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Humans and Volcanoes in Australia and New Guinea.

Peter Bindon ⁽¹⁾ and Jean-Paul Raynal ⁽²⁾ .1

Résumé : Les auteurs examinent la question du volcanisme contemporain de la Préhistoire récente d'Australie et de Nouvelle Guinée par le biais des témoignages conservés par la mémoire aborigène sous la forme de mythes d'acquisition du feu.

FIRST COLONIZATION OF AUSTRALIA

The occupation of greater Australia took place at least 60 KYA and possibly earlier if human burning can be shown to be the cause of increased depositional frequency of ash in some eastern Australian lacustrine deposits dating about 120 KYA (Singh *et al.* 1981). Fires lit by lightning strikes may account for these depositional events, but no satisfactory explanation has been offered for the exponential increase in the frequency of these ash layers after that date. Lightning remains a significant cause of wildfires in Australia and from evolutionary floristic evidence, even in pre-human times has contributed greatly to the structure and composition of the extant Australian floral regimes. The demonstrable isolation for millenia of Australia's flora and fauna from those occurring in adjacent Southeast Asia forms part of the reasoning for a belief that this continent is presumed to have been settled following sea voyages. Carrying fire on sea voyages is not easy, especially as most early watercraft presumably lacked the sophistication of decking and protective deck structures. It follows that Australia's first colonisers must have been able to generate fire independent of lightning strikes, and natural geothermic events. If this were not the case there could be no guarantee that fire could be quickly re-kindled following the completion of a voyage. Access to bush fires ignited by lightning strikes does provide a source of fire for humans to manipulate, and may have been an occasional source of fire for Australian Aborigines. It is obvious that these natural occurrences are unpredictable in frequency and could not be relied upon as a source of fire. Later in this paper we speculate on the more intriguing possible role of volcanoes in mythological representations of the human capture of fire as a resource.

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FIRST OBSERVATIONS OF ABORIGINAL/VOLCANIC ASSOCIATIONS

As early as 1899, Semon wrote:

'In Victoria and in the north there are signs of yet more recent [volcanic] eruptions, for here we find among and under the ashes of volcanoes not only the remains of Pliocene giant marsupials, but also of the dingo, imported into Australia at a much later period by immigration' (1899:240).

Unfortunately it has not been possible to unearth any information about Semon's sources. The reference to the dingo is telling because except for one enigmatic site, the dingo is not known in Australian palaeontological or archaeological sites until about 5000 years before the present and well within the time of human occupation. This placental animal is thought to have arrived about that time along with people who migrated to an already inhabited Australia from a south-east Asian homeland. Although not Asian themselves, it has always been considered that Aboriginal people must have come from that region as it is the closest land mass adjoining the island continent (see for example White and O'Connell 1982). Other later migrations of people from the same source area by-passed mainland Australia although parts of Papua New Guinea, an outlier of greater Australia, were touched by these. Most recently these migrations culminated in the Polynesian colonisation of the islands of the Pacific Ocean.

RECENT STUDIES OF VULCANISM

Volcanic eruptions in greater Australia of an age recent enough to have been observed by Aboriginal people seem to have been either violently eruptive resulting in the deposition of ash sheets or of lesser violence resulting in long flows of lava. The violent eruptive events of this age were confined to Papua New Guinea, western Victoria and South Australia, and the milder eruptive events to north Queensland. We will examine the likelihood of Aborigines witnessing some of these events passing from north to south.

Papua New Guinea.

The archaeological site known as Kosipe lies in the tropical highlands of Papua New Guinea some 2000 m above sea level where stone tools and pieces of charred wood are scattered across a hillside (White *et al.* 1970). Below this is a swamp, several square kilometres in size, in which horticulture was practised. Here a series of drainage channels divide and separate small raised fields on which

various crops were grown. The same drainage channels seem to have been in use at two different times with the two cultivation phases separated by a deposit of volcanic ash.

The artefacts and carbon were stratified within a series of distinctive volcanic ashes that were ejected from Mt. Lamington some 140 km to the south-east. Dates back to 24 KYA years ago have been obtained both from carbon at the site and by stratigraphic correlation of ashes with a series closer to the volcano (White and O'Connell 1982:56). Mt Lamington in east Papua, is still active, and last erupted in 1951 causing considerable damage to property and loss of life. We have been unable to locate any anecdotal or mythical accounts of the vulcanism in this area. Clearly Mt. Lamington's eruptions had considerable damaging impact on human occupation as well as ultimately providing fertile soil for subsequent horticulture.

