

# Crispy roast pork: using Chinese Australasian pig ovens

GORDON GRIMWADE

*Debate over the use of Chinese pig ovens in Australasia has raged for some years. This paper provides a broad overview of oven types in Australia and New Zealand and draws on resources as diverse as the USA and China. The morphological diversity of ovens is considered by reference to the archaeological record and the limited written and oral historical resources. The paper demonstrates the value of a broad-based research strategy when dealing with the relatively recent past and issues of material culture transfer. It provides a detailed description of the roasting process observed at a Chinese New Zealander's property near Auckland, New Zealand including the preparation of the meat, the cooking process and the events for which such preparation might be justified.*

## INTRODUCTION

Stone ovens have been the subject of intense debate in Australia and New Zealand. While the links with Chinese settlements are well established there has been some uncertainty about the actual method of use. Similar ovens are to be found in many cultures around the world. For example, in western China where Turkic cultures have dominated for centuries, they are used for baking bread.

This paper briefly reviews the diversity of Australasian stone ovens and discusses their possible function in the aftermath of witnessing a pig roasting at a property near Riverhead, Auckland, New Zealand. It is noteworthy that there are several anomalies between the archaeological forms and those constructed in more recent times. These are associated with their size, core construction material, and the extent to which the ovens were insulated.

Various Australian writers have described the form, use and construction of nineteenth and early twentieth-century 'pig ovens' (see, for example, Bell 1994, 2002; Comber 1992; Gaughwin 1995; Grimwade 1990, 1993, 2003; McCarthy 1989; Bjornskov 2001; Kaufman & Swift 2003). In New Zealand the issue has been less extensively described in the literature although there is evidence of, mainly twentieth-century, installations in both North and South Islands. In the United States of America Wegars research has indicated the similarly styled ovens are of Italian origin (1991), while Maniery has identified several 'cylindrical cookers' in which pigs were roasted (2001:3).

The major difference between the modern and older oven types is, however, the apparent absence of a significant insulation layer surrounding the actual brick or stone oven in the older examples. Whether or not the outer insulation has been eroded from earlier ovens is conjectural. Bjornskov (2001:130) suggests that those in cooler regions needed more insulation than those in the tropics. That assumption has some merit when one recognises the maximum temperatures for the tropical locations (Pine Creek, NT and Palmer River and Croydon, Queensland exceeds 35 degrees Celsius while those in higher latitudes reach only around 20 degrees Celsius. In winter the sites in southern Australia and New Zealand experience temperatures in the range of 2.3 to 10 degrees Celsius while those in the north range between about 13 and 23 degrees Celsius.

The Australian ovens, from the nineteenth and early twentieth century, are or were of rock, some of which had

mortared joints. An early twentieth-century example at Ashburton, South Island, New Zealand is clay brick with external concrete plastering. The Riverhead oven is externally cuboid using a conical array of firebricks within a concrete casing and soil is used to insulate the void.

Archaeologists involved in oven research generally agree there is no obvious evidence to suggest there would have been such a substantial insulation layer as can now be seen on twentieth-century ovens. However, in north Australia in particular, seasonal heavy rainfall, in excess of 1000 mm per annum, could well wash away any soil or antbed material simply packed over the rock wall as baked clay, therefore making the presence of any insulation layer difficult to establish. More comprehensive archaeological research is needed on this.

## PHYSICAL EVIDENCE

### Distribution

Stone ovens associated with nineteenth and early twentieth-century overseas Chinese occupation sites have been recorded through various parts of Australia; for example: Pine Creek, Northern Territory (Bjornskov 2001; McCarthy 1989); Palmer goldfield, Queensland (Comber 1992; Grimwade 1990, 1993, 2003); Atherton, Queensland (National Trust of

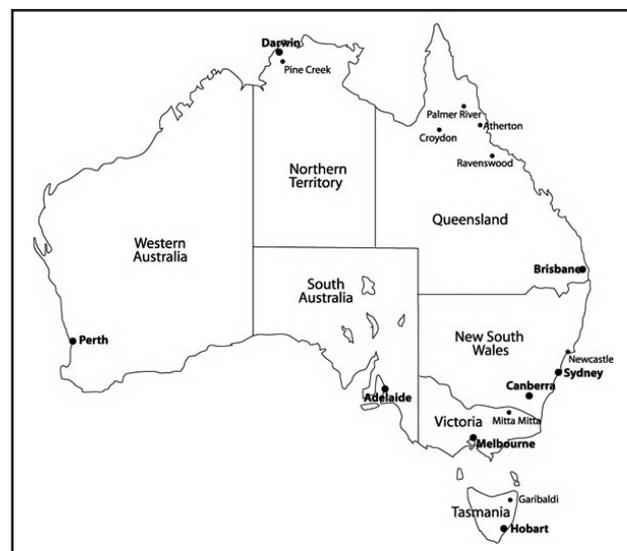


Figure 1: Map showing indicative site distribution in Australia.

