

## Discovery and Research of Various Types of Beads in Bujang Valley, Kedah

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**Abstract:** Research in Bujang Valley which began since the 1840s by Colonel James Low has led us to the remains of human civilisation from the Proto-historic period in the form of temples (candi), building materials, religious sculptures, inscriptions and other artefacts such as pottery, trade ceramics, glass, metals and also various types of beads. The 160 years of research in Bujang Valley have shown that Bujang Valley developed as an entrepot since the early centuries AD and in the 5th century AD, the Malay Kingdom of Bujang Valley was founded and based in Sungai Mas. Apart from functioning as an entrepot and the centre of the earliest Malay Kingdom, Bujang Valley also successfully became one of the Indo-Pacific bead production centres in the Archipelago. This is proven by the discovery of raw materials to produce glass beads at the archaeological sites and the scientific analysis that was conducted on the beads and the beads' raw materials. The scientific analysis involved studies on the chemical composition of the beads and the beads' raw materials found in Kampung Sungai Mas, Kota Kuala Muda, Kedah. Composition analysis of the Sungai Mas beads showed that they are different in terms of their chemical composition if compared to the beads from Arikamedu in India, Khlong Thom in Thailand and Palembang in Indonesia. Research and discoveries of beads in Bujang Valley have been reported by Quaritch-Wales on the discovery of glass beads in Merbok in the 1940s and by Alastair Lamb in Pengkalan Bujang in the 1960s. Alastair Lamb was the first researcher who took the initiative to conduct chemical analysis on the beads found in Bujang Valley. The research carried out by Lamb led him to associate the beads in Peninsular Malaysia to those of other areas in Southeast Asia such as in Sumatra, Java, Thailand, Laos, Vietnam, Sarawak and the Philippines. Most of the beads found in Bujang Valley can be classified as monochrome glass beads or Indo-Pacific glass beads and the area where many of this type of bead were found is in Sungai Mas. Other beads found were polychrome glass beads, semi-precious stone beads, metal beads as well as terracotta beads, wooden beads and bone beads. These beads originated from India, the Middle East and Southeast Asia as well as beads made by the local communities.

**Key words:** Beads, monochrome, polychrome, Bujang Valley, Arikamedu, Southeast Asia

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### INTRODUCTION

Bujang Valley is already well-known for the remains of its monuments in the form of temples (candi), religious sculptures, building materials and discoveries of archaeological artefacts such as foreign ceramics, pottery, Middle East glass and beads. Bujang Valley is known based on the role it played as an entrepot that began since the early centuries AD and the establishment of the civilisation of the earliest Malay Kingdom which was based in Sungai Mas in the 5th century AD and the centre of Hindu-Buddha religious teachings (Abdul Rahman and Yatim, 1990). The other role played by Bujang Valley was as a centre of production of Indo-Pacific beads in the Archipelago apart from those in Khlong Thom, Palembang, Kuala Selinsing and Oc-Eo. The production began a bit late in the 6th century AD until the 11 or 12th century AD, namely during the glory days of the Srivijaya Malay civilization. Sungai Mas was known to the world as

one of the Indo-Pacific bead production areas (Francis Jr., 2002; Zuliskandar and Abdul Rahman, 2009). The beads found in Bujang Valley were not only Indo-Pacific beads but also beads of other types such as polychrome beads, metal beads, semi-precious stone beads, terracotta beads, wooden beads as well as bones beads. The most abundant discovery was of Indo-Pacific beads, followed by semi-precious stone beads and they were found in various shapes and colour. The involvement of the local people in the bead industry can not be denied even though the raw materials used to produce these beads were obtained from outside. Most of the beads were found as a result of archaeological excavation work and also accidental discoveries of the local people. The area where the beads were abundantly found is in Kampung Sungai Mas, Kota Kuala Muda, Kedah (site 32) and most of the beads are of the monochrome glass bead type. The discovery of the Sungai Mas Inscription and thousands of artefacts due to the construction of the irrigation

project in 1979 has attracted many parties whereas before this many were of the opinion that the centre of government for the Bujang Valley civilisation was located in the areas around Pengkalan Bujang and Sungai Merbok. Afterwards, research and excavation in the Sungai Mas area showed that Sungai Mas was the location where the civilisation of Bujang Valley had started (Abdul Rahman and Zakaria, 1993).

The bead making industry is the oldest handicraft industry in the world. The early beads were made from seeds of fruits, cockle or snail shells, teeth and the nails and bones of animals. Several centuries later, clay, stone, resin, wax, glass and metal were used to produce beads in line with the development of human knowledge and technology. The earliest beads in terms of the age of the beads were found in the Neolithic site, namely the Niah Cave, Sarawak and they are about 2500-1000 BC. The beads are terracotta beads which were found together with cockle shells and animal teeth that had holes drilled on them. Glass beads and semi-precious stone beads started to be traded in the Archipelago since the late pre-historic age, namely during the metal age at about 600 BC. It is believed that beads at that time were trade goods used in the barter system to be traded with forest products such as aloes wood, sandal wood, ivory, gold and tin. Beads were also given as gifts or rewards when a transaction is successful. Beads were not only used as items for self-adornment but also functioned as currency, symbol of status, symbol of magic, gifts, decoration in wedding ceremonies and were also used in religious ceremonies.