North Queensland.

The Nulla Geological Province of north Queensland includes five large areas of basaltic rocks dating between the Pliocene and the Recent and covering about 20,000 km². Some 300 vents have been located, mostly too small to have been the source of major eruptive events (Stephenson and Griffin 1976:41). Some of these vents have been the source of long lava flows and the most recent, at Toomba, active some 13 KYA, was probably witnessed in eruption by Aborigines. A tin miner reputedly discovered an edge-ground hatchet head buried by basalts in this area, although we have been unable to trace the full story of this event to date (Kammainga, pers.comm 1995). While five of the eruptive centres in this region exhibit craters, most are heavily eroded and weathered and only the Toomba flow, which lacks a soil cover, retains its pahoehoe surface. The convoluted surface of this flow is of great geological interest, and there are other complex sections of earlier flows exposed around the edges of the more recent flow. The sinuous nature of the last Toomba flow and its evident similarity to a huge serpent following a depression in the surrounding landscape, conjures up visions of the heroic ancestral reptiles which are considered to be creative and formative in Aboriginal mythology. The emergence, progression and final solidification of the lava stream is similarly a creative and formative manifestation. The parallels between the actions of the mythical animal and the natural process are remarkably similar. Are we looking at the origins of a myth in this instance? Sadly the answer to this question is unlikely to be revealed to us although there is some tantalising evidence to suggest that such an interpretation is not too fanciful.

ABORIGINAL MYTHOLOGY AND VULCANISM IN AUSTRALIA

There are few Aboriginal stories describing observations of identifiable geological events, including those which may describe vulcanism. However, as discussed in this paper, there is now ample evidence confirming that they witnessed various kinds of eruptive events. It may be that in our brief survey of the published stories we have failed to identify certain beliefs recorded in myths and legends which make note of volcanic occurrences without mentioning the specifics. Nevertheless, we have identified and retell below a number of myths which seem related to volcanic events. The stories from different parts of Australia recount the surface activities and subterranean travels of heroic ancestral beings who are sometimes human, sometimes animal. Most pertinent perhaps to our examination of volcanic eruption is the huge rainbow serpent, common in mythology through much of Australia. This serpent (or male and female serpents in company), travels beneath the land, and on surfacing often leaves behind a gift of water in the form of a deep permanent pool or rockhole. It is tempting to speculate that the lava flows winding their way along watercourses and valleys were compared by Aboriginal observers to giant snakes, the smaller versions of which they had so often watched. After solidifying and cooling, some of these lava flows revealed tunnels through their interiors which may have held fresh water. It is not too far-fetched to imagine the geological phenomenon giving rise to a myth describing a serpent who provided water. In other parts of Australia where Aboriginal people were seemingly reluctant to enter caves and tunnels it is possible that subterranean serpents, horrifying in their manifestation, belching fire and burning all before them were just too malevolent to be encountered. The geological remnants of such an awesome event may have struck terror into the observers who declined to venture near the now dormant malevolence which they had seen devouring all life in its path.

AN EXPLANATION FOR THE OCCURENCE OF FIRE IN SUBTERRANEAN TUNNELS

Volcanoes are an obvious material source of fire which could be harnessed for human use. Burning vegetation on the edges of lava flows could easily be picked up and carried away to a safer refuge during an eruption. Although we will never discover the absolute origins of the use of fire by Australian Aborigines, it is interesting to speculate on this occurrence. Among the most evocative Australian Aboriginal legends describing the acquisition of fire is the following north Queensland story in which a burrowing animal manages to strike fire with his teeth from the rocks in his tunnel

walls. Perhaps the now hollow lava flows of the region, once rivers of molten lava, gave rise to the notion that in long past times, Aborigines manipulated fire following its production during the eruptive events which later produced the tunnels.

After burrowing reluctantly to extend his home, the Water Rat ‘...backed out of the tunnel in sudden alarm. ‘A strange thing has happened,’ he said. ‘I was gnawing at a root when my teeth slipped and I bit into a stone. There was a flash of light. What do you think could have happened? What could it have been?’

‘Imagination,’ his wife said shortly, thinking it was only an excuse to stop work. It was not imagination, for as he went on with his work, the same thing occurred several times. On each occasion it was when his teeth closed on a stone.