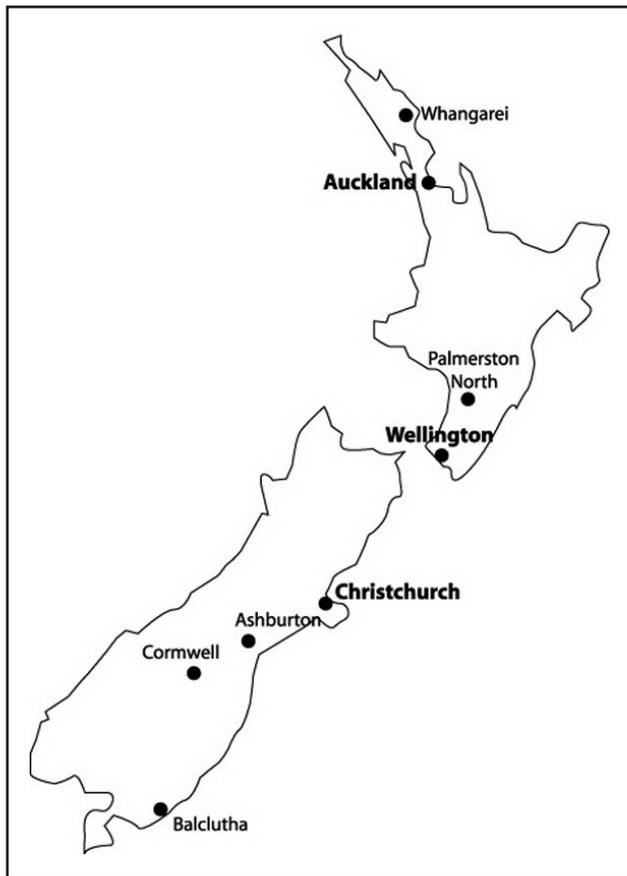


Figure 2: Map showing indicative site distribution in New Zealand.

Queensland c.2001); Croydon, Queensland (Grimwade 2003) and Ravenswood, Queensland; Garibaldi, Northeast Tasmania (Vivian 1985) and on the Jordan and Mitta Mitta goldfields, Victoria (Kaufman & Swift 2003) (Fig. 1).

There are no known New Zealand ovens dating from the nineteenth century (Ritchie 2007, pers. comm.), but those from the twentieth century indicate a technological evolution, which may well have been taking place during an earlier period. In New Zealand's North Island there are at least two twentieth-century ovens in the Auckland area that are operational. Around Palmerston, New Zealand, ovens were in use well into the mid twentieth century (Peter Poy Joe 2000,



Figure 3: The remains of a stone oven on the Palmer goldfield, North Queensland.

pers. comm. quoted in Grimwade 2003). One dating from the mid twentieth century was used at Whangarei for some years (Wong 2007, pers. comm.). In the South Island there is one oven at Ashburton, built in the 1920s, and another of unknown date reported at Balclutha (J. Ng 2007 pers. comm.) (Fig. 2).

It is noteworthy that Ritchie's extensive research in the Cromwell area, New Zealand did not identify any ovens (Ritchie 1986). Similarly, there are relatively few known in Victoria and New South Wales given the large Chinese populations there in the mid nineteenth century. Bell (1994:223) has suggested that ovens are generally associated with later Chinese settlement sites than those in southeast Australia. It is also possible that ovens in mainland southeast and Western Australia may have gone unidentified or that such sites are not documented in the public domain.

The practice of roasting in large wood fired ovens, in Guangdong Province, China, may have been a regional phenomenon. During research, by the writer, in China in 2007 staff of the Office of Overseas Chinese Affairs and archaeologists in Guangzhou were adamant such practices were not traditional. In Zhongshan, however, about 80 km away, there are reliable reports of such ovens being used until relatively recently.

