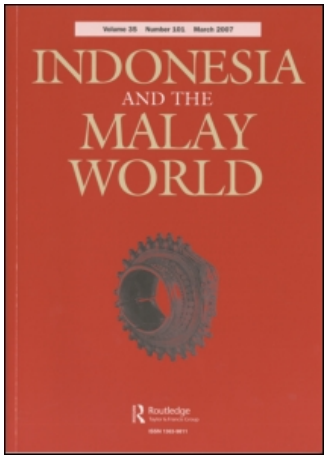

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David Bulbeck and Ian Caldwell

ORYZA SATIVA AND THE ORIGINS OF KINGDOMS IN SOUTH SULAWESI, INDONESIA

Evidence from Rice Husk Phytoliths

This article sets out the first direct evidence for the central role of rice cultivation in the origin and development of complex chiefdoms, or kingdoms, in South Sulawesi after c. AD 1200. This evidence comprises Oryza phytoliths recovered from a test pit excavated from the earliest recorded palace site in South Sulawesi. A chronological context is provided by ceramic sherdage recovered from the test pit and from a partial surface survey of the hill on which the site is located. The combined evidence supports our contention that agrarian kingdoms first appeared in the late 13th century as an indigenous response to the availability of trade goods, mainly Indian textiles and Chinese and Southeast Asian ceramic wares. No material or stratigraphic support was found for an alternative theory that South Sulawesi's early kingdoms were primarily trade based, and that their subsequent development was punctuated by an economic and social collapse lasting several decades.

Introduction

For at least six centuries the lowlands of South Sulawesi (the southwest peninsula of the Indonesian island of Sulawesi) have been divided into political and territorial units which historians have termed kingdoms. The earliest reference is in the Javanese poem *Desawarnana*, completed in 1365, which names three kingdoms, Makasar, Luwuq and Bantaeng, as tributaries of Majapahit. Portuguese visitors in the 1540s describe a landscape divided into small warring polities and observe that their rulers were sometimes close relatives. Historical and literary texts written in the Bugis and Makasar languages from the 15th century onwards clearly describe South Sulawesi's past in terms of the evolution and development of these kingdoms from smaller political units or chiefdoms. Dutch sources starting in 1605 make frequent mention of the major kingdoms of Luwuq, Soppeng, Sidenreng, Bone, Wajoq and Goa–Talloq, whose former importance is reflected today in the names of the province's districts (Ind.: *kabupaten*). Archaeological research carried out since the mid-1980s increasingly supports a late 13th century date for the earliest

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beginnings of these kingdoms, which archaeologists term complex chiefdoms (Bulbeck and Caldwell 2000; Druce 2005).[1]

The conventional model of early socio-political developments in South Sulawesi originates from the Bugis poetic epic *La Galigo*, which describes how the god-rulers of Luwuq, a Bugis kingdom at the far north of the peninsula, founded the Bugis-Makasar tradition of royal authority (Braam Morris 1889; Zainal Abidin 1974; Gibson 2005). Christian Pelras, in particular, has attached a historical veneer to this mythological past with his recognition of three socio-political periods. In *The Bugis*, Pelras presents an initial age of trade-based kingdoms from the 11th to 14th century, followed a by a period of economic and social collapse, from which ruin arose the agrarian and trade-based kingdoms of historical record (Pelras 1996). Zainal Abidin (1974: 163–64) sets out a picture of these putative, pre-agrarian, trade-based polities:

> The situation described in the [La Galigo] cycle refers to a time when the Buginese people were settled on the coast of Celebes and had not yet penetrated the interior. The picture of each individual kingdom conforms to a regular pattern. It was centred around the mouth of a river where large boats could anchor and with a 'capital' some little distance away. A 'capital' consisted of a palace surrounded by a fence or earth wall and beyond this were scattered the houses of the nobility. Near the palace was a *baruga* or council house for the nobles, meeting-place for adult men and reception area for foreign visitors. The arrival of a trading vessel from distant parts caused great excitement. After paying their dues and taxes, the foreign merchants could begin to trade. The ruler had priority in purchasing, or more correctly bartering for goods. He was followed by the nobles and then the general populace. Contact between rulers was always by sea, and young nobles were urged to travel as widely as possible before assuming any responsibility.

Our own programme of historical archaeological research strongly supports the idea that trade and agriculture (primarily wet-rice farming) were closely linked from the outset, the one stimulating the other in a multiplier effect (Macknight 1983; Bulbeck 1992; Caldwell 1995). In addition, while it was clear that in the 15th and 16th centuries the Ur-kingdom of Luwuq acquired enormous wealth from its near monopoly of the iron trade (accounting, perhaps, for its pre-eminence in the La Galigo), no evidence was found that it was older than the Bugis agrarian kingdoms, or that it had ever experienced a period of decline before the 17th century (Bulbeck and Caldwell 2000).

References to the cultivation of rice can be backdated using standard 25-year reign lengths for the rulers of the various kingdoms. The earliest of these references dates to the 14th century or perhaps a little earlier (Caldwell 1995). However, the major Bugis and Makasar chronicles were composed in the 17th and 18th centuries, thus it is possible that the picture they present of the

[1]Sets of hierarchically-nested polities whose rulers recognised a paramount regional noble of varying title: see Caldwell (1995) for a detailed description. By the late 16th century Goa-Talloq had developed into a fully-fledged state (Bulbeck 1992: 469–72).

importance of rice might be over-emphasised or anachronistic. On the other hand, the spatial and qualitative distribution of recovered ceramic sherdage indicates that from the 14th century onwards the distribution of (and possibly the trade in) imported prestige goods was largely controlled by the kingdoms' rulers. This can be deduced from the fact that both the greatest quantities of sherdage, and pieces of the highest quality, are invariably found at major palace sites, with wares of lesser quantity and quality found at secondary settlement sites (Kallupa et al. 1989; Bulbeck and Caldwell 2000; Caldwell and Bougas 2004). Rare and unusual ceramics, such as Cizhou brown underglaze stoneware (discussed below), are almost never found, other than at major palace sites. If rice was the trade good with which these ceramics were obtained, its surplus cultivation must date back to at least the 14th century.