‘It’s a very strange thing about the lights that come and go so quickly,’ he said one night. ‘I can’t understand it. One of the lights fell on my paw today and it was hot. It burnt my fur. I could smell it. I wonder what it is.’ The sparks struck from his teeth had set him thinking. ‘If I could make them last longer instead of dying as soon as they are born, we could light up our burrow and make it warm,’ he told his wife.

He thought about it for a long time. One night he dreamed that the burrow was flooded with light as though the sun was shining inside it, and that bright red and yellow spirits were leaping up from a pile of sticks on the floor. Strangest of all, his wife and children were holding their paws out to the leaping spirits, and steam was rising from their fur. A word came into his mind. It was the word that Water-rats afterwards used for Fire when it raced through the bush and sent them scurrying into their burrows (Reed 1982:199-200).

This story is unique among those told by Aboriginal people which explain the generation of fire by ancestral heroes, who it must be understood could have simultaneous animal and human form. Leaving this complex question of identity aside, there is little evidence in Australia for Aboriginal fire-making using percussion, that is by generating a spark by striking a flint against pyritic rock (Mountford & Berndt, 1941). Anyone familiar with this method of fire-lighting will recognise that there is little chance of fire being produced using stone and tooth struck together. This is not the place to discuss the inadequacy of tooth enamel being used for such a procedure but what might be deduced from this folk tale is that fire became available to Aborigines through some mechanism which produced it underground, and not simply underground but in a tunnel. Could this story contain memories of observations of lava flows?

A STORY ACCOUNTING FOR THE DANGERS ENCOUNTERED IN SUBTERRANEAN WATER-FILLED TUNNELS

Another story series from north Queensland describes the water-filled tunnels and pools which can be found in the now extinct lava flows, and points out the hidden and unseen dangers that lie beneath the surface of these pools.

Hidden in the depths of the pool, two huge crocodiles, the Kurria guardians, felt the unusual turbulence of the water (due to the wives of Baiame swimming in it). Opening their eyes, they saw bubbles and wavelets far above them. Swimming silently upwards, they opened their jaws to their fullest extent, and swallowed the girls whole.... When Baiame learned what they had done, it would be difficult to escape his vengeance. The same thought slowly percolated through their minds. The pool that had been their home was no longer a safe place. Fortunately they knew of a hidden escape route. Near the bottom were two apertures large enough to take even their swollen bodies. One brought water to the pool. It was of no use now, for the stream came from the hills, springing from a tiny rivulet far up on a stony hillside. The other, larger channel led to the Narran River. The crocodiles squeezed through the opening and struggled along the underground stream. Normally they would never have essayed such a dangerous journey. Now it was doubly trying, for their distended bellies scraped against rocks. Bends in the channel had to be negotiated carefully. Twisting their bodies, they eased themselves round the many obstructions. Speed was necessary lest Baiame should surprise them when they were unable to use their tails (Reed 1994: 38-41).

Remarkably, the above story describing subterranean travels of mythical characters, not snakes in this case but crocodiles, also plots the underground route of a lava tube which connects the hillside eruptive vent by way of a previous creek line to the Narran River.

THE CAUSE OF AN ERUPTIVE EVENT

A story from near Cooktown in north Queensland where young scoria cones can be seen, recounts how a giant ancestral being whose name was *Goorialla* was sliced open to set free two brothers whom he had swallowed. Naturally this unexpected surgery awoke the sleeping giant *Goorialla* who in a violent frenzy:

'tore up and scattered the mountainside on which he had lain asleep until disturbed by this assault. He departed eastwards into the sea but returns as shooting stars' (Sutherland 1995: 99).

This myth closely describes an occurrence which can only be a strombolian volcanic event, with ejected bombs featuring as shooting stars in the original mythological narrative of the event.

A STORY ACCOUNTING FOR MAAR STRUCTURES

The volcanic crater lake of Lake Euramoo occupies a maar on the Atherton Tableland in the hinterlands behind Cairns in north Queensland. It dates from about 10 KYA at a time when vegetation in the vicinity as determined from analysis of pollen in lake sediment cores was typical of the Australian sclerophyllous series (Mulvaney, 1975:136). Clearly the Euramoo crater formed during times of Aboriginal occupation, and it too has left us a record of its formation in myth.