### Morphology

While there are several variations in respect of the form of the nineteenth-century ovens on the Palmer River, Queensland; Pine Creek, Northern Territory; and northeast Tasmania they generally follow similar principles: they are built of rock, are circular, have small vent holes in the base and an access opening at the top. Understandably, many have collapsed over the years. Most appear to be, or have been, in the range of 1.2 to 1.8 m high and up to 2 m in diameter in the case of the Pine Creek examples (Bell 1994:2). Those on the Palmer goldfield (Fig. 3) and at Croydon were probably lower and of much smaller internal diameter. One near the North Palmer River has an internal diameter of 700 mm at its present height of 900 mm high.

The Ravenswood, Queensland oven is possibly from the late nineteenth/early twentieth centuries but more probably from the first decade of the twentieth century, as are those at Atherton and Croydon (both the latter were ramped). The Ashburton, New Zealand, oven is built of mortared clay bricks and is circular with slightly tapering walls. There is a thin, 5 to



Figure 4: The brick oven at Ashburton, New Zealand. The brick platforms either side of the oven are at the top of a small flight of steps. The gantry extends some 4 metres above the oven.



Figure 5: The Atherton oven c.1912, the ramp is evident in the foreground. Photo courtesy: Don and Judy Fitzsimmon.

7 mm thick, concrete plaster on the exterior. Like the Atherton oven it has an overhead gantry to lower the carcass into the oven (Fig. 4). The most recent oven, built in the 1980s near Riverhead, New Zealand, extends out from a 2 m high bank allowing ground level access to lower and raise the pig from the oven. The preparation gantry is about 4 m from the oven.

## HISTORICAL EVIDENCE

Several sources have corroborated the use of these structures as cooking ovens. Peter Poy Joe described how his father cooked pigs in ovens of this nature at their farm in New Zealand. The pig was marinated overnight with a blend of salt, sugar and soy sauce before being placed in a preheated, wood-fired oven (Grimwade 2003: 55).

Bell notes the description, provided to him by Lily Ah Toy, of pig roasting in Darwin in the 1920s as follows:

Lily went to live in Pine Creek in 1936. The oven was there, but disused. It was not used in her time there.

(Ah Toy stated) 'That sort of oven is only built for roasting pigs for special occasions. It is made from stones and lined with clay and lime (*suk foi*) mortar. The two occasions each year when it would be used are the *Chin Min* festival, or Chinese Easter, and *Chit Yep* or lantern festival, the fourteenth day of the seventh month.

The pig would be marinated in garlic, ginger and soy sauce. A fire was lit in the oven to heat it. When it was hot the trussed pig was hung head down by the hind legs from two steel bars across the top of the oven and roasted. A heavy flat cast iron lid was placed on the oven while it was cooking. A tray was put in through the opening at the bottom to catch the fat. The roasting time was a few hours – early morning till dinnertime'.

Her grandfather Moo Yet Fah came out from China in the 1870s. She remembers him cooking pigs in Darwin this way when she was a child aged 8 or 9 in the 1920s. The Lows had a piggery in Darwin where Tuckwell Court is, and they used to cook pigs this way. Later Eddie Kwong's father used to roast pigs for people in his baker's oven. (Bell/AhToy telephone conversation notes: 1993).

Frank Chin described a pig roasting process in Tasmania in an interview with Helen Vivian. He noted the pig was roasted in a 'big cement oven...stone and cement. It was round and about six feet (1.8 m) deep' (Vivian 1985:26). The stove:

would be stacked with wood and they would light that up and get the oven absolutely red hot and they would prepare the pig and clean it and put all the different sauces and one thing and the other, whatever it was and put it all in and lower it into the (oven). They would take all the burning embers out (when) the oven was red hot and they would put (the pig) in on cross bars, the whole pig and of course everything was cleaned out with the sauces and they would put that in the big circular oven and cover it all over with sheets of galvanised iron and then get wet bags to cover it over the whole top to keep the heat in and they would put the pig in and roast it for about two to three hours and then they would take that out and have beautiful roast pig' (Vivian 1985:27).