Bead findings in Peninsular Malaysia have been recorded at Angin Cave, Kota Gelanggi, Jerantut, Pahang (Ramli *et al.*, 2001) where glass beads of various colours were found. The stone beads and glass beads found in the stone slabs of a cemetery site in Bernam Valley are estimated to be 2500 years old (Colling, 1937). Beads were also found at the site associated with bronze period or Dongson cultural period (600 BC to 400 AD) such as in Kampung Pencu, Muar, Pantai Batu Buruk, Terengganu, Kampung Sungai Lang, Selangor, Kampung Seberang Limbongan, Jertih and Kampung Gaung, Besut, Terengganu. Glass beads and semi-precious stone beads were also discovered in Johor Lama and Kota Tinggi, Johor (Gardner, 1973). Beads in large quantities were also found in Kuala Selinsing, Perak where this site was also the Indo-Pacific bead production centre in the Archipelago. This site was occupied by the maritime society and the dating of the site showed it to be from 200 BC to 1400 AD. Research on the cultural layers in Kuala Selinsing showed that Kuala Selinsing had already started to produce Indo-Pacific beads even before the 6th century AD (Zuliskandar and Abdul Rahman, 2010).

In his view, Francis Jr. (2002) is of the opinion that Kuala Selinsing and Satin Pra in Thailand were two Indo-Pacific bead production centres of the same period but based on stratigraphy as a result of archaeological excavation in Kuala Selinsing, it showed that Kuala Selinsing was already producing monochrome glass beads since the 2nd century AD, namely of the same period with Klong Thom in Thailand.

#### **TYPES OF BEADS IN BUJANG VALLEY, KEDAH**

Beads found in Bujang Valley consist of monochrome glass beads or more known with the name Indo-Pacific beads, polychrome glass beads, semi-precious stone beads, metal beads, terracotta beads, wooden beads and beads from fish bone. Most of the beads found in Bujang Valley are beads that are known as Indo-Pacific beads. Polychrome glass beads and semi-precious stone beads were also found but in very small quantities. Terracotta beads, wooden beads and bone beads are the beads that are rarely found. The beads produced by the local people were the Indo-Pacific beads and this statement is based on the findings of raw materials to produce beads and scientific research conducted on the glass beads of Sungai Mas (Ramli *et al.*, 2011). There is also the possibility that the polychrome beads and semi-precious stone beads were produced by the local people, however, most of these beads were obtained from India and the Middle East.

Most of the beads found in Bujang Valley are monochrome glass beads or also known with the name Indo-Pacific beads. Polychrome glass beads were also found in Bujang Valley but in smaller quantities in comparison to the monochrome glass beads. In addition to the glass beads, there are also beads made from semi-precious stones for example from agate stone, carnelian, rock crystal or quartz and onyx stone.

Most of the stone beads found in Bujang Valley are from the carnelian type, followed by agate stone and rock crystal or quartz. Most of the archaeological sites were found with carnelian and agate stone beads. These beads were brought in from India by the Indian traders and there were also stone beads, particularly agate stones and amethyst which came from the Middle East and the Mediterranean. Carnelian stone beads are known to be produced a lot in India, namely in Ratanpur near Cambay (Khambat), a stone bead export area that is thousands of years old.

Polychrome glass beads were found in various colours and shapes. Also found were polychrome glass beads known as 'eye bead' and these were produced in the Middle East area or the Roman-Hellenistic-Byzantine

area. Apart from the polychrome beads produced in the Middle East, there were also polychrome beads produced in India. It is quite difficult to find polychromes in Bujang Valley because it was a trade commodity that was quite expensive.

The most widely found beads are the monochrome glass beads. Almost, 90% of the bead findings in any archaeological site in Bujang Valley are monochrome glass beads. Monochrome glass beads were abundantly found in Bujang Valley because Sungai Mas was one of the monochrome bead production areas in addition to those in Oc-Eo, Sating Pra, Klong Thom, Takua-pa, Kuala Selinsing and also Palembang. The earliest and biggest monochrome glass bead production centre was in Arikamedu, Southern India near the present Pondicherry. After the year 200 AD, many monochrome glass bead production centres were opened following the fall of Arikamedu City. A brief description of each type of bead found in Bujang Valley will be detailed in the text to provide a clearer picture.

**Monochrome glass beads (Indo-Pacific):** Glass was first produced in the Middle East about 4500 years ago. However, it took quite a long time for the glass production technology development to expand to the outside world but in the year 1000 BC, this technology had already been established in Europe, India and China.

