

The "Neolithic" Culture of the Padah-lin Caves

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U AUNG THAW

INTRODUCTION

ALTHOUGH Burma possesses a potential wealth of stone-age materials, prehistoric research has been very spasmodically done. Polished stone implements of different sizes are often found on the surface of the ground in many parts of the country, but they usually fall into the hands of those collectors who believe in the superstitions attached to the so-called thunderbolts. The first person in Burma to draw attention to them as prehistoric implements appears to have been W. Theobald (1873) of the Geological Survey of India, who recognized certain remarkable peculiarities of these polished stone implements. Among the few persons who later took interest in such stone implements was T. O. Morris, who made an intensive study of the neolithic tools in Upper Burma. However, there was no systematic exploration of prehistoric sites until the 1937-38 American South-East Asiatic Expedition for Early Man, led by Hellmut de Terra and Hallam L. Movius (de Terra and Movius 1943). They collected materials from palaeolithic and neolithic sites on the terraces along the middle course of the Irrawaddy and explored some caves in the Shan States. As a result of the study of these materials, the palaeolithic culture of the region was properly recognized and was named the Anyathian culture. The caves in the Shan States, however, were superficially investigated and, on finding only traces of neolithic occupation, the expedition did not excavate in them, as their object was to study early, namely, palaeolithic man in Burma.

Appreciating the need for systematic exploration and excavation, the Archaeological Department has chalked out a program for the exploration of river terraces and open sites. However, the unveiling of ancient city sites comes to the forefront and still claims the all-out efforts of the few available hands on its staff. Fortunately, the first prehistoric expedition could be launched at the instigation and support of

U Aung Thaw is Director of the Archaeological Survey of Burma.

the Central Organization Committee Headquarters of the Burma Socialist Programme Party. An expedition team composed of research workers drawn from the Archaeological Department, the Burma Historical Commission, and the departments of Anthropology, Geology, and Zoology of the Rangoon Arts and Science University, together with representatives from the Party headquarters, was organized by the Party to explore the Padah-lin caves. It was able to begin its task on 9 January 1969.

The existence of what look like prehistoric paintings in one of the caves of Padah-lin was first discovered by a geologist, U Khin Maung Kyaw, sometime in 1960. Recently it was brought to the notice of the Party headquarters, which felt the need to substantiate the fact for incorporation in the basic political history of Burma being compiled by the Party. A preliminary survey of the caves was conducted by the Party headquarters before the main team commenced work. The Archaeological Department took the responsibility of organizing excavation in the caves, this being the main function of the expedition.

THE CAVES

The caves are situated in a submontane region west of the Shan Plateau, falling within the Panlaung Reserved Forest area classified as a fairly dense jungle with bamboo. They lie close to the north of the pack-track from Nyaunggyat to Yebok village in Ywangan Township in Taunggyi district, Southern Shan State, the distance from Nyaunggyat (lat. $21^{\circ} 6\frac{1}{2}'$ N; long. $96^{\circ} 18'$ E) being 4 miles and from Yebok 1 mile (Fig. 1).

To the east of Yebok rises the Nwalabo range, with peaks over 4500 ft. high. The caves are in the spur of a foothill 1000 ft. above sea level. The Yebok stream, a tributary of the Panlaung river, passes through Yebok in its southward course and meets the river four miles away. The Panlaung, which rises farther south, turns in a westerly direction for about two miles from the confluence and meanders northward. The rocky terrain between Nyaunggyat and Yebok is uninhabited. It is only along the Panlaung river that small villages are found: Taungbon, Nyaunggyat, Nyaungga, Kyidaing, and Maunggwe, going from south to north.

The western margin of the Shan Plateau in which the caves lie is, generally speaking, a broad belt of limestone which is a prominent member of the rocks characterizing the Shan State. This "plateau limestone" varies from an almost pure calcite to a true dolomite.

The two caves face south, and are about 200 yards apart. The western one is very large, containing nine main caverns connected by narrow passages all in a row on a north to south axis. The entire length is about 800 ft. With numerous bays, alcoves, and tunnels, the interior of the whole cave would be pitch dark but for the sinkholes or apertures in the roofs of four caverns, through which openings sunlight and fresh air penetrate. True to the nature of limestone caves, percolating water drips from the roof, and the process of forming white, glistening stalactites still continues here. Stalagmites also keep building higher and higher, sometimes almost meeting the hanging stalactites. The eastern cave, on the other hand, is much smaller. It is wide open to daylight and fresh air, and is only thirty to forty ft. deep horizontally (Pl. Ia). Here the calcium carbonate drips down along the walls only. Since it is a rock shelter rather than a deep cave, this cavern (numbered 1 by our team), was