A creative and formative ancestral hero, identified as a rainbow snake, was aroused to wrathful ire because of the breaking of tribal laws by newly initiated young men. As the snake could undertake subterranean travels he burrowed down into the earth and violently shook the earth. He generated a cyclonic wind on the earth's surface and caused a huge dust cloud to rise high into the sky. He emerged from the ground leaving a huge crater lake now known as Lake Eacham. Similar behaviour [by this enraged reptile] brought two other similar maar landforms into existence, Lake Barrine and Lake Euramoo (Sutherland, 1995:99).

It is fascinating to see the number of myths which can be correlated with geological events in this area: too many for the parallels to be just chance.

No evidence of vulcanism which might have been seen by Aborigines is forthcoming in New South Wales. Flood suggests that a myth from near Sydney recounting a time when the earth exploded, documents the eruption of Mount Wilson in the Blue Mountains, and demonstrates persistence of observations through long time periods (Flood 1983:113). However, the intrusions into the Permian sediments of the Sydney-Bowen basin, are considered to be of Early Jurassic age (Menzies 1974:503). Thus it is unlikely that in this instance the myth and eruption can be correlated (Brown *et al.*

1968: 263). Just how to account for this story is problematical, but on current geological understanding some explanation other than that of vulcanism must be sought. It is not beyond the bounds of possibility that actual observations of the cataclysmic formation of a similar landscape feature in another region were passed verbally from group to group, eventually being adopted as explanations for the occurrence of similar features in a new far distant region. If this suggestion is accepted, it would not be necessary for Aborigines to have actually witnessed the formation of an eruptive feature in order to be able to describe its occurrence. In Aboriginal cosmology, similar geological features could thus be accounted for without regard for the actual geological dating of the structures.

Victoria and South Australia

In Gippsland, eastern Victoria, are found eroded remnants of the 'Older Volcanics' thought to be Lower Tertiary in age (Ollier 1967: 315). Resulting from continental drift over sub-mantle 'hot spots' these extend along the Gippsland coast and arc off into the Tasman Sea, and although they may again become active their re-emergence is not imminent. It is unlikely that humans witnessed any of these eruptions. In western Victoria and eastern South Australia there is a volcanic province of 'Newer Volcanic Rocks' of mainly Pleistocene and Recent age. The western Victorian eruptive complex of scoria cones, maars and strombolian events at Tower Hill near Warrnambool was generated about 4.3 KYA. Dingo bones and an Aboriginal grinding stone were recovered from beneath tuffs here (Gill 1955 & Brown *et al.* 1968). Other recent eruptive events near Mount Gambier (4.8 KYA) were certainly witnessed by Aborigines, and shells from beneath tuffs near Gnotuk were dated at about 13.7 KYA (Gill 1955). In contrast to the Gippsland events, the western Pleistocene and Recent vulcanicity seems to have abruptly and completely ceased. As Ollier points out the "last eruption probably took place only 5,000 years ago, and yet now there are no fumaroles, no hot springs, no anomalous temperature gradients or seismic effects, in fact nothing to indicate how recently the volcanic activity ceased" (1967:337).

In 1953 Gill observed that "At Mt Gambier in South Australia, implements and hearths have been found beneath the volcanics, and archaeological dating and radiocarbon dating are possible. The eruption at Mount Gambier has now been dated to between 4.3 and 4.6 KYA using plant material embedded in the volcanic deposits (Sutherland, 1995:32). In a number of places in Victoria, too, artefacts have been found beneath volcanic material (Gill 1953). Unfortunately there has been no recent commentary on the interaction of the archaeological and geological events in this region.

