

A 1788 FRENCH SIGHTING OF EVIDENCE FOR VOLCANISM IN THE SYDNEY BASIN: COLUMNAR SANDSTONE AT LA PEROUSE

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Introduction

This article contains an account of the sighting of columnar sandstone on the Northern shore of Botany Bay by members of the French Lapérouse expedition. This discovery was made some time between 26 January and 26 February 1788 and was described by John Hunter as ‘(in miniature) resembling the Giants Causeway in the north of Ireland’ (see below). The surprise identification of this overlooked feature some two hundred and twenty years later by local residents,¹ one of whom is also a co-author of this paper (CA), prompted its description and scientific discussion by its senior author (PCR).

Contacts between officers of the First Fleet and the Lapérouse expedition

The ships of the French expedition were first seen near the Botany Bay Heads on 24 January 1788 but inclement weather prevented them from entering the Bay until two days later. The vessels ‘*Bussole* [sic] and *Astrolabe*, [...] commanded by Mons. de La Perouse’ (Hunter 1968, 44, or SETIS, Chapter II) moored at Botany Bay on 26 February, the very day the First Fleet was completing its move from Botany Bay to Port Jackson.²

¹ The senior author (PCR) is particularly grateful to Lynda Newnam for bringing these columnar sandstone outcrops to his attention.

² The misspelling *Bussole* for *Boussole* was not uncommon in contemporary English accounts of the expedition. ‘M. de la Perouse’, however, was one of several accepted spellings of the French captain’s name, even though in this article we will use the alternative French form ‘Lapérouse’ in a single word, consistent with the captain’s

The contacts between the First Fleet and the French visitors during the Lapérouse expedition's six-week stay at Botany Bay between 26 January and 10 March 1788 have been thoroughly documented by Alec Protos (Protos 1988, 2000). There were a number of shorter visits between the two groups, both at Sydney Cove and at Botany Bay, but Lieutenants Philip Gidley King and William Dawes, two French-speaking officers of the First Fleet, spent a night on Lapérouse's *Boussole* from Friday 1 to Saturday 2 February 1788 (King 1980, 37-40 or SETIS, Chapter XI), and Captain John Hunter 'with a few other officers' spent two nights on the same French ship, from Tuesday 26 to Thursday 28 February (Hunter 1968, 76, or SETIS, Chapter III).

Such leisurely visits obviously allowed for closer, and more informal, acquaintance between the British and French officers. The first of these visits gave Lieutenant Dawes the opportunity to make the acquaintance of the French astronomer Joseph Lepaute Dagelet and to explore together their common scientific interests. A substantial letter by Dagelet to Dawes followed on 3 March (Morrison & Barko 2009).

The second double overnight visit has so far received less scholarly attention. Although Captain John Hunter had been commissioned by Commodore Phillip to welcome the French on their arrival at Botany Bay on 26 January, he did not do so in person. Indeed he had no direct contact with Lapérouse and his officers on that day, when he was in the process of leading the remaining British ships out of Botany Bay to Port Jackson. This failure to engage personally with the French on 26 January might explain his wish to make contact with them a month later, before their departure from these shores. Bradley recorded that 'Cap Hunter went to Botany Bay in the Longboat to visit the French Officers' (Bradley 1969, 86, or SETIS, 26 February 1788). Hunter stated in his journal:

as the two French ships already spoken of were preparing to leave this coast, I determined to visit Monsieur de la Perouse before he should depart; I accordingly, with a few other officers, sailed round to Botany Bay, in the *Sirius's* long-boat.

(Hunter 1968, 76, or SETIS, Chapter III)

signature, and reserve the spelling 'La Perouse' to the area thus named by the New South Wales Geographical Names Board.

But who were the other officers? No names are given. In a letter to his ‘beloved Alicia’ on 25 February 1788 2nd Lieutenant Ralph Clark complained that after not being able to take off his clothes for forty-eight hours he now had to take ‘Poulton’s guard who was going to Botany Bay’ (Clark 1981, 101, or SETIS, 101). That gives us at least one name: 1st Lieutenant John Poulton was in John Hunter’s party.