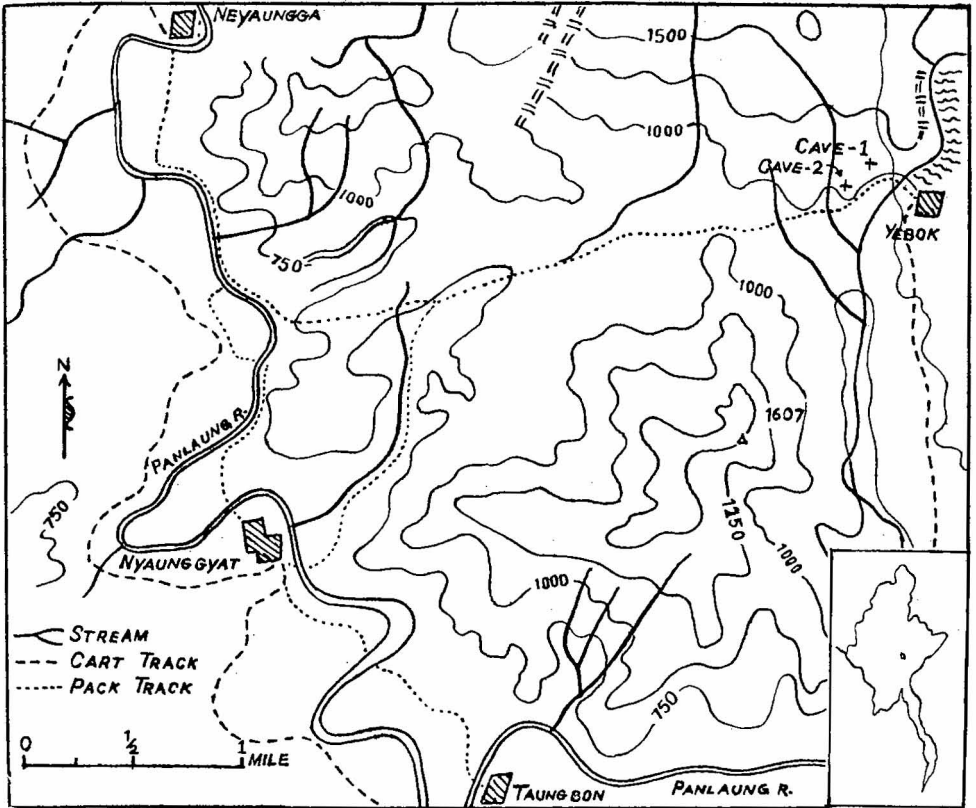


Fig. 1 Location map of Padah-lin caves in Ywangan Township, Taunggyi district.

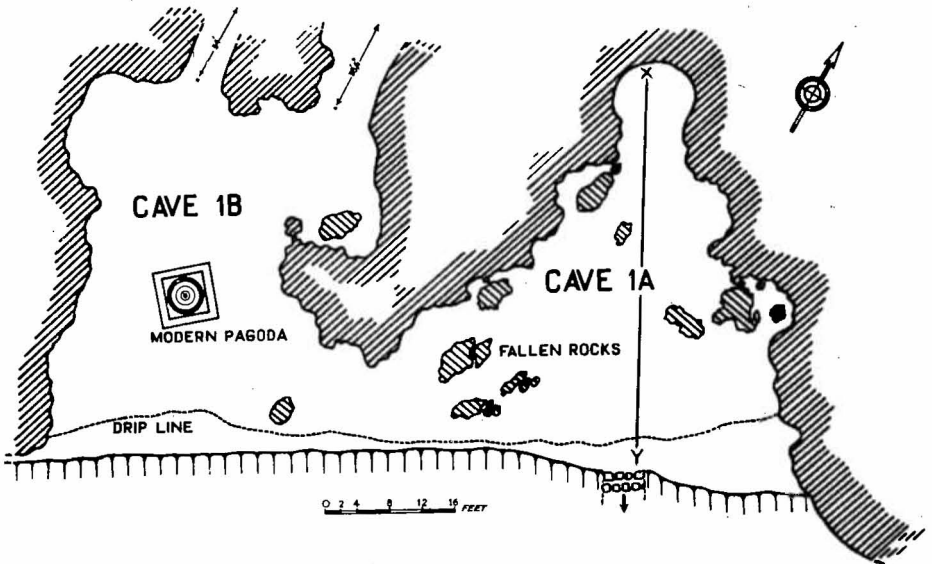


Fig. 2 Ground plan of cave 1.

an ideal place for the prehistoric people to live in. Usually they did not dwell in deep, dark, and damp caves like the huge western cave (numbered 2).

After exploring the two caves, the team decided to conduct excavations mainly in the smaller, eastern cave, no. 1 (Fig. 2), and to dig test pits near the mouth of the western cave. It is in the former cave that mural paintings exist. This rock shelter is naturally divided into two sectors by the forward projection of the central back wall. A casual visitor would not find the paintings easily, as they lie from ten to twelve ft. above the floor level and have deteriorated through long exposure to weather (Pl. Ib). However, careful observation reveals about a dozen figures in red ochre; these represent two human hands, a fish, bulls, bison, a deer, and probably the hind end of an elephant. On the high ceiling is also seen the figure of the sun between two converging crooked lines. This probably depicts the midday sun appearing between the brow of the cave and the far stretched ridge of the mountain range, as viewed by the artist from within the cave.

THE EXCAVATION

A trench 20 ft. by 6 ft. was laid perpendicular to the drip line at the mouth of the rock shelter in the eastern part, which is numbered 1A (Fig. 2). The excavation revealed a homogeneous deposit of cave earth, mainly clayey or powdery matter washed into the cave by infiltrating water, as well as rubble and breccia due to roof falls (Fig. 3). As the ground slopes gradually eastward near the mouth of the cave,

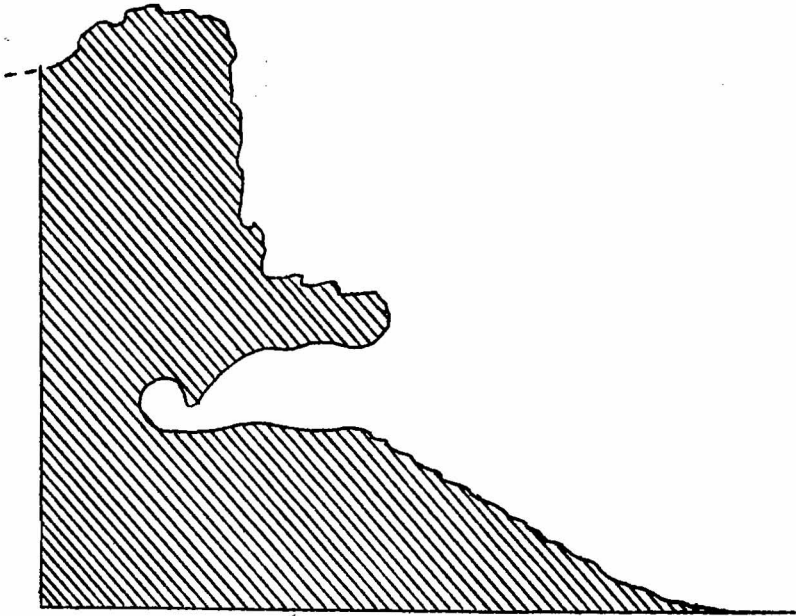


Fig. 3 Section x-y of cave 1.