STORY EXPLAINING THE ORIGINS OF THE CRATER LAKES OF MOUNT GAMBIER

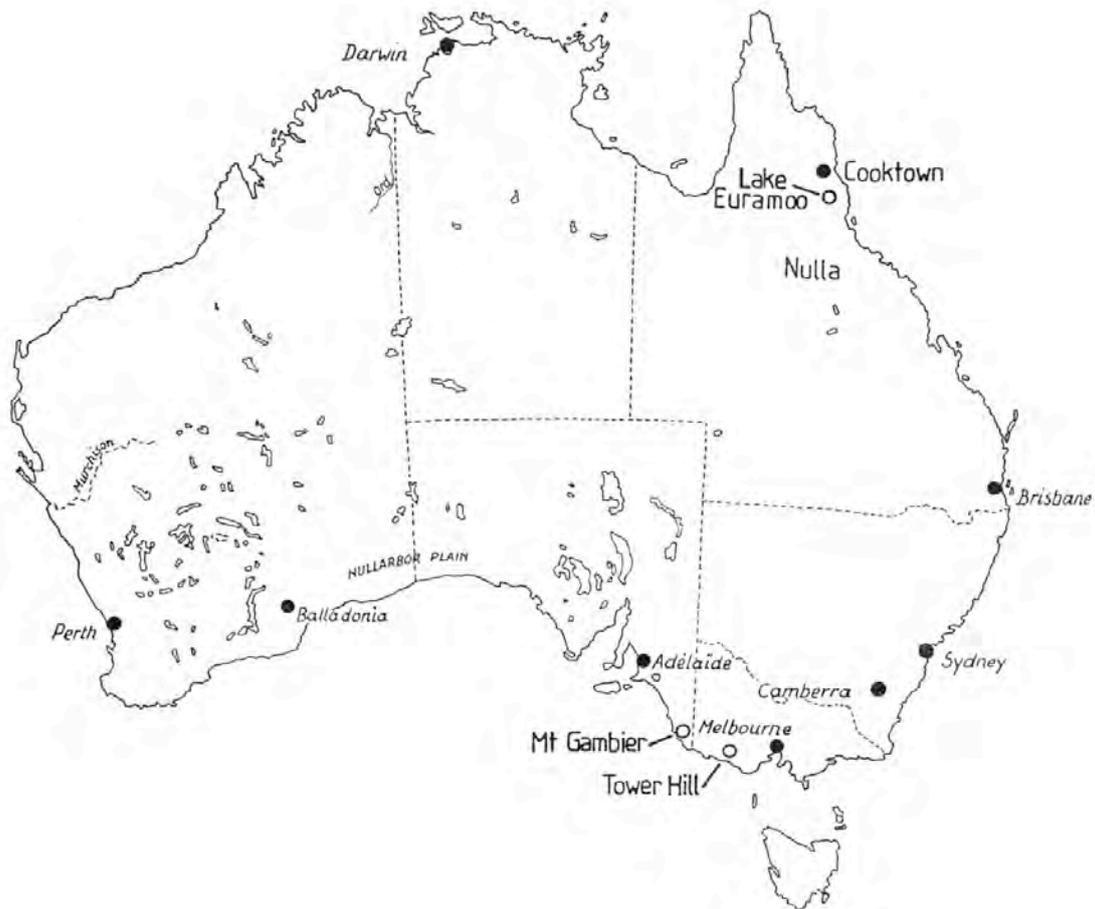
Aboriginal cosmology explains the origins of the Mount Gambier crater lakes from a much different perspective to the well understood geological explanation. According to Aboriginal beliefs a giant heroic ancestor, Craitbul, and his sons created these features. Craitbul's earth ovens are famed tourist destinations now known as the Crater Lakes.

Craitbul and his sons had only one tool, a wooden digging-stick. With this simple tool and their bare hands they dug out their daily food, the underground tubers. They cooked these in earth ovens whose remnants form Mount Muirhead and the scoria cone of Mount Schanck. They spent the time in gathering and cooking their food, or just resting near the oven until the meal was ready. But one night an enemy attacked Craitbul and his sons. He frightened them so badly that they fled to Mount Gambier, where they felt sure that they would be safe.

After digging another oven, the giant and his sons again lived in peace. But one day, without any warning, water bubbled up into the bottom of the cooking oven and put out the fire. Craitbul dug another oven, but the same thing happened again, and yet again, until four ovens had to be deserted. Disgusted by their misfortunes, Craitbul and his sons departed in search of a place where they might dig another oven, but no one knows where they went (Roberts and Mountford, 1971:66).

MORE STUDY OF THE INTERACTION OF ABORIGINAL PEOPLE AND VULCANISM IS REQUIRED

Despite evidence of extensive volcanic activity occurring during the period of human occupation of Australia, the interaction of Aborigines with vulcanism has not been fully explored in Australia. This paper offers some glimpses into the connections between geological events and non-literate records of their occurrence. Perhaps now that new techniques of radiometric dating are widely available more research into this field may follow.



Map of main volcanic localities of Australia cited in text.

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