

ASBESTOS CLOTH AND ELITES IN SOUTHEAST ASIA

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ABSTRACT

In the early first millennium BC, asbestos was amongst the exotic commodities transported along the trade routes that linked China with Southeast Asia, central Asia and the borders of India and Iran. Research also shows that there was an established relationship between asbestos and power. While asbestos is contrary to modern sensibilities, two thousand years ago asbestos fibres were highly prized by emerging elites for their lustre and incombustibility. Asbestos fibres have been identified at Neolithic, Bronze Age and early historical sites in Thailand, including Khok Phanom Di, Ban Chiang, Ban Prasat and Moh Khiew. This paper attempts to explicate the meaning of these exotic materials in prehistoric burials in Southeast Asia using data from historical sources on early Southeast Asian commerce. The presence of such exotic fibres in cultural contexts in Thailand suggests that prehistoric groups in Southeast Asia either contributed to the early asbestos trade or, alternatively, were involved in extensive trade networks much earlier in the prehistoric period than has previously been accepted.

INTRODUCTION

It is not widely known that asbestos fibres have been recovered from burials at several Neolithic and Bronze Age sites in Thailand. These include three of Thailand's most important sites: Khok Phanom Di, Ban Chiang and Ban Prasat, as well as several Portuguese settlements from the historical period. While Chiraporn Aranyanak (1991:78) has positively identified the fibres as asbestos, their relationship to early commerce in Southeast Asia has not been considered. This paper discusses the archaeological evidence for asbestos in Southeast Asia and what is known about the early asbestos trade. Historical sources indicate that in the first millennium BC, asbestos fibres were worked into two different kinds of cloth that were highly prized by emerging elites for their lustre and incombustibility. Asbestos fibres resembling beaten bark cloth were traded in the markets in Funan, on the Mekong delta (see

below), while spun and woven asbestos textiles were traded in markets in East Asia. The latter were as exotic as silk in the early trade that linked the two superpowers of the first millennium, China and Rome. Historical sources (cf. Wylie 1897; Laufer 1917) attest to the usage of asbestos cloth as floor coverings, clothing and shrouds.

Asbestos is a generic term for a group of naturally occurring silicate minerals that can be separated into fibres. As can be seen from Figure 1, the fibres themselves are short-stapled (up to 5.6 cm). The three main types are chrysotile, $Mg_3(Si_2O_5)(OH)_4$; crocidolite, $Na_2Fe_3^{++}Fe_2^{+++}Si_8O_{22}(OH, F)_2$; and amosite, $(Fe^{++})_4(Fe^{++}, Mg)_3Si_8O_{22}(OH)_2$. Chrysotile accounts for 90% of the world's usage of asbestos and is used in spinning and weaving because of its softness and silky texture; the other silicates are too harsh. The asbestos fibres can be spun as wool using the hand spindle to draw them out, extending their length and tensile strength. In its rock form, chrysotile is green in colour but when the fibres are opened, they appear white which is why chrysotile is known as white asbestos. Crocidolite is blue while amosite is brown in colour. Chrysotile is virtually unaffected by temperatures up to 500°C (Anon. 1985:20-21).

ARCHAEOLOGICAL EVIDENCE

The asbestos fibres recovered by Higham and Thosarat during their excavations at the Neolithic village of Khok Phanom Di in Central Thailand appear to be the oldest examples in a cultural context in Southeast Asia. Khok Phanom Di is significant in Southeast Asian prehistory for its elite burials. At the time the site was occupied between 4000 and 3500 BP, it was located at the mouth of the Bang Pakong River. Higham and Thosarat (1994) attribute the wealth represented in the material culture at the site to the rich habitat of the riverine environment. At Khok Phanom Di, 27 burials were wrapped in some kind of material. The close proximity of upper arms to torsos in many of the burials led Higham and Bannanurag (1990, 1993) to

conclude that these burial wrappings functioned as shrouds, described by Higham and Thosarat (1998:47-48) as "White fabric, made from beaten bark or sheets of naturally-occurring asbestos".

The fibres from Khok Phanom Di have been investigated by several experts, with conflicting results. One sample was sent to T. Lawrence, who was unable to match the fibres with any of the plants in the comparative reference collection at London's Royal Botanical Gardens at Kew (Thompson 1996:109). In her analysis of six specimens of fibres from Khok Phanom Di, Thompson (1996:110) found that only two resembled the fibres in ethnographic examples of bark cloth from the Pacific. She described the other four samples as comprising long, fine parallel fibres, with a fibre diameter of 5 microns, which could not possibly be from bark cloth. One of these samples was sent to an expert in New Zealand who opined that it was definitely not asbestos. Hence Thompson remained sceptical of the solution offered by Chiraporn Aranyanak (1991), of the Fine Arts Department of Thailand, who had positively identified asbestos fibres from Khok Phanom Di on morphological grounds using Scanning Electron Microscopy, confirmed with combustibility tests. Thompson proposed the inclusion of phytoliths as an alternative explanation for the fibres' high silicon peaks,



Figure 1. Asbestos fibres prior to spinning (Stout 1960:266).
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whereas Chiraporn noted that these peaks (readily distinguishable in the photomicrographs of her report) characterize asbestos fibres.

