

Bhimbetka Caves, Madhya Pradesh, India.

Tony WALTHAM

11 Selby Road, Nottingham NG2 7BP, UK.

E-mail: tony@geophotos.co.uk



Abstract: The Bhimbetka Hills in central India are made of Precambrian quartzitic sandstone and contain hundreds of small caves and rock shelters, with origins similar to those of other caves in quartzite. The caves are also notable for their wealth of Palaeolithic and Mesolithic paintings.

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REPORT

Beyond the many long and splendid caves in Meghalaya, the main peninsula that is the Indian sub-continent is notably devoid of major caves, for the simple reason that is composed largely of granites, basalts and sandstones, with less than its fair share of limestone. However, there are some little gems tucked away in this great country. Almost in its centre, there are hills of quartzitic sandstone that contain small but significant caves, including those at Pachmarhi, recently described in these pages by Stephen Craven (2007). Almost dead central within the country, just south of Madhya Pradesh's state capital of Bhopal, and about 100km northwest of Pachmarhi, the sandstone of the Bhimbetka Hills contains hundreds of small caves and rock shelters.

There are now more than 750 caves recorded within the Bhimbetka Hills, spread along the range for more than 10km, and

some twenty or so are accessible by visitors within a well managed conservation area. In broad terms the site is a low escarpment, with much of its cap of stronger sandstone dissected into isolated crags and towers (Fig.1), and it is these that house the caves. Many of the caves could best be described as rock shelters, as they are deep overhangs that do not extend beyond daylight, and their origins could be ascribed to localised weathering or modest fluvial scour. But there are many others that are true caves, albeit only short, and these abound with features that indicate their broadly dissolutional origins.

There are many low and wide bedding plane caves (Fig.2), and these have rounded walls and remnant pillars that mimic the morphology of so many limestone caves (Fig.3). Both these and the many tall fissure caves commonly pass right through the small sandstone crags (Fig.4). The fissure caves have more-broken profiles



Figure 1. Crags and residual towers of the Vindhyan Sandstone on the Bhimbetka Hills.