Background to the present study

The present study forms part of the 'Origin of Complex Society in South Sulawesi' (OXIS) project, set up by Ian Caldwell and David Bulbeck in 1996 to research the social and ecological basis for the emergence of kingdoms in the Bugis-speaking areas of South Sulawesi between *c.* AD 1200 and *c.* 1600.[2] The OXIS project complements the limited textual evidence on the period by examining the huge and barely tapped archaeological record contained in early Bugis habitation and burial sites. The scholarly debate over the outline of historical developments in early South Sulawesi, and the antiquity of systematic rice cultivation, is amenable to archaeological research, especially with the continual refinement of scientific techniques in archaeology.

One particularly useful technique in archaeology is the identification of plant matter from phytoliths. These biogenic silica microfossils are deposited in many plants, including rice (*Oryza sativa*), which is a prolific phytolith producer. Unlike organic material or pollen (another plant microfossil), phytoliths preserve well in many environments and can often be diagnostic of the represented plant taxa, even to the species level (Piperno 2006). Phytoliths are important in the study of plant resources, vegetation and climate change at many archaeological sites. The phytoliths we discuss here were obtained from a single 1 m x 1 m text pit excavated on the summit of a hill identified as an early palace site in a Bugis-speaking region on the eastern side of the southwest peninsula. They were analysed by Dr Doreen Bowdery of the School of Archaeology and Anthropology at the Australian National University, who identified the majority as deriving specifically from rice husks (Bulbeck and Bowdery 2004).[3] Unfortunately, phytolith data cannot yet distinguish between

[2]The OXIS project was designed to assess the relative importance of rice cultivaton, iron metallurgy, and organised trade as the major economic factors underpinning the establishment of complex polities in the region. It also sought evidence of a possible age of trade-based kingdoms representing a substantially earlier foundation of chiefly authority and succession amongst the Bugis, referred to by South Sulawesi scholars (and by Christian Pelras) as the 'Age of Galigo'.

[3]This work was carried out as a commercial consultancy (see Acknowledgments). Dr Bowdery plans to publish her full results in a specialist archaeobotanical publication.

rice grown in dry fields (Ind.: *ladang*) or irrigated fields (Ind.: *sawah*). The majority of rice today is grown in irrigated fields, watered by seasonal rainfall, and the authors suspect that this was so from the 14th century onwards (Bulbeck 1992; Caldwell 1995; Caldwell and Bougas 2004). However, all we can say for certain is that rice was present at the site: which type of rice it was cannot be discerned. The term 'rice' will therefore be used throughout this article to allow the possibility of both types of cultivation.

In August 1999 an OXIS research team surveyed the Cenrana valley, which Bugis historical sources indicate was the location of some of the peninsula's earliest polities (Figure 1). The fieldwork concluded with a survey of the summit of a hill called Allangkanangnge ri Latanete (Bugis: The palace on the hill ridge) at Sarapao in We Cudai village in Pammana district (Figure 2).[4] The hill forms part of a low ridge extending southwards from the provincial capital, Sengkang, in the western Cenrana valley. The hill is believed by local people to be the site of the palace of the kingdom of Cina, reputedly one of the two oldest kingdoms in South Sulawesi. The kingdom of Cina has left little record in Bugis or Makasar historical sources, other than as a source of status for the rulers of later kingdoms. Its absence from the historical record suggests that it had declined or disappeared before the development of writing around 1400. Cina does, however, figure prominently in the Bugis poetic epic *La Galigo*, which some scholars believe refers to a period before 1400 (Pelras 1996). The hill Allangkanangnge ri Latanete (hereafter, Allangkanangnge) extends $\pm$ 560 metres north-south and $\pm$ 460 metres east-west, and rises at its highest point to 21.5 metres above the rice fields to its east. The top of the hill forms a long ridge, with large areas of flat or gently sloping land on the eastern side, suitable for *ladang* agriculture. On the widest part of the ridge is a rectangular raised earth platform extending approximately 30 metres north-south by 40 metres east-west (Figure 3). The platform, which has evidently been maintained, is suggestive of the base of a large stilted building. On its surface are several substantial stone graves which are claimed to be those of the rulers of Pammana, a regional power in the 17th to 19th centuries. However, to judge from the fact that these graves have been looted in search of grave goods, some or all date from before the conversion of South Sulawesi's elite to Islam after 1605, after which Chinese and Southeast Asian ceramics ceased to be buried with the dead. One of these graves is reputed to be the resting place of We Cudai, Princess of Cina and wife of Sawerigading, the most famous character of *La Galigo*.

The ceramic survey at Alangkanangnge

The OXIS team began by collecting the ceramic sherds scattered on the surface of the raised earth platform and in the surrounding area (Figure 4). Former elite occupation sites are rich in sherds from southern Chinese and Southeast Asian ceramics, which were imported into South Sulawesi in increasing quantities after the mid 13th century (Bulbeck 1992: 625; Bulbeck and Caldwell 2000: 109). Thirty-five 13th to 14th century sherds and more than 200 late 14th to early 17th century sherds

[4]The hill can be seen on Google Earth at approximately 4°12'49.44" S and 120°02'49.80" E.