Thompson understandably refrained from positively identifying any of the Khok Phanom Di fibres, but asbestos has now been independently identified as layers used in relining furnaces (probably iron-smelting furnaces) at Noen U-Loke, another site on the Khorat Plateau, between about 100 BC and AD 300 (Higham and Thosarat 1998:151-158). At around the same time, as discussed below, early Chinese records described the trade in Funan of a type of asbestos cloth that would appear to be indistinguishable from the Khok Phanom Di burial shrouds. Finally, the availability of asbestos is fully possible, as local deposits of chrysotile occur in the Malay Peninsula, and in the Uttaradit Intrusion Zone west of Ban Chiang (Dr Lodwick, Bureau of Mineral Resources Southeast Asia Desk, pers. comm. 1998). Hence, the results of Thompson (1996:110) are interpreted here to reflect the presence of asbestos in at least three Khok Phanom Di burials (125, 136, 151), and one further feature (10:7 feature 29). Even though the function and meaning of the asbestos in the burials are unclear, and its origins have not been determined, some alternative positive identification for the Khok Phanom Di fibres would be required to displace the asbestos identification.

Chiraporn (1991) also positively identified asbestos fibres from Ban Chiang and Ban Prasat, two Bronze Age sites on the Khorat Plateau. However, Chiraporn was of the opinion that the asbestos fibres in the assemblage of prehistoric fibres she analysed were neither spun nor woven. It is conceivable that the asbestos fibres from Khok Phanom Di, Ban Chiang and Ban Prasat were originally woven, but then unravelled over the several millennia following their burial. However, it is far more likely that they are the remains of asbestine stuff, resembling bark cloth, of the type traded in Funan.

HISTORICAL BACKGROUND

The presence of asbestos at Late Neolithic and Early Metal Age sites in Thailand is of special interest to textile history. Two thousand years ago, asbestos cloth was of considerable economic significance in the early textile trade that linked the two superpowers of the first millennium, China and Rome. Much has been written about the importance of Chinese silk in the trade but asbestos was actually worth more than silk; the latter was worth its weight in gold in Imperial Rome at that time. Pliny the Elder (23 BC) clearly says that in its crude state, asbestos equalled the price of pearls. In the chapter on linen (line) in the 'Naturall Historie of C. Plinius Secundus', Pliny wrote (as translated by Holland 1604), "if they can come by it... (they) esteem it as precious as the best orient pearls

... this line may well be counted for the principal and the best that is in the world". Pliny also held the view that asbestos came from India.

According to Strabo (64 BC-AD 23), asbestos fibres were extracted from quarries at the foot of Mt Ocha on the island of Euboea off the coast of Greece. The technology was also known on the islands of Carystus, Carpasian and Crete. Asbestos was available in the markets of Mosul (Iraq) and used for protective clothing by Persian soldiers spraying naphthalene. From historical sources it seems that the technology was introduced to Euboea when the Persian Expedition landed on the island in 490 BC. The Greek historian of the second century BC, Apollonius Dyscolus, tells us that the short woolly, downy fibres from the stone were combed like wool, then spun and loosely woven into textiles for banquet cloths and shrouds. In the *Chu fan chih*, Chao Ju-kua (c.AD 1200) also records the presence of asbestos cloth in Mosul. Hirth and Rockhill (1911) were of the view that asbestos was brought to Mogul from Badakshan. Wheatley (1959:75) lists asbestos as one of the most exotic commodities in the Song trade, and reports that asbestos deposits were still mined near Kars in Turkey thirty years ago.

Early elites greatly admired the fibre's lustre and incombustibility. Pliny reports that asbestos shrouds were prescribed for elite burials in Rome, including those of royalty. He describes the mortuary ritual as follows: "the manner was to wind and wrap the corpse with a sheet of this textile, the purpose to separate the cinders coming of the body, from other ashes". This is confirmed by finds of archaeological textiles manufactured from asbestos fibres in elite burials in Rome. The Vatican Library houses an early Roman asbestos shroud recovered from the marble sarcophagus of a high-ranking Roman buried outside Porta Major, the Gate of Rome. The burial dates to the time of Constantine (AD 324-337). It is mentioned in *Textrinum Antiquorum* (An Account of Weaving among the Ancients) (Yates 1843). According to Yates, the shroud was still soft and pliant when excavated in 1701. Yates also mentioned similarly worked asbestos shrouds removed from high-ranking Roman burials in other parts of Italy.

