

RECENT ARCHAEOLOGICAL RESEARCH IN LAOS

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ABSTRACT

This paper presents preliminary results from the recent research by Sayavongkhamdy in the Luang Prabang, Vientiane and Xieng Khuang provinces in northern Laos. Two cave sites in Luang Prabang, Tam Hua Pu and Tam Nang An, were first occupied during Hoabinhian times, and then used for secondary burials during the Iron Age. Lao Pako, an open site in Vientiane Province, combines the functions of burial and habitation during the period between 500 BC and AD 500. The three largest sites in the Iron Age "Plain of Jars" complex were test-pitted, revealing funerary pots under the granite blocks lying between the stone jars, in addition to the very different style of mortuary pots associated with the stone jars themselves. A synthetic review of the sites under study will throw light on the role that the Lao territory might have played, thanks to its strategic location during periods when major traditions of stone-tool making, pottery, agriculture and metallurgy were spreading through Mainland Southeast Asia.

INTRODUCTION

Since 1994, archaeological research has been carried out under the direction of Thongsa Sayavongkhamdy on sites within the present Lao People's Democratic Republic. Prior to this project, there had been some pioneering research undertaken by French archaeologists (Colani 1935; Fromaget and Saurin 1935), but there was no major continuation after that time and no radiocarbon dates for Lao prehistory were available until 1996.

In terms of its geographic location, Laos offers prehistorians some interesting questions concerning:

1. The date and source of initial Palaeolithic settlement;
2. Phases of social development during the Holocene;

3. The respective roles of the dispersal of peoples, ideas and technologies within the region;

4. Sources of Indianization and the formation of states.

Only the three last questions are addressed here because the sites under study have all yielded cultural material that postdates the Palaeolithic. The issues are not discussed at length but are presented to the degree that they are relevant to the archaeological data that have been recovered.

CAVE SITES IN LUANG PRABANG PROVINCE

Tam Hua Pu

Tam Hua Pu is located near the village of Ban Tin Hong, Chompet District, Luang Prabang Province. Ban Tin Hong is on the right bank of the Mekong River and can be reached in 1.5 hours by a local motorboat going upstream from Luang Prabang city. Tam Hua Pu is situated on the southeastern slope of Pu Pak Peo, a detached hill lying at the foot of the Pu Luang mountain range, which has a maximum altitude of 921 m above sea level. Tam Hua Pu cave is approximately 600 m above sea level and 100 m above the surrounding plain. The Mekong River lies only 4 km from the cave, but cannot be seen from there because it flows behind Pu Pa Peung mountain. The Houa Hong River rises 100 m from the cave and runs from there to join the Mekong at Ban Tin Hong village. The hills and mountains around the site are still covered by forests and shelter a rich wild life.

The cave is composed of two main chambers of which only the first one appeared to be of archaeological interest, the second being dark and lacking deposits. The floor was dry except for a narrow band where rainwater drains from the back of the cave to the entrance. Rain can enter by an opening in the roof of the inner chamber.

In total, 13 m² were excavated out of a total habitable surface of approximately 90 m² within Tam Hua Pu. One trench of 2 x 3 m was placed in the middle of the first chamber, and another of 2 x 2 m just inside the entrance wall. A third trench of 2 x 1 m led from this second trench out into the rock shelter in front of the cave.

Right from the beginning of the excavation, former disturbance in the cave was recognized because some typical Hoabinhian stone tools and flakes were found mixed up with Iron Age secondary burials. This disturbance was once again confirmed during the analysis of pottery because four pots (although incomplete) could be reconstructed from several conjoining sherds that had been found in different layers of the same square, or different layers of different squares. The recorded archaeological stratigraphy, about one metre deep, is thus composed of complex intercutting burial pits with a backfill that includes the previous Hoabinhian living floor. The high density of pits suggests that the burial activity had been either intense (the cave serving a large community) or active for a long span of time, or both. These pits extended down to the base of the cultural layer, so no undisturbed Hoabinhian deposit remained. The secondary burial pits continued outside the cave into the rock shelter in front.

The grave goods can be divided up into four main groups: pottery, bronze objects, iron implements and beads of glass and shell. Pottery is mainly cord-marked. As for the bronze objects, there was a complete socketed axe, the rest consisting of tiny fragments which are hardly identifiable except for the rim of a bowl. The axe was lying at the bottom of a pit which penetrated to the base of the cultural deposit, together with a remarkable iron spearhead. The textile pseudomorphs found around the spearhead indicate that it had been purposely wrapped before burial. Sickles, knives, staples, hinges (?), nails (?), a hairpin and other unidentified implements illustrate a good variety of iron objects. Beads constitute a rich collection as well since they are made of different distinctive materials such as marine shell, semi-precious stone, carnelian, clay, and glass. Based on the marine cowries (*Cypraea moneta*) with the top removed (a possible indication of their use as currency), the "exotic" beads and the metallic commodities, one can ascertain that Tam Hua Pu participated in several exchange networks. A bow pellet and a clay "spindle whorl" were also amongst the grave goods.