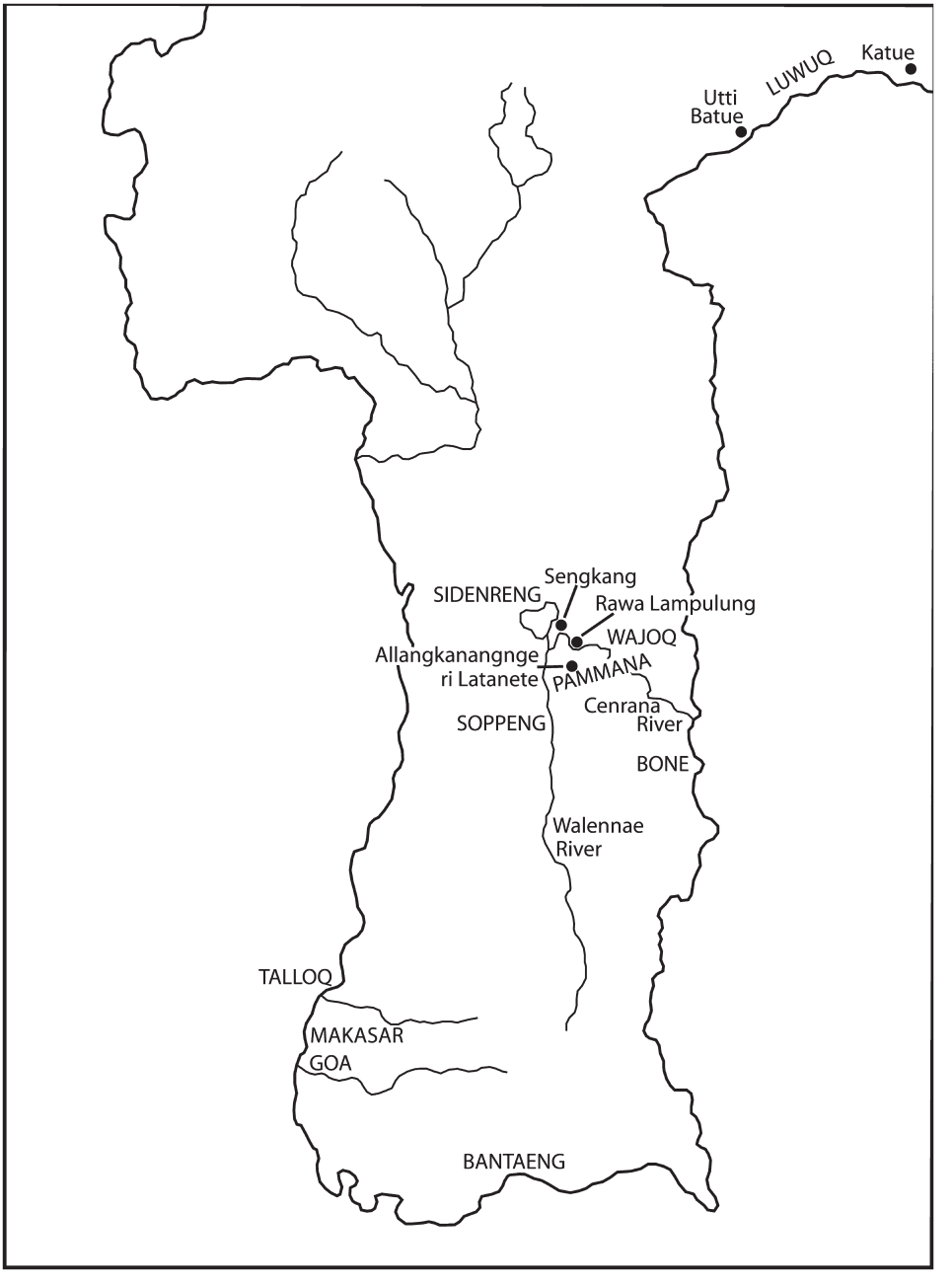

FIGURE 1 Map of South Sulawesi showing sites and locations referred to in the text

were recovered from five collection zones established on and around the raised earth platform. An important feature of the collection is the substantial proportion (27%) which originates from a diverse range of large stoneware jars. Sherds from large jars generally account for around 10% of the porcelain and stoneware surface collection from the occupation zones of early palace centres in South Sulawesi (Kallupa et al.

FIGURE 2 The hill Allangkanangnge ri Latanete at Sarapao

FIGURE 3 The eastern edge of the raised earth platform (looking north)

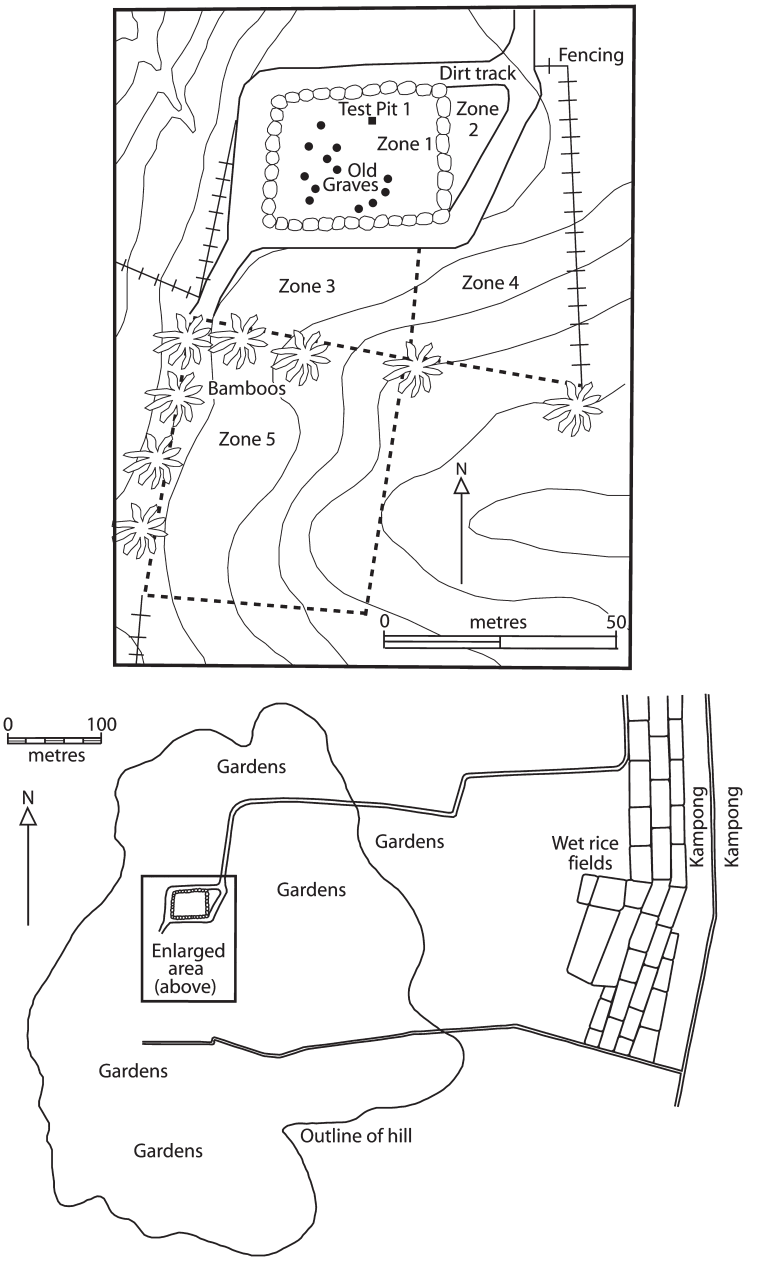

FIGURE 4 The collection zones and location of test pit 1

1989: 19–20, 25; Bulbeck 1992: 368–71). Those collected at Allangkanangnge also include five fragments of iron-painted Cizhou (T'zu-chou) jars, which in our extensive experience of surveying historical sites in South Sulawesi have, with perhaps a single exception, been found only at major pre-Islamic palace centres (Bulbeck and Caldwell 2000: 70; Caldwell and Bougas 2004: 475; Druce 2005: 262, 268) (Figure 5).