In China, asbestos was also associated with elites, not as burial shrouds but as tribute and costume. The Chinese called asbestos cloth *huo huan pu* which means "cloth that can be cleansed by fire". Asbestos itself had several names: *shih mien* (stone fluff, stone down, stone cotton) or *shih jung* (stone floss, stone velvet). The early Chinese were not aware of its mineral origin, some believing it to be derived from salamanders. Other medieval authorities attributed the fibre to the leaves or bark of a tree or the hair of the fire rat (*huo shu*). By Mongol times at the latest, the Chinese knew asbestos was mineral (*Cihai Encyclopaedia*, Vol. 1, p. 842). Obviously traders kept the origins of asbestos secret in the same way that the Chinese

kept their knowledge of sericulture to themselves.

Apart from clothing, asbestos cloth had other functions, not only for wicks and a kind of filter paper but also for insulation on roofs and walls to reduce fire risk. It is not known precisely when asbestos cloth first reached China but the product is mentioned in Chinese dynastic records as early as the Chou Dynasty (1027-771 BC). Imports of asbestos cloth consistently appear in historical sources beginning with the *Shih chi* compiled in 90 BC which refers to events of 100 BC, the *Ch'ien Ha shu* (History of the Former Han), the *Ban Gu* (History of the Later Han) compiled in AD 450, the *San Kuo chih* (Record of the Three Kingdoms) compiled before AD 429, the *Chin shu* (History of the Chin Dynasty) written in 635, the *Pei shih* (History of the Northern Dynasties), the *Chiu T'ang shu* (Old History of the Tang Dynasty), the *Hsin T'ang shu* (New History of the T'ang Dynasty), the *Sung shih* (History of the Sung Dynasty), the *Sung shu* (History of the [Liu] Song Dynasty), the *Liang shu* (History of the Liang dynasty), the *Wei shu* (History of the [Toba] Wei), the Nestorian Stone (AD 781), as well as in Chao Ju-Kua's work, the *Chu fan chih*, compiled in 1225 (Needham and Wang Ling 1954:199).

Space does not permit a detailed discussion of the asbestos described in the above-mentioned historical documents; however, there is one fascinating account worth reiterating. The *Wei chia* (cited in Laufer 1915:311, 312) contains an account of an asbestos robe worn by General Liang ki who lived under Emperor Huan (AD 147-157) during the Han Dynasty (206 BC-AD 220). General Liang ki wore an asbestos robe to great banquets where he would deliberately set up a situation where wine would be spilled on his exotic robe; feigning anger he would then remove the robe and throw it onto the fire where it blazed until the fire was extinguished. The robe was then removed from the fire and to the astonishment of onlookers the woven cloth was not destroyed but cleansed and of even brighter appearance.

During the Hou Wei Dynasty (AD 386-532), the King of Kashgar sent tribute to the Chinese Emperor in the form of an asbestos robe described as a Buddha cloth. According to accounts in the *Wei shu* (History of the [Toba] Wei), the Emperor put the robe's fireproof qualities publicly to the test, burning it on a violent fire for a full day. Chinese records describe spellbound observers witnessing the event. An earlier asbestos cloth was reportedly sent to one of the Chou kings (King Mu) as tribute from the Western Jung, presumably along one of the overland trade routes.

ASBESTOS IN FUNAN

Chinese historical sources also mention other types of asbestos cloth in the early maritime trade in Southeast Asia. One of these is pertinent to this research as it resembles the type of asbestos manufactured today for insulation

and industrial purposes. Asbestos fibres that are too short to spin and weave are massed, mixed with less expensive materials (cotton, flax, wool), consolidated, and flattened into incombustible asbestos stuff.

Several Chinese writers referred to unwoven asbestos cloth being traded in Funan at the beginning of the first millennium AD. Writing in the third century AD, the Chinese alchemist, Ko Hung (AD 249-330), described three completely different types of asbestos cloth in the markets in Funan. According to Ko Hung, the first two types were of vegetal origin while the third was of animal origin. The first type of asbestos was made from the flowers of trees which were spun and woven into cloth. A second type was made from the bark peeled from certain trees, boiled in lime, and worked into cloth which was much coarser than woven forms. A third type was spun and woven from asbestos fibres obtained from rodents.

From Ko Hung we also learn that asbestos products were rare in Funan (as in Rome) and supply could not keep pace with demand (Laufer 1915:330). The Chinese were very vague about the origins of this second type of asbestos cloth, attributing it to a volcanic island. In his commentary on the *Shan hai king*, Kuo P'o (276-324), a contemporary of Ko Hung, located the island as follows: "Ten thousand *li* to the east of Funan is the kingdom of Ke-po. More than five thousand *li* farther east is the burning mountain kingdom" (Laufer 1915:332). Wylie (1897) and Laufer (1915) have identified the volcanic island as Java, whereas Wang Gangwu (1959) attributed the asbestos in the early maritime trade in Southeast Asia to India as its source.