the southern portion of the trench contains larger particles of stone and compact earth. The soil in the northern portion of the trench is very loose in consistency, and in the section looking north the following layers were observed:

- Layer 1 5½ in. thick; brown, fine grained, slightly calcareous soil.
- Layer 2 from 5½ in. to 1 ft. 9 in. from surface; brown and light gray, fine grained, highly calcareous soil. In the middle of this layer is a horizontal band of residual lime 6½ in. thick.
- Layer 3 1 ft. 9½ in. to 2 ft. 6½ in. from surface; medium gray, very fine grained, shaly soil or clay.
- Layer 4 2 ft. 6½ in. to 3 ft. 4½ in. from surface; brown fine grained, calcareous soil.
- Layer 5 3 ft. 4½ in. from surface to 4 ft. and below; natural soil, yellowish brown, compact, gritty and very calcareous.

It was observed that the deposit layers in which stone tools occur are not disturbed by later intruders or modern treasure hunters. The rest of the cave floor was further divided into four sectors. Baulks 2 ft. wide were left between sectors. (These baulks were not excavated because of time limitations.) In the northern part of the cave the natural soil was reached at a depth of 4 ft. below the surface. Here the soil is so loose and powdery that it is impossible to maintain clear-cut sections or even levels from stage to stage. In the excavated areas, as well as in the sections of earth deposit below fairly big boulders fallen from the roof, no sterile layers were observed and all types of tools occurred throughout the levels, thus indicating the homogeneous character of the deposit.

Excavation in the western sector of this rock shelter (cave 1B) was confined to the northern portion, as the presence of a small stupa with a wide square plinth prevented digging in the southern part. The stupa was erected just a few years ago, and it is learned that the stones on the surface of the cave were utilized in its construction. However, the disturbance of soil does not appear to have reached any considerable depth, especially in the two alcoves, where the roof is very low, and the two long tunnels, where there is little more than crouching space. The excavated earth was sieved properly before disposal; thus we retrieved numerous fragmentary bones and pieces of charcoal from all deposit layers.

In the large western cave, no. 2, test pitting in the interior revealed no indication of human habitation. Digging in an alcove near the cave mouth yielded some tools and bone fragments; surface collection added a few others from outside the cave, where rubble cleared from the entrance was accumulated.

THE TOOLS

The excavation yielded over 1600 stone artifacts apart from unworked nodules and fragments. Of these, only 422 were sorted and brought to headquarters for detailed examination. Many others, including entire and split pebbles and very poor specimens, were left buried near the camp.

The tools are largely made on pebbles (Pls. II-IV). They are crudely made, are without marks of secondary flaking or retouching, and resemble the palaeolithic tools. Most of them may be regarded as unfinished implements. Those made on pebbles generally retain the cortex or natural surface on one or both sides or on the lateral sides. These may be classified as hammerstones (Pl. II*a*), mullers (Pl. II*b*), unifacial choppers (Pl. II*c-e*), bifacial chopping tools (Pl. II*f-h*), hand adzes

(Pl. IIIa-b), and scrapers (Pl. IIIc). Flakes struck from pebbles or cores with prepared striking platforms are also found (Pl. IIIe-f).

Though the crudely flaked chopper-chopping tools are predominant, there is a tendency toward the production of comparatively fine tools. Four specimens of bifacially flaked cores of medium size with double ends, pointed or rounded, are among the finer implements. Were they to be ground down, these would make good hand-axes. The technique of grinding had begun to be employed in this industry, as evidenced by the occurrence of an edge-ground flake scraper (Pl. IIIg) and flake adze (Pl. IIIh) and two small core implements which are almost completely ground (Pl. IVa-b). One of the latter has a sharp cutting edge (Pl. IVa). A small flake scraper also has a ground, beveled edge. In a few other specimens of small tools, patches of ground surface or ground edge are observed (Pl. IVc-d).

Some of the flake scrapers bear flat striking platforms and a few of them have ripple marks and bulbs of percussion. There is even a single specimen of a thin small scraper struck from a "tortoise core," that is, one flaked in the Levalloisian technique so that the flake scars converge centrally toward an end of the core.

A remarkable implement recovered from the eastern part of the rock shelter, 1A, is a crude or unfinished shouldered adze (Pl. IVe). As it is not ground, the vertically notched lines directly below the tang are clearly visible on the upper surface. The tool has a crooked body so that the cutting edge, splayed on one side, is not at right angles to the long axis.

Among the tools are many pebbles pitted in the center on both sides and a number of complete as well as broken ringstones (Pl. IVf-g). Probably the pitted pebbles are unfinished ringstones because the perforations they bear indicate the different stages in their manufacture. The perforations are of hourglass shape, having flaring ends in cross section.

A large percentage of the pebbles had probably served as hammerstones and anvils, while others were collected as raw materials for making tools. A few long pebbles seem to have been used as polishers. A collection of small round pebbles probably utilized as sling balls was obtained from the test pit in cave 2. Flat grinding stones with smooth surfaces witnessing their use were also excavated. In all probability they were also used in grinding the red ochre as surely as they served as whetstones to sharpen the tools.

A wide range of rock types is found among the tools, but limestone is predominant. Out of 276 tools from cave 1A, limestone accounts for 34 percent, sandstone 26 percent, quartzite 13 percent, siltstone 7 percent, basic igneous rocks 8 percent, microgranite 5 percent, and granite 1.4 percent. There are very small percentages of milky quartz, calcite, and intermediate igneous rocks. One specimen each of agate and fossil wood was also found, but the latter is an unworked piece. An abundant supply of raw materials in the form of pebbles is available in the streams flowing into the Yebok chaung and the Panlaung river as well as in the shallows of the river. Yet materials not available locally seem to have been transported from far-off places.