FIGURE 5 Sherd from Chizhou jar

There are two possible explanations for the high proportion of sherds from large stoneware jars. One is the use of these jars as burial containers. Prior to the widespread conversion of the Bugis to Islam in the 17th century, the deceased were cremated and the ashes buried, often in large porcelain or stoneware jars (Hadimuljono and Macknight 1983: 69–71; Bulbeck 1996–97: 1034–35). Looting of pre-Islamic elite burial sites – regrettably a common occurrence – leaves a robbers' spoil that includes a high proportion of sherds from these jars (Bulbeck and Caldwell 2000: 87; Druce et al. 2005).

The second possible explanation is the use of the jars as storage vessels in an elite residence. The 12 m x 14 m raised platform of earth, which formed the centre of the survey during which the ceramic sherds were collected, suggests the base of a substantial residence rather than a burial ground (the graves visible today on the platform are likely to date from a later period when the site was abandoned). Whether used as storage containers or as burial containers (or possibly both), the large, imported jars would have conveyed the high status of their owners, living or cremated, as visible prestige goods during the ceremonies in which they were employed. The oldest identified jar fragment was tentatively dated to the 11th to 12th century, although its manufacture may have preceded by a century or more its arrival at the site.

Despite its modest size, the assemblage is unusually rich in variety, ranging from iron painted Cizhou sherdage through 57 classes including brownwares of various

shades, whitewares, celadons, lead-glazed greenwares, other miscellaneous monochromes, wares with enamelled decorations on the glaze, and Ming blue and whites wares. The 251 sherds can be divided into century categories as follows:[5]

C12	C13	C14	C15	C16	C17	C18	C19	C20
0.3	5.8	20.3	58.5	108.3	47.7	0	5.5	4.5

Compared to other elite occupation sites in the Cenrana valley and in Luwu, the assemblage contains a high proportion of 13th and 14th century wares, and shows only weakly the exponential growth of sherdage typical of 15th to 16th century archaeological sites (Kallupa et al. 1989; Bulbeck 1992; Bougas 1998; Bulbeck and Caldwell 2000; Druce 2005). We conclude that by the 13th century an elite group had established itself at Allangkanangnge, and that the level of occupation remained fairly constant, the absolute growth in sherdage counts over the centuries reflecting increasing imports of ceramics rather than an increase in population. In the 17th century the hill was abandoned and remained unoccupied thereafter, with some light use during the 19th and 20th centuries indicated by the tiny quantities of European and late Chinese sherdage. This enables us to date the occupation of the hill to between *c.* 1200 and *c.* 1670, the year in which the region was sacked by the Bugis warlord Arung Palakka at the end of a protracted civil conflict (Andaya 1981).

The excavation on the earthen platform

The OXIS team excavated a single 1 m x 1 m test pit on the northern edge of the raised earthen platform, which appeared the least disturbed area (Figure 4). Excavation proceeded by 5 cm spits, with the exception of spit 3, which was taken to a depth of 10 cm. Excavated sediment was sieved, apart from a 5 cm x 5 cm sediment sample which was collected from each spit for laboratory study. Beneath the thin layer of topsoil the stratigraphy was featureless, made up of uniform gravely sands that are very dark grey (Munsell 10YR 3/1 wet, Munsell 7.5YR 3/1 dry) and slightly alkaline with a pH of 7.5 (Bulbeck 2000). Twenty-four imported ceramic sherds dating between the 11th–12th and 16th–17th centuries were recovered; these showed a clear tendency towards increasing age with increasing depth of recovery, suggesting a basically intact stratigraphy (Table 1). Sherds from large jars made up 58% of the finds, more than double the 27% from the surface survey. Small quantities of charcoal and moderate amounts of faunal refuse were collected from all six spits, and a glass bead was recovered from spit 3. Earthenware sherds – nearly 2,000 in total – were recovered from all six levels and account for 1.2% of the total excavated sediment by weight when corrected for moisture content. The average weight of each sherd was 2.8 grams, and 145 (7.4%) showed signs of decoration (Bulbeck and Hakim 2005). The recovered earthenware assemblage contrasts sharply with what one might expect of a South Sulawesi pre-Islamic burial site, where a small number of complete, fine earthen wares are the rule (Bulbeck 1992: 244, 266, 285; Bulbeck 1996–7: 1031). In addition to the sherdage, a 29.6 g sample of

[5]Sherds assigned across century categories are divided equally, and ten Qing Kangxi blue-and-white/red-green overglaze sherds (*c.* 1650–*c.* 1750) are assigned to the 17th century. The full table can be viewed at <http://arts.anu.edu.au/bullda/Cenrana_AII_report.pdf>.

TABLE 1 Excavated contents from the Allangkanangnge test pit

	Spit 1	*Spit 2*	*Spit 3*	*Spit 4*	*Spit 5*	*Spit 6*	*Total*
Depth (cm)	0–5	5–10	10–20	20–25	25–30	30–35	
Excavated sediment (kilograms)	95.5	50	150.5	67	56	62.5	481.5
Earthenware sherds (grams)	654	243	1741	975	1123	845	5581
Earthenware sherds (count)	361	162	718	212	308	207	1968
Charcoal (grams)	1.5	7.6	8.0	0.8	0.9	3.5	22.3
Faunal fragments (count)	45	22	71	32	31	49	250
Guangdong large jar C 15-17	1	0	3	0	0	0	4
Chinese blue-and-white C 16-17	1	1	1	0	0	0	3
Sawankhalok/Thai large jar C 15-16	1	0	0	0	1	0	2
Sawankhalok black-and-white C 15-16	0	1	0	0	0	0	1
Ming celadon C 15-16	0	1	1	1	0	0	3
Guangdong/Vietnam large jar C 15-16	0	0	0	3	2	0	5
Yueh olive-greenware C 12-14	0	0	0	2	0	0	2
Ming monochrome C 14-15	0	0	0	0	2	0	2
Yuan celadon C 13-14	0	0	0	0	0	1	1
Guangdong/Vietnam large jar C 11-12	0	0	0	0	0	1	1

Note: Data collated from Bulbeck (2000) and Bulbeck and Hakim (2005).

estuarine shell (*Telescopium telescopium*) was collected from the base of spit 6 and was radiocarbon dated to 820 $\pm$ 60 years BP (ANU-11352). This calibrates to an age between the 13th and 16th century, depending on the extent of correction that should be allowed for the marine carbon reservoir effect (Bulbeck and Hakim 2005).

