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# Lava Tubes of Pisgah, Southern California

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## Abstract

Pisgah is a basaltic cinder cone and lava flow located about 175 miles northeast of Los Angeles, in the central Mojave Desert. More than 200 lava tube caves are present of which about 30 are more than 100 feet in length, and the longest (SPJ Cave) is about 1,300 feet. Many of the caves consist entirely of crawlways. The lava flows are geologically young (probably late Pleistocene) and are well preserved due to the dry climate (less than five inches of precipitation per year), which allows only sparse vegetation. Nearly all of the lava tubes are either semi-trenches (leveed channels) or surface tubes.

The longest of the caves include Glove, QQ/Cat, B, C10, C12, C13N, RC3, Finis, O12, O30, Russell Stewart, A, Owl 1, Owl 2, Owl 3, and Woodsey Owl; all of which also have relatively large passage size. Some of the primary lava features of the caves include remelt, drip pendant stalactites, linings, rafted breakdown, breakdown jams, dip-layered stalactites, tube roof crustal plates, hornitos, a lava tube formed in aa, multilevel passages not superposed, layered lava, blowout pockets, spatter, pillars, columns, and well preserved details of roof crusts.

My own studies at Pisgah have included exploration, surface surveying, cave surveying, photography, cave weather magnetism in lava, lava cave morphology, micro-stratigraphy, and cave visitation as well as study of the formation of lava tube caves.

## Introduction

Pisgah lava field is located in the Mojave Desert of Southern California. The lava flow is probably of late Pleistocene age, and the surface is well preserved due to the low rainfall—less than five inches per year. A basaltic cinder cone and lava flow are present, and pahoehoe flows cover much of the area. Surface features include a driblet spire about three feet tall.

There are many caves, such as “A” Cave. Although the passage size is comfortably large, the whole cave is only about 100 feet in length. Pisgah is a fine place for family outings. The main entrance to SPJ Cave is a picturesque spot. SPJ is the longest cave at Pisgah at about 1,500 feet. Most of the cave passages at Pisgah are small, and crawlways in SPJ Cave are common. Many of the caves are very short such as Not Either Cave, which is about 40 feet in length. New discoveries are often made, such as Woodsey Owl Cave, dug open a few years ago. Woodsey Owl is a single-passage cave about 450 feet in length. One of the minor explora-

tion challenges was a high lead in Woodsey Owl Cave. It was eventually free-climbed, but didn't go more than a few feet. C13 North Cave has a portion of large walking passage, including a nice lining curb. Nearby, an upper level overflow extends to the side.

## Surface Tubes and Tube Roofs

The lava tubes that are most abundant are surface tubes. Most of the cave entrances are collapsed portions of the roof. Many of the surface tubes have the original details of the roof well preserved, some even have the delicate upstream edge of the roof preserved. With much of the roof collapsed, it is possible to see relationships like a smaller tube fed as an overflow from a larger tube.

There are numerous examples of surface tube junction pools, some of which have collapsed, exposing the several small tubes that were fed from the pool. Some small surface tubes have been buried by later lava. The entrance to QM, a cave about 35 feet long, was almost completely buried by an

aa flow. If the area was covered with forest it might not even be possible to recognize that the aa and pahoehoe are different flows.

Roof crust details that are well exposed at Pisgah include many examples of incomplete separation of the crust from molten lava below. The roof crust of KB, a natural bridge about 40 feet long, has a massive lower phase, with rubble on top. It appears to be similar to the underriding of lobes described by Baldwin in the 1880 to 1881 Hawaiian lava flow that formed Kaumana Cave. One of the well preserved features is a cast of ropy pahoehoe. In Station 8 Cave, a natural bridge about 100 feet long, the cast surface at the top is the underside of overlying lava. The layer in the middle is the initial roof stratum with remelt on its underside. The bottom layer is a ceiling lining with remelt on the underside.

### Caves

A map of Pisgah shows that the caves are located east of the cinder cone, within about 1½ miles. Three tube flows – C, Q, and Owl – contain most of the caves that are more than about 100 feet in length – the rest are less.

Glove Cave has three entrances that are near the middle of the cave. The cave is about 1,100 feet long, much of which is walking passage, so it is very popular to visit. Glove Cave has good examples of remelt stalactites, as do many of the lava tube caves at Pisgah. There is also a stand of dip-layered stalactites that seem to have grown larger by collecting successive thin frothy layers of lava. Blowout pockets are common at Pisgah. The surface of a shelf in Glove Cave has remelted and sagged. It has also collected some lava drips from remelt stalactites above. Just to the left of the same remelted shelf, lava welled up

through a lining partition and subsided again. Much of the downhill part of Glove Cave is walking passage with a dust floor. In rare times of heavy rain, water flows on the floor leaving a dry stream bed. The middle portion of Glove Cave had the roof fall in while the tube was still hot. The lava found its way through the lower half of the breakdown, and now the passable route through the cave involves doubling back and clambering over breakdown.

QQ/Cat Cave is a segment of the main tube of the Q flow. It has a free drop of 20 to 43 feet at the entrances. Cat Cave was first entered about 12 years ago, and a connection to QQ Cave was later made by digging out hard lava from the floor of a crawlway. Cat Cave has cotton-like deposits of thenardite (sodium sulfate) on the floor that have not yet been trampled by careless visitors. Some of the thenardite makes masses of long needle-like crystals. At the upper end of Cat Cave there is a breakdown jam that was welded in place by molten lava. A small cascade flowed between some of the breakdown blocks. In a closer view of the breakdown jam, blue-grey parts are the lava infilling, and brown rock with shiny spots is the breakdown. Cat Cave also includes some tight crawls. The Southern California Grotto maintains a register in QQ/Cat Cave to monitor traffic.

Glove Cave also has a register, where we collect two to three hundred names per year. Visitation is now two to three times what it was ten years ago. The Pisgah lava field is visited often because it is easily accessible to people from all over Southern California. Land ownership of the caves is about evenly divided between the Bureau of Land Management and railroad land. South of the cave area is the 29 Palms Marine Corps base.