Red ochre and charcoal lumps were found mixed up with the human bones. Animal bones were also present. As far as the human bones are concerned, they were found in small clusters, sometimes with teeth present,

and most of them were incomplete fragments.

During the first reconnaissance visit to Tam Hua Pu, Sayavongkhamdy collected from the surface some Hoabinhian tools, sherds and a pendant made of perforated bone. In January 1975, the Lao-Japanese team headed by D. Phoumsouvanh and Prof. H. Watanabe visited the cave and collected 28 stone implements of Hoabinhian type and many sherds and human bones and teeth (Watanabe *et al.* 1985: site spelt by them Tham Hoa Phou). These surface finds were added to the excavated objects from 1994-5 to give a grand total of 71 stone implements; more than 3080 potsherds weighing 35 kg in all; one complete pot, 14 bronze items, 47 iron items, 40 cowries, and 39 beads.

The whole collection of finds has clearly shown that there were two phases of usage of the cave. The first one was as a habitation site for a Hoabinhian society probably practising a hunting and foraging lifestyle. The second phase was its use by agriculturalists who were probably living in small villages in the alluvial plains. They were using pottery and textiles and iron, engaging in inter-regional trade, and adorning themselves with pendants and beads. Differences in the richness of grave goods found in different pits seem to suggest a differentiation in social status.

The radiocarbon dates for Tam Hua Pu are given in Table 1 below. Despite the disturbance factor there seems to be a general chronological order within the series. In general, it seems likely that the Iron Age burial pits were cut from the upper part of the cultural deposit, at some time between the dates of 2840 and 1340 BP (ANU 10138, 10139). Sample OZD 765, on a marine cowry shell of the "currency" type, seems particularly interesting since it obviously predates any likely use of iron in the site. The dates from the lower levels, between 4500 and 3500 BP, perhaps relate to now-disturbed Hoabinhian occupation. The basal date (OZD 766) remains unexplained. The site contains no clear Neolithic occupation, although it is possible that the dated cowry shell and a number of small shell disc beads could be hints of a minor presence.

Tam Nang An cave

Tam Nang An cave is located 1.5 km from the village of Ban Som. As with Ban Tin Hong, Ban Som village is on the right bank of the Mekong River but lies further inland (approximately 12 km) and so is hampered from exploiting all the advantages offered by the Mekong River, particularly the fluvial traffic and the aquatic resources. Ban Som is reached after at least two hours of walking because the track is winding and goes up and down as it

crosses several hills. The two villages mostly share common features in terms of geomorphology and climate. The main difference lies in the fact that Ban Som has more wet rice land. This enables better forest conservation since the pressures to cultivate the land by slash and burn are reduced.

Tam Nang An is located on the eastern slope of Pu Pa Peung which belongs to the andesitic Pu Kum Kao massif. Pu Pa Peung mountain has a peak 720 m above sea level, or approximately 400 m higher than Ban Som village. The cave is situated approximately two-thirds of the way up the total height of the mountain. A small river runs at the foot of the Pu Pa Peung mountain. The surrounding forest shelters a rich wild life.

Tam Nang An has a long entrance passage, and four inner chambers whose dimensions are respectively 6.60 x 4.50 m, 4.50 x 12 m, 8.50 x 8.00 m, and 16.5 x 21 m. Excavation started within the entrance passage. Contrary to expectation this proved to be completely sterile and the deposit was found to be as thin as 20 cm. The first inner chamber did not provide any prehistoric habitation remains either despite the excavation of a substantial percentage of the total habitable surface. But a large collapsed jar burial was found in one location (square G14) with human bones, one animal incisor, one rectangular-sectioned ground axe, one broken rectangular-sectioned axe/adze, and one axe preform. The jar is decorated with paddle-impression and incised lines. It seems to have been crushed under the pressure of people walking on the floor just above it.

Stoneware sherds and a retaining wall built up with limestone blocks occur near the jar burial in this first inner chamber. These remains, coupled with the fact that the floor was surprisingly flat, clearly demonstrate that earthworks had been undertaken by the Buddhist devotees who converted the cave into a Buddhist temple some centuries ago. This construction work is well recorded in local oral traditions. The use of the cave as a living shrine, as confirmed by a historical inscription found on the ceiling above the entrance, continues to this day.

Tam Nang An with its sole burial jar raises the possibility that more jars once existed in the site but were removed by the Buddhist shrine constructors during the floor levelling. This latter supposition might be adapted to apply to the entrance passage as well, since the deposit appeared to be surprisingly thin and thus any prehistoric habitation remains could have been displaced. Further investigation needs to be conducted before a definitive option is settled on.

Analysis has been conducted on the jar and its contents. It appears that the jar differs in its main character-

istics (shape, rim, decoration and firing) from those found at Tam Hua Pu, suggesting a distinctive pottery tradition which can be interpreted as a cultural trait of either a distinct community or a different time frame. This supposition seems to be supported by the different types of lithic tools found at the two sites: a rectangular-sectioned ground axe (14.5 cm long) at Tam Nang An versus a small almond-shaped ground adze (5 cm long) and one shouldered adze (5 cm long) found in the jar burial at Tam Hua Pu.

