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# THE SO-CALLED 'KĀLA HEAD' ARMBAND OF TEMASEK:

## A PRELIMINARY REPORT

NATALIE S.Y. ONG

TEMASEK WORKING PAPER SERIES

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Dr Natalie S.Y. Ong was Visiting Fellow (2021–2022) at the Temasek History Research Centre of ISEAS – Yusof Ishak Institute where the gold ornaments of 14th-century Singapore were the subject of her research. Her work focuses on the material culture of ancient island Southeast Asia, with a special emphasis on the intersection between the scientific, cultural and sociological phenomena present in ancient Southeast Asian ornaments. Currently a post-doctoral fellow at the KITLV Royal Netherlands Institute of Southeast Asian and Caribbean Studies in Leiden, she is involved in a book project examining the impact of Indian philosophy on Old Javanese art and architecture.

### **Cover Image:**

The so-called 'Kāla head' armband under examination at the Heritage Conservation Centre, National Heritage Board, Singapore, between 24 and 29 April 2022.

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# The So-Called 'Kāla Head' Armband of Temasek: A Preliminary Report

Natalie S.Y. Ong

## ABSTRACT

*This paper focuses on the gold armband that was unearthed in 1928 on Fort Canning Hill in Singapore as part of a cache of eleven ornaments. The initial attempt to identify the objects attributed them to East Javanese Majapahit origin, and the motif on the armband as a 'Kāla head'. For nearly a century since, this attribution has prevailed. The present study, the first and only archaeometallurgical analysis of ancient Temasek's gold ornaments to date, challenges this assumption through a close technical and scientific examination of the armband's manufacture in combination with a detailed stylistic analysis. The article retraces the history of the ornaments and their archaeological context, then compares the visible cultural and technological elements on the armband with diverse archaeological remains from around Asia. On this basis, it is argued that the armband was commissioned by an extremely wealthy individual and worn by one of marriageable age. It furthermore features neither a Kāla head nor any trace of Javanese manufacture or Majapahit influence. Instead, a simhamukha (lion face) is shown, which, along with other indicators intrinsic to the construction and style of the ornament, all point to a connection with northwest South Asia. This study demonstrates that, far from being simply beautiful treasure, jewellery is a repository of information that can impart new perspectives from which to review ancient societies and their social practices. However, this preliminary conclusion should be viewed in conjunction with the other extant objects of the hoard, and should also be subject to further analysis such as within the broader scope of archaeometallurgical research on the metal-working industries in both Temasek and the region.*

## INTRODUCTION

ON THE 7TH OF JULY 1928, while excavations were taking place at the summit of Fort Canning Hill, a cache of gold ornaments was found. The find was published in a four-page article by the historian R.O. Winstedt (1928), and describes a total of eleven objects. The most noteworthy was a unique pair of monster head armbands with flexible chains. The other ornaments included six (or three pairs of) rings with 'inferior diamonds of the Pontianak type', one elliptical ring with an 'inferior pale ruby' cabochon, a finger ring inscribed with a goose, and a 'jewelled joint or clasp' (Fig. 1). Most of these were lost during the war, and only one of the armbands and two of the six rings remain (Fig. 2).

Fig. 1: Original cache of gold ornaments found on Fort Canning Hill: a) a pair of armlets with an alleged 'Kāla head' motif and flexible chains, b) six rings with 'Pontianak diamonds', c) one elliptical ring, d) a conch ornament, and e) an inscribed finger ring.

(Credit: Winstedt 1928: pls. XXVI-XXVII)



Fig. 2: Alleged 'Kāla head' armband and two ring ornaments.

(Credit: Collection of the National Museum of Singapore, National Heritage Board.)



Following Winstedt's publication, the artefacts are commonly associated with the 14th-century Javanese Majapahit style, but this attribution has never been properly evidenced. The ornaments have been variously referenced in writings on ancient gold of Southeast Asia, and have enjoyed a resurgence of interest following archaeologist John Miksic's first dedicated excavation in Singapore in 1984. For nearly a century, Winstedt's article has been the

source of information *par excellence* on these objects, but, despite featuring prominently in archaeological studies of premodern Singapore, no in-depth research has ever been conducted on these artefacts of Temasek's early history. In view of the new technology and scientific methods now available to us, a close re-examination of these artefacts, intended to bring a more accurate identification, seemed in order.

With the support and collaboration of the National Museum of Singapore (NMS) and the Heritage Conservation Centre (HCC), two institutions owned and managed by the National Heritage Board (NHB) of Singapore, the author was permitted to have the remaining objects of the Fort Canning cache removed from display in the galleries and transported to HCC for a detailed archaeometallurgical analysis conducted by Conservation Scientist Ms. Lynn Chua. The objects were examined under an optical stereomicroscope, a digital microscope, a Scanning Electron Microscope (SEM) with Energy Dispersive Spectroscopy (EDS), a Thermo Niton XL3t X-Ray Fluorescence (XRF) spectrometer, and a Raman spectrometer.<sup>1</sup> Under these different instruments, it became obvious that a review of the initial identification was necessary, and the results can be seen in many of the following images, which were taken at HCC between 24 and 29 April 2022.

This fresh enquiry brings to light a number of significant observations that will be discussed in this working paper, which commences with a re-consideration of the previous literature on the ornaments to better situate their place in the studies of premodern Southeast Asia. Next is a review of the circumstances of their discovery to determine the soundness of the archaeological context and the attributed date of the 14th century. An assessment of Winstedt's descriptions follows, to verify the assertions presented in his article, in conjunction with a comparative analysis, concentrating on the cultural and technological elements visible on the monster head armband, with the caveat that such conclusions are preliminary as each new discovery requires further investigation. As such, the attempt made at the end of the paper at inferring the larger implications of these findings must be regarded as a mere prelude to further research.

## 1. LITERATURE REVIEW

It was while workers were clearing the summit of Fort Canning Hill to build the Service Reservoir that the cache of gold ornaments was found. The discovery was published twelve days later in the local newspapers ('Remarkable Discovery' 1928) and followed by Winstedt's article in the November issue of the *Journal of the Malayan Branch of the Royal Asiatic Society* (JMBRAS). Both these publications mark the beginning of the objects' existence in the historiography of Singapore's early archaeology. In the review that follows, the crucial point is that for nearly a hundred years Winstedt's identifications have been, with a single exception, uncritically accepted until now. This paper challenges the established attribution in order to obtain a more accurate identification of the objects, thus

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<sup>1</sup> The stereomicroscope provides low magnification views of an object, while the digital microscope gives images of higher magnification. The other three spectrometers all measure elemental composition of the materials but use different mechanics. The SEM-EDS does so by bouncing electrons off the surface of an object in a vacuum, and also measures the object's surface topography. The handheld XRF spectrometer attempts to aim X-rays through the object. However, the objects were too small and irregularly shaped, thus scattering the X-rays; unfortunately, without a targeted reading, no conclusive results could be obtained, other than a general 'major amounts of gold, and traces of silver and copper'. The Raman spectrometer is a special machine that also aims lasers of different wavelengths through an object.

leading to a better understanding of ancient Singapore's role within the wider maritime network.

The *Malaya Tribune* article, although succinct, provides some other information not found in the Winstedt article (1928), namely that the discovery could very well have been lost if an unnamed official had not noticed a labourer with the ornaments. Despite this strongly biased judgement from colonial-era sources, this piece of information highlights the problem of looting. Looting was and continues to be a real threat at historic sites across Asia, which has serious consequences for our study of the past. The situation in Palembang, Sumatra is a stark reminder of the detrimental loss of known material heritage.<sup>2</sup> As numerous scholars have noted, the Śrīvijayan thalassocracy is still almost completely unknown to us; aside from some inscriptions, we have very little direct evidence of the dynasty that Temasek's legendary founder Sang Nila Utama (also known as Sri Tri Buana, his coronation name) was supposedly associated with, and that apparently ruled the seas around Temasek and its environs from the 7th to the 14th centuries. Thus, not only is much valuable information about the past frequently lost in favour of a more immediate pittance derived from the sale of these artefacts, but there is also often the difficulty of establishing the provenance of most known gold and silver treasure. The gold ornaments from Fort Canning Hill are, therefore, among the extremely rare excavated artefacts that we know are not modern re-creations; as such, as we shall see, they have much to tell us.

Winstedt himself called this discovery the 'most interesting archaeological remains in British Malaya' at that time (Winstedt 1928: 4), and although they were fortunately reported and subsequently entered the then Raffles Museum's collections, the ornaments were forgotten as soon as the following year, when the reservoir was unveiled ('Singapore's New Reservoir' 1929). Despite featuring a paragraph on the brief history of Fort Canning Hill and the colonial buildings that stood upon it, this article made no mention of the artefacts found. Their next appearance was in a 1948 newspaper article reporting the theft of most of the objects ('Japs Took Ancient Ornaments' 1948), although if it were merely for the monetary value of the gold, it would surely have made sense to take all the ornaments and not leave the few imperfect specimens behind.<sup>3</sup> Thus, the article informs us that only the broken armband and three of the ring ornaments remained.<sup>4</sup>

In 1951, amidst the post-war revival of interest in the history of the island, which paralleled the nationalistic movements of the era in colonised countries, a feature story in the *Singapore Standard* on the legend of the founding of Singapura by the mythological prince Sang Nila Utama mentions the gold artefacts found, but provides no new information (Singham 1951). A later *Straits Times* article informs us that a commotion had apparently broken out upon the discovery of the ornaments, which caused the engineer in charge of the works, a Mr Butler, to investigate the incident (H.T.S. 1960). The description seems to contradict the account given in Winstedt's article, but it is not clear where

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2 For example, recent articles on the rampant looting and sale of heritage objects along the Musi River have made international news (<https://www.theguardian.com/world/2021/oct/22/have-sumatran-fishing-crews-found-the-fabled-island-of-gold>, accessed 15 June 2022). See fn. 23 below.

3 The author would like to thank S.T. Foo for this observation.

4 However, only two of the ring ornaments are currently in the National Museum of Singapore's collections, one of which is missing its pin, and it is not clear what happened to the third in the intervening years. A short study on these ornaments has been published in Ong 2023.

this additional information comes from as no sources were cited. This problem is not restricted to popular media, as it plagues Winstedt's article as well, which opens with two paragraphs citing seemingly the same Mr Butler<sup>5</sup> without specifying the origin of this apparently written information (see next section).

In terms of scholarly production, the number of times the ornaments of Fort Canning Hill are referenced over the following decades in journal publications on Southeast Asian gold can be counted on one hand. H.G. Quaritch Wales catalogues a large number of artefacts found in the Malay Peninsula, and characterises the armband's figurative motif as a *sirīhamukha* (lion face) (Quaritch Wales 1940: 42–43; see below). Other mentions include an article on the goldwork of Borneo (Harrisson 1949), a one-sentence remark on inscribed rings (Malleret 1963), and a comment on Winstedt's opinions on metal recycling<sup>6</sup> (Manning et al. 1980). Most of these are brief comparisons of the artefacts in relation to objects found at various sites in the region, and do not delve into any detail about the Fort Canning ornaments at all, accepting instead Winstedt's identifications, which will be examined in detail shortly. Winstedt himself references the objects in his own publications as if they were already established fact (e.g., Winstedt 1969: 9).

From 1984 onwards, as interest in the remote past was rekindled after the first official archaeological excavation in Singapore, a plethora of new writings on the island's earliest history appeared, too many to enumerate.<sup>7</sup> All without exception repeated the identification given in Winstedt's article, and despite featuring prominently in many publications—on the cover of *Archaeological Research on the 'Forbidden Hill' of Singapore* (Miksic 1985), for example—the ornaments have generally been glossed over, and their place in the early history of Singapore considered negligible. It was only much later, in a chapter on the archaeology of Singapore, that the ornaments were brought up and the esteemed Dutch art historian Pauline Lunsingh Scheurleer's opinions on the armbands were mentioned. She believed that they were of late South Indian make, 'perhaps 18<sup>th</sup> century', an assessment which Miksic then briefly discussed, although he drew no definite conclusion from them (Miksic 2013: 17). Probably, without access to the ornaments themselves, most previous researchers were unable to dedicate more than a page's worth of comments on them. As close inspection will presently demonstrate, the remaining ornaments of the Fort Canning hoard are an invaluable store of information, but we should first determine whether they actually belong to the 14th century, as it has often been repeated.

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5 The same person may be referenced in Singapore's Municipal Administration Reports of 1929, a Junior Assistant Engineer named L.T. Butler (see page 6 at <https://www.nas.gov.sg/archivesonline/private-records/record-details/f2d58f46-520a-11e6-b4c5-0050568939ad>, accessed 15 June 2022).

6 'We know that with the introduction of Islam in the 15th century A.D. all such jewellery went out of use and was generally melted down' (Winstedt 1928: 4).

7 Using the Google Scholar online tool (<https://scholar.google.com>), search parameters of the terms 'gold' and "Fort Canning" (the double quotation marks are a Boolean operator indicating that the words in the phrase are meant to be searched together instead of separately, e.g. 'fort' and 'canning') gives 29 results for the period between 1928 and 1984. Not all results are relevant; for instance, the search algorithm does not distinguish between the different literal or figurative usages of the terms, but includes both of them, and only those references that are available online and made searchable. Nevertheless, after 1984, 373 results are returned. The increase is indicative of the interest brought about by new research on the archaeology of early Singapore.

## 2. FORT CANNING HILL: DISCOVERY AND ARCHAEOLOGICAL CONTEXT

Winstedt's article begins by quoting two paragraphs written by a Mr. Butler, ostensibly of Singapore's Municipal Engineering department. It is not clear, however, what kind of writing the historian was referring to, whether a letter or a formal report filed with the authorities. The presence of a detailed hand-drawn map with a scale accompanying Butler's description of the excavation and discovery tends to suggest the latter, although no records can be found in the National Archives of Singapore (NAS).<sup>8</sup> Searching the NAS brought to light a photograph of a partly built reservoir from above ground, showing the extent of the construction on the summit of Fort Canning Hill in 1928, a few months prior to the discovery,<sup>9</sup> although it is not clear if the location of the discovery is pictured. There are thus no known photographs of the site, and no independent verification of the discovery's location is now possible. It is therefore still worth reproducing the two paragraphs in full, for they, along with the map, represent the only currently known published record in existence of the excavation (Winstedt 1928: 1–2):

The Hill was originally a cone-shaped eminence but when Fort Canning was built the summit was taken off and with the excavated earth a plateau of approximately 10 acres<sup>10</sup> was formed, surrounded by ramparts and a moat. This plateau is now being excavated over an area of 7 acres to a depth of 10 feet for the building of Singapore's new Service Reservoir. The bottom of this excavation is all solid original ground, but in many places the line between it and the filling placed above it about a century ago, can still be followed.