On Thursday 28 February, according to Hunter’s journal,

When I took my leave, the weather proved too stormy to be able to get along the coast in an open boat; I therefore left the long-boat on board the *Bussole*, took my gun, and, with another officer and two seamen, travelled through the woods and swamps, of which there were many in our route.

(Hunter 1968, 76, or SETIS, Chapter III)

Can we assume that the other officer was Poulton? Possibly, but not necessarily if, as Hunter stated, there were a ‘few other officers’ with him.

William Bradley’s account of Hunter’s return trip is slightly different: ‘The weather was such that our Boat could not get out of Botany Bay, Captain Hunter walked over with some of the French Officers’ (Bradley 1969, 86, or SETIS, 28 February 1788). Bradley’s representation of the return trip might be due to his misreading of Hunter’s journal (published in 1793), where he refers to his ‘walking on shore with the officers of the French ships at Botany-Bay’ (see below). It should be noted that Bradley was not an eye-witness.

According to Bradley, the longboat’s return journey occurred on Saturday 1 March: ‘The Long boat returned from Botany Bay, the French Ships had launch’d their Boats which they had built in lieu of those destroyed at Navigators Isles & proposed sailing in a few days’ (Bradley 1969, 87, or SETIS, 1 March 1788). We will probably never know who was left behind by Hunter to sail or row back to Sydney Cove on the *Sirius*’s longboat.

Hunter’s account of his stay on board the *Boussole* gives us a glimpse of the friendly, casual interaction between the officers of the First Fleet and those of the Lapourouse expedition:

We staid two days on board the *Bussole*, and were most hospitably and politely entertained, and very much pressed to pass a longer time with them [...].

(Hunter 1968, 76, or SETIS, Chapter III)

Did they communicate in French or in English?³ French was the international language of the eighteenth century, just as English is today, but while we know that both King and Dawes spoke French well, there appears to be no archival evidence that Hunter was proficient in the language. However that may be, it was during one of their relaxed and informal strolls that the French officers showed Hunter a geological phenomenon that they thought was worthy of his attention. In his journal, Hunter recorded:

Whilst walking on shore with officers of the French ships at Botany-Bay, I was shewn by them a little mount upon the north shore, which they had discovered, and thought a curiosity; it was quite rocky on the top, the stones were all standing perpendicularly on their ends, and were in long, but narrow pieces; some of three, four or five sides, exactly (in miniature) resembling the Giants Causeway in the north of Ireland.

(Hunter 1968, 76, or SETIS, Chapter III)

That is a classic description of columnar or prismatic sandstone that is caused by conducted heat and superheated steam when a volcanic intrusion occurs.

No date was given for Hunter's walk with the French officers but it was probably on Wednesday 27 February 1788. It is believed that by 10 March, the date of the departure of the expedition, some of these blocks of columnar sandstone had been loaded onto the *Boussole*. The choice of the *Boussole* is probably not unrelated to the fact that the surviving scientist, the Abbé Mongez,⁴ sailed on this vessel.

³ See John Dunmore's essay on Anglo-French contacts in 1788 in this same issue.

⁴ Such a discovery would have been promptly reported to the scientists of the expedition interested in geological features, the Abbé Mongez (on the *Boussole*) and Father Receveur (on the *Astrolabe*), but Father Receveur died at Botany Bay on 17 February 1788, three weeks after the arrival of the expedition. Another scientist, the Chevalier de Lamanon, who had been killed in the Tutuila (Navigator Islands) massacre in December 1787, worked in partnership with the Abbé Mongez (both on the

Almost two centuries later, during the 1981, 1986 and subsequent underwater excavation campaigns at Vanikoro Reef (Solomon Islands), blocks of columnar sandstone were found on the site of the wreck of the *Boussole*, and some were retrieved and stored at the Noumea Maritime Museum [Figure 1].⁵ Tests carried out by the Noumea Public Works Laboratory in 2003 suggest that these specimens came from Botany Bay, the only location on the route that Lapérouse took where that comparatively rare feature exists.