Two radiocarbon dates have been obtained from Tam Nang An: the first, for charcoal associated with the burial jar, is modern (ANU 10140). The second, an AMS date on a long bone fragment from the burial, is 1010±50 BP (OZD 769). These dates suggest that the Tam Nang An burial jar is younger than the bulk of the material buried within Tam Hua Pu, despite the fact that the associated goods are essentially Neolithic in character.

The human bones have been analyzed by David Bulbeck and his report is attached as an appendix below.

Tam Nang An rock shelter

Tam Nang An rock shelter is situated 2.6 m below the cave and is a natural cavity in the approximate shape of a half dome, 7.5 m wide at the entrance, 7m deep, and a maximum height of 6 m at the entrance. During excavation, two rectangular pits emerged, suggesting that our operation was of limited value, as it was an unintended re-excavation of an old trench. Upon investigation, an old man in the village told us that a Frenchman came around some time during the 1930s and took some men from the village to dig in several places; he was believed to be "a treasure hunter". It was found out later on that this man must surely have been A. Fromaget because he mentioned Tam Nang An twice in his published works. It was unfortunate that he never published a report on his excavation at Tam Nang An.

Despite disturbance of the site, the retrieved archaeological data have proved to be informative about prehistoric occupation of the rock shelter. The sequence appears to be identical to that at Tam Hua Pu: firstly, occupation by Hoabinhian hunters and gatherers; followed by use of the shelter as a mortuary repository by an agricultural society. The Hoabinhian occupation is evidenced by typical Hoabinhian stone tools and flakes, and a large quantity of animal bones. The secondary burial repository is suggested by cord-marked pottery; human bones and teeth; grave goods consisting of iron bracelets and iron implements; and the presence of red ochre.

The grave goods of the Tam Nang An rock shelter appeared to be "poorer" than those of Tam Hua Pu but a

reliable qualitative appreciation cannot be ascertained because what had been retrieved by the French excavator is completely inaccessible to us.

As a concluding remark we can probably draw a parallel between the Tam Hua Pu and Tam Nang An rock shelters as far as their chronology and sequential use are concerned, and consider Tam Nang An cave an exceptional case because of its recent history of disturbance.

VIENTIANE PROVINCE

Lao Pako

A detailed account of the archeology at Lao Pako is given in the preceding papers by Karlström and Källén, thus another report is not necessary (see Källén and Karlström 1999). Sayavongkhamdy nonetheless wishes to add his personal observations deriving from participation in the excavation of the site, which included finishing the excavation of square B2. He believes that the buried jars were originally used for jar burial since some contain small pots inside, some have lids in place, some still contain fragments of bone. The acid leached soil of the site would have destroyed most of the bone, as in so many burial sites of this age in tropical and equatorial Southeast Asia.

The analysis of phytoliths carried out by Doreen Bowdery, on three sediment samples from the B2 square, has added another dimension to the history of the site. Two of the samples were collected at 117 and 173 cm depth, and the third represents sedimentary infill of a buried jar. They collectively reveal the presence of rice, bamboo, palm trees, bananas, and various hydrophylic plant species (Bowdery 1999). These data suggest that the location of the site was close to cultivated land, possibly annually inundated.

The Lao Pako mound rises above the level of regular flooding and supported habitation and a cemetery. It appears that local people brought in jars containing secondary burials and interred them in groups. The whole mound seems to have been used for such a purpose, as evidenced by the discovery of other jar burials which the construction workers encountered when they were digging some 30 m away from our test excavation during our fieldwork.

The mound also seems to have been used as a habitation site, as indicated by the presence of a thick layer of broken potsherds and the remains of iron-working implements above the layers with the jar burials. It is noticeable that the material culture associated with the habitation zone is similar to that of the jar burials and this indicates that the same people, perpetuating the same cultural traditions, were involved. Presumably, the jar

burials were placed in pits dug from the level of the habitation layer.

Comparative observations with other sites in Laos are for the time being impossible since Lao Pako is the first site of this kind ever found there. But affinities between the Lao Pako assemblage and those of several sites in northeastern Thailand (Ban Chiang, Ban Na Di, Ban Chiang Hian, Ban Kan Luang and Muang Fa Daed) are readily observable; the bronze bracelets, the baked clay rollers and the pottery are redolent with the same flavour. These similarities demonstrate that the Mekong River has never been a barrier between the populations living on opposite banks, but rather has served as a communication highway. On the other hand, the discovery of a miniature Dong Son drum (Källén and Karlström 1999: Plate 23) at Lao Pako immediately draws this site into the sphere of the renowned Dong Son culture. The production source might have been somewhere in Yunnan rather than Vietnam, since the origins of these remarkable drums are still a matter of debate. Other Bronze/Iron Age jar burial sites have also been recently discovered in central and southern Vietnam, such as Tam My, Phu Khuong and Phu Hoa, where placement of small pots and iron objects within a burial jar is a practice similar to that observed at Lao Pako. Future research might reveal communication between these prehistoric communities.

In its specific characters, the Lao Pako assemblage differs from those of Tam Hua Pu and Tam Nang An. It is too early to ascertain whether Lao Pako represents an independent development of the jar-burial practice from that at Tam Nang An.

