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A small cave in a basalt dyke, Mt. Fyans, Victoria, Australia

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Abstract

A small but unusual cave has formed within a large dyke that intrudes a scoria cone at the summit of Mount Fyans, western Victoria. Draining of a still-liquid area, after most of the dyke had solidified, left an open cavity. Features within the cave mimic those of conventional lava caves, and suggest that the lava levels oscillated within the cave. Some smaller fingers of lava that intruded the scoria also have hollow, drained, cores.

Keywords: pseudokarst, volcanic caves, dyke.

The Volcano

Mount Fyans is a volcano within the Western District Province of western Victoria, Australia (Figure1. Price & others, 2003, Joyce & Webb, 2003). The age of the province dates back at least 5 million years, but Mount Fyans is a relatively youthful eruption, undated, but possibly less than 500,000 years old – judging by the well preserved "stony rises" (remnants of the original hummocky lava surface) and minimum soil development (Joyce, 1998; MacInnes, 1985). The volcano is a broad gently-sloping shield of basaltic lava with a low scoria cone at the summit and possibly once had a small crater – though an extensive quarry in the scoria makes the original form difficult to deduce!

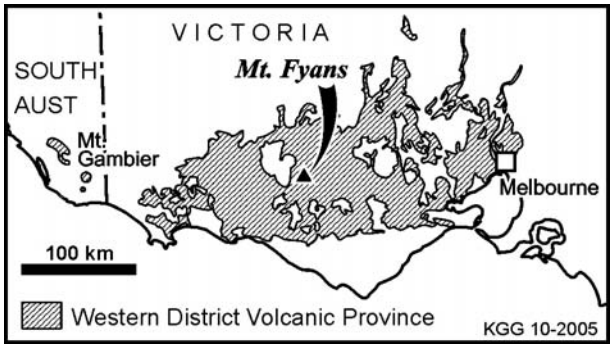

Figure 1: Location of Mt Fyans within the Western District Volcanic Province of Victoria, Australia.

The scoria at the summit has a thin cap of basaltic lava, and ropy patterns on the underside of this are well-exposed on the southern margin of the quarry. The loose scoria has been intruded by two large basalt dykes up to 12 m across (which would have fed the lava cap) and a number of smaller pipe or finger-like basalt bodies, some of which have been partly drained to leave small cavities. Figure 2 is a view of the quarry and the main

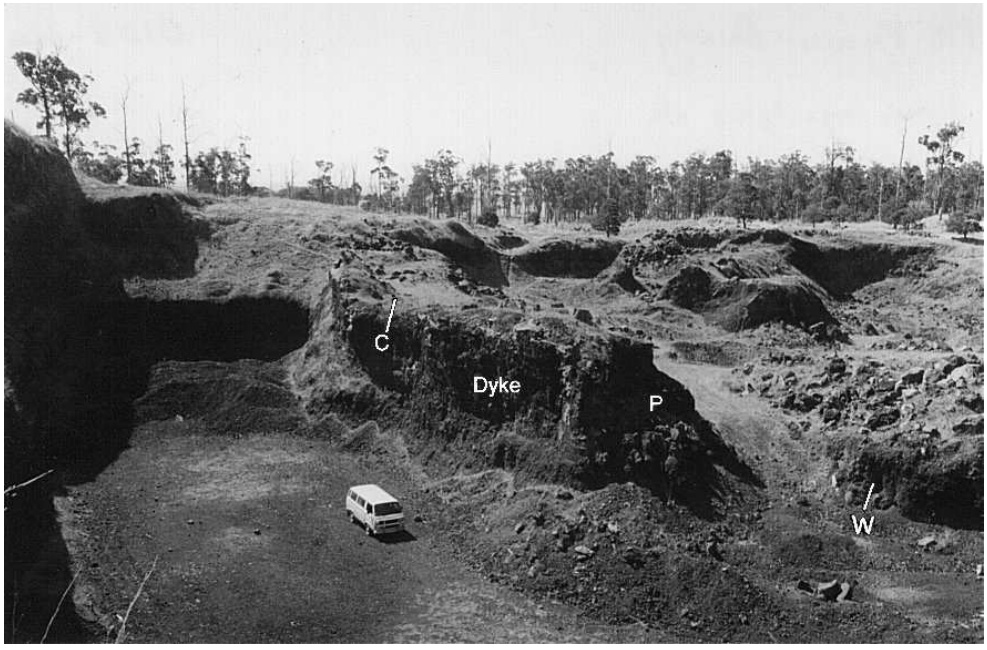

Figure 2: View of Mt. Fyans Quarry, looking north towards the large dyke. C = cave, P = pipe, W = witch's hats.

dyke. An inset map in Figure 3 shows the location of the various features described here. The quarry operations have worked around the large dykes, but damaged the smaller intrusive features (which is how we know they are hollow!). Minor quarrying activity appears to be continuing.