The existence of asbestos in the markets of Funan is confirmed by reports from two Chinese diplomats, K'ang T'ai and Chu Ying. The diplomats had been sent on a mission to Cambodia and on their return recorded their impressions in an article on Funan in the *Annals of the Liang Dynasty* (502-556). According to these envoys, the asbestos at Funan came from a volcanic island located in what is now Malaysia. They reported that the people in the vicinity of the volcanic island peeled off the bark, and spun and wove it into cloth measuring a few feet in length.

Historians of early Southeast Asia have seriously questioned the existence of such strange, exotic cloths. Only Maspero (1915:46) believed the asbestos fibres in the markets at Funan was Malaysian bark cloth. The strongest criticism of the early Chinese accounts comes from Laufer who completely rejected Ko Kung's accounts because of a lack of comparable ethnographic examples. "How can we assume a Malayan asbestos cloth if asbestos has never been found and wrought anywhere in the archipelago?" (Laufer 1915:499). Obviously, at the time of writing, asbestos fibres had not been recorded in archaeological contexts in Thailand. A Malaysian or Mainland Southeast Asian source is indeed plausible given the de-

posits of asbestos in the Malay Peninsula and the Uttaradit Intrusion Zone in Northeast Thailand.

The origin question aside, there are two problems with the historiography. First, scholars like Laufer are ethnocentric; if a particular type of cloth is not known in the West, Laufer rejected its existence. Laufer also implied that Ko Hung would not have been able to tell the difference between bark and asbestos. This is unacceptable. The early Chinese were very knowledgeable about fibres. Taxes were paid to the state in bast fibres and it is inconceivable that a Chinese alchemist such as Ko Hung would not have been able to differentiate between bast fibres. It is far more likely that meaning has been lost through translation and the pre-occupation with the origins of asbestos. If we reduce the question to the basic principles of fabric construction and replace the word bark with asbestos, Ko Hung's descriptions become plausible. The first type of asbestos cloth made from flowers would refer to a mixture of cotton and asbestos fibres, spun and woven into thread. Ancient sources often refer to cotton floss as flowers and Laufer himself mentioned cloth of this material composition in his essay on asbestos. The second type of asbestos probably was not bark cloth but had been made using bark-cloth techniques, i.e. the asbestos fibres were macerated and matted through pounding and beating. There are references to fireproof cloth resembling this type known as *huo ts'ui* (fire down), produced by the southern Man in Shu, now in Szechuan Province (Laufer 1915:360). Some scholars believe this type of asbestos cloth must have been a composite of asbestos and bird feathers. The same downy appearance would have been obtained through beating. The third type of asbestos cloth in Funan can be identified with the spun and woven asbestos cloth of the Sino-Roman trade.

CONCLUSION

Notwithstanding the confusion in Southeast Asian historiography about the origins of asbestos fibres, a few general conclusions can be drawn. There remains unequivocal evidence that prehistoric groups in Thailand used asbestos cloth in secular and burial contexts before and during the first millennium BC. Historical sources also indicate that both woven asbestos and unwoven asbestos stuff were traded in Funan around 2000 years ago. We also know from historical records that "Southern Barbarians" from Southeast China macerated asbestos fibres and worked them into unwoven asbestos stuff in the historical period. However, the relationship between these known forms remains unclear. Are the archaeological examples of asbestos cloth in Thailand remnants of the Sino-Roman textile trade, unravelled over the millennia after their burial, or are they linked to the unwoven asbestos cloth observed in both Funan and Szechuan? In my view, the latter is indicated. The excavation director (Charles Higham pers. comm. 1999) and the fibre analyst (Aranyanak 1991)

clearly state that the asbestos fibres from Khok Phanom Di were not woven. Both Aranyanak's and Thompson's photomicrographs of the asbestos show straight parallel fibres. If previously spun and woven fabric had become disentangled over time, the diagnostic spin would have been discernible in the archaeological threads from Thailand. The main point is that the spin remains in prehistoric threads. Textile archaeologists have been able to determine the direction of spin (whether a fibre was s- or z-spun) of textiles dating back 8000 years ago. It remains unclear from the available data whether the asbestos stuff in Central and Northeast Thailand was derived from a local source or introduced down the Mekong River from Szechuan Province. Further research is intended. All that can be stated with certainty is that asbestos would have been as rare in prehistoric times as it was during the early historical period and, *ipso facto*, the prerogative of elites.

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