Rice chaff has occasionally been found both in the pottery and in the tuyères from Lao Pako. It does not occur at a frequency sufficient to talk of ceramics deliberately tempered with rice chaff, as would be true of the pottery from Ban Na Di and other sites on the Khorat Plateau. However, the presumed-accidental inclusion of rice chaff with the grit used in tempering the Lao Pako wares is firm evidence that rice was cultivated by the inhabitants. Further, an AMS radiocarbon date from the chaff indicates that some of these vessels, at least, are over two thousand years old (OZD 761, below).

The radiocarbon dates from the site (Table 2), from the Australian National University, Australian Nuclear Science and Technology Organisation (AMS dates), and the Swedish Museum of Natural History (Laboratory for Isotope Geology, Stockholm), reveal some interesting differences. Two of the dates from ANU, on samples from the basal excavated deposits in square B2, would seem to refer to burning events that preceded the main occupation (cf. Bowdery 1999:163). Interestingly, the

circa 4000 BP radiocarbon date (ANU-10769) occurs at about the same depth as one of the samples in which Bowdery identified rice phyloliths.

The Swedish dates, however, relate well to two of the ANU dates (ANU 10874, 10875), yet are several centuries younger than the two AMS dates (OZD 761 and 762). These dates in total suggest that the main jar burial and habitation phase could have covered several centuries between c.500 BC and AD 500, and that there was prior use of the site, possibly for agricultural purposes, as early as 4000 BP. The date of sample ANU 10768 remains enigmatic, but is paralleled by evidence for similarly early burning on the Plain of Jars (see below).

XIENG KHUANG PROVINCE

The Plain of Jars

The stone jars of Xieng Khuang Province, together with the upright stone complexes of Hua Pan, comprise the megaliths of northern Laos, a particular class of prehistoric monuments described at length by the famous French archeologist Madeleine Colani (1935).

To date there are more than 40 recorded sites of stone jars in Xieng Khuang Province, 30 of which were visited by Colani. The number of jars varies from a few specimens to 250, and thus provides a measure of the size of each individual site. The three biggest sites were test pitted by Sayavongkhamdy between 1994 and 1996. Their present names are Phon Savan, Ban Xieng Di and Pu Salato, respectively called Ban Ang, Ban Soua and Champ d'Aviation Latsen by Madeleine Colani.

The stone jar sites all lie within the modern administrative province of Xieng Khuang, which occupies a remarkable geographical location since it is located in the middle of an area with numerous archaeologically renowned locations. These include Hua Pan Province where the upright stones are found, and also the famous Tam Pong and Tam Hang cave sites (Fromaget and Saurin 1935); Vietnam's Hoa Binh Province, the eponym for the Hoabinhian sites; Khammuane Province in Laos where Madeleine Colani found Neolithic axes and/or adzes at Nhommalat; Vientiane province with the Lao Pako site; and Luang Prabang Province with a large number of prehistoric sites including those mentioned above. Xieng Khuang is a large plateau situated at more than 1000 m above sea level and encircled by a series of mountain ranges with Pu Bia (2500 m) being the highest peak in Laos.

The stone jars are made of local rock cut from a quarry and hollowed out with iron chisels. The general shape is roughly a cylinder with the bottom always wider

than the top. Many of them have a sub-rectangular mouth and an irregular base. The walls are ten centimetres thick on average but bases are usually thicker and vary from one quarter to one third of the total height. Diameters range from 0.85 m to 2 m and heights from 0.85 to 3.00 m. The surface of the jar is usually plain, and only two of the three sites under study have jars carved with a human figure.

Circular stone discs 1 to 2 m in diameter are also found lying on the ground scattered between the stone jars. These discs are believed to be lids of the jars but their diameters do not match and the discs are always outnumbered by the stone jars. However, some stone jars have rebated rims which suggests that they once supported a lid that could have been made either of stone or wood. No stone jar has been reported covered with such a supposed lid, although the lids might have been removed as part of a ritual or by looters. Some stone discs are ornamented with carvings representing human figures, tigers, and monkeys.

The present contents of the jars include mud, water, and black greasy soil where sometimes a plant has taken root. The stone jars have been exposed to vandalism since time immemorial; they were reported as being systematically looted by armed bands of more than six hundred people during 1875. Madeleine Colani had various jars emptied by the villagers but only a few human bones were found inside, along with an insignificant number of artefacts. The original contents seem to have been lost, along with evidence of the primary functions of the stone jars. Were they burial containers or simply monuments erected for funerary rituals?

In the centre of the Plain of Jars at Phon Savan, there is a limestone hill which contains a cave. Madeleine Colani has demonstrated that the natural entrance of the cave was enlarged by humans, and that the sole chamber of the cave had been used as a crematorium, because two of the openings had been purposely enlarged to function as chimneys. Her excavation in the cave floor revealed burnt human bones and a large quantity of ash which confirmed her hypothesis that the bodies had been cremated there before their deposition inside the stone jars.