Indo-Pacific beads are beads made from glass. Indo-Pacific beads can be categorized as monochrome and tiny beads, produced through the monochrome drawn technique and this technique grew in southern India before the Christian era (BC) and is still used to this day. These beads can still be found in most of the countries located in the Indian Ocean and the Pacific Ocean. It is produced by pulling soft glass using steel wire. This glass is rolled along the metal wire and then cut into small sections. When the glass is cold and hard, it is removed from the iron wire and becomes beads. The resulting beads are subsequently polished mechanically or through reheating (Francis Jr., 1991).

Glass beads are made of silica (usually sand, silicon dioxide). This silica will be heated above its melting point and then cooled before its crystal form takes shape again. Furnace in the old days could not reach temperatures of 1450°C which is the melting temperature of the sand. The furnace usually only reached the maximum temperature of 1100°C. To lower the melting temperature of the sand, flux (usually Na or K) and stabilizing materials (usually soda) were added intentionally or unintentionally by the people at that time.

Modern and ancient glass has been blended with different types of elements which are mostly derived from the earth. Glass manufacturing is interpreted by some researchers as an art rather than a science. However, some

elements in glass are important in order to distinguish and detect where the basic resources were obtained from. Glass content can be divided into six categories.

**Material for glass formation:** All glass is silica based. Silica content in glass is usually not <55% and the maximum content sometimes goes up to 75%. The difference in silica content is dependent on the content of the other elements. Material for glass formation other than silica is sometimes lead which makes up 90% of the total element content. Indo-Pacific glass bead is not made from high lead glass. The high lead glass bead usually originated from China.

**Alkaline material:** Silica melts at very high temperatures, very high that there is no ancient burning furnace capable of reaching temperatures to melt silica. Flux is therefore, necessary to reduce the melting level of silica and needs to be added in the mixture to make glass. Lead can serve as a flux but usually sodium and potassium are more frequently used as flux. Often this alkaline substance is obtained in the sediments in the soil, evaporated sea-water, saltwater lakes and the ashes of plants. Plant ash often contains both the alkaline materials above. Alkaline content in glass is important in determining the basic resources of the glass and its distribution.

**Other main content:** Calcium, aluminium, iron, manganese and magnesium are often present between 1.0-10.0% and sometimes exceeding 10% in ancient glass. Calcium is often required to stabilize glass burning even though ancient glassmakers did not realize this (Turner, 1956). Manganese and iron are added as colouring material. Both aluminium and magnesium content are usually present with sand, alkaline material, colouring material and pottery clay.

**Colouring material:** Elements that are often used as colouring material are iron and copper where both of these elements can have an impact on the colour spectrum. Manganese, lead and cobalt have also been used as a colouring material since a long time ago.

**Opacifiers:** Arsenic, antimony and silver have been used as materials to make glass opaque other than salt, bone and fluoride. These materials are often found in the trace element content. These materials are added to the glass if its concentration is around 1%.

**Trace elements:** Trace elements are also present in glass in very small quantities.

**Indo-pacific beads-making centres:** Indo-pacific beads were produced in several different areas around Asia

since a long time ago. Ancient bead makers did not need to make glass prior to producing the beads because broken glass can be re-used. Hence, a question arises on the origin of the glass used to produce the beads. Some say that the glass was imported from western countries.

Studies have been conducted by Francis where the Indo-Pacific beads were matched with glass from the West and the results show that the element content of the Indo-Pacific beads are not the same as the glass from the west (Francis Jr., 1988-1989). Although, the Indo-Pacific beads (analysis carried out in India and Southeast Asia) show variations in their chemical composition, the glass used basically have the same quality. The glass used can be classified in the category of Middle Eastern glass or Hellenistic-Roman-Byzantine glass which is glass with low lead content and no barium content (Lamb, 1965a). Chinese Glass on the other hand has high lead content.

However, the place where the glass was produced in areas where the Indo-Pacific beads were made remains unanswered. Several scientific studies have been conducted on the glass beads, namely in areas such as Arikamedu, Karaikadu, Oc-Eo, Kuala Selinsing, Sungai Mas, Khlong Thom and Takua Pa. Studies have shown that there is a difference in terms of the element composition for each bead in these areas.