Mount Fyans Cave, 3H-105

A small horizontal cave occurs within the largest dyke. It lies close to the west edge of the dyke and runs parallel to the dyke wall (Figure 3). Entry is via a small hole broken into the roof by the quarry operation. The cave is about 17 m long and generally less than one metre high. The roof and walls have numerous lava drips (Figure 4). The floor is a horizontal ropy pahoehoe surface which rises gently towards the northern end – but the ropy structures suggest a final flow direction from south to north. The drainage points for the lava are not obvious; but there is a very small hole in the floor at the southern end. Both roof and floor have common patches of pale-cream coatings over the basalt – possibly fumerolic alteration? There are well-developed rolled benches (10 cm diameter) along the edges of the floor (Figure 5). These suggest that the lava rose and fell within the cavity at least once after its initial draining. One small hole in the ceiling, near the entrance, opened into broken scoriaceous material.

Related features

As well as the cave, the main dyke also has a drained hollow vertical pipe at its southern end – this has been broken into by the quarry operation and we found the upper part lying on its side 20 m to the NE (see inset map, Figure 3). This pipe had spatter and dribble patterns on its inside walls (Figure 6). Elsewhere in the quarry there are intrusive pipes and smaller fingers of basalt that have pushed up through the loose scoria. Several of these have drained back after the outside had solidified so as to leave a hollow core, some with lava drips. Probably the most distinctive are conical "witch's hat" structures (Figure 7).

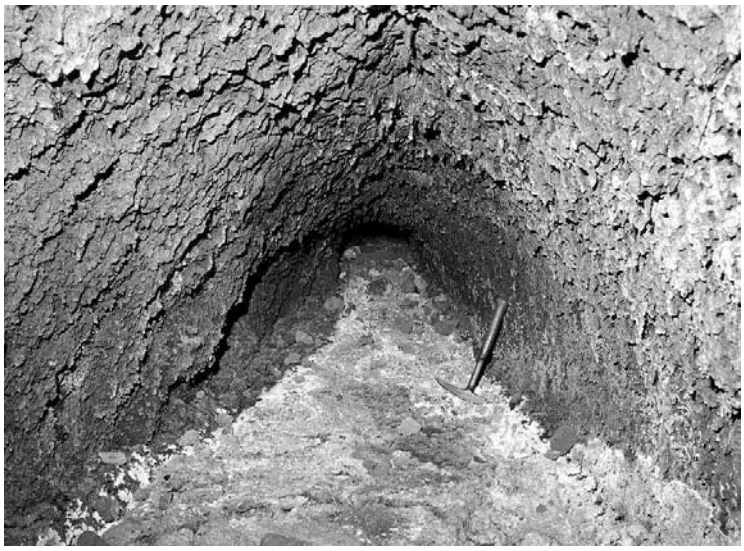

Figure 4: View looking north from the cave entrance.

Figure 5: Looking south from section X4. Note the small rolled bench against the foot of the wall and the pale patches on the wall. Notebook is 18 cm long.

Figure 6: Spatter and drips in a vertical pipe.

