAS: School of historical studies on-line journal, http://www.arts.monash.edu.au/eras/edition_1/powell.htm, 17 pp.
- Ratcliffe, F. 1947. *Flying fox and drifting sand*. Angus and Robertson, Sydney, 332 pp.
- Ratcliffe, F.N., Myers, K. Fennessy, B.V. and Calaby, J.H. 1952. Myxomatosis in Australia. *Nature*, 170, 7-11.
- Ray, J.J. 1982. Climate and conservatism in Australia. *Journal of Social Psychology*, 117, 297-8.
- Roennfeldt, R. 1980. *Tiddalick, The frog who caused a flood* (adapted). Melbourne.
- Saloranta, T.M. 2001. Post-normal science and the global climate change issue. *Climatic Change*, 50, 395-404.
- Sanderson, M. 1988. *Griffith Taylor. Antarctic scientist and pioneer geographer*. Carleton University Press, Ottawa, 218 pp.
- Sculthorpe, P. 1999. *Sun Music. Journeys and reflections from a composer's life*. ABC Books, Sydney, 144 pp.
- Stigler, S.M. 1982. Jevons as statistician. *The Manchester School*, 50, 354-65.
- Swan, R.A. 1990. Wilkins, Sir George Hubert. In *Australian Dictionary of Biography Vol. 12* (J. Ritchie, ed.), Melbourne Univ. Press.
- Taylor, G. 1915. *Australia. Physiographic Economic*, Clarendon Press, Oxford, 256 pp.
- Walker, D. 1998. Climate, civilisation and character in Australia, 1880-1940. *Australian cultural history*, 16, 77-95.
- Warren, H.N. 1945. Bradfield Scheme for "Watering the inland". Meteorological aspects. Commonwealth Meteorological Bureau,

Bulletin No. 34, 82 pp.

pp.

West, B. and Smith, P. 1996. Drought, discourse, and Durkheim: a research note. *Australian and New Zealand Journal of Sociology*, 32, 93-102.

White, R. 1981. *Inventing Australia*. Allen and Unwin, Sydney, 205