A palace site at Allangkanangnge (which the name clearly implies) would have been dominated by large wooden dwellings standing on piles, as documented for the palace centres of 14th to 16th century Luwuq (Bulbeck et al. 2006: 138), 17th century Makassar (Bulbeck 1992: Photo 1–1), and 17th century Cenrana (Andaya 1981: map 8). Habitation refuse would have been a major source of sediment build-up beneath and between the dwellings on the earthen platform. Debris from wear and tear on the timber structures, hastened on occasions by structural collapse or by burning, would also have been incorporated into the accumulating sediment.

Analysis of the earthenware sherds provides clear evidence both of changing styles of manufacture and decreasing quantities of vessels from the past to the present, as indicated by the changes from spit 6 to spit 1 (Table 2). As one moves upwards, it can be seen that the average weight of the sherds decreases by more than 50%, while their combined weight as a percentage of the excavated sediment falls by almost two-thirds. There are also marked differences in the vessel forms that can be identified from rims and other diagnostic fragments. Spits 5 to 6 are dominated by the forms that recur throughout the assemblage (long-necked, covered jars, and serving vessels); the dominance of these vessels in the lowest two levels possibly represents an eating area. Spits 3 to 4 contain all of the cooking pots (Ind.: *periuk*), most of the large pots (Ind.: *jumbangan*) and half of the large jars (Ind.: *tempayan*). The dominance of these vessels in the middle two spits possibly represents a kitchen assemblage (Figure 6), and the greater fragmentation of the

TABLE 2 Stratigraphic changes to the Allangkanangnge earthenware

	Spits 1–2	*Spits 3–4*	*Spits 5–6*
Average weight per sherd	1.7 g	2.9 g	3.8 g
Proportion of sherd weight to excavated sediment weight (corrected for moisture content)	0.6%	1.2%	1.7%
Long-necked jars and covered jars	9	22	18
Large jars	12	13	1
Serving vessels (cups and bowls)	10	10	13
Large pots	2	16	6
Cooking pots	0	35	0
Stoves	1	0	1

Note: Data summarised from Bulbeck and Hakim (2005) and Table 1.

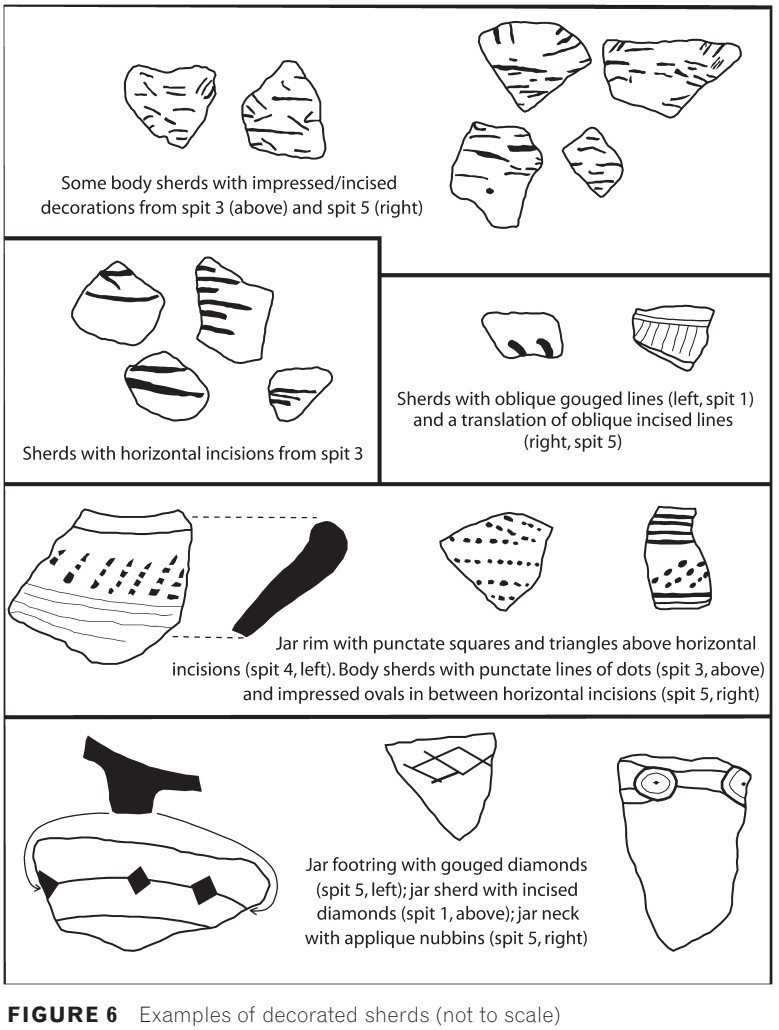

FIGURE 6 Examples of decorated sherds (not to scale)

earthenware in spits 3 and 4 compared to spits 5 and 6 might also be explained by breakage during cooking. Based on the predominance of large jars in spits 1 and 2, the uppermost levels might represent a storage assemblage, where a lighter accumulation of earthenware sherdage (compared to a domestic context) would be expected.

To recapitulate, the earthenwares recovered from the lower levels of Test Pit 1 (spits 3 to 6) may be interpreted as representing dense habitation by people dwelling in stilt houses, and those from the upper levels (spits 1 to 2) as the debris from a storage area. The imported ceramics (Table 2) divide the excavated sediments into an earlier phase (spits 4 to 6) relating to the 13th to 15th century and a later phase (spits 1 to 3) dating primarily to the 16th and 17th century.

Phytolith evidence for the cultivation of rice

Sediment samples of 5 cm x 5 cm were gathered from the northwest corner of each spit for laboratory analysis. Samples of 5 grams each were later separated from the sediment samples and submitted to Dr Doreen Bowdery of the Australian National University for phytolith extraction and analysis. The following summary of the methodology and the findings is based on a public seminar by Bulbeck and Bowdery (2004) and Bowdery's (2006) final report to the authors.