Figure 1 Columnar sandstone specimens from the wreck of the *Boussole* at Vanikoro Musée de l'histoire maritime de la Nouvelle-Calédonie, Noumea (Photo Véronique Proner)

Boussole). Lamanon listed the ‘analysis of stones and water’ as one of Mongez’s areas of expertise, and geology as one of his (Milet-Mureau 1797, IV, 246–247). Although as an editor of the Paris *Journal de physique*, one of the most influential scientific journals of the time, Jean-André Mongez was bound to be aware of the contemporary debates on the igneous origin of stony substances, we will never know whether he made the connection between the Botany Bay phenomenon of columnar sandstone and volcanism.

⁵ Musée de l'histoire maritime de la Nouvelle-Calédonie, Noumea. See also Association Salomon 2008, p. 105, and personal communications from the Association Salomon, Noumea (Alain Conan, Véronique Proner and Pierre Larue).

The columnar sandstone

This feature can still be seen on a high point outside of, and to the east of, 1589 Anzac Parade at La Perouse (Lat, Long. -33.987127, 151.233822 [Figure 2], although this outcrop is not as impressive as that described by Hunter.



Figure 2 Columnar Sandstone at La Perouse, opposite 1589 Anzac Parade, 2009

An example of this sandstone was displayed in Paris in 1854 (Norrie 1855) but no other description of the columnar sandstone at La Perouse has been found prior to the brief account in 1865 by Clarke (1865, 294 & 302). In 1866 Professor M.D. Smith donated to the Australian Museum a ‘piece of columnar sandstone from the neighbourhood of La Perouse’s monument’ (Anonymous 1866) and in the following year that was exhibited in Paris as ‘prismatic sandstone from Botany Bay’ (Anonymous 1867, col. 5) although Dr John Smith (1867) expressed the location more specifically as ‘Prismatic sandstone—from near La Pérouse’s Monument, Botany Bay’ and Keene (1867, 82, Compartment 3, Sp. B5, B6) supplied two specimens of ‘Columnar sandstone from a quarry near La Pérouse’s Monument, also to be found in two or three other localities near Sydney’. ‘Botany Heads’ was named as the source of a specimen that was displayed in 1875 in Sydney (Anonymous 1875, 6) prior to being sent to the International Exposition at Philadelphia of 1876 (New South Wales Commission, 1876, 18, Sp. 558) and also when it was shown at the Paris Universal Exhibition of 1878 (New South Wales Commission 1878, Class 43, 14, Sp.178). However when sent to the Melbourne International Exhibition the sample was labelled by the Department of Mines with the inaccurate location ‘Columnar

Sandstone (Hawkesbury Series), Botany' (New South Wales Commission, 1880, 70, Sp. 598).

Although not common in the Sydney Basin, columnar sandstone is not a rarity, for other occurrences have been recorded subsequently (Rickwood 1985, 227–229). During twentieth century building work columnar sandstone was also exposed, briefly, near the back door of n° 1587 Anzac Parade, Lat, Long. $-33^{\circ} 59' 12.696''$, $151^{\circ} 14' 1.0782''$.⁶ At both this site, and that shown in Figure 2, the sandstone is columnar but neither as robust nor as indurated as it is on the northern side of the dyke.

There is probably no single mechanism of formation of columnar sandstone but heat is required (Rickwood 1985, 225–227). Molten igneous rock can be the direct cause of this baking of sandstone, either by being injected into a nearby sub-vertical narrow fissure to create a dyke (Curran 1899, 257–258), but more often it is the greater heat capacity of an adjacent carrot-shaped diatreme, or volcanic neck, as it is sometimes called. Superheated groundwater may transmit the heat some distance from the source as has been well established at North Bondi (Goldbery & Fishburn 1964), but no diatreme has ever been recorded at La Perouse and Clarke explicitly stated that he could not find a dyke (Clarke 1865, 302). However, in 1902 Waterhouse was the first to draw on a map (Waterhouse 1902) a dyke at La Perouse [Figure 3].