Heritage Victoria describes a different approach in which: a fire would be lit in the base of the oven and fed from the opening at the base, then large stones would be lowered and allowed to get red hot (sic). A whole pig would be lowered onto the stones and a brass or metal covered (sic) was placed over the opening until the meat was thoroughly cooked (HCV Register 2007:1).



Figure 6: The Riverview oven. Note how it was opportunistically constructed into an existing bank.

Figure 7: The carcass is wired, and the spine opened, to maximise even distribution of heat during the cooking period.



This process appears to be conjectural and the information source is undocumented. Feeding a fire from the base would be a fairly slow process, is inconsistent with other recorded practices and is unlikely to make 'large stones...red hot' and retain sufficient heat to roast a 40 to 50 kg pig. Secondly, large stones lowered onto a fire fed from the vent would probably extinguish the fire. Thirdly, it would require a particularly large oven to contain sufficient rocks as well as a pig. While the dimensions of the Baw Baw shire's oven are unstated the ovens recorded across Australasia are no more than 2 m high and wide (inclusive of wall thickness).

There is a single photograph of two European ladies at the Atherton, Queensland oven taken in about 1910–12. The ramp, a gantry and a galvanised roof are evident from the photograph (Fig. 5).

On the Palmer River many of the ovens recorded there are unlikely to have been capable of roasting a full size carcass. One of the better examples is 900 mm high and has an internal diameter of 700 mm at the top, tapering in from 900 mm wide at ground level. There are numerous rocks on the ground around the oven indicating it may, originally, have been higher: still not high enough to hang a dressed carcass within it. Oral tradition/rumour has it that such ovens were used to 'roast pigs and bake bread'. It is more likely the ovens were used to roast joints of meat suspended from metal rods across the top opening and for baking bread.

Descriptions from the written record are elusive. For example, the Reverend Alexander Don, despite his comprehensive documentation of Chinese lifestyles on the Otago goldfields of South Island, New Zealand makes no references to pork roasting processes, although he frequently observes the importance of pork in the diet of the Chinese goldminers (eg. Ng 1995: 36, 39, 40, 55, 56, 57, 88, 216, 266, 305, 324). Likewise, the Australian written records are scant on this aspect of Chinese culture.

Ng (2007 pers. comm.) recalls an oven in Balclutha, South Island, New Zealand and the use of the Ashburton oven during his childhood. The latter, on a market garden on Allen Road, Ashburton was fired up with discarded wooden fruit boxes. The property, known as 'King Brothers' was 'a large market garden founded and worked by a dozen Ng clan shareholders, plus 6 or more employees, dating from 1921...In the 1950s it worked around 100 acres and had an associated fruit shop and hawking rounds of the Ashburton county' (Ng 2007, pers. comm.). Ng also captions a photograph of a pig being prepared

for roasting at Arrowtown with the note that 'strangely, no pig ovens have been described or excavated on the southern goldfields, but one once existed behind the Sun Young store in Dunedin' (1999:102).

An oven was reportedly constructed at Whangarei, North Island, New Zealand by the Wong family in the mid twentieth century. The design came from the American West Coast lifestyle publication, *Sunset Magazine* (Gilbert Wong 2007, pers. comm.). A recent site visit suggests the present owners have removed it.

Several copies of *Sunset Magazine* (1942, 1943, 1972) contain information on constructing ovens in various forms. In one article there is reference to 'Clyde W. Manley of Ben Lomond, California, first (learning) about outdoor ovens in Hawaii (in about 1917). There the Portuguese on sugar plantations build them and use them for baking bread – particularly their famous sweet bread at Easter time' (*Sunset*

*Magazine* 1942: 16). The same article goes on to describe a ‘Chinese type oven...which may be round or square’ (*Sunset Magazine* 1942: 17). The 1972 publication shows an elaborate tapering cylindrical oven with a seat/step extending around the base area and referred to directly as a ‘Chinese oven’.

### Contemporary oven

Baw Jay, a stonemason, from Sha Xi<sup>1</sup>, Guangdong Province constructed an oven for Ray Chong on his property at Riverhead, New Zealand in about 1985 (Fig. 6). It comprises three core elements:

- A tapered fire brick oven
- A rectangular concrete block retaining wall and concrete top
- An earth filled void to provide insulation.