Bowdery extracted the phytoliths by removing calcium, clay and organics through heavy liquid flotation using sodium polytungstate. The supernatant float was then mounted on glass slides using Eukitt® as a mountant, and a full scan of each slide was conducted. Bowdery noted approximately 100 different phytolith morphologies, which she classified into sections indicative of possible plant origin, and then into identifiable morphologies and their sub-groups. The resulting number of 28 morphological groups (Table 3) is low in comparison to full scans of phytolith samples from other South Sulawesi sites. These include two archaeological sites in Luwu – the first millennium AD settlement of Katue (Bowdery in press), and the 14th to 16th century palace centre of Utti Batue (Bulbeck et al. 2006) – as well as a core from the Rawa Lampulung swamp, 5 km north of Allangkanangnge (Caldwell and Lillie 2004). The reduced variety of phytolith morphologies at Allangkanangnge suggests that the sediments had accumulated in a sheltered area, which is consistent with the domestic signature of the artefacts recovered from the excavation (Table 3).

Of particular interest, the Allangkanangnge phytolith assemblage is dominated by two morphologies which are virtually absent from the three other South Sulawesi sites studied by Bowdery. She identified them as peaks and fragments from rice husks, and received confirmation of this identification in 2003 from Dr Lü Houyan and Dr Zhao Zijun, two Chinese experts on rice phytoliths (Figure 7). The husk fragments are large, in general over 50 microns, but of considerable size variation whether attached to peaks or not. The peaks occurred either attached or not attached to a husk fragment, and up to five peaks in a row were observed (Table 4).

Bowdery performed a second scan to count the two rice husk morphologies and the AT phytoliths (Table 4). The AT phytoliths (Arc/Triangle, fan-shape, motor cell, bulliform) are important for environmental reconstruction as they are generally deposited in the leaves of hydrophilic grasses, including *Oryza*, and so monitor any

TABLE 3 Presence of the phytolith morphologies observed at Allangkanangnge

Group	*Class*	*Description*	*Spit 1*	*Spit 2*	*Spit 3*	*Spit 4*	*Spit 5*	*Spit 6*
1	A/S/H	Palm–echinate	X	X	X	X	X	X
2	A/S/H	Palm–coconut	X	X	X	X	X	X
3	A/S/H	Spherical psilate	X	X	X	X	X	X
4	A/S/H	Anticlinal	X	X	X	X	X	X
5	A/S/H	Interlocking		X	X			
6	A/S/H	Complex		X			X	
7	A/S/H	Arc		X	X	X	X	X
8	A/S/H	Faceted		X				
9	A/S/H	Perforated–clear	X	X	X	X	X	X
10	A/S/H	Perforated–black	X				X	
11	A/S/H	Sheet	X	X	X	X	X	X
12	A/S/H	3D chunks	X	X	X	X	X	X
13	A/S/H	Tracheid	X	X	X	X	X	X
14	A/S/H	Trichome	X	X	X	X	X	X
15	A/S/H	Cyperacaea (sedges and rushes)	X	X	X	X		X
16	A/S/H/G	Rectangle	X	X	X	X	X	X
17	A/S/H/G	Ornamented rectangle	X	X	X	X	X	X
18	A/S/H/G	Other rectangle	X	X	X	X	X	X
19	A/S/H/G	Square	X	X	X	X	X	X
20	G	Bilobe groups	X	X	X	X	X	X
21	G	Angular groups	X	X	X	X	X	X
22	G	Ornamented rectangle	X	X	X	X	X	X
23	G	AT	X	X	X	X	X	X
24	G	*Phragmites* (reeds)	X		X			
25	G	*Oryza* (rice)	X	X	X	X	X	
26	G	Husk–peaks	X	X	X	X	X	X
27	G	Husk–fragments	X	X	X	X	X	X
28		Other	X	X	X	X	X	X

Note: A/S/H stands for arboreal/shrub/herb. A/S/H/G stands for arboreal/shrub/herb/grass. G stands for the grasses.

increase or decrease of surface water in the local environment. Total husk phytolith numbers consistently increase from spit 6 to spit 1, apart from a slight dip at spit 3, suggesting an increase in the presence of rice over time. This trend is not observable in the *Oryza* AT cells, whose numbers remain very low throughout the sequence, indicating that *Oryza* leaves rarely reached the site. The AT phytolith counts in total, however, correlate with the husk fragment counts in steadily increasing quantities from bottom to top, again with the exception of spit 3, where there is a distinct dip. Spit 3 is estimated to date to the 16th century when conditions for rice growing were perhaps less favourable; the three decades between 1543 and 1573 were unusually dry, according to the widths of tree rings measured on teak trees in Java (Lamb 1977: 603).

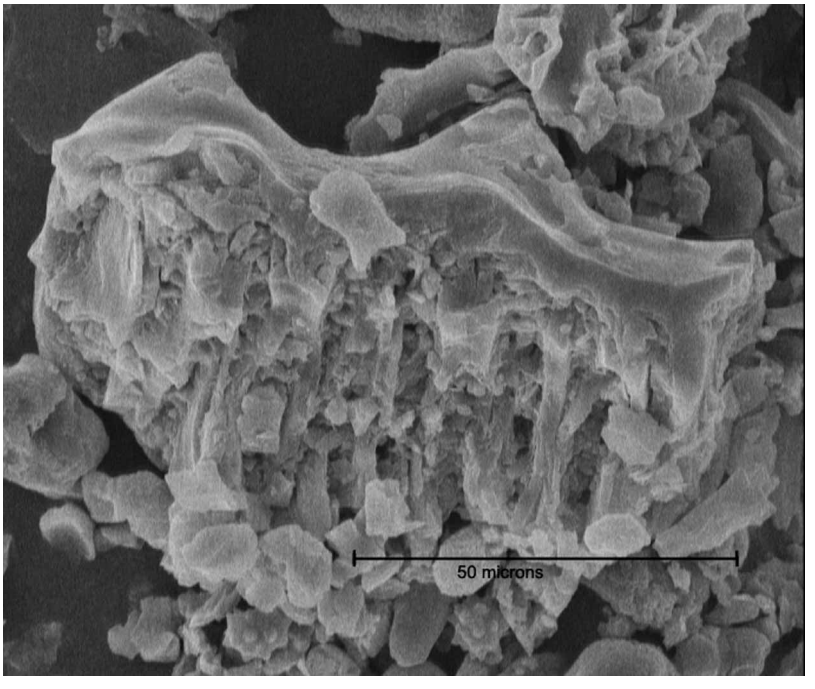

FIGURE 7 Phytolith from rice husk showing distinctive double peak

Rice production is labour intensive, from the preparation, planting, tending, and harvesting in the fields, to the numerous threshing, winnowing, drying and storage processes which take place after harvesting. These include milling to separate grains from their husks, pounding to remove the bran coating and to polish the grain, sieving to separate the grain fractions, and winnowing of the coarse fraction to remove husk material. Thompson (1996: 275) gives a schematic diagram of rice processing. From her descriptions of rice processing procedures in Asia, husk fragments