The Indo-Pacific bead making industry began in Arikamedu (250 BC to 250 AD) in India. The city was a famous port city and was prosperous for about five centuries and is identified as Ptolemy's Poduca Emporium. The city was abandoned in the 3rd century because it was attacked and destroyed by the Kalabras of which the Tamil Sangam literature considers it as the attack of the 'barbarians'. Before, the city was abandoned, the producers of the Indo-Pacific beads had moved and opened new production places in the 2nd century which were located at:

- Mantai, Sri Lanka (1st/2nd century to the 10th century AD) the port became the centre of trade and exchange of goods among ships from the west and also the east. Identified based on Modutti Emporium
- Khlong Thom, southern Thailand (2nd to 6th century BC) became bead producers for the Southeast Asian market. Identified based on Ptolemy's Takkola Emporium
- Oc-Eo or Go Oc Eo, Vietnam, Funan territory port (2nd to 7th century AD) an important port of call between Malaya and China Identified based on Ptolemy's Kattigara Emporium. Traded beads in the East Asian market

In Southern Thailand, Sating Pra (7th to 10th century AD) became the Indo-Pacific bead producer. It had

relationship with the Oc-Eo government and similar to the Oc-Eo government, Sating Pra built canals in the city to facilitate water transport and these canals were linked to the South China Sea and the Andaman Sea.

Kuala Selinsing, Perak is also believed to be one of the centres of Indo-Pacific bead producers. The beads here were sent to Bujang Valley which had a thriving port. Preliminary observations on the composition of the Kuala Selinsing beads and the Sungai Mas beads showed differences in terms of chemical composition. Nevertheless, this statement has yet to be proven scientifically. Braddell emphasizes the close relationship between Kuala Selinsing and Trang (Klong Thom). There is the possibility that the bead-makers from Oc-Eo settled in Sating Pra while those from Khlong Thom moved and settled in Kuala Selinsing. Researcher does not agree with Braddell's opinion because from the scrutiny of the cultural layer and absolute dating conducted on the site of Kuala Selinsing, it showed that Kuala Selinsing had already become the producer of Indo-Pacific beads even before the 6th century. It can be suggested that Kuala Selinsing and Khlong Thom, Thailand had become Indo-Pacific bead producers at the same period of time, between the 2nd and the 6th century AD.

Takua Pa, in Southern Thailand (9th to 10th century) had become one of the Indo-Pacific bead producers and the bead workers and producers here probably came from Sating Pra (Francis Jr., 2002). Trade ceramic findings in Takua Pa are similar to the trade ceramic findings in Sungai Mas. Researcher is of the opinion that the Takua Pa and Sungai Mas entrepot developed at the same time. Takua Pa and Sungai Mas also respectively became the centre of Indo-Pacific bead production in the Archipelago at the same time.

Sungai Mas, Kedah was also a bead production centre in Southeast Asia. The role played by Sungai Mas as an entrepot started since the early centuries AD. In the 5th century AD, a Malay Kingdom was established that was based in Sungai Mas. This is evidenced by the discovery of the votive tablet with the image of Buddha from the Gupta period and the inscriptions such as the Sungai Mas Inscription and Cherok Tokun Inscription which indicated that it was produced in the 5th century AD. Francis Jr. (2002) argues that there is the possibility that the Sungai Mas bead producers came from Kuala Selinsing. Sungai Mas developed as the centre of bead production after Kuala Selinsing was abandoned or possibly earlier than Takua Pa. Sungai Mas might have become the Indo-Pacific bead production centre in the 8th-11th century AD, namely during the glory days of Srivijaya and its Buddha Mahayana religion (Fig. 1).