The occurrence of a large number of pebbles, innumerable flakes, crude chopper-chopping tools and scrapers, partly ground tools, a crude shouldered adze, ringstones and pebbles in different stages of perforation indicates that the rock shelter was not simply a habitation site but a tool-making workshop.

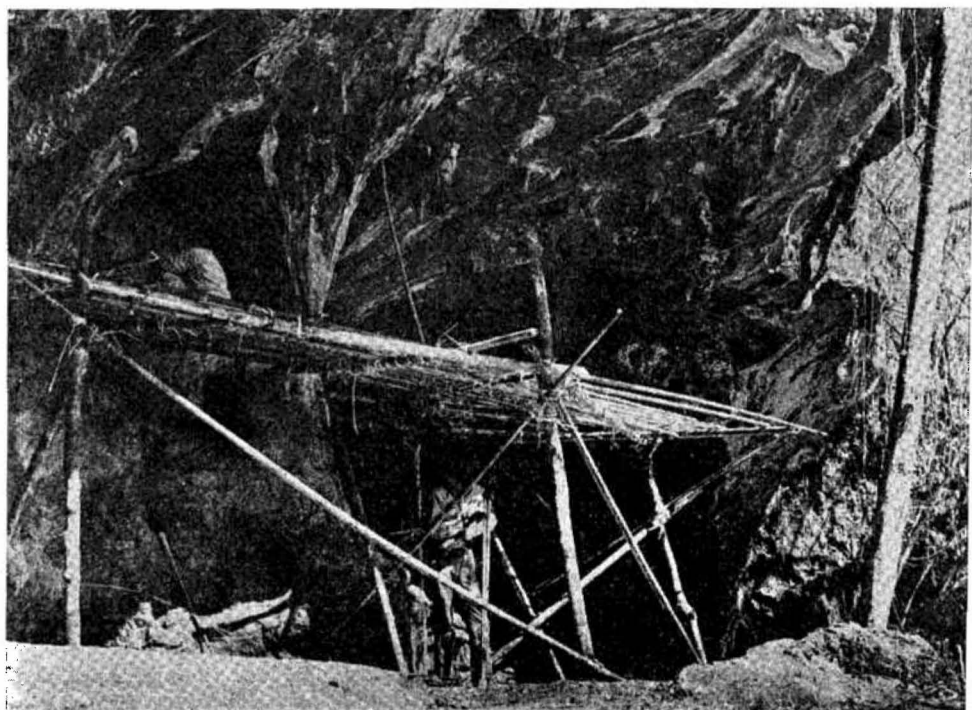
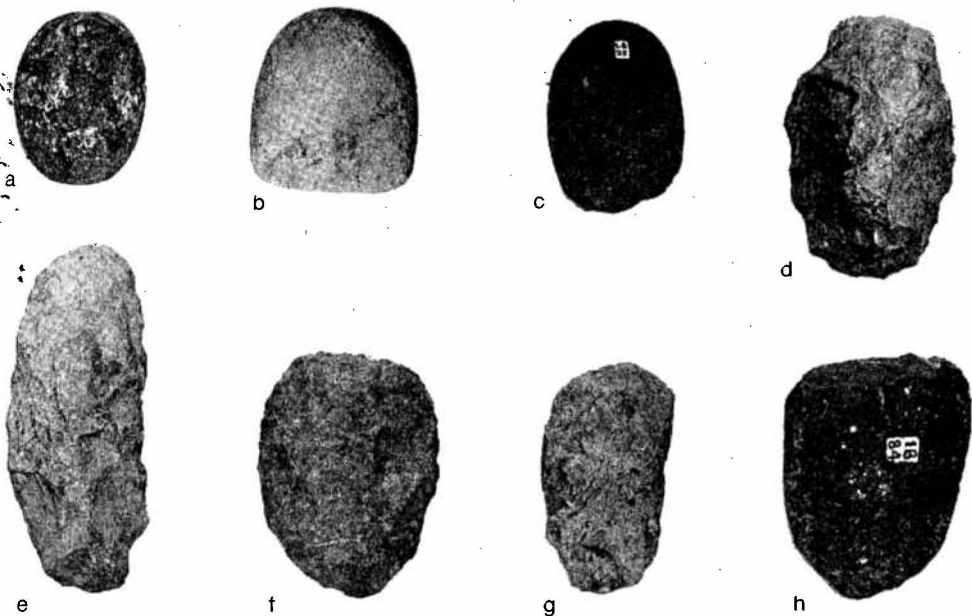


Plate I Padah-lin cave 1: *a*, exterior; *b*, interior (the man on the scaffolding is copying the paintings on the wall).

Plate II



II

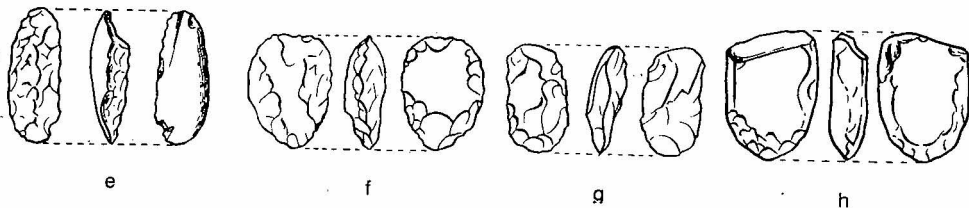
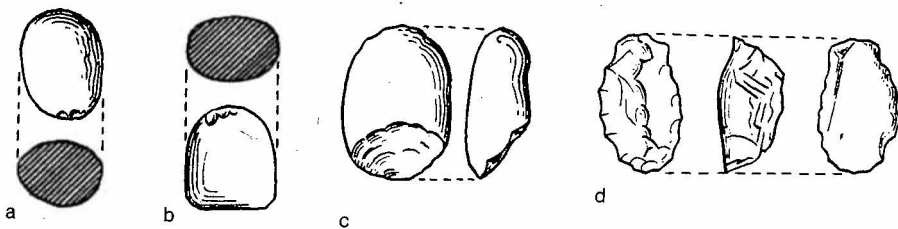