The firebrick oven was built using firebricks from a local brick factory that was, fortuitously, closing down. The oven has a circular base, about 850 mm diameter, with four courses of bricks laid horizontally but extending vertically above it. On one side is an ash and draft ‘door’ about 300 mm wide and 400 mm high. At about 1 m above ground level the walls start to taper to the stage the top opening is 650 mm wide.

The concrete block wall is about 1500 mm high, although Baw Jay recommends them to be 2000 mm high and wide (Baw Jay 2007, pers. comm.). It is capped with a concrete slab laid over earth backfilled into the space between the firebrick oven and the outer wall. Unlike some older ovens this particular example does not require a ramped approach (to aid in accessing the oven to lower and raise a pig) as it was constructed at the edge of an embankment.

### Associated artefacts

About 3 m from the oven two timber posts, 200 mm diameter and 2.4 m out of the ground, were erected about a metre apart. Between them are rudimentary ‘hooks’ to hold a 25 mm water pipe, from which the pig is suspended during cooking.<sup>2</sup> A variety of stainless steel hooks and fencing wire are used to secure the carcass and to ensure it does not fall or disintegrate during the roasting process (Fig. 7).

A steel plate, (approx. 1000 x 750 x 3 mm) heat buckled from prior use, and lying on the oven top is used to cover the



Figure 8: A misshapen wok is used to catch the fat as the animal is roasted. The added chains enable the wok to be raised and lowered easily.

top vent once the pig is roasting. Other implements used for the roasting include a battered old wok rudimentarily tied with wire and chain, to facilitate it being lowered and raised to the oven floor. It is partially filled with water during the cooking process and catches the fat (Fig. 8). The water prevents the fat from burning and smoking the carcass. A steel pipe ash rake was made from a 3 m length of steel pipe and a flat steel plate 300 x 250 mm (Fig. 10). A piece of timber planking into which several wire staples have been driven through is used to pierce the skin to aid in cooking and releasing the fat (Fig. 9). A sharp butcher’s knife is used to scrape off any residue hair on the skin. A meat cleaver is used to split the backbone and to open the shoulder area to ‘spread’ the meat for an even roasting.

### The pig

The whole, gutted pig carcass is split internally along the spine, the shoulder blade is removed and the fleshier areas incised. This ensures the meat will cook evenly. With the pig laid belly up on a flat board a marinade is poured over the meat and allowed to soak overnight. The marinade is made of a mix of Chinese ‘five spice’, soy sauce and Chinese whisky.<sup>3</sup> This preparatory work takes about an hour for a pig of around 50 kg.

To ready the carcass for cooking a U-shaped, stainless-steel double hook is secured either side of the split spinal column. It extends about a third of the length of the spine. Fencing wire and a timber crosspiece are also secured to the hook to tie in parts that might detach during cooking (Fig. 7).

The back is scraped with a butcher’s knife and struck with the staple ‘spiker’. The former removes some of the remaining hair while the latter pierces the skin to help release the body



Figure 9: The home-made spiking device used to assist with the release of fat.



Figure 10: The ash rake.



Figure 11: The pig is suspended in the preheated oven for cooking. The top is covered with sheet metal and damp cloths.

fats. This, along with a liberal application of salt water, encourages the ever-popular crackling to develop. Some cooks will add cochineal to the water to develop a brighter red colour to the cooked meat (Ray Chong 2007, pers. comm.). This is possibly for good luck, as red is a propitious colour in Chinese culture.

### The fire

A substantial fire is generated before the actual cooking period starts. Personal preference seems to be to build a small fire initially and then add to it within about fifteen minutes (R Chong 2007, pers. comm.). This possibly contributes to a more even heat distribution in the longer term. Others may fire up the oven the day before the roasting is planned (R McKenzie 2007, pers. comm.).

Obviously, the duration of a fire before it reaches the desirable, but unmeasured temperature depends upon the timber itself. In New Zealand old untreated pallet timber was used. Once the oven is considered to be hot enough the fire is allowed to die down. This is about one to one and a half hours after first being ignited. The embers are raked out of the bottom of the oven and the draught vent closed (Fig. 10). Ray Chong did this by placing a thin metal plate over the gap and holding it in position with a heap of wood ash and charcoal.