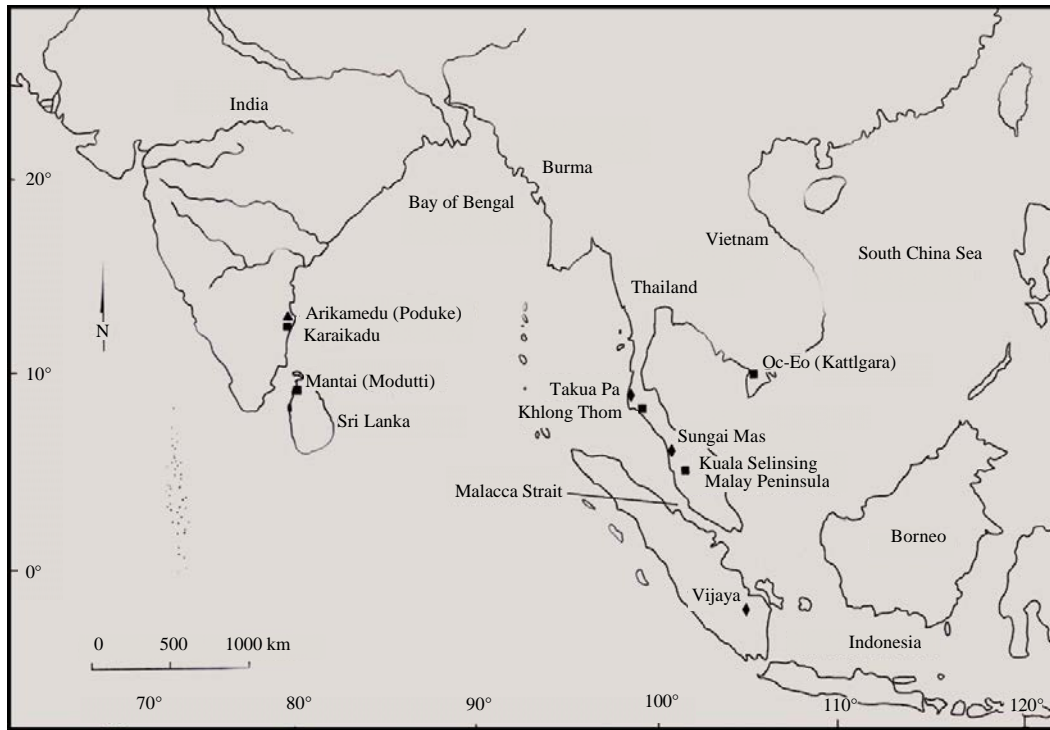


Fig. 1: Indo-Pacific beads making centre in Southeast Asia

**Polychrome glass beads:** This type of bead is often found in Bujang Valley but in lesser quantities in comparison to the monochrome glass beads. Most of this type of bead were obtained from outside, especially from India and the Middle East. Among those that were abundantly found are the polychrome beads that are black in colour and have white stripes. These beads which are known as 'eye bead', produced in the Middle East or the Hellenistic-Roman-Byzantine areas since the 3rd century AD were also found in Sungai Mas and also in Takuapa and Kuala Selinsing. There is no conclusive evidence to show that the local people could produce this type of polychrome beads because of its small quantities even though some scholars think that this type of bead was also produced in Southeast Asia such as in Thailand, Indonesia and the Bujang Valley and among these are the Takuapa eye bead or also known as tortoise bead. Among the polychrome beads found in Bujang Valley are as follows (Fig. 2 and 3):

**Takua Pa eye bead:** Dotted or circular patterned beads that resemble the shape of the eye were often used as the material for making amulets. It is named Takua Pa because it was found there by Lamb (1961a). It is blue or blackish green glass with white dots that have blue speckles in the middle. They were found in Takua Pa, Mantai, Morong Rizal (Philippines), Sungai Mas and Laem Pho.

**Oval eye spot bead:** It is made from amber coloured glass. This type of bead is oval-shaped and has a layer of white and amber has patterns in the shape of a blue eye that usually circles the centre of the bead. They were found in Sungai Jaong and Sungai Mas.

**False chevron beads (V-shaped false beads):** The original beads originated from Europe but this imitation is almost similar to the real ones. They were found in Batan Island District, Sarawak, Malaysia, Bali and Taiwan. It is a heritage passed down for generations and possibly had existed after the Europeans brought the original chevron beads, produced in the 16th century from China.

**Bird beads:** These beads are made from blue and black glass. It has bird decoration on one side and sun sparks on the other. It is known to have originated from Oc-Eo, Klong Thom, Dvaravati and Indonesia. It has a lot of similarities with carnelian etched beads from Kosam (Kosaumbi) India.

**Semi-precious stone beads:** These beads were made of quartz minerals such as rock crystal (quartz), carnelian, onyx, agate, amethyst, jasper, calcedony and green stones. Most of the findings of stone beads in the Archipelago are carnelian stone beads, followed by rock



Fig. 2: Several type of polychrome glass beads found in Takuapa which similar with Sungai Mas polychrome glass beads



Fig. 3: Among the beads found in Bujang Valley, Kedah

crystals and agate beads. The rock crystals are quartz stone that is clear and colourless. These beads have a variety of sizes and shapes and the longest carnelian bead found is 5 cm long. The majority of these semi-precious stone beads came from India and was produced at Ratanpur near Cambay (Khambat), an export area of stone beads thousands of years old. In identifying the agate beads, we need to be careful because the beads look like agates but they are not actually agates; they are beads made of glass that resemble agate. These beads were found in Kota Tinggi and also Kuala Selinsing.

Stone beads exported to Southeast Asia from India were initially oblate and barrel shaped. After the 11th century AD, faceted shape became popular and in the 12th century AD, the bicon shape became the most popular shape. The process of making stone beads was founded in Central Asia about 2500 BC and at that time, the carnelian beads were carved on its surface by using materials such as soda and liquid from plants. Carnelian stone beads have been found in the Royal tombs of Ur in Mesopotamia. In India, carnelian stone beads were produced on a large scale since 1500 BC.

Semi-precious stone beads have been abundantly found in archaeological sites, especially in Kuala Selinsing, Perak and in Bujang Valley, Kedah. Among the

beads found in large quantities are the carnelian beads, rock crystal beads, onyx and agate beads. Stone beads were brought to Southeast Asia by merchants from India to be traded in areas around the Archipelago. These beads were not only beads produced in India but also beads produced in the Mediterranean area and also the Middle Eastern area.