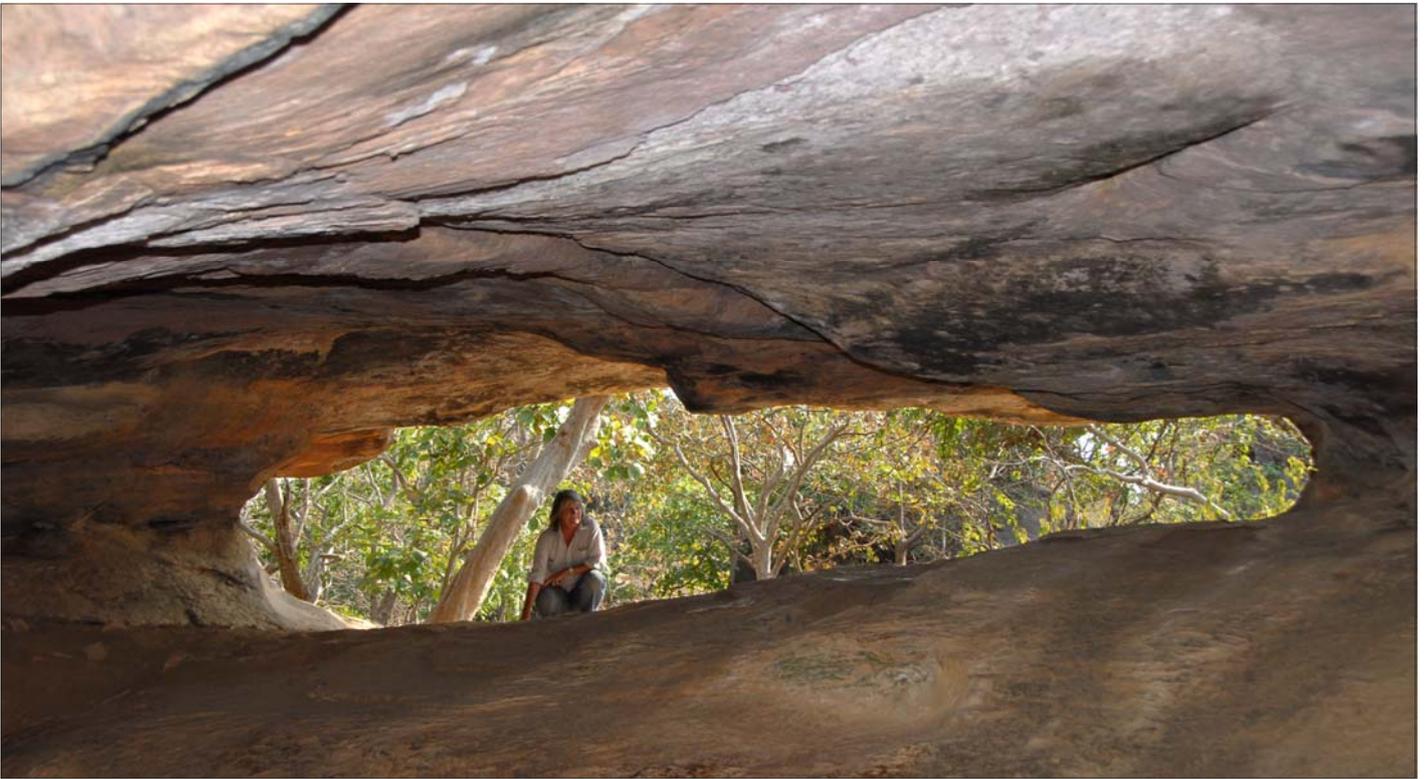


Figure 2. A spacious cave along a bedding plane in the sandstone at Bhimbetka.

on their joints and small faults, and it is tempting to wonder how some of these might have opened up partially by stress relief over the exposed hill crest. An isolated cave fragment passing through a rib of sandstone has a classic keyhole cross-section with a tapering slot in the floor of an almost perfect tube a metre in diameter (Fig.5). The largest single cave, Auditorium Cave, has about 50m of branching tunnels, each 5m high and wide, between multiple entrances within a

single large crag (Fig.6). These last two caves are the clearest evidence of normal cave erosion, and could be taken to imply significant flows of groundwater at some stage in the distant past.

The Bhandar Sandstone, in which all the caves have been formed, varies in lithology from a strong, well-cemented, fine-grained sandstone to a dense and compact material that could be described as a quartzite, or more strictly as an orthoquartzite. It lies in the upper



Figure 3. A bedding plane slot that retains small rounded pillars of bedrock, etched into the wall of Rock Shelter #15, with a red ochre painting of a mythical bull just above.

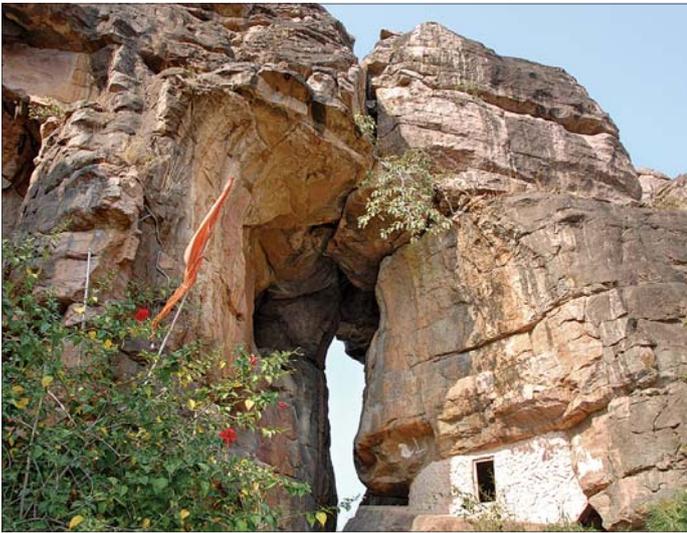


Figure 4. A tall fissure cave above a wall that encloses a smaller cave by the small temple on the Bhimbetka Hills.

part of the Vindhayan Group, which is of late Precambrian age, but has been little folded due to its position on the stable Indian craton (Valdiya *et al.*, 1982). The Vindhayan sequence includes conglomerates that have been the main source of India's fabulous diamonds, which were originally derived from kimberlite pipes in the basement, though these horizons are not developed at the caves. The thick Deccan basalts overlie the Vindhayan, and form the Umatwara Tableland just west of Bhimbetka's rather lower sandstone hills.

Parts of the Bhandar Sandstone are significantly calcareous, as they were formed in tidal flats and lagoons, and other parts might have had a calcite cement that has been leached from them since Precambrian times. In such a sandstone, cave development is initiated by weakening or loss of the intergranular cement over a very long period of weathering. Whether this, at Bhimbetka, was by dissolutional removal of calcite, hydration and breakdown of a partial clay cement, or even hydrolysis and breakdown of feldspar grains, is uncertain. But the next stage would have involved the removal of the loosened grains, in the style of piping failures that develop headwards along initial fractures or bedding planes. Once a complete pipe has been created to allow rapid water flow, normal stream erosion could enlarge the caves to the profiles seen today, before surface denudation truncated the passage fragments that now survive in the isolated sandstone crags. Though on a smaller scale,

Figure 6. The main entrance to Bhimbetka's Auditorium Cave, with the longest passage leading off behind the figure.