At 1 o'clock on the 7th July the final trimming up of the 10 foot wall of the excavation was in progress on the East side of the Plateau [sic], directly above the existing "Tomb of Iskandar Shah" which is 120 yards further down the hillside. The Chinese men and women coolies were working from the level of the excavation, hacking at the earth on the level with their heads and drawing it down with *changkols* into baskets at their feet. It was while they were digging at the outflung roots of a tree that the gold ornaments were exposed, being dragged down by a blow of the *changkol*. All in one spot, not wrapped up in any way, they seemed to be lying about 5–6 feet below the existing ground level of the plateau but only just beneath the line of the original solid ground level.

To understand Butler's description, it is necessary to retrace the historical chronology of the site. The hill, previously known as Bukit Larangan (Forbidden Hill in Malay), has had a long history, as indicated by Singapore's second Resident John Crawfurd, who described his visit in February 1822 on his way to Siam and CochinChina. He reported seeing the remains of brick terraces measuring approximately 12m a side near the summit of the hill, fourteen sandstone blocks with shallow depressions that likely functioned as bases for wooden pillars, surface finds of 10th- to 12th-century Chinese Song dynasty coins, pottery

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8 It is possible that the Colonial Office holdings of the National Archives of the United Kingdom, located in Surrey, possesses such a record, but the author was unable to verify this personally since not all records there have been digitised.

9 The image, belonging to the National Archives of the United Kingdom, is dated 30 April 1928, about three months before the discovery of the cache of gold (<https://www.nas.gov.sg/archivesonline/photographs/record-details/aee9abf9-1162-11e3-83d5-0050568939ad>, accessed 3 May 2022).

10 10 acres is approximately 40,469m<sup>2</sup>, or the size of an American football field.

sherds of Chinese and local manufacture, as well as ancient fruit trees that were previously 'cultivated by the ancient inhabitants of Singapore' (Crawfurd 1830: 68–73). Crawfurd also informs us that, in order to build the residence where Raffles lived, later dubbed Government House, the summit of the hill was cleared of the extensive forest that covered it. He does not, however, mention what happened to the ancient remains that he had found.

Between Crawfurd's 1822 visit and the discovery just over a century later, several other buildings and elements of infrastructure were also constructed on the hill, including a lighthouse, a flagstaff, a sundial, a time ball, a Christian cemetery, and an experimental botanical and spice garden. In 1859, Government House was torn down and the summit of the hill levelled to create an artificial plateau for a military fort, the eponymous Fort Canning, named after Viscount Charles John Canning, Governor-General and First Viceroy of India. This is the plateau that Butler's description refers to. The fort was then completed in 1861, but never saw use and was demolished in 1907, whereupon a military headquarters with barracks, an underground bunker, and a moat were constructed. Most of these buildings were then razed in 1927, at which time the plateau was excavated again to build the Service Reservoir that still stands today. It was during these works that the cache of gold ornaments was unearthed and subsequently entered the Raffles Museum's (now National Museum of Singapore's) collection.

More detailed accounts of the Fort Canning landscape and the archaeology of ancient Singapore can be found elsewhere (e.g. Miksic 2013), but this necessarily brief history of the hill suffices to demonstrate the number of recorded disturbances that transpired in the landscape while the site was occupied during the 19th and 20th centuries, which unfortunately translate to a significant loss of invaluable information on Singapore's earliest settlements and society. In addition, at any time during the intervening years, amidst these various architectural and structural developments, anyone could have deposited the objects, and the stratigraphy<sup>11</sup> that Butler mentions—the 'solid original ground' and 'the line between it and the filling placed above it'—is not as clear-cut as it would first seem. The 14th century dating attributed to the ornaments is, therefore, not a guaranteed dating, and all the evidence points to a *terminus ad quem* for the interment of the objects around 1860, after which they were covered by the plateau. Winstedt also informs us that there were 'no signs of a grave or of bones', indicating that this find was isolated, lacking other archaeological remains that would have provided further context. Not only have the remains that Crawfurd spoke of disappeared for good, but they may have been deposited elsewhere as landfill.<sup>12</sup> Thus, if archaeological methods cannot function in this void and no other archival records are known to exist, what other approaches do we have recourse to for dating the objects and establishing their origins?

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11 Stratigraphy is the geological study of rock and soil layers. In archaeology, stratigraphy provides a reverse chronology of the age of buried deposits—most recent are on the upper layers, while ancient ones appear as we dig downwards (assuming that the site is undisturbed, which is not the case at Fort Canning Hill as the preceding findings show).

12 See the records numbered SIT 325/26, SIT 339/26, and SIT 938/28 (respectively, [https://www.nas.gov.sg/archivesonline/government\\_records/record-details/6d75ec42-1159-11e3-83d5-0050568939ad](https://www.nas.gov.sg/archivesonline/government_records/record-details/6d75ec42-1159-11e3-83d5-0050568939ad), [https://www.nas.gov.sg/archivesonline/government\\_records/record-details/6d763c73-1159-11e3-83d5-0050568939ad](https://www.nas.gov.sg/archivesonline/government_records/record-details/6d763c73-1159-11e3-83d5-0050568939ad) and [https://www.nas.gov.sg/archivesonline/government\\_records/record-details/67e6a739-1159-11e3-83d5-0050568939ad](https://www.nas.gov.sg/archivesonline/government_records/record-details/67e6a739-1159-11e3-83d5-0050568939ad)).

## 3. THE ARMBANDS

Of all the objects found in the 1928 excavation, the pair of armbands with the alleged 'Kāla head' motif and flexible chains is perhaps the most interesting for the historical and contextual information they can potentially provide. Winstedt describes the ornaments cursorily, providing the first and only detailed account available in scholarship to date, consisting of one succinct paragraph (Winstedt 1928: 1, 3). Where facts are concerned, the characterisation is fairly accurate, although Winstedt falls short of examining the implications of his descriptions. There is, in fact, much to be learnt from even the most basic measurements, such as weight and dimensions of the armbands. From these we may infer the object's possible value and presumed owner or wearer, which in turn significantly impact on our interpretation of the ancient inhabitants of Singapore. The present study exploits advances in scope technology to develop these notions further.

To recapitulate Winstedt's article, the armbands weigh 50 *mayams* each; hence, a *mayam* being a goldsmith's weight at one-twelfth of a Troy ounce<sup>13</sup> (Winstedt 1965: 230), one armband weighs 129.59g. Its circumference is 195mm, translating to a diameter of 62mm, which, as he notes rightly, is 'too large for a wrist'. The Dutch archaeologist whom Winstedt consulted, P.V. van Stein Callenfels, states that flexible chains are rare, giving an example seen in Purwakarta in West Java. This specimen cannot now be traced due to the lack of sources—an issue highlighted earlier. Winstedt goes on to describe the repoussé plaque concealing the tongue of the clasp, which is secured by a split pin. When an identification of the main decorative element is attempted, Winstedt interprets it as 'an old Javanese Kala head, originally a lion's head but highly conventionalized:—the lower jaw is missing, the tongue extruded, horns spring from the cheeks and from the outer corners of the eyes'. He quotes van Stein Callenfels, who affirms that the motif is commonly used in East Javanese metalwork, and attributes the style to 'the Majapahit period at its best, *i.e.*, the middle of the 14th century A.D.', an identification which has been regularly repeated since for nearly a century, and which will be discussed in detail in Section 3.3 below.

To verify Winstedt's claims, at the Heritage Conservation Centre, Ms. Lynn Chua and the present author subjected the remaining armband to scientific analysis as described above, and found that the remaining armband weighs 135.41g (Fig. 3). Although some of this weight may be due to sediments deposited in the empty spaces of the socket and interstices during burial, this armband is missing some of its chains, with the bottom one almost entirely lost, possibly indicating that the now missing intact armband may have been as heavy as 140g. The discrepancy in weight between the 1928 measurement and the more recent one may be attributed to improvements and technological advances in the manufacturing of precision instruments, leading to a more accurate result.

The weight is interesting when phrased in terms that readers today might understand. This rather hefty mass is about the same as a contemporary smartphone; a 2020 Apple iPhone 12 Mini, for example, weighs 135g. Sportive readers who have their phone strapped around one arm while engaged in physical activity will recognise the challenge of having this cumbersome contraption attached to their person. The wearer of the pair of armbands would have had one object on each arm; thus, they would not have been engaged in any kind of strenuous activity as the weight and fragility of the ornaments

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13 Troy weight derives from mediaeval European terms still in use in the precious metals industry. For weights and measures in Southeast Asia, see Le Roux et al. 2004. For European perspectives, see for example Hallock and Wade 1906, Zupko 1977, and Gyllenbok 2018.

Fig. 3: Weight of remaining armband with missing strands



would greatly limit their range of movement.

We do not know however the actual value of the ornaments found. At the end of his article, Winstedt appraises the hoard, informing us that ‘the total intrinsic value of the gold is about \$450’, without specifying the currency. As American dollars were used for gold prices in 1928, that value today, adjusted for inflation, is over USD 7,600 or SGD 10,000<sup>14</sup> for all eleven objects.

It is important to note, however, that these modern values were not likely to have been relevant for the period and geographical area under discussion. Considering the variety and diverse uses of money in early Southeast Asia, it is difficult to establish a frame of reference regarding ancient monetary values. As money use is conventionalised ex-

change, knowing the worth of the armbands would require exact knowledge of the modes of exchange, both customary and numerical (Wicks 1992). So, although large quantities of Chinese copper coins—mostly from the Song dynasty periods—have been found in Singapore in strata related to Temasek-era occupation,<sup>15</sup> this information is lacking for Temasek’s economy. It is therefore not possible to suggest that the pair of armbands were worth, for example, specific quantities of Chinese coins (Borell 2000; Heng 2006)<sup>16</sup> or of piloncito, another currency in use during the same period in the Southeast Asian archipelago for high-value items like land, but variations of which existed in Sumatra, the Philippines, and Java (Capistrano-Baker 2011: 154, Flecker 2002: 65–67, and Christie 1996).

Suffice to say, although we may not be able to determine the precise value of these

14 The inflation calculator used by U.S. Bureau of Labor Statistics contains average Consumer Price Index information from 1913 for goods and services consumed in the U.S. ([https://www.bls.gov/data/inflation\\_calculator.htm](https://www.bls.gov/data/inflation_calculator.htm), accessed 7 June 2022). While the amount given by Winstedt does not seem substantial today, it should be known that in 1928 gold prices were on the ‘interwar gold standard’, which regulated the price of the precious metal and also served to stabilise currencies: ‘The gold value of the dollar rather than of the pound sterling would typically serve as the reference point around which other currencies would be aligned and stabilized’ (Officer 2017).

15 See Zaini 1997; Lim 2017, 2019; and site excavation reports at <https://epress.nus.edu.sg/sitereports/>.

16 Moreover, at the Singapore Cricket Club site on the Padang, the remains suggest the existence of a metal workshop where strings of Chinese coins were found in a ‘distorted condition [that] indicates that smelters of copper/bronze put them into the crucible while they were still strung together’ (Miksic and Goh 2019). The recycling of Chinese coins may also have occurred in metal-poor Java (van Aelst 1995: 385).

ornaments in their time, it seems reasonable to infer that the pair of armbands alone would have amounted to many months' worth of income and goods, too prohibitive for members of the general population at that time. This therefore suggests that whoever commissioned their manufacture would have been either independently very wealthy, or from a family with means and likely very high-ranking among the ruling classes. If the former, then the pair of armbands may have been presented as a gift by, for example, a consortium or guild of foreign traders.<sup>17</sup> If the latter, then we may wonder about Singapore's ancient inhabitants. The discovery of the *Temasek Wreck*, a 14th-century ship carrying a large cargo of Chinese ceramics, was characterised by Michael Flecker as containing 'more Yuan blue-and-white porcelain than any other documented shipwreck in the world, with well over 100 kg being documented to date', and presumably heading towards the island of Temasek. Kwa Chong Guan, who wrote the foreword to Flecker's report on that wreck, asked the important question of whether Temasek's '*rajas* and their *orang kaya* [were] sufficiently wealthy to fund a trader to go to Jingdezhen [...] to purchase this consignment of Chinese ceramics' (Kwa in Flecker 2022: 4). Considering the presumed high value of this remaining armband, the answer to that question appears to reside in the realm of the affirmative.

In a similar manner, because data is lacking for normative sizes and weights of people in precolonial times, the 195mm circumference of the armband can perhaps be apprehended in terms of today's values. The World Health Organisation (WHO) publishes a list of health measurement standards for children aged three months to five years, and upper arm circumference is one benchmark by which growth is quantified.<sup>18</sup> The charts show that unless the child is over the 97th percentile, one would have difficulty reaching a circumference of 195mm. For those between five and nineteen years of age, there does not seem to be any published data on bicep size.<sup>19</sup> An informal poll was hence conducted for demonstration purposes (Table 1), with the girth of the upper arm measured while relaxed, not with flexed muscles, for the wearer would probably not have been engaged in any type of strength-based activity when adorned with such ornaments. The results show the nearest measurements in an 11-year-old girl of average height and weight today.<sup>20</sup> Gender of course cannot be determined from the measurements of the armband alone, but, assuming that people were smaller in the past, for a young person to attain the circumference of 195mm around the biceps, he or she would probably have been between 12 to 17 years of age, depending on various factors such as diet and level of activity, although it should be noted that arm sizes of people from different ethnic groups may also vary greatly.<sup>21</sup> After that age, growth spurts plateau into near adulthood dimensions. This range suggests that the armband's owner was a fairly young person, who would have been of an

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17 This observation was made by the reviewer of this paper (see Acknowledgements).

18 See <https://www.who.int/tools/child-growth-standards/standards/arm-circumference-for-age>, accessed 10 June 2022. For adults, the range of sizes and weights is far more diverse, and no data is available on the WHO website.

19 See <https://www.who.int/toolkits/growth-reference-data-for-5to19-years>, accessed 10 June 2022.

20 Refer to the charts on pp. 45–46 in the Child Health Booklet for parents to monitor their child's development, published by the Health Promotion Board, a statutory board under the purview of Singapore's Ministry of Health, downloadable from <https://www.healthhub.sg/programmes/183/parent-hub/child-health-booklet>, accessed 11 June 2022.

21 The present writer would like to thank the late E. Edwards McKinnon for suggesting, in a personal communication, the addition of this qualification.

age when he or she could be married off, a practice that was common in the premodern world.

Table 1: Bicep circumference in relation to age, weight and height.