**Metal beads, wooden beads, bone beads and terracotta beads:**

These types of beads are rarely found in Bujang Valley. Wooden beads, bone beads (fish bones) and terracotta beads were often found in Sungai Mas. These types of beads if seen from the cultural layer were found in the early age layer, namely the 5th-8th century AD. Metal beads are also very rarely found and among the metal used is gold. Although, Bujang Valley traded gold, no bead producers made beads from gold. If there was then, indirectly, a lot of gold beads would be found at the archaeological sites in Bujang Valley but if you refer to Fig. 3 there are beads made from gold found in Bujang Valley.

**SCIENTIFIC RESEARCH OF BEADS**

Studies on beads scientifically have already been carried out by Lamb (1960, 1964, 1965a, b, 1966) and Harrison (1964) in the 1960s. Writings about the beads in Asia have begun to be carried out by Beck (1930) which touched on glass beads in Asia. His efforts have been fundamental in the study of beads, especially in Southeast Asia and Malaysia, in particular. Beads found in Malaysia have ties with beads elsewhere in Southeast Asia such as South Sumatra, Java, Thailand, Vietnam, Laos and the Philippines and outside of Southeast Asia such as Taiwan, India, Africa and the Mediterranean.

Previous bead researchers faced problems in determining the appropriate methods to be used in the study on beads. For example, in determining the exact

colour, one would have difficulty even when one is assisted by colour charts. However, Lamb has provided an outline of the features that can be used to make bead classification, namely based on the material, colour, decoration, shape, production methods and finally the function, usage and symbolic value (Lamb, 1965b). The last feature is often left out by researchers because it is difficult to determine accurately the meaning and the implied meaning behind the production of these beads. Studies conducted on the attitudes of the primitive society toward beads found that they were not only used for decorative purposes but have deeper meaning. Some beads were seen as more valuable than the others and some beads were thought to have supernatural powers.

The beads most abundantly found are the stone beads and beads made of glass. Stone beads comprised of agate, carnelian, rock crystal and amethyst. The materials to make these beads were found in large quantities in India and Sri Lanka. Thus, India played an important role in stone bead trade and indeed this bead-making industry had existed even before the AD era, namely about 1500 BC where the production of the carnelian beads were carried out on a large scale. The centre of this industry was in Cambay, North of Bombay. Agate and carnelian from Cambay were exported to Africa and Southeast Asia.

Apart from Cambay, another centre of bead making was in Arikamedu which is located south of Pondicherry. The centre might have existed in the early AD or even earlier. The beads here are of the same type as those beads found in Cambay. Generally, Arikamedu beads are similar to those found in Southeast Asia but there are researchers who believe that the beads in Kuala Selinsing do not necessarily originate from South India but were produced in Kuala Selinsing. This is based on the fact that the craftsmen who made these beads migrated to Kuala Selinsing because their expertise was recognized and respected by the local people (Lamb, 1965b).

The existence of beads in this country can show that there was an international relationship between the areas in this side of the world with the outside world as the materials for bead-making was not available in Malaysia. While there may be involvement of the local people in the process of making beads, the raw materials still had to be imported from outside. This involved trade between Malaya and India and Sri Lanka. As a hypothesis, agate and carnelian chronology can be associated with the onset of India's intensive relationship with Southeast Asia as early as the 3rd century BC or at the beginning of early AD.

Quaritch (1940) has reported on the discovery of glass beads on the island near Takua Pa, Thailand and

several sites in Merbok, Kedah. Evans, on the other hand, also found glass beads in Kuala Selinsing, Perak (Evans, 1928, 1932) and Collings (1937) in the Iron Age cemetery area in Slim River, Perak. In Johor Lama and Kota Tinggi, Gardner (1973) in the mid-1930s has been collecting various types of beads and sending them to Horace Beck to be researched and for his views. The discovery of thousands of stone and glass type beads in Kampung Sungai Mas, Kedah has been reported in other studies produced by Nik Hassan Shuhaimi Nik Abdul Rahman and Mohd Othman Yatim in 1990 and a follow-up study that was conducted by Nik Hassan Shuhaimi Nik Abdul Rahman and Kamaruddin Zakaria in 1993. The excavation conducted at Angin Cave, Kota Gelanggi, Jerantut, Pahang has also found beads of the glass type that have a variety of colours (Ramli *et al.*, 2001).

According to research conducted by Lamb (1966) most of the glass beads found in archaeological sites in Malaya can be associated with other areas of Southeast Asia such as Sumatra, Java, Thailand, Laos, Vietnam, Sarawak and the Philippines. However, until the end of the Second World War, there were no writings that discussed the origin or chronology of these beads.

There are many different types and shapes of beads spread throughout Southeast Asia that have attracted the interests of scholars to carry out research on them but none have been able to determine their origins. For example, Lamb questioned the opinion of Beck (1930) which states that opaque red beads were produced in South India and indeed these beads were sometimes mistaken as made of clay, carnelian or corals. In Indonesia, these beads are known as mutisalah beads. Rouffaer and Beck are of the opinion that these beads originated from South India (Lamb, 1961b). These beads have been found in Megalithic sites in South India. They have also been found in some other places like the Philippines (Luzon, Mindoro and Palawan), Timur-Timur, Sulawesi, Java, Borneo, Sumatra, Thailand, Malaya, Cambodia, Vietnam, Laos and Burma. Most scholars now think that these mutisalah beads were first produced in Arikamedu, Southern India and were subsequently produced by the local people of Southeast Asia after the year 1100 AD.