Plate II Tools made on natural pebbles:

- a*, cylindrical, rounded ends; micaceous sandstone, highly weathered, very light brown, 9.8 × 7.3 cm (1A/114);
- b*, cylindrical with one flat and one rounded end; sandstone, calcareous, medium grained, greenish; 10.0 × 8.5 cm (1A/4);
- c*, microgranite, medium grained, light color index, 11.3 × 8.1 cm (B/25);
- d*, massive rectangularoid with round working edge, basic igneous rock, fine grained, dark color index, 13.3 × 8.1 cm (1A/192);
- e*, long oval, double ended chopper, quartzitic sandstone, very fine grained, light gray, 17.2 × 6.6 cm (1A/254);
- f*, pointed oval, dacite, acid igneous rock with fused glasses of quartz and feldspar, medium gray, medium grained, 11.0 × 8.1 cm (B/83);
- g*, rectangularoid with rounded edge, basic igneous rock, light color index, fine grained, 10.4 × 6.2 cm (B/44);
- h*, chopping tool with flat butt and pointed end, 8.1 × 6.1 cm (1B/84).

Plate III

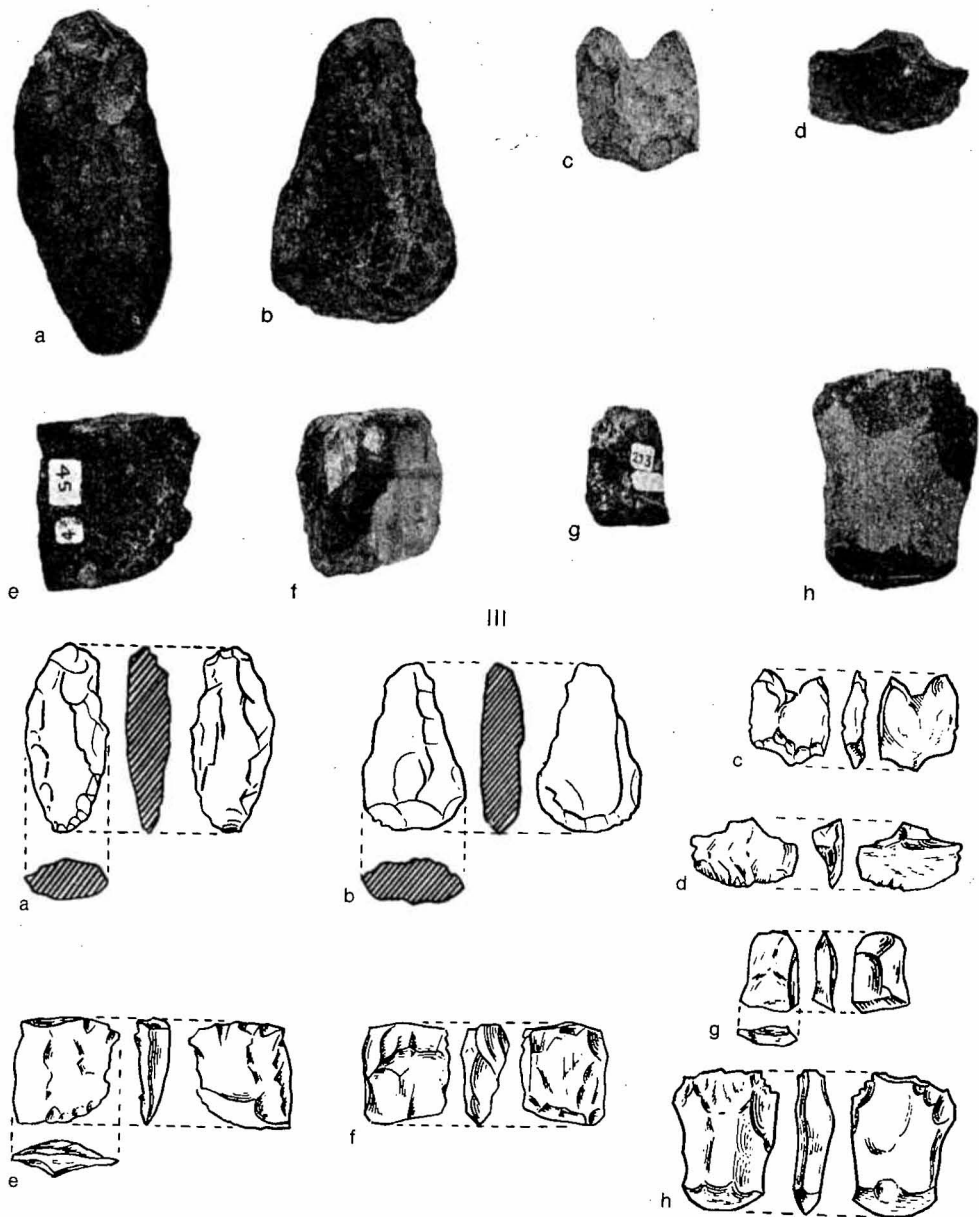
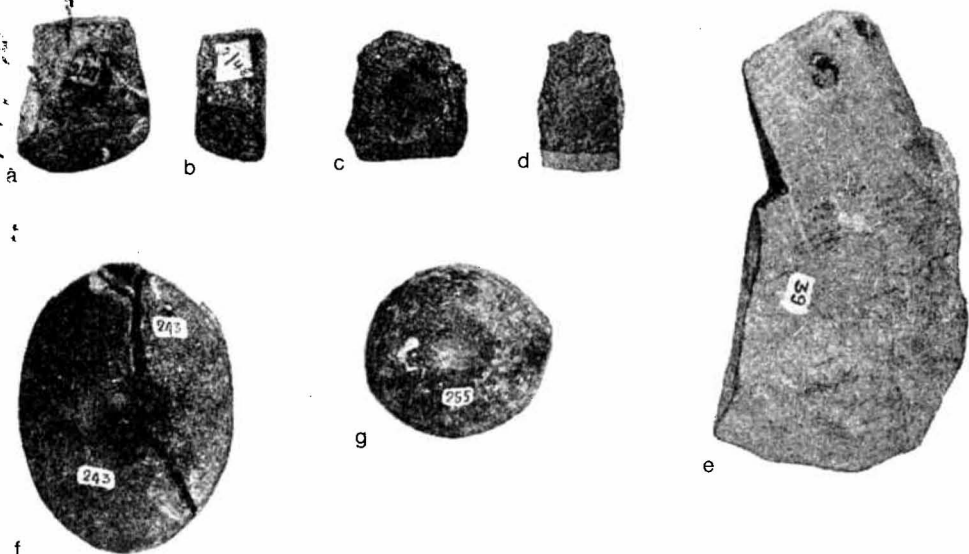