TABLE 4 Total slide count of *Oryza* caryopsis and AT phytoliths at Allangkanangnge

Oryza caryopsis	*Spit 1*	*Spit 2*	*Spit 3*	*Spit 4*	*Spit 5*	*Spit 6*
1 peak	72	111	73	80	24	31
1 peak + fragment	339	168	80	95	22	30
2 peaks	27	83	14	64	35	20
2 peaks + fragment	246	140	33	52	31	38
3–5 peaks + fragment	23	13	3	12	6	8
Fragments	992	981	300	649	735	570
Total *Oryza* peaks & fragments	1699	1496	503	952	853	697
AT morphology						
Oryza	14	25	8	8	11	7
Others	596	458	186	379	304	245
Total AT count	610	483	194	387	315	252

may remain with the grain throughout processing until final hand cleaning and fine sieving is carried out to remove the last vestiges of the chaff before cooking.

Given the high production of phytoliths in a rice leaf, leaf morphologies could be expected in high numbers if phytolith recovery had occurred in a rice production area. The paucity of rice leaf morphologies in the Allangkanangnge samples would indicate that the husks and enclosed grains had been removed from the rice stems. This, and the dominance of peaks and fragments from rice husks, points to the pounding and final winnowing of harvested rice that had been threshed, winnowed and dried elsewhere.

Do our results suggest an increasing importance of rice as a cultivar at Allangkanangnge? With the exception of a drier period perhaps represented by spit 3, there is evidence to suggest that the presence of rice husks increased over time. A possible explanation would be a greater role of rice in the inhabitants' subsistence economy, owing to intensified rice production or the residents' improved socio-economic status. However, a more parsimonious explanation would be a shift in activity focus from domestic residence to rice winnowing. The earthenware pottery in the basal two spits is dominated by long-necked, covered jars and serving vessels, suggesting an eating area in which the rice would have already been polished. The cooking pots and jars of spits 3 to 4 possibly represent a kitchen assemblage, implying an increased scope for the discard of rice husks in the final clean-up steps before cooking the polished rice. The absence of cooking pots combined with the presence of large jars in spits 1 and 2 suggests an outhouse context, which would be consistent with the location's use for the husking of harvested rice. We can imagine the rice winnowers taking advantage of the shade beneath the dwelling, or provided by garden trees, surrounded by large water jars also stored in a cool location, as they performed their monotonous daily task.

Discussion

Rice has been cultivated for many centuries in South Sulawesi. Rice grains from a hearth in a Maros cave are securely dated to approximately AD 500 (Glover 1985: 272), and Paz (2005) has recently proposed a dating of 2000 BC for other rice grains from the same site. However, the scale of rice production must have been modest until its economic potential as a staple and trade good was realised around AD 1300. The archaeology of South Sulawesi before this date provides no grounds for inferring a greater role for rice than as a dry-field crop grown as a delicacy for feasts on special occasions (Bulbeck 1996–97). From *c.* 1300 onwards there appears to have been a shift to seasonally inundated lowland fields, with their enormous potential for intensive rice production. The stimulating factor for this shift, which allowed rice to become a commodity, appears to have been the increasing availability of trade goods from other parts of the archipelago, of which ceramic goods are the most visible in the archaeological record (Hadimuljono and Macknight 1983; Bulbeck and Caldwell 2000). It was this shift to wet-rice cultivation, we argue, that allowed an exponential rise in the population of South Sulawesi, and the development of the Bugis and Makasar kingdoms of historical record.

The crucial role of rice cultivation in the rise of South Sulawesi kingdoms has been inferred from scattered reports by 16th century Portuguese visitors and,

importantly, from Bugis historical texts that describe the centrally-directed expansion of ricefields and the attendant conquest and capture of neighbouring lands. Most chronicles and foundation myths start with the appearance of a *tomanurung* (Bugis: heavenly descended being) in a landscape of rice farming communities. He (or occasionally she) is invited to become ruler, and to provide for the security and welfare of his people by 'protect[ing] our fields from birds so that we do not lack food [...] bind[ing] our rice sheaves so that we are not empty and lead[ing] us near and far' (Caldwell 1988: 110). The picture they present is that from their very beginnings the political economies of South Sulawesi kingdoms were based on rice, and that their rulers took a keen interest in its cultivation. The expansion of rice cultivation was dependant on the smelting of iron for the production of agricultural tools, as well as weapons. Evidence of iron smelting found at several former palace sites, and the name of one early ruler of Bone is simply 'The ironsmith'. The Chronicle of Bone, in which his name is found, tells of rulers directing the setting out of fields, the planting of rice, the harvesting of the mature crop, and the military conquest of neighbouring settlements in the dry months following the harvest (Macknight and Mukhlis unpublished).