In South India, mutisalah beads have been found at megalithic sites in Madras, Mysore and Kerala. In the Arikamedu Trade Centre, in the past, these beads were produced in enormous quantities. However, these beads were also produced in Southeast Asia in the pre-European times. Lamb reported that the raw materials to make these beads have been found in Pengkalan Bujang and he even thought that all mutisalah beads do not have to

necessarily originate from Arikamedu even though they had probably originated from India (Lamb, 1961a). In terms of chronology, these beads began from the megalithic era of Kerala, Mysore and Madras until the mid Chola period. Thus, it is not surprising that this type of bead was also found in Kampung Sungai Lang by B.A.V Peacock (Barbara and Peacock, 1964).

Based on the results of the research and surveys conducted by Lamb around Site 18, Pengkalan Bujang in 1961, he expressed the opinion that the glass beads totalling 5000 beads (that were found alongside other artefacts such as ceramic and glass fragments) are the remains of an important entrepot trade. The existence of these beads and glass showed that the glass from the Middle East played an important role in trade in Southeast Asia (Lamb, 1961a). This is evidenced by the discovery of beads and glass in Kuala Selinsing and Takuapa which have almost similar physical characteristics and chemical content to the glass in Pengkalan Bujang.

The discovery of the West Asian glass in Pengkalan Bujang and other areas in Southeast Asia clearly shows that the waste from the glass production factory was very important because the glass was used as the raw material in bead-making (Lamb, 1964).

Chemical analysis was carried out by Lamb (1961b) on several beads found on the island of Ko Kho, Takuapa and Single Base. Two beads from Pengkalan Bujang which were dark red and orange red in colour, shared similarity with the beads found in Takuapa that have high percentages of copper and iron compared to the others. The high copper content in the pinkish glass beads is similar to the beads from South India, Africa and Kuala Selinsing.

Tom Harrison who made the report about the discovery of Sarawak beads found that these beads are still worn by the Kelabit, Kayan and Kenyang. He has submitted a chemical analysis on the beads found in Kuala Selinsing, Santubong and Kelabit (Harrison, 1964). Chemical studies have been carried out on the moderately small monochrome beads that are simple-shaped and made of natural glass.

Harrison has divided them into three series, namely Series A that is comprised of seven small monochrome glass beads. These beads were collected by J. McHugh in 1963 in Kuala Selinsing. Series B consists of 10 small monochrome beads as a result of excavation in Bukit Maras, Santubong, Sarawak. Other findings in this site are the ceramic of the late Tang and early Song as well as a Buddha Gupta sculpture which shows Indian influence. This site might have been occupied between the years 750-1000 AD while series C is the larger monochrome beads worn by the Kelabit people as a necklace.

Based on the results of the chemical analysis conducted by Harrison, he is of the opinion that there are similarities between Kuala Selinsing beads and the Santubong beads even though their distance is very far in contrast, the two series are different from the necklace of the Kelabit people.

Things that are considered important in Harrison's study is to examine the content of lead and barium in the beads as it can help in determining the origin of some of the beads. Prof. Earle R. Caley from Ohio State University who carries out analysis on beads is of the opinion that the beads of China after the Han period do not contain barium even though they are from the lead glass types. Results from previous research showed that some beads which were found in several places in Malaysia and Thailand were found to contain the percentages of lead as follows: Kuala Selinsing 0.74%, Pengkalan Bujang and Ko Kho Island Thailand 0.76%, Bukit Maras, Santubong 0.26% and Kelabit 14.8% while there was no barium content or it was not analyzed. This suggests that these beads came from Mainland China and Indo-China especially during the Tang period (618-960 AD).

Based on his studies of beads in these three places, Harrison hypothesized that there are two main places for these bead sources. The first is in the North, namely China of which he cannot determine accurately as yet the actual date which may be the Tang or Song period or even later. This date is for the beads of Series C (Kelabit). The second originated from the west, namely West Asia which began several centuries earlier. It covers the beads of Series A and B (Harrison, 1964).

As a result of the comparison carried out by Lamb on the beads found in Takuapa, Pengkalan Bujang and Kuala Selinsing, he found that based on the characteristics of the composition, the beads were produced by the factory in West Asia (Lamb, 1961b). Mutisalah beads that were analysed included the 12 bead samples from South India and Southeast Asia, for example those from Kampung Sungai Lang, Pasemah (Sumatra), Arikamedu, Oc-Eo, Kaver-ipattima (South India), Kuala Selinsing and Pengkalan Bujang. The result was that there were 16 types of chemicals found in these beads that showed they have similarity with one another.