Local oral traditions are not supportive of these above-mentioned hypotheses, however. They refer to a superhero called Khun Cheuang who celebrated a great victory by his army over a powerful enemy. He supposedly commissioned these stone jars for fermenting the rice alcohol his festivities needed. Despite Colani's marvellous work, the stone jars are still surrounded with mystery as regards their origins, their functions, and the nature of the society that created them.

At the Phon Savan site, three different locations were test excavated: the terrace facing the cave, the top of the northern mound, and the slope of the southern mound. The excavation on the terrace facing the cave revealed a deposit which seems to have undergone several stages of disturbance. Potsherds, miniature pots, stone pendants, iron objects, bronze fragments including bells, glass beads, one stone slab and a large quantity of charcoal were encountered in the cultural layer, which is 30 cm thick in average and lies only a few centimetres beneath the top soil. This layer also contained several heaps of stones (pebble size) which sometimes looked like they had been heaped into an irregular pavement. Miniature pots and glass beads seem to have been deposited there as if they had been spread from a digging activity or dropped during emptying the stone jars.

A layer of charcoal was also found running underneath a stone jar, suggesting a burning activity prior to the establishment of the cemetery. Several early Holocene radiocarbon dates from this layer are listed below.

Beneath the cultural layer were found a buried jar and two burial pits with fragmentary human bone. The buried jar is a round-bottomed red pot with everted rim and a height of 30 cm. Its wall is surprisingly thin, approximately 3 to 5 mm. There is no decoration and no lid. No bones were found inside. One of the burial pits is covered by the stone slab, the bottom part of which seems to have been engraved with schematic human figures representing a naked couple. Human bones and teeth were found in the pit, crushed up into small fragments. The second pit contained two fragmentary skulls mixed up with large numbers of other bones. One skull fragment from this pit was sent for AMS dating and the result is listed in Table 3 (OZD 770). None of the bones showed sign of cremation. They had been defleshed before their secondary burial.

The second test pit on top of the northern mound yielded two pottery vessels which were different from each another and also different from the buried jar encountered in the first test pit. One is a black globular jar, whose neck and mouth have disappeared so only the body was found. No bones were observed inside. The second pot resembles a modern mortar and has the shape of a flower vase sitting on a thin round foot. Miniature pots, beads, iron and bronze fragments were encountered. A historical (17th-19th century AD) copper weight was also found. A spindle whorl was also uncovered.

The third test pit, on the slope of the southern mound, was centred on a granite block. The context proved to be very different from that of the locations described previously. Just below the surface lies a 25 cm thick layer of

sherds of notable density. A series of cylindrical coarse jars was found buried in a group. The jars were decorated with comb-incised spiral lines and covered with a vegetal resin which gives a dark green patina. There was also a thinner and better-fired round-bottomed incised grey pot. Miniature pots, beads and metallic objects were totally absent. This assemblage looks rather modern when compared to its counterpart associated with the stone jars, as described previously.

Three samples of phytoliths from the test pits have been analyzed by Doreen Bowdery. She concludes: "the assemblage suggests a wet habitat and more varied vegetation than occurs at present. Three economic plants, palm, banana and rice, were identified in the phytolith assemblage" (Bowdery 1999:163). This last observation would suggest either use of the sampled locality as a garden, or habitation in the near vicinity by farming groups.

Table 3 gives the radiocarbon dates for Phon Savan. The early Holocene dates presumably reflect a vegetation burnoff that has little connection with either the local practice of farming, or the mortuary sites on the Plain of Jars. It is paralleled by the early dates, especially ANU 10768, for the charcoal layer beneath Lao Pako. Only the more recent date (ANU 10767) seems to reflect on the age of these celebrated stone jars. The AMS date on a piece of human skull (OZD 770) from the first test pit provides a hint that burial activity in the site might have commenced as much as 3000 years ago, but cultural materials definitely from this date, which would obviously be pre-iron, have not yet been identified.

The test pits carried out at the two other sites, namely Ban Xieng Di and Pu Salato, have yielded similar artefacts and data to those uncovered from the Phon Savan site. During a complementary archeological survey, a quarry site was identified at Pu Keng, approximately nine km from the Phon Savan site. Some finished stone jars and some "preforms" lie *in situ*, and traces of working stone are clearly visible. One previously unrecorded site containing approximately 85 stone jars was also located during our archaeological reconnaissance.

As a preliminary conclusion we can offer the following remarks on Phon Savan. The site was once well watered and perhaps supported rice cultivation. At some point a cemetery was established. The mortuary practice seems to have revolved around the stone jars which might have contained the body or the pre-treated bones of the person to whom the jar was dedicated. Selected members of his or her family might have been subsequently interred as secondary burials around the stone jar, either in a burial pit or in a ceramic burial jar. Excavations at Phon Savan by Nitta in 1994 (Nitta 1996) have

produced similar evidence.

In Sayavongkhamdy's view, the necropolis was abandoned for perhaps several centuries and later reused by people who were making cylindrical, resin-coated jars. These people favoured the granite blocks which lie scattered in between the stone jars as their funerary monuments. The burial pots under the granite blocks are so distinctive from those excavated around the stone jars that their contemporaneity is unlikely, unless they represent two distinct communities which co-existed peacefully and manufactured pots within their own separate traditions. The difference between the pots is more likely to indicate that the granite blocks were used as "substitutes" for the stone jars during a later chronological stage, during a period when the "megalithic" cult was fading away.