Gender	Age (years old)	Height (cm)	Weight (kg)	Bicep circumference (cm)
F	25	167	50	24
M	17	182.5	71	26.5
M	13.5	166.5	40.6	18.5
F	11	149	35.9	19
M	5	107.5	17.5	17.5

The above is the limit of what can be deduced from the dimensions of the armband alone. Perhaps an examination of its other aspects will contribute to drawing a better picture of Singapore's past. The following sections present detailed discussions of the armband's individual components: the chains, the plaque socket, and the alleged 'Kāla head' motif.

### 3.1 The flexible chains

Where the flexible strands are concerned, it is true that armlets of this nature are rare. Most armbands of the Hindu-Buddhist era, of Javanese origin at least, are made from a single sheet of hammered gold. Examples can be found in museum collections,<sup>22</sup> with only the artefacts of the Wonoboyo hoard, excavated in 1990 and currently housed in the Museum Nasional in Jakarta, being of secure provenance (Fig. 4).<sup>23</sup> There exists however a specimen, fished up in Kedah, of a gold ornament with flexible chains and a repoussé plaque that Quaritch Wales characterises as a belt with a *simhamukha* (lion face), a motif which will be analysed shortly. The example given in Quaritch Wales's article, however, is of gold wire woven into a length of interlocking chains (Quaritch Wales 1940: pls. 75–76). Braided gold wire is an ancient technique, known from Etruscan times, commonly used to create flexible strands.<sup>24</sup> The chains of the Fort Canning armband are made from linking minuscule beads. Viewed with the optical stereomicroscope, the digital microscope, and the Scanning Electron Microscope (SEM), we are now able to understand the armband's techniques of manufacture.

It was found that each bead consisted of a rectangular 'brick', hollowed in the middle along its length in the same shape and having a blunt-tipped pyramid on each end. Each faceted brick is about 2mm wide and 4 to 5mm long (Fig. 5). A second brick was then fused to the first transversally, and this pair made up one unit of the chain (Fig. 6). One unit was inserted through an identical unit, then repeated to create a length of a flexible chain, a technique representing an exquisite variation of the simple ring links

22 See for example <https://www.metmuseum.org/art/collection/search/40119>.

23 This large collection of gold and silver objects was unearthed in October 1990 by farmers in the Klaten region in Central Java, about 5km east of Prambanan and 20km from Yogyakarta (Martowikrido 1994). As mentioned, carefully excavated caches of precious metal artefacts are extremely rare in Southeast Asia.

24 Examples abound from Phoenicia (Flourentzos and Vitobello 2009), Oc-Eo (Malleret 1962), Khao Sam Kaeo on the Isthmus of Kra (Pryce et al. 2006), and Sirkap (J. Marshall 1951), to name a few.

assembled into a chain.<sup>25</sup> Each armband had five of these chains, with only one strand left intact on the remaining armband. The five chains are inserted into the repoussé plaque, the latter functioning as a socket featuring a main decorative motif. Moreover, each chain corresponds to an unfolded lotus petal that forms the border of the plaque (Fig. 7). Judging by the photograph of the intact specimen and what survives, the chains do not appear to overlap. The initial end of the five chains is fused and soldered inside the plaque socket, rendering it immovable. The other end of the five chains is attached to a C-shaped tube, forming a tongue, which is inserted into the plaque socket. A split pin is inserted through the tube to form a clasp that can be loosened to enable the wearer to put on and remove the ornament.<sup>26</sup>



Fig. 4: Intact armbands of hammered gold sheet, Wonoboyo hoard, 10th century, Central Java.  
(Credit: author)

25 Two similar examples, belonging to a private collection, supposedly date from Angkor period Cambodia of the 9th to 14th centuries, and are described as necklaces with beads of 'cruciform elements linked to form a chain' (McCullough 2000: 77–78, Figs. 17–19). From the images featured, each bead is bullet-shaped with rounded ends, and the eyelet in its middle is not a clearly cut shape, but appears as if the bead were a seed that had been deliberately split open in the middle. The manufacturing technique of such a flexible chain appears similar to that of the Temasek armband, but the forms differ greatly. See also fn. 31 below.

26 A video of the tongue comprising the chains and tube can be viewed at <https://youtu.be/uQBqLGO9qs>.

Fig. 5: One strand of chain of 'brick' beads with pyramidal ends.



Fig. 6: Schematic of faceted 'brick' bead unit construction: a) [left] two separate beads; b) [right] transversal placement; c) [bottom] fused unit (not to scale).

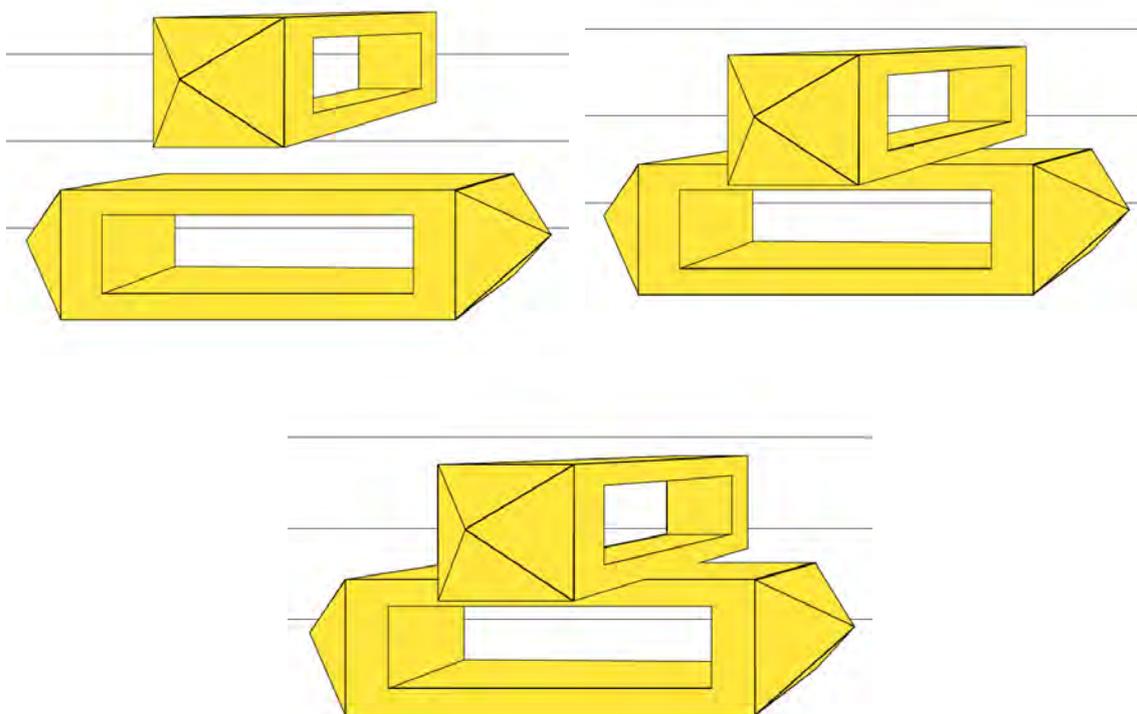


Fig. 7: Chains corresponding to unfolded lotus petal border of the repoussé plaque socket.



Close inspection of the flexible strands also shows the repairs that Winstedt mentions in his article (Figs. 7 and 8), restorations that occurred before the objects were buried.<sup>27</sup> Repairs can also be seen on other locations along the strands of beads (Fig. 9), pointing to a well-used ornament that was, unsurprisingly, prized enough to have repairs commissioned. Some have attributed these ornaments to Temasek craftsmanship (e.g. Miksic 2017: 122). Excavations on Fort Canning Hill and around the Singapore River, resulting in finds of gold fragments, crucibles, and slag and copper prills, suggest that copper ore was imported into Temasek as raw material (Zaini 1997: 18), and attest to the presence of metal-processing workshops. Furthermore, Chinese chronicler and trader Wang Dayuan affirms that 'gold' (赤金) was imported into Banzu, a settlement that was also associated with Temasek.<sup>28</sup>

However, from the limited excavations done in the areas of modern Singapore where Temasek-era artefacts are mostly likely to be found, metal-working activities appear to have been limited to recycling and manufacturing small utilitarian objects like fish-hooks.<sup>29</sup> Most of the flakes and fragments of gold found during excavations in Sin-

27 '[O]ne of the strands shows clear signs of a roughly looped join done by an amateur and not by a smith and another of fusing' (p. 3).

28 The Chinese term in the *Dao Yi Zhi Lue* can be variously translated as 'red gold', 'red copper', 'dark red gold' (see Miksic 2013: 283–285; Rockhill 1915: 133, fn. 2). Wheatley (1961: 83, fn. 4) accepts Wang Dayuan's designation as a 'half tael coin'. Tai Yew Seng reads the term as 'pure gold' (personal communication, 11 June 2021).

29 See fn. 15 above.

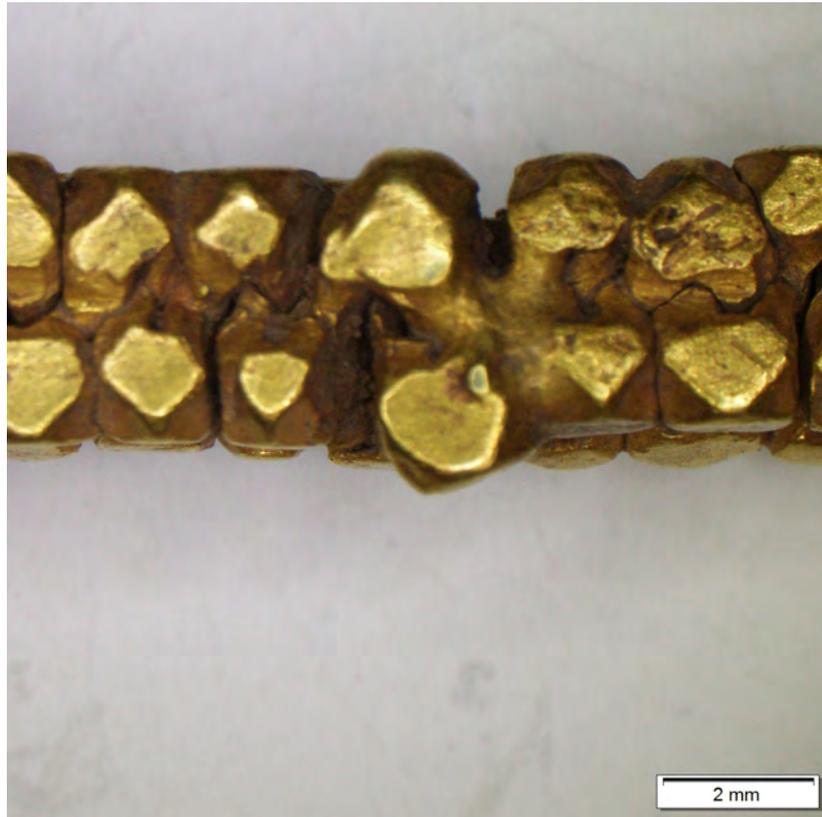
gapore have not been published,<sup>30</sup> so no overview of a local goldsmithing industry, if it existed, is yet possible. If, however, the ornaments were made locally, surely the same workshop would have been able to effect a better repair? Furthermore, considering the minuscule size and the regularity of shapes and details of the individual beads, it is likely that a mould was used to produce the hundreds of beads that make up the chains of the armbands. Jewellery moulds would have been of fine stone and are therefore not easily degradable in this climate. None have been found so far, although the possibility of discovery in a future excavation cannot be ruled out.

Fig. 8: Reformed bead repair to broken beads on armband.



30 Excluding the ornaments under study, known gold fragments include: 1) one gold wire bent into a sinuous shape from the St. Andrew's (STA) Cathedral excavation in the 2003/04 seasons (unpublished, not mentioned in the NUS Press Archaeological Site Report, accessible at <https://doi.org/10.25717/sd70-865c>); 2) the gold foil found at the National Art Gallery (NAG) site in 2009/10, now on display at the National Gallery Singapore (briefly mentioned in Lim 2017, where the identification is purely speculative); 3) four fragments from the Parliament House Complex (PHC) excavation in 1994/95 (three of which are referenced in Borell 2000); 4) eight fragments from the 1997/98 excavations of Fort Canning Hill (FTC 97/98) (unpublished); and 5) several ornaments and fragments from the 2015 excavation of Empress Place (unpublished, except for a number of newspaper articles covering the dig and the finds, accessible via the National Library Board's website: <https://eresources.nlb.gov.sg/newspapers/>). The author wishes to thank Prof. John Miksic and Prof. Goh Geok Yian of Singapore's Nanyang Technological University History Department for permission to view the artefacts listed in 3) and 4).

Fig. 9: Other beads showing signs of repair.



In continuing the technical investigation of the beads for further information as to the armband's possible provenance and final disposal, it was also found that two individual beads appeared to be fused together manually to form a unit; evidence of uneven fusing and irregular tensile strength can be seen where several units showed cracks at the joint where one bead was fused to the other (Fig. 10). If the units had been moulded together as a whole, there would be no such regular cracking and there would have been less fragility at the joints.<sup>31</sup> The ends of two strands with broken beads also show the nature of the fusing at the centre of a unit (Fig. 11), with one bead evidently burst apart.