### The cooking process

At this stage the oven is considered hot enough and the wok, roughly half full of water, is lowered into the bottom of the oven to catch the fat. Two men take the pig, now suspended from its hindquarters on a length of water pipe and lower it into the oven (Fig. 11). Wet rags are laid around the top hole and the sheetmetal plate laid over them to form a rudimentary cover. A tight seal is undesirable, as this retains the moisture and will cause the pig to steam rather than roast (Ray Chong 2007, pers. comm.).

The cooking progress is checked after about half an hour.<sup>4</sup> A 50 kg pig can normally be expected to be ready in about two and a half hours.<sup>5</sup> If the heat is insufficient the pig can be removed, a new fire started and the pig replaced, once the



Figure 12: The cooked pig is removed from the oven after about two hours.

oven has been reheated. The whole process, after marinating for about 24 hours, takes nearly five hours (Table 1).

If chickens are to be cooked concurrently, they are usually added after about half an hour and left to cook for up to three quarters of an hour. When the pig is considered to be fully cooked it is removed (Fig. 12), kept intact and laid on a suitable board from which, after appropriate thanksgiving prayers and offerings of incense, it is carved and eaten.

## CONCLUSION

The opportunity to observe a range of ovens and then to see one in operation, albeit a twentieth-century variant, raises several issues of interest to historical archaeologists. It indicates a significant evolution in the design of the oven between the mid-nineteenth and early twenty-first centuries, although it does little to resolve the question of where the ovens originated; a potentially fruitful field for future researchers. Existing studies indicate ovens of this form were not unique to southeast China, but were widely used in Europe and Asia for many centuries in one form or another.

While mid to late nineteenth-century ovens may have been covered with some form of insulation it was probably of limited extent, a mud or concrete plaster at best. The archaeological evidence is scant in this regard. It is possible the covering was not particularly durable and has been washed away in the intervening years. In the Palmer goldfield, for example, the stone ovens were probably abandoned by the 1880s while the Croydon oven was abandoned by c. 1915. Tropical rainfall can be quite severe in these areas and could, quite conceivably, result in a predominantly mud mortar or plaster being lost from the archaeological record.

By the 1920s brick replaced rock in an example from Ashburton, NZ. In the 1940s the influence of the *Sunset Magazine* plans were starting to alter the design of New Zealand ovens where the Whangarei oven was unashamedly derived from the one illustrated in the *Sunset Magazine* (Gilbert Wong 2007, pers. comm.). Forty years on, insulated surrounds (Riverhead, NZ) were more extensive and possibly marginally reduced cooking times. By the early twenty-first century in southern China pigs were roasted in stainless steel,

**Table 1: The cooking process**

Elapsed total time	Activity	Task duration (hrs)
0	Pig carcass marinated and spine split.	24
24	Small fire ignited in oven base	0.25
24.25	Pig carried to cooking site and hung for final preparation	0.25
24.5	Fire built up	0.1
24.6	Meat is 'spread' to minimize areas of excessive thickness and securely wired to wood and wire hanger	0.5
25.1	Fire checked and additional timber added if required	0.1
25.2	Carcass is scraped with sharp knife to remove hair and spiked to encourage release of fat during cooking	0.25
25.45	Ash from fire is scraped out and draught vent sealed	0.2
25.65	Wok is filled with water and lowered into base of oven	0.1
25.75	Carcass is carried to oven and hung from a pipe suspended across the top opening.	0.25
26	Lid is placed over the top and moist sacks placed loosely around the edges	0.1
26.1	Cooking process before being briefly checked	0.5
26.6	Pork is ready for removal	1.5 to 2
28.1 to 28.6	Top is uncovered and carcass is removed and laid on a large board to facilitate transport	0.1
28.7	Ready to eat	

gas-fired ovens, while at least one Chinese restaurant in New Zealand used a similar unit (Huang 2006, pers. comm; pers. obs. Dunedin, N.Z.).

The ovens recorded in most locations are much smaller than the contemporary oven on which much of this paper is based. Most are, or probably were, around or even less than 1500 mm high, whereas Baw Jay was adamant that a 2 m high oven was necessary to cook a full grown pig. Even allowing for the fact that domestic pigs are possibly larger than those of a century ago this was certainly borne out by the need for such height when the 50 kg pig was lowered into Ray Chong's oven; a pig of that size is about 1500 to 1600 mm long when hung vertically.