We have argued elsewhere that the expansion of rice cultivation after the 13th century was stimulated by the increasing availability of imported trade goods (primarily Indian printed textiles and Chinese and Southeast Asian ceramics), and that rice was the currency with which imported goods were purchased from Filipino, Javanese, and other Indonesian traders (Bulbeck and Caldwell 2000: 103). As Bugis and Makasar sources do not concern themselves with the details of trade, the importance of rice as an exchange good has to be inferred from European sources. English East India Company factors in Makassar writing in the first half of the 17th century reported that the region's chief exports – cited at the end of a long list of imported trade goods – were 'chiefly rice and arrak,[6] with some native gold and some tortoise-shells' (British Library IOR 398: 3). When Admiral Speelman laid waste to the south coast city of Bantaeng in 1666, 'about 100 boats in the harbour carrying some 6,000 tons of rice were set aflame' (Andaya 1981: 76). Of an inland, landlocked kingdom that has yielded copious Chinese and Southeast Asian sherdage dating from the 14th to 17th century, an 18th-century Dutch visitor observed that '[Soppeng] yields nothing but paddee' (Stavorinus 1798: 228; Kallupa et al. 1989).[7]

The scale of the importation of high-fired ceramics into early historical South Sulawesi beggars imagination. The surface survey of a single site in Soppeng yielded no less than 1,116 sherds from Chinese and Southeast Asian wares dated to the 17th century or earlier (Kallupa et al. 1989: 24). The survey of Makassar and its environs recovered over 10,500 pre-17th century ceramic sherds; at one site, the survey team collected 159 such sherds from a single garden field, and then recorded 694 more such sherds from the same field less than a year later (Bulbeck 1992: 368, 608, 662–63). Between 1973 and 1977 the local archaeological authority in Makassar recorded nearly 14,000 of the hundreds of thousands of

[6]Which the report make clear was distilled from rice.

[7]Large numbers of slaves were exported in the 17th and 18th century, many to Dutch settlements. However, there is no evidence of the export of slaves before the arrival of the Dutch.

ceramic grave goods looted in South Sulawesi up to 1977 (Hadimuljono and Macknight 1983: 75, 77). Looting and the accidental discovery of buried ceramics has continued in South Sulawesi to this day, including the major plundering of burial sites in Luwuq during the 1980s (Bulbeck 1992, 1996–97; Bougas 1998; Caldwell and Bougas 2004; Druce 2005). Yet there are good grounds to suspect that ceramics were merely the tip of the iceberg when the importation of exotic sumptuary goods to pre-Islamic South Sulawesi is considered as a whole. In addition to quantities of gold and other metallic goods (Bulbeck 1996–97; Bougas 2007), and large numbers of glass beads (Bulbeck and Caldwell 2000), textiles were probably the single major imported good, even though few of these perishable wares have survived till today.[8]

The strategic location of Allangkanangnge, today overlooking productive ricefields, suggests that systematic planting, tending and cropping of rice had commenced by the 13th century.[9] This date precedes the 14th century date nominated by Caldwell (1995) for the expansion of rice agriculture by Soppeng, one of Cina's neighbors, as it temporarily became the major agrarian power in the central lakes region. It is also earlier than the date of *c.* 1400 which Macknight (1983) proposes for the systematic expansion of Bugis rice agriculture, under elite sponsorship, based on his analysis of the Bone and Wajoq chronicles. Our evidence comes from hard physical evidence obtained under controlled excavation conditions; similar evidence should be readily available in the sediments deposited by any community whose subsistence basis included rice.

The findings presented here, combined with historical and ethnographic documentation, indicate that Cina's eclipse after *c.* 1400 was due not to a shift from a trade-based economy to an agriculture-based economy via an intervening period of chaos, as the 'La Galigo' model would have it, but was a consequence of its geographical limitations. In a pioneering development that was to transform the landscape of South Sulawesi, Cina had by *c.* 1300 extended its political dominance over the potential rice-growing lands of the southwestern Cenrana valley, setting out a radically new economic model that others were to follow. Its political decline was due to its lack of a sizable plain on which to expand when the kingdoms of Soppeng, Bone and Wajoq applied a similar programme across much larger areas of potential ricefields. Hemmed in by its larger neighbours, Cina (and its political descendant, Pammana) became alternately a fealty of Bone or Wajoq, depending on the fortunes of these two powerful kingdoms in their chronic tussle for local supremacy during the 16th and 17th century (Caldwell 1995). By the 17th century, when the chronicles of the South Sulawesi's major kingdoms began to be written, Cina's memory had faded to a vague source of status for the rulers of later kingdoms. We conclude

[8]Dr Ruth Barnes of the Ashmolean Museum has carbon dated a number of block-printed Indian textiles from South Sulawesi to between the 14th and 16th century (Ruth Barnes, personal communication). Guy (1998: Plate 44) shows a textile from the Toraja region dated by Barnes to AD 1340 $\pm$ 40.

[9]Dating the antiquity of the ricefields would theoretically be possible by excavating the rice phytoliths buried in the soil and dating them in clusters of sufficient carbon mass to produce Accelerated Mass Spectrometry (AMS) dates. Such an ambitious programme is beyond the scope of our current resources.

that Cina's importance in the *La Galigo* epic – a fact that those opposed to the 'La Galigo' model must contend with – reflects its 13th to 14th century florescence, when, far from representing the highpoint of a pre-agrarian, trade-based *pasisir* economy, it 'experimentally' developed the combined agrarian and trade-based economy which was to become the leitmotif of the major Bugis rice-growing kingdoms.

Conclusion

Rice phytoliths have played an important role in reconstructing the origins and expansion of rice agriculture in East and Southeast Asia. These reconstructions have focused in general on phytoliths recovered from leaves, which relate to harvesting and other field-based activities. Ethnographic research by Thompson (1996) and Harvey and Fuller (2005) points to the potential of the husk phytoliths to identify the settlement-based stages – storage and post-storage processing – in the rice production cycle, which our evidence demonstrates here.

At a local level, the phytolith data lend weight to the local oral tradition that the hill Allangkanangnge was the centre of an early Bugis kingdom called Cina. At a general level, the phytolith data are consistent with (but do not prove) our conviction that the origins of the South Sulawesi kingdoms lay in an intensification of rice agriculture, perhaps as early as the 13th century. Textual sources imply that the Bugis were intensively cultivating rice from the 14th century onwards, and there now seems no reason to doubt the veracity of this claim. The phytolith data does not, of course, tell us *why* the Bugis began to plant rice on a scale sufficient to support not just farming settlements but also an emergent elite population suggested by Alangkanangnge and several other palace sites dating from the 14th and 15th century. The answer to this question comes from our combination of historical and archaeological research which has revealed the same general pattern of social transformation across the South Sulawesi lowlands during the centuries leading up to 1600: sustained population growth, the incorporation of small communities into larger polities, the development of a professional military, flourishing local literary traditions, the making and breaking of political alliances through strategic marriages and formal treaties, and above all the exponential growth in trade between South Sulawesi polities and with external states – in short, all the ills and advantages of civilisation.

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