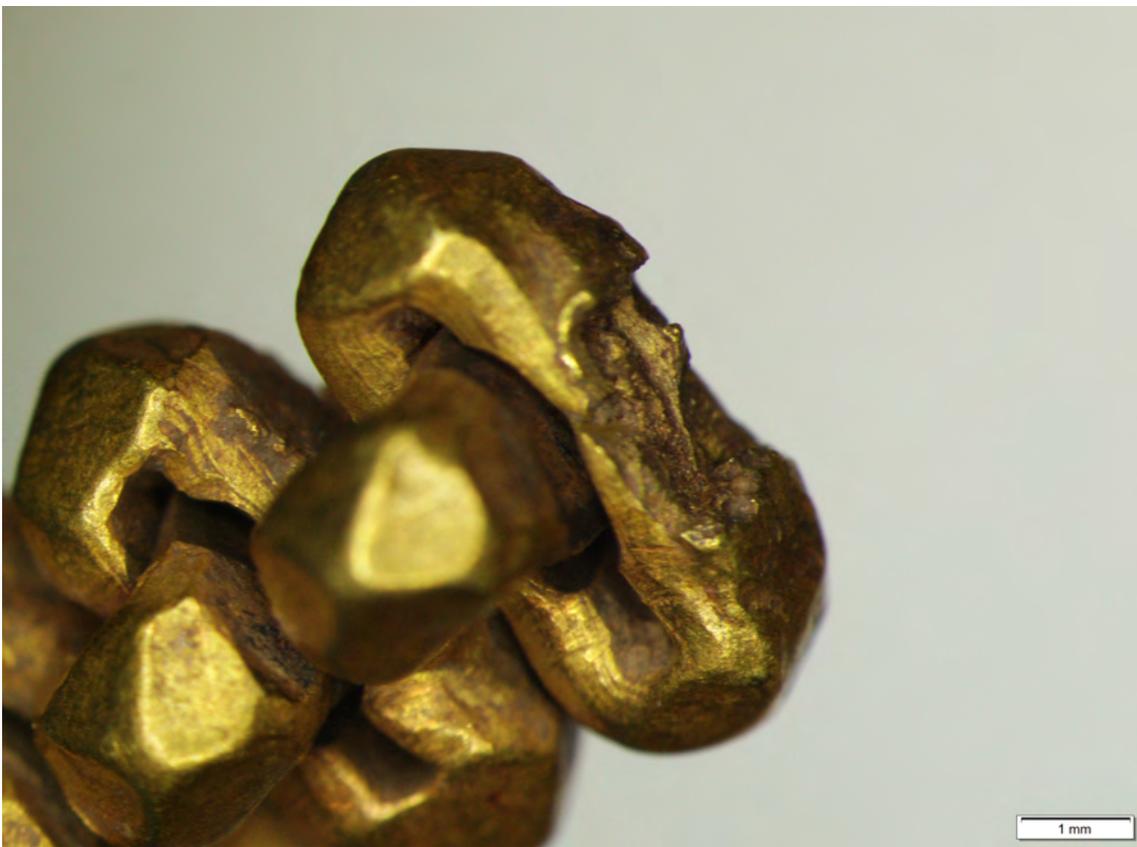
What could have caused such a rupture? At  $19.3 \text{ g/cm}^3$ , gold is quite dense as an element, compared to steel at around  $8 \text{ g/cm}^3$ . The former is also the most ductile of metals, meaning that it can be greatly stretched or deformed under stress before it breaks; a characteristic that allows it to be hammered into paper-thin sheets. This signature softness is reduced when making gold jewellery, by alloying gold with other metals like silver or copper. In doing so, gold changes its colour: silver gives the object a paler, whiter appearance, while copper increases its reddish hue. Alloyed gold ornaments are more durable and can withstand wear and tear through regular use. Taken together, these facts indicate that to cause this particular rupture, a great and sudden force was applied to pull the strands away from something that was nearly equally resistant, but most of the chains ultimately failed to resist the pull.

Fig. 10: Cracks at joint of two fused beads (see arrows).



<sup>31</sup> Unlike the beads of the Temasek armband, the photographs of the two Khmer-era examples mentioned above (see fn. 25) do not seem to show any evident fracture at the joints of each bead and corresponding unit, suggesting that they were cast from a mould as a whole.

Fig. 11: Broken ends of two strands with ruptured bead.



This burst bead might lead one to recall the various stories in the *Sejarah Melayu* claiming that Temasek was attacked by the Javanese and the Siamese (Brown 1952), which undoubtedly inspired Winstedt himself to conjecture reasons for the interment of the objects: 'It may be surmised that the jewellery was lost, or buried for safety during a siege or flight or for the purpose of theft or by some one who wanted to hide loot.' A more mundane possibility could be that the armband strands were caught on a branch or a protuberance, a circumstance which may explain the abovementioned repairs. The ruptured bead could also have been caused by a blow of the *changkol* that Butler describes, but no mention is made of the objects being wrapped around a root or something that might resist the impact of such a blow. Furthermore, if this were the case, then loose beads should have been part of the cache found in 1928, although they may have simply been overlooked due to their size, or workers may have picked them up. However, close-up images taken with the stereomicroscope show that the thinnest edges of the ruptured bead are rounded, which suggests that the ornaments had been weathered by a considerable amount of time underground (Fig. 12).<sup>32</sup>

Fig. 12: Weathered edges of a ruptured bead.



32 A more precise estimate of this length of time is no longer possible. As mentioned, the location of the ornaments' discovery had been highly disturbed and the excavation process was not a systematic procedure. Hence, it is no longer possible to measure the kinds of chemical interactions and tectonic forces that the ornaments may have been subject to. Such information has been irretrievably lost, but Fig. 12, showing pressure fusion of this particular chain, also points us to the same conclusion. The beads are distorted and do not retain their individual shapes, indicating a good amount of time spent underground subject to considerable load. This is consistent with the levelling of the hill summit and construction of the plateau described above, although, again, it is not possible to allocate a specific time frame.

It might also be argued that Butler's observation, that the objects were found 'all in one spot, not wrapped up in any way', indicates a plausible consequence brought about by these attacks; that is, that the owner of the ornaments had the objects hurriedly buried as Winstedt suggests. However, the only conclusion one can derive from Butler's remark is that the cache of eleven ornaments was not an arbitrary occurrence; lost objects tend to be dispersed and are often singular, whereas the presence of six identical rings and a pair of armbands indicates a deliberate collection. This grouping further suggests that the artefacts were transported to their final location in some way; either the wearer removed them on that spot, or, unlike Butler's belief, a receptacle was used that has since disintegrated. This packet may have been of textile or some other easily degradable matter, such as a wooden box, which would not have survived the tropical climate and the years between inhumation and discovery. The objects would thus have been exposed to organic reactions and activity within the soil; indeed, signs of use on the objects cannot now be seen under the microscope, due to post-burial damage of the objects' surfaces, which renders these traces indistinguishable and any hope for DNA analysis impossible. Finally, it is just as likely that the objects may have been torn off in anger, and/or considered inauspicious for any number of reasons, which may explain why they were not melted and reformed. It is also possible that whoever was responsible for the disposal intended to retrieve them, as they were seemingly buried shallowly; however, this lack of depth could also have been because the earth from Fort Canning Hill was removed and re-used in other projects as highlighted above. It thus seems evident that one might imagine countless explanations for the burial of the objects without being any closer to the real reason behind this act, their owner now long passed, rendering this mere speculation.

The new findings revealed in this paper may, however, inform us as to the origin and purpose of the ornaments. In the repertoire of personal adornment in Southeast Asia, there is a great assortment of gold beads: spheroid, ovoid, cubic, biconical, complex polyhedrons, all of which may be variously ornamented by openwork or with ribs and lobes, filigree, granulation, facets, and so on.<sup>33</sup> What is available tends to support the observation that these faceted 'brick' beads with four-sided pyramidal ends composed into units are very unlikely to be regional creations, bearing instead formal similarities with examples from the north-western region of South Asia.<sup>34</sup> According to the metalsmith Oppi Untracht, such beads are termed *lahsan*, the Punjabi word for 'garlic', and are strung into a bracelet (Untracht 1997: 258, figs. 598–600). In both the Temasek armband and the South Asian specimen, each bead is composed of a central polyhedron (of varying number of sides) capped with pyramids at both ends.<sup>35</sup> There however the similarities end; Untracht

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33 In addition to the publications listed in fn. 24 above, see also Barnes et al. 2015, Calo et al. 2020, and Reinecke et al. 2009, amongst others.

34 In this paper, the designation 'South Asia' refers to the geographical and ethno-cultural region extending from Afghanistan in the west, Nepal and Bhutan in the north, Bangladesh in the east, to Sri Lanka in the south. Tibet may sometimes be included in this bloc, as well as various territories in the Indian Ocean. Shifting definitions may be determined by geopolitical, economic, historical, and socio-cultural considerations.

35 Similar examples can be found in Hendley 1909: pl. 23, no. 175, illustration of a wrist ornament with similar beads, 'Upper India'; pl. 39, no. 269, *bazuband* (armlet) from Bahawalpur, Punjab; pl. 43, no. 293, diagram of arm ornaments, see in particular 2. *bata*, from Punjab; pl. 57, nos. 357–359, *tawiz* (amulet or 'charm cases'), Kashmir; pl. 70, no. 448, modern 'Saracenic' amulet case for necklace, from Cairo; pl. 71, no. 450, strung amulet cases, modern Turkish; pl. 95, no. 646, amulet case with Kāla head design from

does not state what the significance of the garlic clove and its shape are, or what such a bracelet would be used for. The beads on the South Asian examples are also strung together lengthwise, and do not form transversally interlocked units. The specimen cited belongs to the modern period, when scholarly interest in the peoples of the subcontinent began to preoccupy researchers and initiated the often problematic acquisition of collections, both private and public, which was accompanied by the even more problematic issue of fakes and pastiches. There are precious few firmly provenanced objects from historical periods prior to the 18th century, partly because precious metals like gold could and would be reformed according to taste, and because Indic rituals for the deceased do not provide sumptuous burial furnishings as elsewhere.

Fig. 13: 'Truncated pyramid' tin ingots from the Intan Wreck. (Credit: Michael Flecker)



There does exist however one form that the four-sided pyramidal ends are highly reminiscent of: the characteristic truncated pyramidal tin ingots that the Thai-Malay Peninsula was renowned for trading in (Fig. 13). As has been noted by many, the largest sources of tin in ancient times were mainly found on the Thai-Malay Peninsula and the Riau archipelago, with sporadic deposits on Sumatra (Bronson 1992: 83–84).<sup>36</sup> This region was probably where India obtained all her tin for her bronzes (Rajan 2011: 188–190), used in worship or

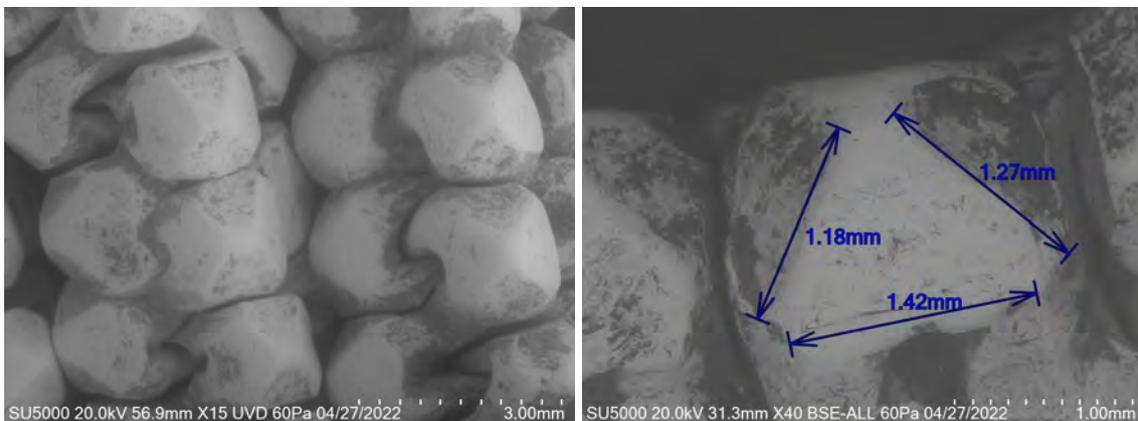
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Bangalore. Another specimen, attributed to 19th-century South Indian manufacture, can be seen in Krishnan and Kumar 2004: 184, fig. 292, although the garlic units only have a conical form on one end.

36 It has also been kindly pointed out by this paper's reviewer that the island of Bangka, facing Palembang, was in the medieval period a source of tin, although the greatly disturbed workings of later times render it difficult to ascertain the chronology of tin exploitation. See Edwards McKinnon 1985: 25, although, according to Manguin, 'No direct archaeological proof of its early extraction has yet been brought to light, but the archaeological wealth of sites found along its production zone and its appearance in ingot

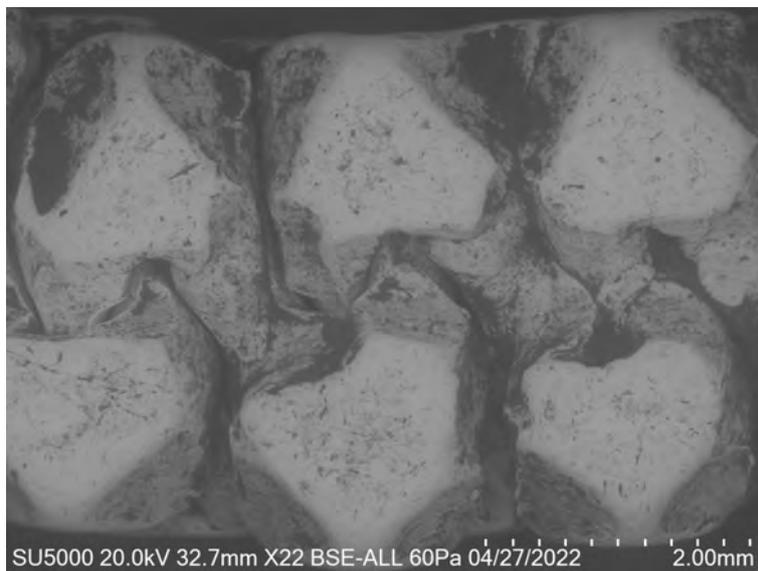
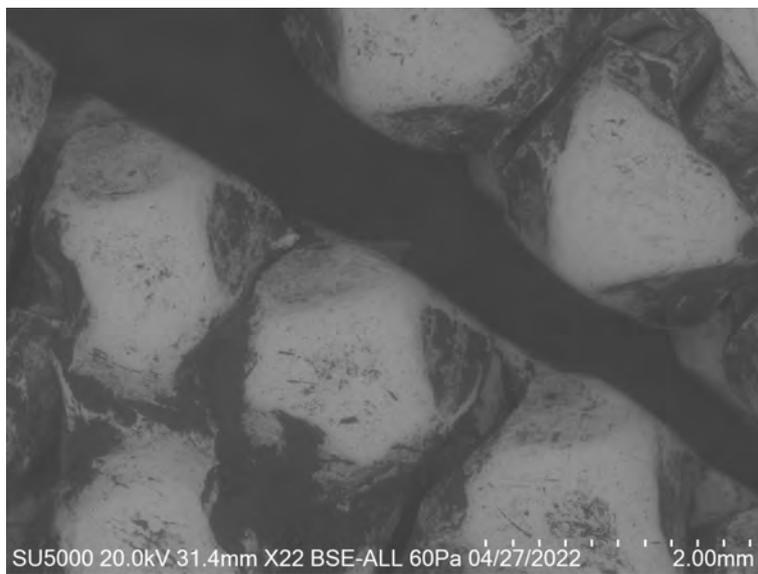
rituals. Archaeological finds of stone moulds and tin ingots in Malacca, Negri Sembilan, Perak, and the *Intan* shipwreck all show the same shape (Flecker 2002: 81–83), with some ingots having markings. The beads on the Temasek armband being tiny, one should not expect markings on each tip (Figs. 14a–c). The tips are also not pointed but blunt, somewhat truncated, some more evident than others, and uniform on all beads, suggesting deliberate design. One explanation lies in the fact that the ornament was meant to be worn, and sharp pointed pyramids all along the chains would have been uncomfortable for the wearer. It may also be that the pressure from the earth above the buried cache and the time the objects spent underground contributed to the shape. But in this case, one would expect the roundedness of the tips to be specific occurrences along the strands, with some parts being more weathered than others, rather than the current uniform rounding seen on all sides. This strongly suggests that deliberate design is the likeliest explanation to date.