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Tam Hua Pu textile pseudomorph and assisted with submission of radiocarbon samples.

REFERENCES

- Bowdery, D. 1999. Phytoliths from tropical sediments: reports from Southeast Asia and Papua New Guinea. *Bulletin of the Indo-Pacific Prehistory Association* 18:159-168.
- Bulbeck, D. n.d. Human remains from Tam Nang An, Laos. Typescript.
- Colani, M. 1935. *Megalithes du Haut-Laos*. Paris: Publications de l'Ecole Française d'Extrême Orient 25-26.
- Fromaget, J. and Saurin, E. 1935. Note préliminaire sur les formations cénozoïques et plus récentes de la Chaîne Annamitique septentrionale et du Haut-Laos (stratigraphie, préhistoire, anthropologie). *Bulletin du Service Géologique de l'Indochine* 22, fasc. 3. Hanoi.
- Källén, Anna and Karlström, Anna 1999. *Lao Pako: A Late Prehistoric Site on the Nam Ngum River in Laos*. Oxford: BAR International Series 777.
- Nitta, E. 1996. Comparative study on the jar burial traditions in Vietnam, Thailand and Laos. *Historical Science Reports, Kagoshima University* 43:1-19.
- Watanabe, H., Shigematsu, K. and Anzai, M. 1985. Archaeological survey of prehistoric cave sites in Laos. *Bulletin of the Department of Archaeology, Faculty of Letters, University of Tokyo* 4:31-54.

Table 1. Radiocarbon dates from Tam Hua Pu.

Identification	Provenance	Material	Lab. code	Date
THP 94 E8 5-10	Square E8 spit 5-10 cm	Charcoal	ANU-10138	1340 ± 70 BP
THP 94 E8 45-50	Square E8 spit 45-50 cm	Charcoal	ANU-10139	2820 ± 60 BP
THP 94 E8 60-65	Square E8 spit 60-65 cm	Charcoal	ANU-10770	4440 ± 100 BP
THP 94 E8 80-85	Square E8 spit 80-85 cm	Charcoal	ANU-10771	3840 ± 150 BP
THP 94 F8 80-90	Square F8 spit 80-90 cm	River shell	ANU-10141B	3750 ± 70 BP
THP 94 F3 80-85	Square F3 spit 80-85 cm	Cowry shell	OZD-765 (AMS)	4420 ± 60 BP
THP 94 G9 95-100	Square G9 spit 95-100 cm	River shell	OZD-766 (AMS)	32500 ± 900 BP

Table 2. Radiocarbon dates from Lao Pako. For the Swedish C14 dates for Lao Pako, see the previous paper by Anna Karlström.

Identification	Provenance	Material	Lab. code.	Date
LPK 96 B2 S43	Square B2 170 cm below surface	Charcoal	ANU-10769	3950 ± 120 BP
LPK 96 B2 S36	Square B2 180 cm below surface	Charcoal	ANU-10768	9390 ± 80 BP
LPK 96 Jar 5	Square B2, Jar 5 (Källén and Karlström 1999: Appendix 13)	Rice chaff	OZD-761 (AMS sample)	2420 ± 80 BP
LPK F49 S4	Square E2, layer IV (Källén and Karlström 1999:30)	Organic material inside miniature bronze drum	OZD-762 (AMS sample)	2570±120 BP
LPK D1 S22	Square D1, 120 cm below surface, inside Jar 11	Charcoal	ANU-10874	1520 ± 70 BP
LPK B2 S40	Square B2, 120 cm below surface	Charcoal	ANU-10875	1840 ± 80 BP

Table 3. Radiocarbon dates from the Phon Savan and Ban Xieng Di sites, Plain of Jars.

Identification	Provenance	Material	Lab. code	Date
THH 96 (Phon Savan) BS S1	Square F4 29 cm deep	Charcoal	ANU-10767	920 ± 50 BP
THH 96 (Phon Savan) BS S32	Square G4 79 cm deep	Charcoal	ANU-10765	8270 ± 120 BP
THH 96 (Phon Savan) BS S33	Square G3 72 cm deep	Charcoal	ANU-10766	8150 ± 90 BP
THH 96 (Phon Savan) BS S35	Square G3 80 cm deep	Charcoal	ANU-10764	8320 ± 100 BP
THH 96 (Phon Savan) F68	Find 68, secondary burial pit, 70 cm below surface	Human skull frag.	OZD-770 (AMS)	3410 ± 190 BP
THH (Phon Savan)	Northern Mound square 2, 25 cm below surface beneath stone jar	Charcoal	ANU-10873	6600±130
THH (Ban Xieng Di) S1	Secondary burial pit, 25 cm below surface	Charcoal	ANU-10871	2280±110

APPENDIX: HUMAN REMAINS FROM TAM NANG AN, LAOS

David Bulbeck

INTRODUCTION

In 1995, Thongsa Sayavongkhamdy excavated the limestone cave of Tam Nang An in Luang Prabang Province, under the supervision of Peter Bellwood. Square G14, in the second hall, produced a broken Neolithic burial jar at about 25 cm depth. Human bones were found mingled with the dirt and potsherds, and brought to Canberra for identification.