Economic considerations may have influenced oven size. Ng (1993:179) notes, for example, pigs sold for around £1 to £5 each in 1872 while sheep were 6 shillings to 16 shillings (20 shillings in a pound) each. With price differences of this magnitude Chinese residents, in New Zealand at least, would have probably been content just to eat an almost symbolic amount of pork at feasts rather than to regularly consume it in large quantities. Smaller ovens would have adequately cooked smaller pigs or joints of a size that most people could afford.

Pig roasting is a highly social activity. The construction of an oven would have involved a small team of men working steadily for several days. The preparation of the carcass is undertaken by at least two people over a total period of upwards of five hours spread over two days (day one preparation of the carcass and day two the cooking). Given the large quantity of meat available after the roasting has been completed and the lack of refrigeration in nineteenth-century villages a 50 kg pig could be expected to feed about 100 people at a single meal. Ng (1995:56) notes Don being told that eight miners considered 26 pounds (13 kg) of pork lasted them three days (a little over 500 gms per day). Pig roasting would, therefore, be associated with a strong social base in a reasonably large community.

Pig ovens were, and remain in some areas, as significant material evidence of transported Chinese culture into Australia and New Zealand. There is evidence to suggest that the oven designs evolved over the decades following their introduction. While modern gas ovens can replicate the cooking process that rare blend of marinade, pork and wood fires produced a unique and popular centrepiece for special celebrations. Crispy roast pork is something to be savoured at leisure.

This study also indicates the value in broadening traditional research bases, where practical, and certainly not least across the Tasman. There are significant and self-evident similarities between the settlement of both Australia and New Zealand and in this instance they extend even further. At a recent conference in Cairns, Queensland a Chinese resident of Papua New Guinea noted the use of similar ovens there.<sup>6</sup>

Clearly, there is significant value in extending research beyond the realms of Australia and New Zealand. Tracing that connectivity and adaptation would be a fascinating topic in international historical archaeology. Comparative studies are more achievable through relatively cheap airfares and ease of access to significant, reliable data via the Internet.

## ACKNOWLEDGEMENTS

My sincere thanks to Mary Low (Cairns), her brothers Jack and Ray Chong (Riverhead, Auckland), Baw Jay (Zhongshan), and Gilbert Wong (Auckland) for their help. Jim and Eva Ng (Dunedin, NZ) not only identified South Island, New Zealand ovens but provided exceptional hospitality during my visit.

Alexy Simmons fortuitously located several elusive copies of relevant *Sunset Magazines*. Peter Bell kindly provided copies of his notes on the topic and his unpublished paper delivered at the ASHA Conference in Townsville 2002. Peter, along with other colleagues made several helpful comments on various drafts of this paper. They include Denise

Gaughwin, Ray Supple, Neville Ritchie, Priscilla Wegars (Moscow, USA), Mary Maniery (Sacramento, USA), Mary Casey and Martin Gibbs. Janet Grimwade prepared the maps. Ivy Liao (journalist/curator, Zhongshan), Raywen McKenzie (film producer, Auckland), the late Henry Chan (historian) and Maureen Martin (field assistant) provided invaluable information and support.