Plate III Bifacial core, flake, and edge-ground tools:

- a*, roughly oval, elongated, with slightly pointed working end, quartzite, blue, very fine grained, 13.4 × 5.9 cm (1A/131);
- b*, trianguloid with rounded working edge, rhyodacite, extrusive igneous rock, fine grained, with colored glasses, reddish brown, 12.2 × 7.5 cm (1A/2);
- c*, flake scraper with pointed edge, basic igneous rock, dark color index, very fine grained, 4.7 × 4.0 cm (1B/73);
- d*, flake scraper, convex edge, dolomite, light gray, very fine grained, 5.3 × 3.5 cm (1B/36);
- e*, flake scraper, rectanguloid, with striking platform, obliquely rounded edge, basic igneous rock, 5.4 × 5.0 cm (1A/45);
- f*, rectangular scraper with slightly oblique edge, fossil wood with layers of milky white, brown and light gray minerals, 5.0 × 4.2 cm (1B/31);
- g*, flake scraper with straight ground edge, quartzite with mica flakes, bluish gray, medium grained, 3.7 × 2.5 cm (1A/273);
- h*, large scraper on flake (or small hand axe) with ground edge, dorsal side slightly fluted, basic igneous rock (basalt?) fine grained, dark color index, 6.8 × 5.0 cm (1B/71).

Plate IV



IV

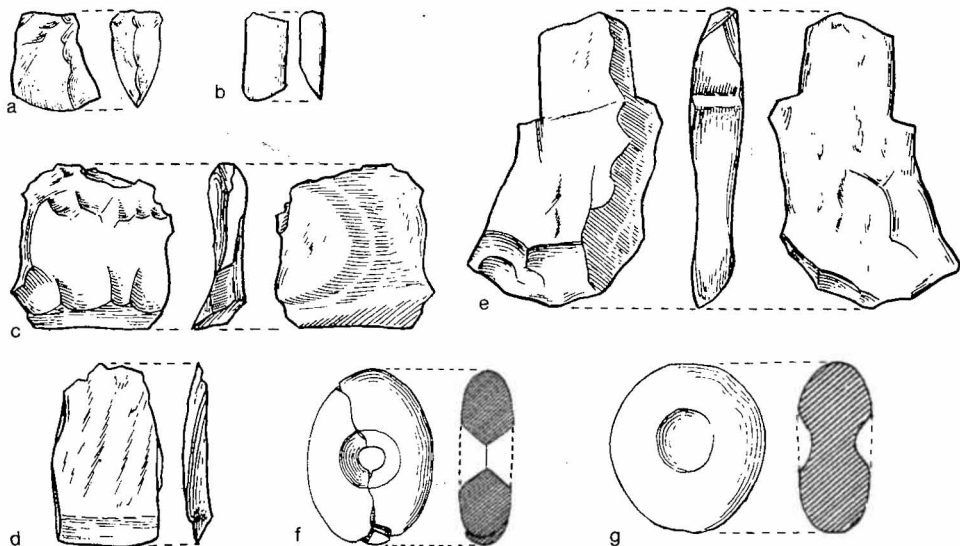


Plate IV Edge-ground tools and pitted and perforated pebbles:

- a*, scraper or tiny celt almost completely polished with sharp convex working edge, quartzite, very fine grained, 4.7 × 4.5 cm (2/27);
- b*, cylindrical pebble scraper with slightly polished body, fine grained, 4.4 × 2 cm (2/48);
- c*, edge-ground quadranguloid scraper, quartzite sandstone, dark green, medium grained, 4.1 × 3.8 cm (1A/275);
- d*, edge-ground scraper, rectanguloid, siltstone, purplish red, very fine grained, 4.5 × 2.7 cm (1B/13);
- e*, shouldered adze, tang prominent but projecting obliquely from the body, limestone with tiny veins of calcite, 13.9 × 7.2 cm (1A/39);
- f*, oval pebble with hourglass perforation, broken into two halves, (mace-head or weight for digging stick?), sandstone, coarse grained, 13.5 × 9.5 cm (1A/13 & 243);
- g*, oval pebble, centrally pitted on both sides, siltstone, reddish brown, fine grained, 8.1 × 7.5 cm (1A/255).

OTHER FINDS

The siftings contained hundreds of bone fragments and molar and canine teeth of mammalian animals, a large quantity of charcoal pieces, shells of land mollusks, a skull (probably of a deer), a few fragments of tortoise shells, pieces of soft hematite (red ocher), and a few cord-impressed sherds. The bulk of the animal bones and a few human bones are being identified, and charcoal samples have been sent abroad for C-14 analysis. A smooth surface on a piece of red ocher indicates that the ocher was ground down to obtain pigment powder which, in all probability, was used in painting the figures on the rock wall. The occurrence of potsherds characterizes the Neolithic pattern of culture.