The 131 bones and fragments represent a single individual. They derive from across the skeleton excluding the hands and the facial region. The individual is adult, but whether male or female is totally unclear. The bones had been exposed to an intermediate temperature, in the order of 500-700°C, after the organic fraction had decomposed. This exposure to heat evidently resulted from post-depositional factors.

IDENTIFICATION OF THE TAM NANG AN HUMAN BONES

The following 131 fragments were recovered from the burial jar. From the cranium, four small calotte fragments varying between 3 and 11 millimetres thick. From the vertebral column, an almost complete third to sixth cer-

vical vertebra, a cervical vertebral spinous process, the occipital centra from two upper thoracic vertebrae, the centrum of a lower thoracic vertebra, a thoracic vertebral superior articular process, three thoracic vertebral pedicles, the spinous process of a lumbar vertebra, and a lumbar vertebral transverse process fragment. From the thorax, 12 rib fragments of which three include the head and/or articular facets that occlude with the vertebrae, while two include the sternal ends farthest away from the vertebrae. From the pelvis, a pubic fragment and an acetabulum fragment. From the arms, three humerus shaft fragments, a proximal fragment from the left radius (between the head and the tuberosity), a proximal radius shaft fragment, an olecranon fragment from an ulna, two ulnar shaft fragments, and a fragment from the distal left ulna (but without the styloid process). From the upper legs, a fragment from the femur's greater trochanter, and four shaft fragments representing both femora, of which the largest comes from the distal right shaft. From the lower legs, an inferior patella fragment, five fragments from the tibial proximal epiphysis, an anterior tibial diaphysis fragment, and two fibular diaphysis fragments. From the feet, the complete right middle metatarsal in occlusion with the proximal two thirds of the right fourth metatarsal, plus a further proximal metatarsal fragment, and the medial portion of a third or fourth proximal pedal phalanx. The further 75 splinters and other fragments of bone could possibly be identified with some degree of confidence after considerable effort, but they would add nothing new to the evidence of the representation of the skeleton available from the more diagnostic fragments.

We have sporadic representation across virtually the entire skeleton without the duplication of any anatomical element. Conspicuous omissions are the hands, and especially the jaws, face and most of the cranial vault. The profile suggests a more or less random selection of fragments from a broken-up, originally complete skeleton, but with the following proviso. The skull was either essentially not available for selection, or the portions identifiable as skull were specifically avoided. The absence of teeth in the assemblage could be explained in various ways, e.g. the deceased individual had lost most of her/his teeth before death, but this could not explain the absence of the jaws. The mandible is the most robust bone in the body, and should survive when virtually all else has decayed. For example, at the Romano-British cemetery at West Tenter Street, London, the mandibular corpus, ramus and condyles were preserved in 50% to 65% of the skeletons. This range is higher than the 11-61% preservation rate for those anatomical elements which we can observe in the Tam Nang An burial (cf. Waldron 1987). Hence human activity rather than taphonomy would appear to be responsible for the absence of jaws among the Tam Nang An remains.

The nature of the Tam Nang An bone is quite peculiar. The fragments are very light, they tend to make a ringing sound when tapped just as the sherds of stoneware vessels and high-fired earthenwares do, their exterior colour is a strong to dark brown criss-crossed by a white lattice, and their interior colour is also a strong brown. These observations are best explained by hypothesising exposure to heat, at temperatures in the order of 500-700°C, after the collagen fraction had decomposed. Prior decomposition of the collagen fraction would explain the bones' lightness, since the organic fraction of fresh bone accounts for approximately half of its weight. Prior collagen decomposition would also ex-

plain the lack of visual evidence of charring, as it is the organic fraction which blackens upon exposure to heat (cf. Burns 1987). Exposure to heat would have occurred before fossilisation set in because otherwise the bones would be denser than they are, and the fragments would have begun to take on the visual appearance of heated-up limestone. Instead, the surficial white lattice corresponds to the crackle observed experimentally when defleshed bones are heated up to around of 500°C, just as the splintery shape of the fragments corresponds to the longitudinal cracking of experimentally heated, defleshed bones (cf. Ubelaker 1984; Burns 1987). My reason for proposing a temperature slightly higher than 500°C is the stoneware-like ring which many of the fragments produce upon tapping. This suggests a phase transition towards the "clinkers" which are produced at temperatures of around 900°C from the hydroxyapatite fraction of cremated bone (cf. Henderson *et al.* 1987). The Tam Nang An bones were not, however, exposed to temperatures of quite this order, because they do not show any of the calcining that would be expected, nor the melted shape which results from fusion of the bone apatite crystals above 700°C (cf. Burns 1987).