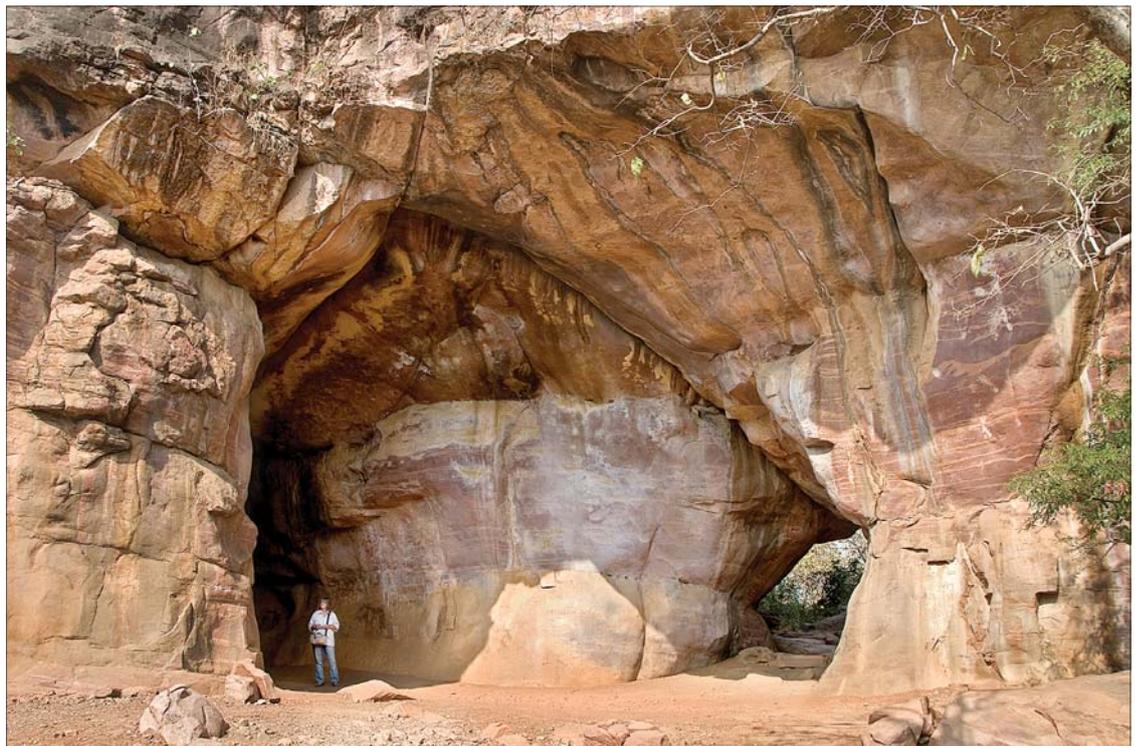


Figure 5. A splendid keyhole passage, with its upper tube about a metre in diameter, passing right through a rib of the Vindhyan Sandstone.

the Bhimbetka Caves do appear to be directly comparable with various other caves recorded in sandstones and quartzites on the ancient continental blocks of South America and Africa, and can be ascribed to a similar genetic model (Corrêa Neto, 2000). They also appear to share a similar, very long, time-scale for their development, as they all occur in ancient continental landscapes.

Far greater than their significance as a rather fine example of pseudokarst in silicate rocks, the caves of the Bhimbetka Hills are important as a major site of Palaeolithic and Mesolithic art. The caves were rediscovered only in 1957, by V. S. Wakanker, a professor of archaeology at Vikram University in western Madhya Pradesh. His excavations revealed a wealth of cultural remains from the early Palaeolithic through to Medieval times. Some of the cupules (rounded hollows a few centimetres across) carved or hammered into the rock pre-date Acheulean deposits that are 290,000 years old and can therefore claim to be among the world's oldest art. More conspicuous is the abundance of cave paintings. Of similar age to those at Lascaux and Altamira, they are far more numerous, though most lack the powerful colours of the European art



Figure 7. Bhimbetka's Zoo Cave, little more than a large rock shelter, with some of the most extensive artwork on its roof.

(Neumayer, 1983). Paintings have now been found in more than 500 of the Bhimbetka caves. Even in the prime sites that are accessible, much of the artwork is well hidden and rather obscure, so the casual visitor will not find it without a guide. But some of the paintings cannot be missed, and the Zoo Cave, though little more than a deep alcove at the foot of a crag, is a splendid site (Fig.7); its hordes of animal figures, each 100 to 400mm long, were created with a pale lime-based paint on the cave roof (Fig.8). Other caves have cruder figures that date from different periods, but some of these are drawn in bright red and yellow ochres.

With their major cultural importance the Bhimbetka Caves have been designated as a World Heritage site, so are now well protected, with good access to the few accessible caves. They offer a fine day out from Bhopal, by bus or train to Obaidullaganj and then a taxi (or

a very long walk) to the roadhead. The SRT kit is not needed, but these caves are worthy of note both geologically and culturally.

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Figure 8. Detail of the animal paintings on the roof of the Zoo Cave.