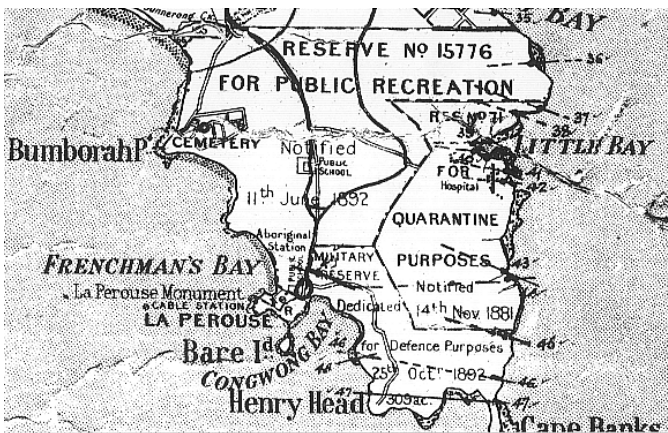


Figure 3 Part of the map of igneous dykes by G.A. Waterhouse 1902

⁶ N° 1587 Anzac Parade, La Perouse, is the home of one of the co-authors of this article, Charles Abela, and n° 1589 is also in the family.

It was not numbered but it does align with, and may be an extension of, n° 45 on the coast (now St Michael's Golf Course) and may be an extension of that.



Figure 4 A weathered igneous dyke in a trench
outside of 1585 & 1587 Anzac Parade, La Perouse – 29 March 2010

That dyke was copied onto several later maps, yet no subsequent confirmed sighting of it occurred until 29 March 2010 when it was intersected between 1585 and 1587 Anzac Parade in a trench that was dug by Energy Australia on the western side of Anzac Parade [Figure 4].

Initially, the fissure in the sandstone would have been filled with basaltic magma that was injected under pressure and which on cooling solidified as basalt. As with most dykes in the Sydney Basin, this one has been highly altered by circulating groundwater and what is left near the ground surface is clay, at the sides grey mottled orange-brown due to iron staining but white in the middle, the colour being largely due to residual anatase—titanium dioxide. It is about three metres wide but from this small exposure it is not possible to give a reliable direction for the trend of the dyke: however it is much as Waterhouse drew it—roughly east to west—and seemed to be heading to the

south side of 1585 Anzac Parade. Locations along the predicted trend of the dyke could prove to be problematic to builders for the dyke clay has much less strength than the sandstone. The dyke clay becomes more robust at depth and sometimes residual outlines of crystals from the original basalt are preserved in the clays, but alteration of igneous dykes extends to depths of many tens of metres in the Sydney Basin.

Most of the sandstone exposed near the dyke is iron stained purple-brown in colour; on the northern side of the dyke it is indurated and although not columnar it is more robust than that shown in Figure 2 and also that seen near the back door of n° 1587 Anzac Parade. The main location where it has been converted to columns is 32 m from the predicted southern side of the dyke and the sandstone has been bleached [Figure 2]; the distance to the columns is too great for heat to have come directly from the dyke, so the groundwater would, most probably, have been the medium to transport the heat—as explained above. The bleaching indicates that the iron has been removed by groundwater and that process happens more readily when the water is superheated.

Conclusion

For a long time the area known as La Perouse has been occupied by Aborigines: it is therefore highly probable that they were aware of the columnar sandstone before Europeans arrived—but, so far as is known, they did not relate that to the new arrivals and they certainly did not leave a visual record of that feature. Hence, the sighting by the French of the columnar sandstone at La Perouse was a significant geological discovery and its description by Hunter was the first account of material in the Sydney Basin, and almost certainly anywhere in Australia,⁷ from which volcanism can be inferred to have occurred, albeit apparently not recognised as such by Hunter's party. After being essentially ignored for over two centuries, Hunter's narrative and the phenomenon it describes are discussed here for the very first time.

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⁷ The perusal of contemporary accounts, including the journals of the First Fleeters and other early explorers and visitors, has revealed no prior mention of volcanic phenomena in Australia.

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