Fig. 14: a) Pyramidal head ends on 'brick' bead units; b) under SEM; c) with measurements.



form in shipwrecks recovered in regional seas dating from the ninth to the twelfth centuries confirm its importance in regional trade' (Manguin 2021: 91).

Fig. 15: SEM of faceted pyramids.



It was also found, under the Scanning Electron Microscope (SEM), that each pyramid had depressed sides on opposing faces, with the two remaining faces left smooth, probably to reflect light. These faceted pyramids present a number of particularities. The reflective faces were either triangular or hexagonal, and both may be present on any strand of the chains (Fig. 14a). The depressed sides were almost always triangular and of varying depth, with some edges of the triangles more recessed than others (Fig. 15). The irregularity of these indentations are also unevenly distributed along the strands, and cannot thus be attributed to weathering or tectonic forces; natural processes like these would have affected the top and the bottom parts of the object, depending on how it was positioned within the burial site. No record is available, but the randomness of the indentations suggests that the imprints were handcrafted, perhaps by some kind of tweezer, plier, or clamp. Given the quantity of beads and their minuscule size, the amount of work this would require would be enormous, perhaps on a scale unimaginable to our modern minds.

Fig. 16: a) Depressed sides of pyramid heads; b) side view of tin ingots from the Intan Wreck with depressed, slightly curved faces (Credit: Michael Flecker).



Nevertheless, the imprints again suggest intentional construction, and appear to represent another point of similarity with the tin ingots, which also have slightly depressed sides (Figs. 16a–b), and were also known as ‘dipper tin’ or ‘scoop tin’. The formal similarity between the beads and the tin ingots may be an allusion to the wealth of the person who commissioned the gold ornaments, but this resemblance may also be supported by the information given in the *Dao Yi Zhi Lue*. Wang Dayuan informs us that tin was a product of Lung-ya-men (Linga) (Rockhill 1915: 117, fn. 1; 131; see also Wheatley 1961: 82–83), a locality where no ore has ever been found but that has a hill named Bukit Timah. Likewise, G.E. Gerini (1905: 501) points out that the Chinese name of Temasek ends with the word for tin 錫 (*xī*), and Iain Sinclair, in his essay ‘The Inception of Lion City’, posits that ‘Temasek’ may be related to the words *timah*, tin, and *sikka*, cash (Sinclair 2021: 68–69). This hypothesis would very conveniently explain both the name of Bukit Timah, as well as the origin of Temasek’s rulers’ wealth—and thus their presumed ability to commission this set of ornaments and to finance the cargo of the *Temasek Wreck* (see p. 10 above).

However, more questions arise; in particular, how did Temasek’s rulers mobilise capital to fund the flourishing tin trade; secure access to regular supplies of ore; control mining and smelting technology (Bronson 1992: 73); manage the logistical issues of transporting the resources from the Tin Belt to the southern end of the peninsula for transshipment; and how all of this relates to the question of sea power in the straits? Sinclair points out that the island was never known as independent or distinct from the mainland (Sinclair 2021), which may have alleviated the freightage problem from a political perspective, but the Portuguese traveller Tomé Pires, writing in the early 16th century, learns and remarks that Singapore had no trade in the 15th century (Pires 1944, II: 232). The foregoing shows how much more investigation is necessary before Singapore’s ancient past can be elucidated. This tin-related hypothesis may help narrow the field of research but requires much more study and verification.

### 3.2 The repoussé plaque socket

In his description, Winstedt briefly outlines how the plaque socket functions, then focuses on the motif itself. He does not mention the many different parts of the decoration that the present writer believes could function as clues to the origin of this particular ornament. The manufacture of the plaque socket with the main decorative motif in the repoussé technique is fairly standard, and as mentioned above, the tongue is attached to five chains on one end and secured by a split pin within the socket (Fig. 17). The tiny bar on one arm of the pin helps lock the pin once the latter is in the socket holding the tongue and chains in position. To remove the clasp, the user must deliberately tilt the pin at an angle to loosen the lock.<sup>37</sup> The socket itself is essentially a rectangular sheet folded over and soldered at the back (Fig. 18), with the monster head motif in the front formed mainly by repoussage, a technique that pushes the gold sheet outward from the back, forming a design in relief, then augmented by various other goldsmithing techniques.

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37 A demonstration of how the clasp functions can be viewed at <https://youtu.be/uQBoqLGO9qs>.

Fig. 17: a) Split pin, and b) nail securing it to the socket.



Fig. 18: a) Front of repoussé plaque socket with decorative motif, b) back of plaque.

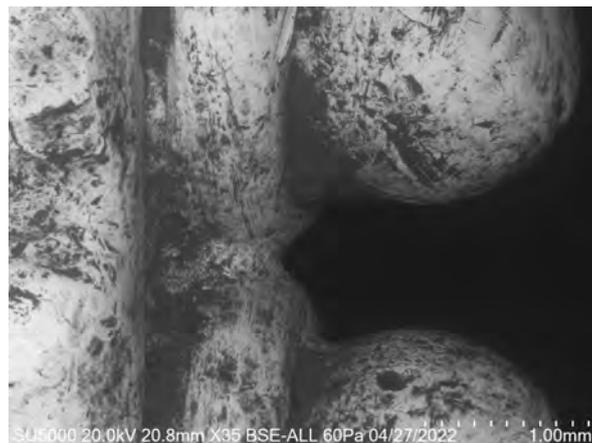


Above and below the face, running along the edge of the square plaque, are two borders, as already mentioned, of five unfolded lotus petals corresponding to the flexible chains. The left and right sides are flanked by a row of seven grains of gold, each sitting on a circular fragment of drawn gold wire,<sup>38</sup> with the central granule forming part of the split pin that sits flush in the socket (Fig. 19). These balls of gold were formed by granulation, an ancient and advanced goldsmithing technique for the creation of tiny spheres of gold, which are then fused onto surfaces as decorative patterns or texture (J. Wolters 1981).<sup>39</sup> The size of each grain on the Temasek ornament is approximately 2mm in diameter,<sup>40</sup> with the wire base of each grain soldered to its neighbour (Fig. 20). SEM imaging also brought to light a joining technique that leaves traces of crackling on the surfaces of the joints (Fig. 21), probably indicating embrittlement of the metal, which may have been partly due to the soldering method and agent used.

Fig. 19: Left and right borders of granulated beads.



Fig. 20: SEM of two granulated beads and joints between bead, wire and plaque.



38 The characteristic parallel and regular striations along the length of each wire indicate that the wires were drawn, a method of creation that passes softened gold through a tiny hole drilled into a mould or drawplate.

39 The Metropolitan Museum of Art in New York demonstrates one method of attaching granules of gold: <https://www.youtube.com/watch?v=zCikTT1zjfy>.

40 Grain sizes can vary from tenths of a millimetre up to several millimetres in diameter. Smaller, regular grains are associated with high levels of expertise.

Fig. 21: SEM of a) surface of joints between bead, wire and plaque; b) at  $\times 300$  magnification.



A case in point is that of ornamental plaques used as personal adornment in Island Southeast Asia and decorated with borders of gold grains. Where spherical shapes decorate edges, these are generally made by repoussage, embossing, stamping or punching in imitation of true granulation.<sup>41</sup> Granulation is a technique known to have been used in ancient Southeast Asia (Riederer 1994: 55). However, judging by the specimens in published collections, it was not a common method, and forms and arrangements<sup>42</sup> do not correspond as closely as parallels with other South Asian talismanic ornaments. In particular the quadrangular shape of the amulet itself and knobs of gold sitting in a straight row on a round support (Untracht 1997: 100–101, figs. 162, 166) are again from Punjab in northwest South Asia, which themselves bear similarities to ancient Greek ornaments.<sup>43</sup> This does not mean that decorative plaques made in this format and with this technique did not exist in other areas of ancient South and Southeast Asia; however, as it is generally assumed that most gold is melted down and reused, extant examples of indisputable origin are scarce.

### 3.3 The 'Kāla head' motif

Winstedt very succinctly enumerated the features of the face in his article, as follows: 'an old Javanese Kala head, originally a lion's head but highly conventionalized:—the lower jaw

Fig. 22: 'Kāla head' motif, with a) no lower jaw; b) lolling tongue; and c) horns, as identified by van Stein Callenfels in Winstedt 1928.



is missing, the tongue extruded, horns spring from the cheeks and from the outer corners of the eyes' (Fig. 22). From this description alone, it is unsurprising that the motif was identified as Javanese, as van Stein Callenfels asserts: 'from their style he is inclined to ascribe these armbands to the Majapahit period at its best, i.e., the middle of the 14th century A.D.' In order to determine if this identification holds, it is necessary to define the term *kāla* by examining the motif's origins, symbolism, and specific iconographic characteristics in various parts of Asia and, in particular, in Java, where this nomenclature is widely used.

41 See Fig. 5 and the Kedah belt above, the Muteran gold belt plaques in Leiden's Museum Volkenkunde (without gemstones, RV-1403-2786a–k, accessible at [collectie.wereldculturen.nl](http://collectie.wereldculturen.nl), discussed in Lunsingh Scheurleer 2005), and the gemmed set in the Museum Nasional Indonesia (MNI 1524 in Brinkgreve et al. 2010).

42 See Lunsingh Scheurleer 2012: 64–6, nos. 6–8 and Miksic 2011 (Yale University Art Gallery accession numbers: 2007.142.323, 2007.142.139, 2007.142.140, 2007.142.57, 2007.142.137, 2007.142.138, 2007.142.141, 2007.142.142, 2007.142.234, 2007.142.275, 2007.142.143, ILE2012.30.741).

43 See F.H. Marshall 1911: 85–93, nos. 1103–1153, pls. XI–XII; 162–3, nos. 1576.1–6, pl. XXVI.

The face thus described is commonly seen in South and Southeast Asian ornamentation, most frequently encountered at the summit of architectural structures—in particular that of thresholds, above a gateway, door, window or niche—or as decoration on *stūpas*, votive objects, items of ritual significance, and articles of personal adornment (Diskul 1980, Fontein 1990, Krishnan and Kumar 2004, Perret 2014). The motif has a long history and is a complex subject; much ink has been spilled about its genesis, forms, function, and meaning (Brandes 1901, Stutterheim 1929, Kramrisch 1946, Vogler 1949, Agrawala 1965, Donaldson 1976, and Vajracharya 2014), as indicated by its many names: *kīrtimukha*, *pañcamukha*, *pañcavaktra*, *kālamukha*, *siṃhamukha*, *kālasīṃhamukha*, and so on.<sup>44</sup> The Dutch archaeologist J.Ph. Vogel points out that the term 'Kāla head' used to designate this motif in ancient Java is perplexing, and may be related to the god of death Kāla (Vogel 1924: 272).<sup>45</sup> In ancient Java, the motif was never known by the label used today; instead, texts designate monster heads as *cawinten* or *cawiri* (Robson 2012: 259; Zoetmulder and Robson 1982, I: 317). Today, the motif is termed *banaspati*, 'Lord of the forest',<sup>46</sup> in Java and Assam, *boma* in Bali, and 'the head of Rāhu' in Cambodia (Stutterheim 1929: 31; Marchal 1938).

The symbol may have roots in early Vedic belief systems, with subsequent developments in Hinduism, Buddhism, and Jainism. One of the motif's most enduring stories relates to the myth of the Churning of the Ocean: the head of the demon Rāhu was chopped off by the god Viṣṇu as punishment for having sipped the *amṛta*, the elixir of immortality (Kramrisch 1946: 325). As the *amṛta* had passed through Rāhu's mouth, the head became indestructible and forever after chased the moon, the source of *amṛta*. Eclipses happen when Rāhu swallows the moon, but, as the demon no longer had a body, the moon reappears after passing through Rāhu's mouth (Zimmer 1946: 176). Thus, the monster head is related to astronomical phenomena, and in this guise is sometimes depicted with a disk-shaped moon in its mouth, with or without hands grasping the celestial body (Stutterheim 1935: 197). In this case, Rāhu is identified with the sun, which is also the astrological sign of the lion (*siṃha*), and some texts associate Rāhu with leonine features (Vajracharya 2014), which leads to confusion regarding the correct designation for similar symbols. As the solar sign, the lion *siṃha* complements the life-giving aquatic sign, symbolised by the crocodilian *makara*, and this can be seen in the earliest depictions of the motif constituting the oft-mentioned *kāla-makara* ornament (Vogel 1924; Donaldson 1976). This is also the form that the motif takes on in Central Javanese period architecture, where the monstrous head adorns the summit of doorways and is always attached along the doorjambs to sinuous *makaras*, which disappear in the East Javanese era (Kempers 1959).

It is furthermore possible that *kīrtimukha* or *kālasīṃhamukha* may have descended from Hellenistic imagery, namely the Gorgon, or lion faces, in Greco-Roman iconog-

44 The Sanskrit terms *mukha* and *vaktra* mean 'face', 'visage' or 'mouth', to which various qualifiers are appended: *kīrti* for 'glory', *pañca* for 'five', *kāla* 'time' (i.e., 'death'), *siṃha* 'lion'. The Chinese *taotie* (饕餮) mask may be a cognate (Marchal 1938; Kramrisch 1946, II: 323).

45 It is also possible, according to Lunsingh Scheurleer (email 22 April 2022), that the term *kāla* may derive from frequent usage by 19th and 20th-century Dutch scholars who thought that Indological terms also applied to Southeast Asian cultural remains, as they considered the region a 'colony' of 'Greater India'. She is careful to note, however, that the evidence for this idea is circumstantial at best.