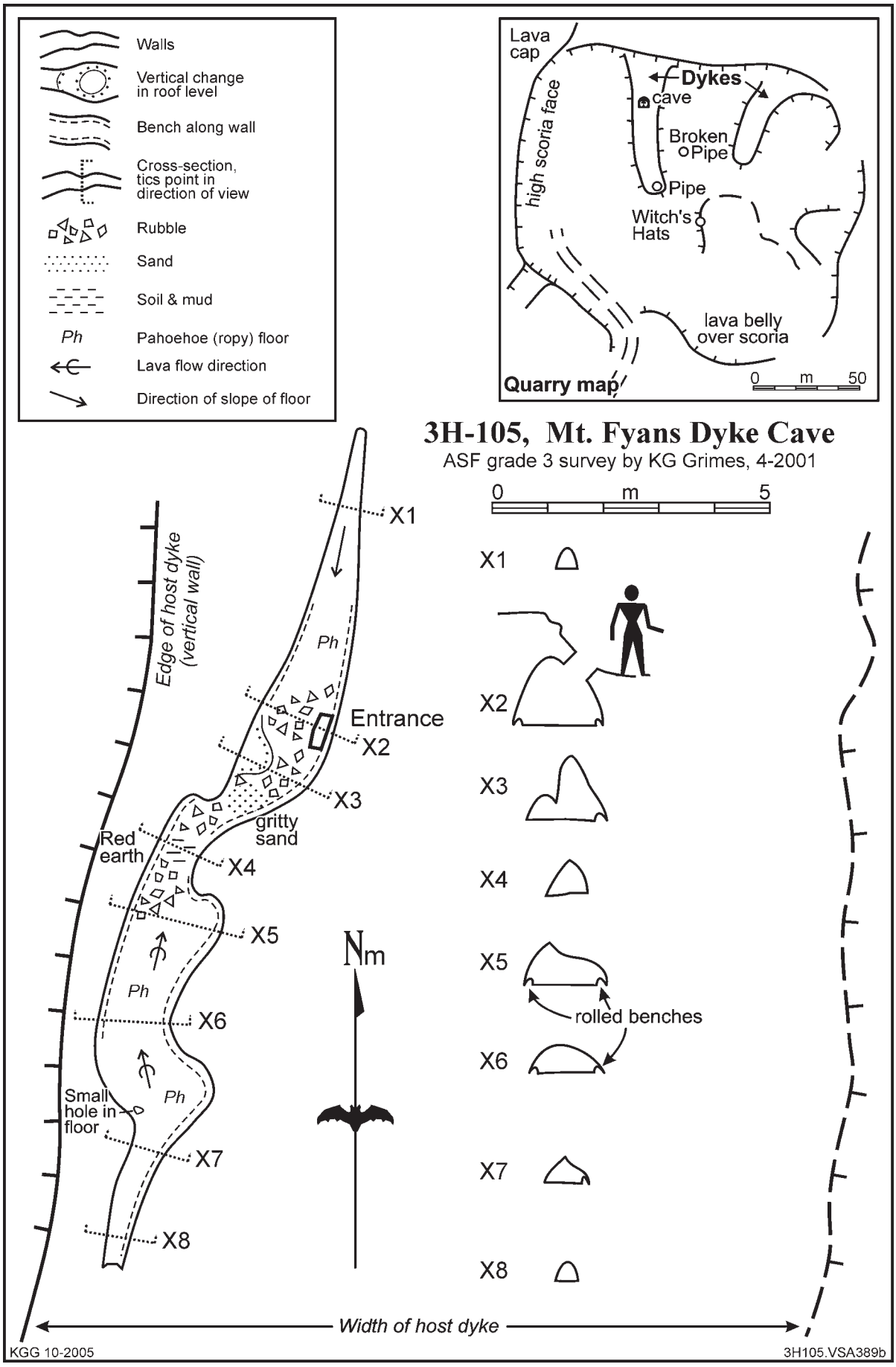

Figure 3: Map of Mt Fyans Cave, 3H-105. The inset map shows the volcanic structures within the quarry.

Figure 7: A conical "witch's hat" formed by a finger of lava that intruded the loose scoria, then drained back to leave a hollow core. Stereopair.

The area has other features of both geological and historic interest and warrants preservation. For example, the underside of the lava flow capping the scoria is exposed in several places and shows a wrinkled "belly" with fragments of the loose scoria stuck to it. The surrounding "stony rises" have some particularly elegant and distinctive dry-stone walls that were constructed by early European settlers.

No other volcanic caves formed in dykes have been reported in Australia – a cave described by Hale & Spry (1964) in dolerite in Tasmania was produced by solution of secondary minerals formed in an alteration zone. Elsewhere in the world, a larger, but apparentlysimilar, dyke cave has been reported from the Canary Islands (Socorro & Martin, 1992).

Genesis

The dykes and other bodies would have been intruded into the loose scoria towards the end of the eruption, where they would have cooled and partly solidified. Then, as pressure was lost those liquid parts that were still connected to the main feeder channels would have drained a little way back to leave the cavities. There may have been some oscillation in lava levels to form the rolled benches in the dyke cave.

Acknowledgements

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