THE ROCK PAINTINGS

The mural paintings are seen in the eastern cave or rock shelter, no. 1 (Fig. 4). They are on the middle section of the wall which divides the rock shelter into two sectors by its forward projection. They are above the ordinary reach of human hands. Some of them are in outline and some are flat wash or silhouette paintings in red ocher. About a dozen of the figures are still to be seen distinctly, but originally there seem to have been painted several more which are now obscured by weathering and by the deposition of calcium carbonate on the rugged wall. The first two figures on the west are human hands, one with concentric circles in the open palm and the other with what looks like a human skull. On a smooth spot of the ceiling is the drawing of the sun between two converging irregular lines. It is most likely that the artist had captured the scenery viewed from within the cave, that is, the sun appearing between the brow of the cave and the distant ridge of mountain range. The rest are animal figures—bulls, bison, a deer, hind-ends of elephants, and a huge fish. Each of the two bulls is followed at the heels by a calf. They are depicted in the most natural and vivid manner, full of life and energy.

One may naturally feel skeptical about the antiquity of these monochrome paintings, since traces of modern intrusion are visible—especially in the western cave, where enthralled visitors have indelibly inscribed their names on the walls. However, such modern inscriptions in yellow or white are not seen above the normal reach of man. The choice of subject, the style of painting, and the manner of superposition of the drawings strikingly conform to prehistoric art in the caves of southern France and northern Spain, where depiction of animals was the main theme and representation of human hands was also made. The deposits of stalactite have partially covered some of the figures and have mutilated many others. Considering the slow formation and the lesser quantity of calcium carbonate in the rock shelter compared to that of the western cave, the deposits overlying the paintings could not have taken less than a century or so to accumulate to such a degree. Above all we have the partially ground piece of red ocher and many unground pieces that had obviously served as pigment materials. Since these are coeval with the stone tools, as evidenced by the stratigraphy, the paintings may safely be assumed to pertain to the Neolithic culture of the cave dwellers.

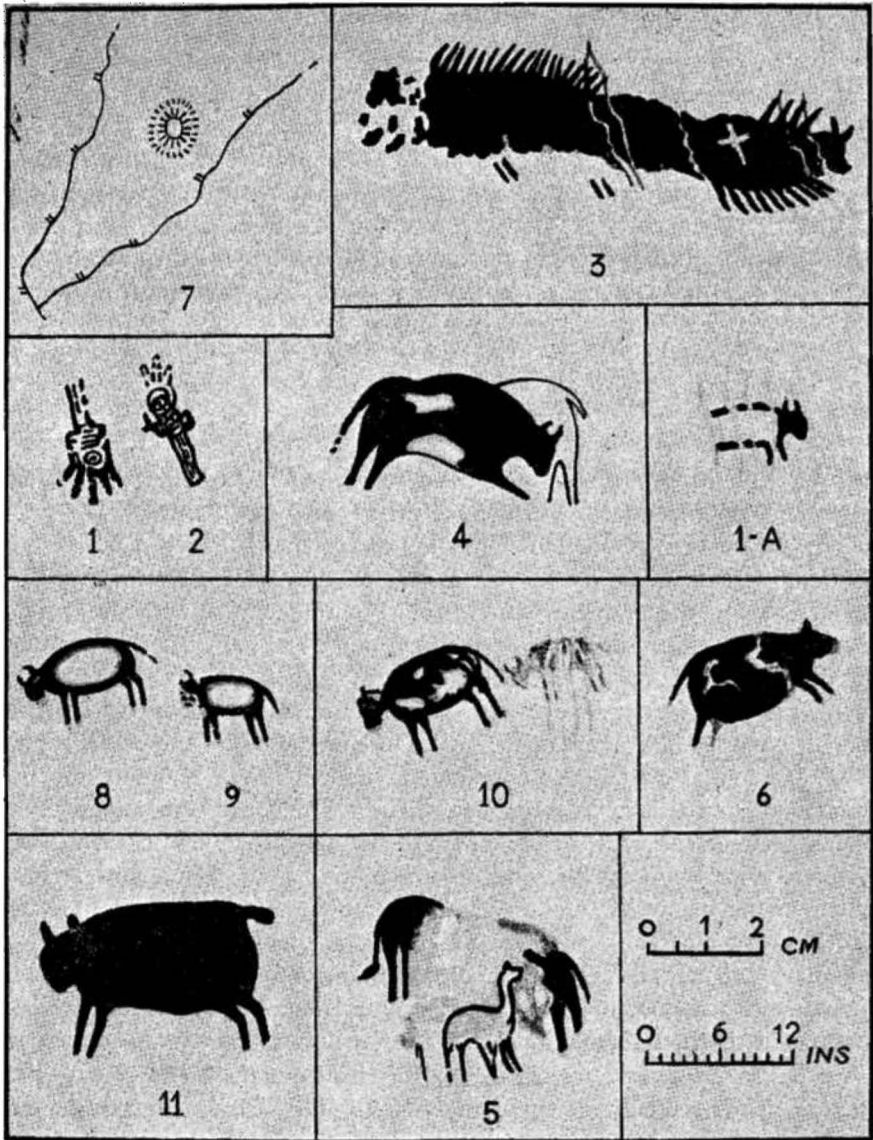


Fig. 4 Reproduction of paintings in cave 1.

CHRONOLOGY

Owing to the homogeneous cultural deposit of the excavated rock shelter, the palaeolithic tool types are considered to be coeval with the other tools, however small in quantity, which characterize the neolithic technique. Therefore, the older culture is found to have persisted till the Neolithic period. But the paucity of partially ground tools is indicative of a transitional stage to the new technique. This stage is to be regarded as early Neolithic and has a parallel in the Hoabinhian and Bacsonian cultures of Indo-China. The time span of the Neolithic period in Burma

has yet to be determined by further exploration of such caves and correlation with the polished stone-tool industry which prevailed in other parts of the country. Radiocarbon analysis may possibly provide an absolute date for the Padah-lin culture.