46 Kramrisch relates *vana* to 'light' or 'intellectual Splendour' (1946, II: 324, fn. 79). According to Andrea Acri, this derivation may be erroneous, 'for it is rather from *vana* or *van* (*vanas* probably being the genitive of *van*), a wood' (personal communication, 7 Sept 2023).

raphy. The archaeologist John Marshall for example believed that *kīrtimukha* in Indic art derived from horned lion masks that appear on jeweller moulds and ornaments found in the archaeological site of Taxila in modern-day Punjab, notably in the Sirkap strata dating to the last two centuries BCE (J. Marshall 1951, II: 583). Similar 'grotesque' faces can also be seen in Central and West Asian as well as Sino-Sogdian representations<sup>47</sup> and even in South American art, leading some scholars to posit an extra-Indian origin that was part of a feedback loop from Java to the subcontinent (e.g. de Coral-Rémusat 1933: 114), a line of reasoning that requires further substantiation. Given the motif's pervasiveness in much of Asia, the presence of specific features of the *kīrtimukha* may depend on regional, period, and sectarian preferences towards choice of style, symbolism, and characteristics to best suit prevailing needs. It is generally agreed however that the motif's main—but not only—use is apotropaic, a ward against evil influences. It therefore seems evident that the long and complex history of the motif does not lend itself to easy identification. Considering also that much evidence has been lost over time and the vast variety of styles in the available corpora of monster heads all over Asia (e.g., Dhar 2010, Vajracharya 2014), the present author is led to think that it does not seem likely that an exact match for the face seen in the remaining gold armband from Fort Canning Hill will be found, and that Winstedt's and van Stein Callenfels's confusion in determining its origin and manufacture is understandable.

It is, however, possible to rule out the idea that the armband demonstrates Javanese influence. Actual Javanese Kāla heads are fairly standardised in form, and Marijke Klokke has already outlined the development of the motif (Klokke 2000). To summarise her paper, the earliest Central Javanese versions have neither a lower jaw nor paws (Fig. 23), while the next development consists of the head having downward-pointing paws. This progresses to the Kāla having both a lower jaw and downward-pointing paws, which become upward-pointing paws in the next point of development (Fig. 5), and eventually change into upward-pointing hands with the index and middle fingers raised. It is this version that is ubiquitous in the East Javanese era, and especially during the Majapahit period (Fig. 24), whereas it is difficult to identify hands on the Temasek armband. Other points of note are the teeth and the horns. In the Central Javanese heads, teeth are rectangular and horns are generally absent. In East Javanese faces, the dentition can be pointed and is always equipped with very prominent tusk-like upper and lower canines<sup>48</sup> while the horns are always conspicuously present above each eyebrow and inward-curving, details that are again distinct from the face on the armband. The so-called 'horns [that] spring from the cheeks and from the outer corners of the eyes' (Winstedt 1928: 3) may be interpreted in other ways.

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47 See Schulz 2019, especially p. 187, fn. 10. Cheng and Zhang term such faces from the Northern Zhou Dynasty (c. mid 6th century CE) 'animal masks' (2009: 27, 36, Fig. 22).

48 One anthropologist notes that the fangs on Javanese and Balinese Kāla heads have been, since probably around the 14th century, wrongly occluded, with the upper fangs in front of the lower, i.e. the canines fit together in a manner that does not correspond to any examples of animals within the natural world, and posits a cultural explanation for this iconographic element (Forge 1980).

Fig. 23: Kāla head lintels on various candis of Dieng Plateau, Central Java, c. 7th–8th century.  
(Credit: author)



Fig. 24: Kāla head on the dated building, Candi Panataran, Malang, East Java, c. mid-14th century.  
(Credit: Anandajoti Bhikku, photodharma.net, CC BY-SA 3.0)



Fig. 25: Monster head on the Fort Canning armband.



If this face is not a Javanese Kāla head, what can it be? It is opportune here to go into detail about the monster head on the Temasek armband (Fig. 25). Under the stereomicroscope, the monster head revealed details that Winstedt's visual examination had been unable to detect nearly a century ago. Starting from the top of the head, the border of unfolded lotus petals has already been mentioned, but several features that were ignored by Winstedt deserve highlighting. In the middle of the forehead, a three-petalled flower-like ornament can be seen, and is given subtle emphasis by the deep grooves around it in the shape of a diamond, raising it in relief in contrast to its immediate surroundings, which are given a *pointillé* type of treatment. Minuscule dots speckle the entire surface

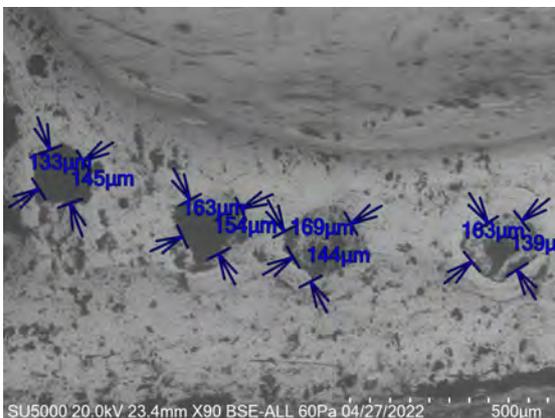
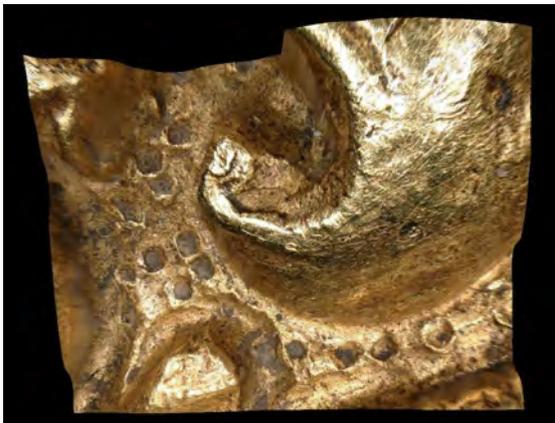


Fig. 26: a) Stipple surface treatment; b) digital microscope; c) SEM with measurements.

around the main motif, and under the digital microscope and SEM-EDS their nature is revealed (Fig. 26). The points are not circular—as one would expect from a needle, for example—but square, and measure approximately 150 microns (0.15mm) on average. They are also a secondary treatment of the surface, done after the face had been made with the repoussé technique; the digital microscope image, taken with higher magnification and angled lighting, clearly shows that gold has been pushed aside around each dot. The random distribution and irregular spacing of the flecks also indicate that this treatment was handmade and deliberately done to contrast with the raised relief; a smooth background would have reflected light, whereas an uneven surface disperses light waves to create the impression of a darkened complexion. Below the flower ornament and properly between the eyebrows is a smaller flame-shaped droplet. These details are not immediately apparent on previously published images (Fig. 2). Indeed, the photograph in Winstedt's article (pl. XXVI) of the intact armband that is now lost shows a forehead decorated with additional flourishes above the eyebrows and different designs between the brows. Other changes include a lower half of the face that is reduced in height, resulting in fewer details such as the tongue not having engraved lines, less defined teeth, and a shorter curl below each cheek.

Fig. 27: Monster head, upper and lower half.



On the upper and lower halves of the face (Fig. 27), other facial features include thick eyebrows, indicated by a few curling scrolls extruding towards the sides; deep-set eyes indicated by an orbital crease; eyelashes with dots at the end of each lash; eyelids; bulging elliptical eyes with pupils in spirals that circle outwards from the centre in opposite directions; a nose bridge that appears to be divided vertically by deep grooves near the bottom which separate it from the nose; and a blunt nose with prominent nostrils. Directly below the nose are four outward-curving incised lines that possibly indicate the philtrum,<sup>49</sup> followed by what looks like a moustache or a prominent muzzle or raised lips, given emphasis by deep valleys outlining the form, and decorated with a few line engravings that extend the lines below the nose. Five pointed incisors and two larger outward-turning canines protrude from beneath the lips, with the gums showing, as indicated by a horizontal incision at the top of each tooth. Under the fangs, a half-circle, decorated with two incised lines following the shape, thrusts forward towards the viewer. Finally, at the bottom edge of the squarish plaque, a boat-shaped arc can be seen, which splits into two or three curls at the extremities.

The last two features can be variously interpreted. First, if subscribing to the idea that the face is a *rāhumukha*, then the half-circle could be perceived as a moon. In this case, the boat-shaped curl could be interpreted as upward-pointing digits grasping the celestial body. Alternatively, the bottom curl could simply be some kind of ornamental vegetal scroll. Finally, another interpretation includes viewing the half-circle as a tongue, with the bottom curl being a beard, which is styled in a similar manner as the bushy tufts of the eyebrows.

Which of these possibilities is more likely can be elucidated by examining the rest of the face (Fig. 28), in particular, the sides of the face where, according to Winstedt, 'horns spring from the cheeks and from the outer corners of the eyes.' The supposed horns extruding from the corners of the eyes are teardrop-shaped, with the tips curling inwards. A shallow cavity is carved inside the outer half of this teardrop shape and decorated with tiny swirls at the bottom. The 'horns' of the lower part of the face are in fact part of an irregularly shaped scroll that contours each bulging cheek before cascading into a curl that 'brackets' the gaping maw. Each scroll is also embellished with curls and tufts similar to the eyebrows at three specific places: above the cheek and below each eye; below the cheek and next to the canine; and cascading in the final long inward-curving hook shape. Taking all this into account, the author agrees with Sinclair's assessment of the armband, that it is 'a relatively naturalistic depiction of a lion-like animal', although it is not clear what he meant by 'definite ear shape' nor how he arrived at the same conclusion, his chapter being a brief summary of a lecture (Sinclair 2021).

Winstedt was partly right in his characterisation of the motif. It is indeed a lion's head. More specifically, the face that the artisans of the armbands attempted to portray belongs to the animal known as *panthera leo*, the lion—*sirīha*, *singa*. The reasons for this identification lie in several features previously misinterpreted and/or ignored. The curls and scrolls surrounding the face—eyebrows, cheeks, and a beard that were previously overlooked in Winstedt's description—are instead very likely a stylised depiction of a lion's mane, with the many tufts representing unruly clumps or matted locks of hair, and

49 The philtrum is the vertical medial indentation between the nose and the upper lip common to some types of mammals.

Fig. 28: Monster head, proper right (top) and proper left (bottom) sides.



the stippled surface an allusion to its colouring.<sup>50</sup> The 'horns' next to the eyes are in fact ears; physiologically, lions have round ears, but when members of the *felidae* family cock their ears to the side, the ears appear to become pointed. In particular, this angled ear is also typical of cats, both big and small, when they snarl and flatten their ears in a menacing posture. A snarl is primarily defined as an aggressive sound, a growl or other threatening noises, which evidently cannot be represented on an object of personal adornment. It is usually accompanied by facial expressions which are however readily depicted visually. Snarling animals raise their upper lips and expose their front teeth (and sometimes the gums). All these elements are shown on the armband, although less obvious on the armband pictured in Winstedt's article. During this process, the animal's muzzle contracts and the nose widens, resulting in bulging cheeks and facial wrinkles, both of which are also depicted on the armband's face, the latter as lines across the nose bridge and below the nostrils. The many photographs of snarling lions online provide abundant examples to compare with, which leads to the conclusion that the face is a *siṃhamukha*. While the *kīrti-*, *kāla-*, *rāhu-* and *siṃha-mukha* have often been confused (Vajracharya 2014), this is not the case here, due to the specific details just outlined. All this seems to suggest that the artisan responsible for this depiction had either observed such an animal in action, or based his depiction on a similarly detailed representation.

This inference naturally leads to the question of where the artisan could have had such an opportunity. Despite its name, Singapore has no native populations of the lion nor can the animal be found in any locale in Southeast Asia, so the oft-cited sighting of a *singa* where the mythological Sri Tri Buana supposedly founded Temasek is mere myth (Brown 1952: 30–31). In the modern world, the most well-known lion is the African subspecies, but there also exists the lesser-known Asiatic lion, the *panthera leo persica*, native to West and South Asia. Having been hunted to extinction in many parts of its native habitats, the last remaining population currently resides in Gujarat, Western India, but the Asian lion had been recorded, in the first quarter of the 20th century, as ranging from Sindh and Punjab in Pakistan to Bengal and Central India (Kinnear 1920, Schnitzler and Hermann 2019). It is possible that a captive animal was sent to Temasek in the 14th to 16th centuries as part of a cargo, unlikely as this potentially deadly endeavour seems. One such undertaking had in fact occurred in Palembang, in the early 11th century, where an official of a Cham king attempted to purchase a lion, brought from India by Arab traders, to present to the Song emperor (O.W. Wolters 1970: 200, n. 8). While possible, such instances were likely very rare and would certainly have been remarked upon by chroniclers of the era, and if this were the case, then the ornaments might have been made at that time when artisans in Palembang may have had actual access to a lion. Thus, the two most plausible explanations for such a realistic depiction lie in, firstly, an origin in India itself, in particular the north-western area of the subcontinent and specifically the Punjab region, or secondly a copy of an earlier depiction by, for example, an itinerant jeweller.

<sup>50</sup> The darkness of a lion's mane is correlated to higher levels of testosterone and signals its viability as a mate (West and Packer 2002).

## 4. A NORTHWEST CONNECTION?

At least two elements of the extant armband have features that specifically resemble Punjabi forms and styles, namely the form of the beads and the form of the plaque,<sup>51</sup> and while the range of the Asiatic lion represents a third point of convergence, a final factor to be considered is the illustrious history of the region. This northwest region is at the crossroads of Central, West, and South Asia. It was in this area, in Harappa, Punjab, that the Indus Valley Civilisation (c. 3000 BCE) was first discovered. In the first millennium BCE, the Achaemenid Persians and Macedonian Greeks claimed the region as their eastern border, and Alexander the Great conquered it in the 4th century BCE before attempting to proceed further into India (J. Marshall 1951). It was from this area that Gandhara and Taxila gained renown, thus contributing to the spread of Buddhism to Central and East Asia (Salomon 1999).

Recall then that the *Sejarah Melayu* dedicates several early chapters to the lineage of Temasek's and Malacca's sultans, thus earning its original name *Sulalatus Salatin*, or *A Genealogy of Kings*. In particular, there is the claim to being descended from Alexander the Great himself, the Conqueror of the Worlds, via the mythological Sang Nila Utama/Sri Tri Buana (Brown 1952), whose epithet, Lord of the Three Worlds, is an echo of the former's. Through Sri Tri Buana's venerable origin descends the historical figure of Parameśvara, who fled from Palembang to Temasek and later founded Malacca after converting to Islam and taking the name of Iskandar Shah (Pires 1944). Although the claim of legendary descent is very likely hyperbole, the historian O.W. Wolters has nevertheless extracted the utility of such a conceit as it is employed in the genealogy. He very convincingly argues that its purpose was to imbue the historical figure of Parameśvara and Śrīvijayan royalty with ancient and religious power; to justify their transfer of the new capital to Singapore and then to Malacca; to highlight their conversion to Islam; and to ensure that history sanctioned their actions in spite of the harsh vicissitudes of maritime trade amidst political changes happening outside of their control (O.W. Wolters 1970). In short, the text aimed to legitimise Parameśvara's sovereignty (and that of his descendants in the Malacca Sultanate) by an appeal to history. The ornaments found on Fort Canning Hill were therefore probably part of this quest to establish the antiquity of their lineage.