## BIBLIOGRAPHY

- BELL, P. 1993 Notes from telephone interview with Lily Ah Toy of Darwin 25.6.93 1993, copy in author's possession.
- BELL, P. 1994 Chinese ovens on mining settlement sites in Australia, unpublished typescript, copy in author's possession.
- BELL, P. 2002 Chinese ovens revisited: what were they really used for?, paper at Joint ASHA/AIMA/AAA National Conference Land & Sea, Townsville, November 2002.
- BJORNSKOV, M., 2001 'Rock, mortar and traditions: an archaeological study of Chinese 'ovens' in the Northern Territory' in Fredericksen, C., and I. Walters (eds), *Altered states: material culture transformations in the Arafura region*, NT University Press, Darwin, pp 121–147.
- COMBER, J. 1992 Palmer goldfield heritage sites study (stage 2), unpublished report to the Queensland Department of Environment and Heritage.
- GAUGHWIN, D. 1995 'Chinese settlement sites in North East Tasmania: an archaeological view' in Macgregor, P. (ed.) *Histories of the Chinese in Australasia and the South Pacific*, Museum of Chinese History, Melbourne, pp. 230–245.
- GRIMWADE, G. 1990 Palmer goldfield heritage sites study (stage 1), unpublished report to the Queensland Department of Environment and Heritage.
- GRIMWADE, G. 1993 EIS Cultural resources Palmer Goldfield (R16) ML 40050 & Access Road & update on adjacent sites in ML 3054, unpublished report for Jabarol Pty Ltd, Holloways Beach.
- GRIMWADE, G. 2003 'Gold, gardens, temples and feasts: Croydon's Chinese Temple', *Australasian Historical Archaeology* 21: 50–57.
- HERITAGE VICTORIA 2007 HCV Register Entry.
- KAUFMANN, R., & A. SWIFT 2003 Chinese oven and hut Site, Mitta Mitta Goldfield, unpublished assessment notes for Heritage Victoria.
- MAINERY, M. 2001 'Fuel for the fire: Chinese cooking features in California', typescript of paper presented at Society for Historical Archaeology annual meeting, Long Beach, California.
- MCCARTHY, J. 1989 Would-be diggers & old travellers, the Chinese at the Union Reefs and the Twelve Mile in the Northern Territory 1876 – 1910, unpublished report to the National Trust of the Northern Territory.
- NATIONAL TRUST OF QUEENSLAND c.2001 *Hou Wang Temple, Atherton Chinatown, Queensland*, National Trust of Queensland, Brisbane.
- NG, J. 1993 *Windows on a Chinese Past, Vol 1*, Otago Heritage Books, Dunedin.

NG, J. 1995 *Windows on a Chinese Past, Vol 2*, Otago Heritage Books, Dunedin.

NG, J. 1999 *Windows on a Chinese Past, Vol 3*, Otago Heritage Books, Dunedin.

RITCHIE, N. 1986 Archaeology and history of the Chinese in southern New Zealand during the nineteenth century: A study of acculturation, adaptation and change', unpublished PhD thesis, Univ of Otago, Dunedin, NZ.

SUNSET MAGAZINE 1942 'How to build ovens above and below ground', June 1942: 16–17.

SUNSET MAGAZINE 1942 'Hillside oven', January 1943:36–37.

SUNSET MAGAZINE 1972 'Smoke ovens pit barbecues', third printing 1972, pp 38–43.

VIVIAN, H., 1985 Tasmania's Chinese heritage: an historical record of Chinese sites in North East Tasmania, unpublished report for Australian Heritage Commission and Queen Victoria Museum.

WEGARS, P., 1991 'Who's been workin' on the railroad? An examination of and ethnic origins of domed railroad-related sites', *Historical Archaeology* 25:37–65.

## WEB PUBLICATIONS

Tan, C., 'Babe watch', [www.foodfella.com:2007](http://www.foodfella.com:2007)

Marriott, N G. 2000 'Preparation of whole roastling pigs', [www.ext.vt.edu/pubs/foods/458-001](http://www.ext.vt.edu/pubs/foods/458-001) Virginia Polytechnic Institute and State University.

Peake Products, Leicestershire, UK, 'The Hogg Boss Oven' [www.thehoggboss.com](http://www.thehoggboss.com).

## ENDNOTES

- 1 Formerly Loong Dhu and part of the region also known as Shekee, Zhongshan.
- 2 Marriott, N. G. 2000, in his web paper, advocates a shallow oven in which the pig is laid on its side and cooked on charcoal coals. This 'horizontal cooking' position is favoured by many Western pig roasters.
- 3 A website offers a variation on this marinade: 2 teaspoons of maltose, 2 teaspoons red vinegar, 2 teaspoons white vinegar, 1 tablespoon plus 1 teaspoon water, 1 tablespoon plus 1 teaspoon Chinese rice wine, oil for basting (Tan: 2007). As noted earlier in this paper other variations include 'a blend of salt, sugar and soy sauce' (Poy Joe in Grimwade 2003) or 'garlic, ginger and soy sauce' (Ah Toy to Bell 1993 and Chinn to Vivian nd).
- 4 This is consistent with the method described by Peter Poy Joe (Grimwade 2003:56) in which he suggests the process was checked after 'about 45 minutes'.
- 5 The gas fired, stainless steel, horizontal spit roast cooker produced by Peake Products, Leicestershire, UK as the Hogg Boss oven claims to cook a 130 pound (60 kg) pig in 5.5 hours.
- 6 Unnamed delegate to the Second CHINA Inc conference: *Rediscovered Past: China in northern Australia*, February 2008.