The physical condition of the Tam Nang An bones would be compatible with heat exposure either through mortuary practices or as a post-depositional event. We could account for the status of the remains by proposing a mortuary procedure in which the skeleton was defleshed under conditions which led to the rapid decay of the collagen fraction. Various portions of the skeleton (but excluding recognisable skull) could have then been collected, heated at temperatures between 500 and 700°C, and the remains buried in a jar in the site. However, the Tam Nang An human bones need not have been heat-treated when they were originally interred in the site. Thongsa Sayavonkhamdy (pers. comm.) recorded

Table 1. Measurements of the Tam Nang An cervical vertebra (in mm) compared to nearby populations

Specimen/Population	Diameter across the transverse processes	Vertebral foramen transverse diameter	Centrum anterior height	Centrum medial height
Tam Nang An	=> 52	25.6	12.8	11.0
Male Japanese	55.5-60.6	24.0-27.0	12.8-14.5	10.4-11.5
Male Australian Aborigines	49.5-55.5	22.0-23.6	11.1-11.3	9.1-9.4
Female Japanese	50.2-55.1	22.0-24.4	11.6-12.6	9.4-9.8
Female Australian Aborigines	44.9-49.0	21.2-22.7	9.1-9.4	8.1-8.3

Note. Data for Australian Aborigines are from Tulsi (1972), and data for Japanese are from Tsunematsu (1957). The ranges shown are the means on the vertebrae between the third and sixth cervical vertebrae, as it is not clear exactly where the Tam Nang An specimen belongs on the cervical vertebral column.

the burial jar in a shallow stratigraphic position (mainly 25-30 cm beneath the surface), and noted the archaeological evidence of hearths, a terrace wall, and possible pits produced by Buddhist devotees over the last few centuries. Perhaps a hearth directly above the jar burial baked the bones in their jar, or perhaps the Buddhist devotees disturbed what they then recognised to be a human burial, and then lightly cremated the bones (whilst souvenirising the skull). The radiocarbon dates from the burial (see main text) support the scenario of Buddhist-period burning of an uncremated burial.

The bones are clearly those of an adult. Complete fusion of the epiphyses to the diaphysis is clearly visible on the left distal ulna fragment and the complete right metatarsal. These fusions usually occur in the early twenties (cf. Brothwell 1981:66). Sex is difficult to estimate because the most sexually diagnostic anatomical elements are lacking. The proximal left radius fragment has a marked tuberosity, but otherwise the fragments are neither especially robust (as may suggest a male) or gracile (as may suggest a female). In size, the bones seem to fall in the region of male/female overlap. For instance, the cervical vertebra has a spread across the transverse processes of 52 mm or slightly greater, a transverse diameter of the vertebral foramen that equals 25.6 mm, an anterior height of the centrum of 12.8 mm, and a middle height of the centrum of 11.0 mm (Table 1). These measurements consistently fall within the range of averages recorded on the third to sixth cervical vertebrae among Japanese males or, in one case, Australian Aboriginal males. In all cases, except one, they lie above the range of averages recorded among Japanese and Australian Aboriginal females (Table 1). However, in contrast to the typically masculine size of the Tam Nang An cervical vertebra, the middle right metatarsal would be very short for a male's. Its maximum length of 61.9 mm is much less than the 66.8 mm average (range, 62-79 mm) recorded for male Australian Aborigines (Rao

1966:109), or the 69.0 mm average (range, 60-80 mm) recorded for North Chinese males (von Bonin 1932). Without access to comparative Indochinese postcranial material, it is pointless to speculate on the sex of the Tam Nang An individual.

REFERENCES

- Brothwell, D.R. 1981. *Digging up Bones*. Third edn. London: British Museum (Natural History).
- Bonin, Gerhardt von. 1932. Preliminary study of the Northern Chinese foot. *Anthropologischer Anzeiger* 9:214-27.
- Bums, Karen Ramsey. 1987. *The Effects of Drying and Burning on Human Bones and Teeth*. PhD thesis. Ann Arbor: Dissertation Information Service.
- Henderson, J., Janaway, R.C. and Richards, J.R.. 1987. Cremation slag: a substance found in funerary urns. In A. Boddington, A.N. Garland and R.C. Janaway (eds), *Death, Decay and Reconstruction: Approaches to Archaeology and Forensic Science*, pp. 81-100. Manchester: Manchester University Press.
- Rao, Pappu Durga Prasada. 1966. *The Anatomy of the Distal Limb Segments of the Aboriginal Skeleton*. PhD thesis. Adelaide: University of Adelaide.
- Tsunematsu, Yojiro. 1957. An anthropological study of the vertebra in Japanese inhabitants of Kyushu. *Jinruigaku Kenkyu* 4:302-27.
- Tulsi, R.S. 1972. Vertebral column of the Australian Aborigine: selected morphological and metrical features. *Zeitschrift für Morphologie und Anthropologie* 64:117-44.
- Ubelaker, D.H. 1984. *Human Skeletal Remains: Excavation, Analysis, Interpretation*. Revised edition. Washington: Taraxacum.
- Waldron, T. 1987. The relative survival of the human skeletons: implications for palaeopathology. In A. Boddington, A.N. Garland and R.C. Janaway (eds), *Death, Decay and Reconstruction: Approaches to Archaeology and Forensic Science*, pp. 55-64. Manchester: Manchester University Press.