All these various references to northwest South Asia can be perceived as reminders of this glorious past, considering also that the lion motif may have originated from the same region (see pp. 31–32 above), and especially in the form of the lion throne, the *simhāsana* (Auboyer 1949: 34, 44, 108–112). The *simhāsana*, a key object in the *abhiṣeka* ceremony (accession rituals for kings ascending the throne), is an ancient symbol of royalty in Buddhism (Coomaraswamy 1935: 59) and appears to be part of the bodhisattva Avalokiteśvara's iconography, to whom Sri Tri Buana, Parameśvara's substitute, is likened (O.W. Wolters 1970). It is also interesting that the particular aspect of the lion shown in this remaining armband is one of aggression, strength, and virility,<sup>52</sup> evoking power, dominion and protection, and possibly a vital attitude to convey in 13th–14th century Insular Southeast Asia where Parameśvara/Iskandar Shah's contemporaries were like-

51 Specifically, the polyhedral beads with pyramid ends and the squarish plaque with borders of gold granules sitting on a gold wire; see pp. 20–21, 30 above.

52 As opposed to other attitudes such as the lion rampant, for example, which was a feature on some types of *simhāsana* (Auboyer 1949).

wise proclaiming their own divinity (Bade 2016). Furthermore, in view of the relationship Paramēśvara had with Java, it may be possible that the references to northwest South Asia were also a means of differentiating himself and that of his descendants, a reminder of a distinct cultural pedigree than the Javanese and Majapahit hegemony, especially since he had effectively staged a rebellion against the empire before being ejected first from Palembang, and then from Singapore (Brown 1952; O.W. Wolters 1970).

## 5. CONCLUSION

Without doubt, this armband with its *simhamukha* symbolism, along with the other aspects brought to light by the foregoing re-examination in this paper, is complex and much more study clearly needs to be done. Nevertheless, it has been shown that detailed re-evaluation of historical objects with updated technologies and methodologies can help resolve some unknowns.

Thus, the remaining armband has been shown to be a *simhamukha*, not a Kāla head, and especially not of Javanese Majapahit manufacture, bearing instead similarities to elements of jewellery from northwest South Asia.<sup>53</sup> And although the ornaments cannot be definitively dated to the 14th century, there are some indications that the objects belong to the time period conventionally ascribed to it. In particular, the *simhamukha* motif of the armband tends to suggest that the ornaments belong to a period no later than the 16th century, after which time Islam became more widely adopted in insular Southeast Asia. As Winstedt points out, such imagery fell out of fashion and most precious metal ornaments were melted and reforged.

In fact, this may be related to the reason for the interment of this assemblage of precious gold ornaments. Although the exact motivations for this act can no longer be determined without direct evidence, the present writer is of the opinion that above examination hints at such an undertaking, because the diverse articles of jewellery of this collection should be considered as a unit, whether or not they were commissioned as such. Consider the following. This remaining armband with its repairs demonstrates the high value accorded to this pair of ornaments, and this was not for monetary reasons. If economic value were a concern, then the ornaments would have better served their owner melted down or sold. Instead, they were deliberately grouped and buried. The forms of the armbands and the symbolism of the *simhamukha* were not only a testament to Paramēśvara's glorious lineage, but were more significantly associated with Hindu-Buddhist beliefs and practices (O.W. Wolters 1970: 130–135) that are also strongly evoked by the cosmological signs present. These are also alluded to in the other jewels found on Fort Canning Hill; for instance, the remaining two ear ornaments with inset gemstones that have been examined in a separate publication (Ong 2023). The now lost disc-and-conch ornament and 'goose' ring are also tellingly Hindu-Buddhist; of the former, many examples can be seen in museum collections of ancient Javanese gold, and the latter may have made reference to Visnu or another non-Islamic deity. Burying these precious objects could very well have been a signal that the conversion by Temasek's rulers to Islam was permanent, a symbolic interment of a very precious albeit heathen past that was aligned with Islamic

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53 The potential Siamese influence, arising from assertions in the *Sejarah Melayu* of Siamese overlordship 'of these regions below the wind' (Brown 1952: 64ff.), was not discussed because the Kāla head motif was not as popular there as elsewhere in Southeast Asia.

practices condemning cremation. Perhaps a more integrated study of the remaining artefacts of the cache would allow us to determine their original significance and subsequent disposal.

Yet, many more questions remain; for example, when were the objects buried, and why in Singapore, not Malacca, the key location of the *Sejarah Melayu*? Or, from a technical perspective, the origin of the manufacturing technique for the linked bead units? It would bear expanding the field of investigation to West Asia and beyond for precedents with more secure dating and clearer stylistic and technical lineages. As shown throughout this paper, highlighting similarities in forms and styles provides insight into the cultural and historical connections Temasek had with the wider Asian region. These insights, in turn, are useful in identifying further areas of research, particularly for in-depth scientific and metallurgical studies. Metallurgical analysis of gold ornaments in the region is in its infancy, and there is currently not enough of a body of work that enables intra- and inter-regional comparisons. Nonetheless, several themes have been emphasised throughout this paper. The technique of granulation in Southeast Asia is, for example, a subject worthy of its own monograph, which could in turn allow identification of workshop recipes and cultural preferences. The dating of gold objects is another possible avenue for further enquiry. Although this is extremely difficult due to gold's inherent lack of chemical reactivity, it is not impossible, as recent studies have shown (Eugster 2018). This method has so far not been widely attempted, but, if means allow, future metallurgical research on the Singapore artefacts should pursue this line of inquiry in order to contribute to the growing scholarship on metal objects in Southeast Asia. Broader metallurgical analyses of Temasek-era metal products with trace element analysis could also illuminate origins of the tin, copper, bronze, and gold artefacts found on the island. The role of the possibly itinerant jeweller is another approach to understanding the different vectors of transmission of ideas and knowledge in ancient Southeast Asia. These are some of the ways in which historical networks of exchange, both material and cultural, can be actualised, thereby anchoring Temasek's place in the global community.

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## BIBLIOGRAPHY

- van Aelst, Arjan. 1995. 'Majapahit picis: The currency of a "moneyless" society sa1300–1700', *Bijdragen tot de taal-, land- en volkenkunde* 151 (3): 357–393. <https://doi.org/10.1163/22134379-90003037>.
- Agrawala, Vasudeva S. 1965. *Studies in Indian Art*. Varanasi: Vishwavidyalaya Prakasha.
- Auboyer, Jeannine. 1949. *Le trône et son symbolisme dans l'Inde ancienne*. Annales du Musée Guimet, Bibliothèque d'études 55. Paris: Presses Universitaires de France. ark:/12148/bpt6k33518067.
- Bade, David. 2016. '(Spi)ritual Warfare in 13th-Century Asia? International Relations, the Balance of Powers and the Tantric Buddhism of Kṛtanagara and Khubilai Khan', in Andrea Aciri (ed.), *Esoteric Buddhism in Medieval Maritime Asia: Networks of Masters, Texts, Icons*, pp. 141–162. Singapore: ISEAS–Yusof Ishak Institute.
- Barnes, Ruth, Emma Natalya Stein, & Benjamin Diebold, eds. 2015. *Gold in Early Southeast Asia: Selected Papers from the Symposium Gold in Southeast Asia: Yale University Art Gallery, 13–14 May 2011*. Yale Southeast Asia Studies Monograph 64. New Haven, CT: Yale University Southeast Asia Studies.
- Bernet Kempers, A.J. 1959. *Ancient Indonesian Art*. Amsterdam: Van der Peet.
- Borell, Brigitte. 2000. 'Money in 14th Century Singapore', in Wibke Lobo & Stefanie Reimann (eds.), *Southeast Asian Archaeology 1998: Proceedings of the 7th International Conference of the European Association of Southeast Asian Archaeologists, Berlin, 31 August–4 September 1998*, Veröffentlichungen des Museums für Völkerkunde Berlin 70, pp. 1–16. Hull; Berlin: Centre for South-East Asian Studies, University of Hull; Ethnologisches Museum, Staatliche Museen zu Berlin, Stiftung Preußischer Kulturbesitz.
- Brandes, J.L.A. 1901. 'Eene fraaie variatie van het olifantvisch- of makara-ornament', *Notulen van de Algemeene en Directievergaderingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen* XXXIX: cix–cxix.
- Brinkgreve, Francine, Pauline Lunsingh Scheurleer, & David J. Stuart-Fox, eds. 2010. *Kemegahan emas di Museum Nasional Indonesia | Golden splendour in the National Museum of Indonesia*. [Jakarta]: Museum Nasional Indonesia.
- Bronson, Bennet. 1992. 'Patterns in the Early Southeast Asian Metals Trade', in Ian Glover, Pornchai Suchitta & John Villiers (eds.), *Early Metallurgy, Trade and Urban Centres in*

- Thailand and Southeast Asia: 13 Archaeological Essays*, pp. 63–114. Bangkok: White Lotus.
- Brown, C.C. 1952. 'The Malay Annals', *Journal of the Malayan Branch of the Royal Asiatic Society* 25 (2/3 [159]): 5–276. <http://www.jstor.org/stable/41502950>.
- Calo, Ambra, Peter Bellwood, James Lankton, Andreas Reinecke, Rochtri Agung Bawono, & Bagyo Prasetyo. 2020. 'Trans-Asiatic exchange of glass, gold and bronze: analysis of finds from the late prehistoric Pangkung Paruk site, Bali', *Antiquity* 94 (373): 110–126. <https://doi.org/10.15184/aqy.2019.199>.
- Capistrano-Baker, Florina H., ed. 2011. *Philippine Ancestral Gold*. Edited by Ayala Museum. Makati City, Philippines; Singapore: Ayala Foundation; NUS Press.
- Cheng, Linqun, and Xiangyu Zhang. 2009. 'Tomb of Kang Ye of the Northern Zhou in Xi'an, Shaanxi', *Chinese Archaeology* 9 (1): 23–38. <https://doi.org/10.1515/CHAR.2009.9.1.23>.
- Christie, Jan Wisseman. 1996. 'Money and its Uses in the Javanese States of the Ninth to Fifteenth Centuries A.D.', *Journal of the Economic and Social History of the Orient* 39 (3): 243–286. <https://doi.org/10.1163/1568520962601252>.
- Coomaraswamy, A.K. 1935. *Elements of Buddhist Iconography*. Cambridge: Harvard University Press. Reprint, 1998, New Delhi: Munshiram Noharlal Publishers.
- de Coral-Rémusat, G. 1933. 'Concerning Some Indian Influences in Khmer Art as Exemplified in the Borders of Pediments', *Indian Art and Letters* VII (2): 110–121.
- Dhar, Parul Pandya. 2010. *The toraṇa in Indian and Southeast Asian architecture*. New Delhi: D.K. Printworld.
- Diskul, M.C. Subhadradis, ed. 1980. *The Art of Śrīvijaya*. Kuala Lumpur, Paris: Oxford University Press, Unesco.
- Donaldson, Thomas. 1976. 'Development of the Vajra-Mastaka on Orissan Temples', *East and West* 26 (3/4): 419–433. <http://www.jstor.org/stable/29756320>.
- Edwards McKinnon, Edward. 1985. 'Early Politics in Southern Sumatra: Some Preliminary Observations Based on Archaeological Evidence', *Indonesia* (40): 1–36. <https://doi.org/10.2307/3350873>.
- Eugster, Otto. 2018. 'Dating geologic gold deposits and authenticating a Greek gold tiara, an ancient gold chalice, and swimming dragon artifacts of the Chinese Han dynasty', *Gold Bulletin* 51 (4): 139–144. <https://doi.org/10.1007/s13404-018-0238-z>.
- Flecker, Michael. 2002. *The Archaeological Excavation of the 10th Century Intan Shipwreck*. BAR International Series 1047. Oxford: Archaeopress.
- . 2022. 'The Temasek Wreck (Mid-14th Century), Singapore: Preliminary Report', *Temasek Working Paper Series 4*. Singapore: ISEAS–Yusof Ishak Institute; Temasek History Research Centre.
- Flourentzos, Pavlos, & Maria Luisa Vitobello. 2009. 'The Phoenician gold jewellery from Kition, Cyprus', *ArchéoSciences* 33 (Special Issue: Aurum, Archaeometry and authenticity of gold, edited by Maria Filomena Guerra and Thilo Rehren): 143–149. <https://doi.org/10.4000/archeosciences.2135>.
- Fontein, Jan, ed. 1990. *The Sculpture of Indonesia*. Washington, D.C.; New York: National Gallery of Art; Harry N. Abrams.
- Forge, Anthony. 1980. 'Tooth and fang in Bali', *Canberra Anthropology* 3 (1): 1–16. <https://doi.org/10.1080/03149098009508613>.
- Gerini, Girolamo E. 1905. 'The Nagarakretagama list of countries on the Indo-Chinese mainland (circa 1380 A.D.)', *The Journal of the Royal Asiatic Society of Great Britain and Ireland*, July 1905: 485–511. <https://doi.org/10.1017/S0035869x00033517>.
- Gyllenbok, Jan. 2018. *Encyclopaedia of Historical Metrology, Weights, and Measures*. Vol. 1. 3