GENERAL OBSERVATIONS

The results of the excavation may be recapitulated as follows:

- (1) An early Neolithic culture comparable to the Hoabinhian and Bacsonian cultures of Indo-China is brought to light for the first time in Burma.
- (2) The tool-making industry of the caves sheds light on the transition from the flaking and chipping technique to the grinding and polishing method.
- (3) Evidence is discovered to confirm the rock paintings as Neolithic.

In his valuable study on the prehistoric stone implements of Burma, T. O. Morris (1935) remarked that none of the Burma chipped stone implements could be compared at all closely with the palaeolithic survivals from the "Bacsonian" of Indo-China and Malaya. Now that a tool-making workshop which has produced a considerable quantity of crude implements with Palaeolithic affinities has been discovered, the earlier findings recorded by Morris can be appropriately revised. Implements which are bifacially flaked all over but ground at the edges only are classed as "protoneoliths." Since such tools also occur at Padah-lin, Morris's statement regarding the absence of protoneoliths in Burma is now superseded.

The perforated pebbles and crudely flaked shouldered adze with a perfect tang clearly exhibit the successive stages of manufacturing the tools. Though highly finished shouldered adzes pertain to the late Neolithic, the crude specimen from the present excavation cannot definitely be placed in the same category, as it belongs to the homogeneous industry of an earlier stage. Morris (1935) conceived that the ends of linear notches remaining at the intersection of shoulders and tang are due to the use of sharp-edged ringstones mounted on a lathe, and that it would be extremely difficult and laborious to produce the perfect angular form without some such rotary abrasive assistance. A. H. Dani, on the other hand, rejected this theory and emphatically contended that in order to get right angles at the corners and perfectly straight sides, one must employ a sawing technique, using at least a wire and an abrasive (Dani 1960: 215, 225). We now have a specimen belonging to the early Neolithic stage when sharp-edged ringstones were not produced and metal wire was definitely unknown. Though it is hard to make out the exact technique of fashioning such an implement, it would have been possible to employ only stone tools in making shouldered adzes when perforations could be bored or drilled to produce pebble ringstones without any metallic tool.

Dani (1960: 216) is also of the opinion that the completely ground tools have nothing in common with the chipped class, and asserts that "these two classes of tools belong to different traditions: the chipped tools continuing the local tradition from the palaeolithic period, and the completely ground tools appearing suddenly in this region from outside." Since, in the Padah-lin industry, edge-ground tools as well as completely ground tools are definitely associated with chipped implements, we can observe the gradual stages in evolving the techniques of manufacture. It is

therefore apparent that the finished ground tools are not suddenly introduced from outside.

Though the excavation is of limited extent, it has made an important advance in prehistoric research in Burma, especially regarding the cave culture. In the light of present discoveries, it is now possible to modify such ambiguous statements in this regard as the following conclusion drawn by M. R. Sanhi (1952: 152):

No stone implements or other handicraft of man has so far been discovered in the Shan States region of Upper Burma. However, remains of edible shells and what appears to be fragments of Neolithic pottery occur in certain caves as, for example, those near Mong Pawn, Yawngnwe and Tongta. This has been taken as evidence that man existed at least on the Southern Shan plateau during Neolithic times and he may have occupied the region even earlier, during the Mesolithic. But the complete absence of stone implements makes any positive assertion on this point impossible.

As the predominant chopper-chopping tools are essentially wood-cutting implements, it may be inferred that they were used by wood-working people. That the industry of Padah-lin is Neolithic in age is attested not only by the tool types but also by the associated faunal remains. A large quantity of bones broken into fragments, probably for the extraction of marrow, still await detailed identification. As far as they have been examined, they have been found to be the remains of wild varieties of existing local species. From the available materials it is hard to establish definitely whether domestication of animals and cultivation of plants were practiced. The paucity of cultivable tracts in the rocky terrain might have impeded agriculture, but indirect evidence, in the occurrence of crude sherds and ringstones which were probably used as digging weights, suggests that food-production was in vogue to a certain extent. Thus we can observe the beginning of the change from the food-collecting economy toward a food-producing economy concurrently with the transition from the use of crude tools to finer tools suited to the mode of occupation.

At the present stage of our research it is not possible to establish the particular race or stock of man which was responsible for this culture. It is hoped that further excavations will reveal more aspects of the Neolithic culture of Burma as a whole.

ADDENDUM

The co-occurrence of chopper-chopping tools made on pebbles with core and flake implements, including small edge-ground tools, ringstones, and potsherds, in all the loamy layers of the cave led one to surmise that the tool assemblage is Neolithic though retaining palaeolithic patterns. The link with the Hoabinhian and Bacsonian technocomplexes was also recognized. The radiocarbon results now obtained, which are summarized in the following table, indicate that the occupation of the cave began during the late Pleistocene and continued intermittently until recent times. But the terminal date for the Hoabinhian complex may be taken as ca. 6500 B.P. Results of faunal identification and soil analysis are still awaited.

POSITION	LAYER	SAMPLE	LABORATORY* REG. NO.	C-14 AGE (YEARS BEFORE 1950)
Cave 1A, Tr. I	1	Charcoal	R2547/1	1750±81
1B, Tr. I	2	Charcoal	R2547/2	6570±125
1A, Tr. II	3	Charcoal	R2547/3	7740±125
1A, Tr. I	3	Bone carbonate	R2547/4(A)	6570±125
		Bone collagen	R2547/4(A)	11250±200
1A, Tr. II	4	Bone carbonate	R2547/5(B)	6230±90
		Bone collagen	R2547/5(B)	13400±200

* Institute of Nuclear Sciences, New Zealand.

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