- vols. Science Networks. Historical Studies 56. Cham, Switzerland: Birkhäuser; Springer International Publishing. <https://books.google.com.sg/books?id=XnRVDwAAQBAJ>.
- H.T.S. 1960. 'Harem girls buried gems on Canning Hill', *The Straits Times*, 28 May, 1960: 7. <http://eresources.nlb.gov.sg/newspapers/Digitised/Page/straitstimes19600528-1.1.7>.
- Hallock, William, & Herbert T. Wade. 1906. *Outlines of the Evolution of Weights and Measures and the Metric System*. New York; London: Macmillan. <https://archive.org/details/outlinesevolutioohallgoog/page/n16/mode/2up>.
- Harrisson, Tom. 1949. 'Gold & Indian Influences in West Borneo', *Journal of the Malayan Branch of the Royal Asiatic Society* 22 (4 [150]): 33–110. <http://www.jstor.org/stable/41560106>.
- Hendley, Thomas Holbein. 1909. *Indian Jewellery*. London. Original publication 1906–1909, extracted from the *Journal of Indian Art and Industry*, nos. 95–107.
- Heng, Derek Thiam Soon. 2006. 'Export Commodity and Regional Currency: The Role of Chinese Copper Coins in the Melaka Straits, Tenth to Fourteenth Centuries', *Journal of Southeast Asian Studies* 37 (2): 179–203. <https://doi.org/10.1017/S0022463406000518>.
- 'Japs Took Ancient Ornaments.' 1948. *The Straits Times*, 6 March, 1948. <http://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19480306-1.2.38>.
- Kinnear, N.B. 1920. 'The Past and Present Distribution of the Lion in South Eastern Asia', *Journal of the Bombay Natural History Society* XXVII (1): 33–39.
- Klokke, Marijke J. 2000. 'Ornamental motifs: The stylistic method applied to ancient Javanese temple art', in Wibke Lobo & Stefanie Reimann (eds.), *Southeast Asian Archaeology 1998: Proceedings of the 7th International Conference of the European Association of Southeast Asian Archaeologists, Berlin, 31 August–4 September 1998*, pp. 85–98. Hull: Centre for Southeast Asian Studies, University of Hull.
- Kramrisch, Stella. 1946. *The Hindu Temple*. 2 vols. Calcutta: University of Calcutta.
- Krishnan, Usha R. Bala, & Meera Sushil Kumar. 2004. *Indian Jewellery: Dance of the Peacock*. Reprint ed. Mumbai: India Book House. Original publication 1999, *Dance of the Peacock: Jewellery Traditions of India*, Mumbai: India Book House.
- Le Roux, Pierre, Bernard Sellato, & Jacques Ivanoff, eds. 2004. *Poids et mesures en Asie du Sud-Est. Systèmes Métrologiques et Sociétés. Vol. 1: L'Asie du Sud-Est austronésienne et ses marches*. Études Thématiques 13. Paris; Marseille: École française d'Extrême-Orient; Institut de Recherche sur le Sud-Est Asiatique.
- Lim, Chen Sian. 2017. 'Preliminary Report on the Archaeological Investigations at the National Gallery Singapore', *Nalanda-Sriwijaya Centre Archaeology Unit Archaeology Report Series 5*. Singapore: Nalanda-Sriwijaya Centre; ISEAS–Yusof Ishak Institute
- . 2019. 'Preliminary Report on the Archaeological Investigations at the Victoria Concert Hall', *Nalanda-Sriwijaya Centre Archaeology Unit Archaeology Report Series 9*. Singapore: Nalanda-Sriwijaya Centre; ISEAS–Yusof Ishak Institute
- Lunsingh Scheurleer, Pauline. 2005. 'The Finds from Muteran and Wonoboyo', in Endang Sri Hardiati & Pieter ter Keurs (eds.), *Indonesia: Discovery of the Past*, pp. 52–67. Amsterdam: KIT Publishers.
- . 2012. *Gold from Java (Goud uit Java)*. Translated by Jany Tucker. Edited by Titus M. Eliëns. The Hague: Gemeentemuseum Den Haag; Zwolle; WBOOKS.
- Malleret, Louis. 1962. *L'archéologie du delta du Mékong. III: La culture du Fou-Nan*. 2 vols. Publications de l'École française d'Extrême-Orient 43. Paris: École française d'Extrême-Orient.
- . 1963. 'II. Pierres gravées et cachets de divers pays du Sud-Est de l'Asie', *Bulletin de l'École française d'Extrême-Orient* 51 (1): 99–116. <https://doi.org/10.3406/befeo.1963.1565>.

- Manguin, Pierre-Yves. 2021. 'Srivijaya: Trade and Connectivity in the Pre-modern Malay World', *Journal of Urban Archaeology* 3: 87–100. <https://doi.org/10.1484/j.Jua.5.123677>.
- Manning, Ann, E. Edwards McKinnon, & F.E. Treloar. 1980. 'Analysis of Gold Artifacts from the Kota Cina Site, near Medan, Sumatra', *Journal of the Malaysian Branch of the Royal Asiatic Society* 53 (2 [238]): 102–116. <https://doi.org/10.2307/41493596>.
- Marchal, H. 1938. 'Les déformations de la tête de Kāla dans le décor bâlainais', *Revue des arts asiatiques* 12 (4): 142–148. <http://www.jstor.org/stable/43474420>.
- Marshall, F.H. 1911. *Catalogue of the Jewellery, Greek, Etruscan, and Roman, in the Departments of Antiquities, British Museum*. London: Trustees of the British Museum.
- Marshall, John. 1951. *Taxila: An illustrated account of archaeological excavations carried out at Taxila under the orders of the Government of India between the years 1913 and 1934*. 3 vols. London: Cambridge University Press.
- Martowikrido, Wahyono. 1994. 'The Gold of Wonoboyo', in W.H. Kal (ed.), *Old Javanese Gold (4th-15th century): An Archaeometrical Approach*, Koninklijk Instituut voor de Tropen Bulletin 334, pp. 30–45. Amsterdam: KIT-Tropenmuseum.
- McCullough, Theresa. 2000. 'Gold Jewellery in Pre-Angkor and Angkor Civilisations of Cambodia', *Arts of Asia* 30 (2): 70–79.
- Miksic, John N. 1985. *Archaeological Research on the 'Forbidden Hill' of Singapore: Excavations at Fort Canning, 1984*. Singapore: National Museum.
- . 2011. *Old Javanese Gold: The Hunter Thompson Collection at the Yale University Art Gallery*. 2nd revised ed. New Haven: Yale University Press. Original publication 1990.
- . 2013. *Singapore and the Silk Road of the Sea, 1300–1800*. Singapore: NUS Press.
- . 2017. 'The Archaeology of Singapore', In Junko Habu, Peter V. Lape & John W. Olsen (eds.), *Handbook of East and Southeast Asian Archaeology*, pp. 119–123. New York: Springer. [https://doi.org/10.1007/978-1-4939-6521-2\\_11](https://doi.org/10.1007/978-1-4939-6521-2_11).
- Miksic, John N., & Geok Yian Goh. 2019. 'The Singapore Cricket Club Excavation Site Report, April 2003', *Southeast Asian Archaeological Site Reports*. <https://doi.org/10.25717/7woe-3n3c>.
- Officer, Lawrence H. 2017. 'Gold Standard', in *The New Palgrave Dictionary of Economics*, 5352–5361. London: Palgrave Macmillan. [https://doi.org/10.1057/978-1-349-95121-5\\_1102-2](https://doi.org/10.1057/978-1-349-95121-5_1102-2).
- Ong, Natalie S.Y. 2023. 'Style and Substance: Investigating the Gold Ornaments of Ancient Temasek', *IIAS The Newsletter* 94 (Spring): 22–23. <https://www.iias.asia/the-newsletter/article/style-and-substance-investigating-gold-ornaments-ancient-temasek>.
- Perret, Daniel, ed. 2014. *History of Padang Lawas, North Sumatra. II: Societies of Padang Lawas (Mid-Ninth – Thirteenth Century CE)*. Vol. 2. 2 vols. Cahier d'Archipel 43. Paris: Association Archipel.
- Pires, Tomé. 1944. *The Suma Oriental of Tomé Pires: An Account of the East, from the Red Sea to Japan, written in Malacca and India in 1512–1515, and The Book of Francisco Rodrigues: Rutter of a Voyage in the Red Sea, Nautical Rules, Almanack and Maps, Written and Drawn in the East before 1515*. 2 vols. Works issued by the Hakluyt Society, 2nd series 89–90, edited by Francisco Rodrigues & Armando Cortesão. London: Hakluyt Society.
- Pryce, Thomas Oliver, Bérénice Bellina-Pryce, & Anna T.N. Bennett. 2006. 'The development of metal technologies in the Upper Thai-Malay Peninsula: Initial interpretation of the archaeometallurgical evidence from Khao Sam Kaeo', *Bulletin de l'École française d'Extrême-Orient* 93: 295–315. <https://doi.org/10.3406/befeo.2006.6040>.
- Quaritch Wales, H.G. 1940. 'Archaeological Researches on Ancient Indian Colonization in Malaya', *Journal of the Malayan Branch of the Royal Asiatic Society* 18 (1 [136]): iii–85.

<http://www.jstor.org/stable/41559946>.

- Rajan, K. 2011. 'Emergence of early historic trade in peninsular India', in Pierre-Yves Manguin, A. Mani & Geoff Wade (eds.), *Early Interactions between South and Southeast Asia: Reflections on Cross-Cultural Exchange*, pp. 177–196. Singapore; New Delhi: Institute of Southeast Asian Studies; Manohar.
- Reinecke, Andreas, Laychour Vin, & Sonetra Seng. 2009. *The First Golden Age of Cambodia: Excavation at Prohear*. Bonn: [German Foreign Office].
- 'Remarkable Discovery.' 1928. *Malaya Tribune*, 19 July, 1928: 10. <http://eresources.nlb.gov.sg/newspapers/Digitised/Article/maltribune19280719-1.2.80>.
- Riederer, Joseph. 1994. 'The goldsmith's techniques', in W.H. Kal (ed.), *Old Javanese Gold (4th-15th century): An Archaeometrical Approach*, Koninklijk Instituut voor de Tropen Bulletin 334, pp. 46–57. Amsterdam: KIT-Tropenmuseum.
- Robson, Stuart. 2012. 'Imagery of the temple in Old Javanese poetry', in Alexandra Haendel (ed.), *Old Myths and New Approaches: Interpreting Ancient Religious Sites in Southeast Asia*, Monash Asia series, pp. 252–266. Clayton, Vic.: Monash University Publishing.
- Rockhill, W.W. 1915. 'Notes on the Relations and Trade of China with the Eastern Archipelago and the Coast of the Indian Ocean during the Fourteenth Century: Part II', *T'oung Pao* 16 (1): 61–159. <http://www.jstor.org/stable/4526442>.
- Salomon, Richard. 1999. *Ancient Buddhist scrolls from Gandhāra: The British Library Kharoṣṭhī fragments*. Seattle, WA: University of Washington Press.
- Schnitzler, Annik, & Luc Hermann. 2019. 'Chronological distribution of the tiger *Panthera tigris* and the Asiatic lion *Panthera leo persica* in their common range in Asia', *Mammal Review* 49 (4): 340–353. <https://doi.org/10.1111/mam.12166>.
- Schulz, Robert. 2019. 'The Stroganov Bowl in the State Hermitage: Zoroastrian Beliefs between Late Roman and Posthellenistic Iconography in Central Asia', in Archil Balakhvantsev & Nikolai Makkaveev (eds.), *The Age of Empires. Eastern Iran from the Achaemenids to the Sasanians: Archaeology, History, Culture. Proceedings of the International Scholarly Conference Dedicated to the Memory of Boris Anatolevich Litvinsky, Moscow, April 16–18, 2018*, pp. 183–194. Moscow.
- Sinclair, Iain. 2021. 'The Inception of Lion City', in Chong Guan Kwa (ed.), *1819 and Before: Singapore's Pasts*, pp. 65–76. Singapore: ISEAS–Yusof Ishak Institute.
- 'Singapore's New Reservoir.' 1929. *Malaya Tribune*, 7 February, 1929: 9. <http://eresources.nlb.gov.sg/newspapers/Digitised/Page/maltribune19290207-1.1.9>.
- Singham, Durai Raja. 1951. 'Prince saw a lion and named Singapore after it'. *Singapore Standard*, 22 September, 1951: 8. <http://eresources.nlb.gov.sg/newspapers/Digitised/Article/singstandard19510922-1.2.139.20>.
- Stutterheim, W.F. 1929. 'The Meaning of the Kala-Makara Ornament'. *Indian Art and Letters* NS 3 (1): 27–52.
- . 1935. 'Oudheidkundige Aanteekeningen', *Bijdragen tot de taal-, land- en volkenkunde* 92 (1): 181–210. <https://doi.org/10.1163/22134379-90001392>.
- Untracht, Oppi. 1997. *Traditional Jewelry of India*. London; New York: Thames and Hudson; Harry N. Abrams.
- Vajracharya, Gautama V. 2014. 'Kirtimukha, the Serpentine Motif, and Garuda: The Story of a Lion that Turned into a Big Bird', *Artibus Asiae* 74 (2): 311–336. <http://www.jstor.org/stable/24913485>.
- Vogel, J.Ph. 1924. 'De makara in de voor-Indische beeldhouwkunst', *Nederlandsch-Indië Oud en Nieuw* 8 (9): 263–276.

- Vogler, E.B. 1949. *De monsterkop uit het omljstingsornament van tempeldoorgangen en -nissen in de Hindoe-Javaanse bouwkunst*. Leiden: Brill.
- West, Peyton M., and Craig Packer. 2002. 'Sexual Selection, Temperature, and the Lion's Mane', *Science* 297 (5585): 1339-1343. <https://doi.org/10.1126/science.1073257>.
- Wheatley, Paul. 1961. *The Golden Khersonese: Studies in the historical geography of the Malay Peninsula before A.D. 1500*. Kuala Lumpur: University of Malaya Press.
- Wicks, Robert S. 1992. *Money, Markets, and Trade in Early Southeast Asia: The Development of Indigenous Monetary Systems to AD 1400*. Studies on Southeast Asia 11. Ithaca, NY: Southeast Asia Program, Cornell University. <http://books.google.com.sg/books?id=Qs1q9VEoEkoC>.
- Winstedt, R.O. 1928. 'Gold Ornaments Dug Up At Fort Canning, Singapore', *Journal of the Malayan Branch of the Royal Asiatic Society* 6 (4 [105]): 1-4. <http://www.jstor.org/stable/41559712>.
- . 1965. *An Unabridged Malay-English Dictionary*. 6th enl. ed. Kuala Lumpur: Marican.
- . 1969. 'Tumasik or Old Singapore', *Journal of the Malaysian Branch of the Royal Asiatic Society* 42 (1 [215]): 5-9. <http://www.jstor.org/stable/41491958>.
- Wolters, Jochem. 1981. 'The ancient craft of granulation: A re-assessment of established concepts', *Gold Bulletin* 14 (3): 119-129. <https://doi.org/10.1007/BF03216741>.
- Wolters, O.W. 1970. *The fall of Śrīvijaya in Malay history*. Ithaca, NY: Cornell University Press.
- Zaini, Shah Alam. 1997. 'Metal Finds and Metal-working at the Parliament House Complex, Singapore'. Master of Arts dissertation, Asian Studies, University of Michigan. <https://hdl.handle.net/2027.42/149090>.
- Zimmer, Heinrich. 1946. *Myths and Symbols in Indian Art and Civilization*. Bollingen Series VI. New York: Pantheon Books.
- Zoetmulder, P.J., and Stuart O. Robson. 1982. *Old Javanese-English Dictionary*. 2 vols. 's-Gravenhage: M. Nijhoff.
- Zupko, Ronald Edward. 1977. *British Weights & Measures: A History from Antiquity to the Seventeenth Century*. University of Wisconsin Press.