Analysis on Sungai Mas monochrome glass beads also showed that the beads are locally made by beads maker that settled in Sungai Mas which probably local people (Ramli *et al.*, 2011). Compositional analysis that has been done on glass beads from Sungai Mas, Kedah showed that Sungai Mas, Kedah produced their own glass to make Indo-Pacific beads. Indo-Pacific beads found in Sungai Mas are locally made and did not originate from Arikamedu, India. Sungai Mas beads



contain higher amount of aluminium comparing with Western glasses that has amount of aluminium below than 5%. Sungai Mas glass beads also contain higher amount of silica and used sodium as a flux. The results indicate that beads and three samples suspect as raw material have relatively high amount of silica that is >60%. Content of sodium is also high that is in the range of 14.08-18.53% whilst potassium in range of 1.54-2.12%. This signified that the Indo-Pacific beads are drawn beads and soda glass type. This data is in agreement to the previous report by Hancock *et al.* (1994) that most drawn beads are soda glass rather than potash glass type. The content of lead also confirms that Sungai Mas beads are Indo-Pacific beads not lead glass beads originated from China. The aluminium content in Sungai Mas beads is also relatively high that is in the range of 7.79-13.52%. No Arikamedu glass approaches these high levels of aluminium and it showed that Sungai Mas made their own glass beads. The relatively high aluminium has also shown in some of the glass beads from Kuala Selinsing, Khlong Thom of Thailand and Oc-Eo of Vietnam. Compositional analyses on Sungai Mas glass beads have proven that Sungai Mas was one of the Indo-Pacific beads making centres in Southeast Asia. The drawn monochrome glass beads are not from Arikamedu but locally made. Based on archaeological data, Sungai Mas established itself as the Indo-Pacific beads centre from the 6th-13th century CE.

**MIXED OF ELEMENTS USE AS COLOURING AGENT**

Copper, lead, iron and possibly Zr, Sr and Ce were the materials used to shape the spectrum of colours for the beads of Sungai Mas. Green beads or glass used both copper and lead elements of which the lead content was often higher than copper. Blue beads or glass used copper as colouring material while yellow beads or glass used lead as the colouring material. Red beads or glass used copper and iron elements as the colouring material while for brown or dark brown, it contained very high copper content which is over 10% and also iron.

Glass or bead material that is black in colour contained high Ce in addition to Zr and Sr content. The discovery of glass material of pale yellow colour indicates that this material is very low in terms of its copper, lead and iron content while it's Zr and Sr content is very high. This suggests the possibility of Sr and Zr being used as colouring material. Further, research needs to be carried out to determine whether these two elements were indeed used as colouring material to make beads. Element content used as colouring material is summarized in Table 1.

Table 1: Elements which gave the spectrum of colours to the bead materials and beads

Sample	Element					
	Cu	Pb	Fe	Ce	Zr	Sr
M1 (Yellow)	<10	5386	1.85	Trace	387	284
M2 (Green)	2529	6634	2.00	Trace	519	381
M3 (Black)	45	154	2.39	1083	314	416
M4 (Blue)	5254	95	1.38	Trace	558	429
M5 (Brown)	13938	<10	3.04	Trace	348	446
M6 (Blue)	4095	69	1.80	Trace	616	415
M7 (Blue)	3789	244	1.79	Trace	638	504
M8 (Green)	2668	6454	1.96	Trace	527	404
M9 (Blue)	5295	104	1.63	Trace	522	611
M10 (Red)	2661	<10	2.74	Trace	708	248
M11 (Light yellow)	17	<10	1.72	Trace	490	458
M12 (Yellow)	171	6533	1.70	Trace	490	467
M13 (Blue)	3976	111	1.67	Trace	584	398
M14 (Green)	2196	6424	1.70	Trace	510	360
M15 (Light yellow)	<10	<10	1.91	Trace	758	976
M16 (Red)	2240	<10	2.03	Trace	578	795
M17 (Blue)	3264	64	1.87	Trace	649	481
M18 (Black)	<10	746	1.43	328	701	764
M19 (Green)	2368	4078	2.06	Trace	499	422
M20 (Light yellow)	<10	<10	1.38	Trace	779	1029
M21 (Blue)	6187	18	1.36	Trace	343	361
M22 (Dark brown)	14587	268	3.83	Trace	337	240

**CONCLUSION**

Research on the beads in Bujang Valley, Kedah has proven the role played by Bujang Valley, particularly Sungai Mas as the main entrepot in the Archipelago since the early centuries AD. The role of Bujang Valley as the producer of Indo-Pacific beads has also been proven with the findings of raw materials to produce beads at the Sungai Mas and Pengkalan Bujang archaeological site and the scientific research conducted. Based on the observation on the stratigraphy and cultural layers in Sungai Mas, it is suggested that Sungai Mas became the production centre of Indo-Pacific beads in the 8th to the 11th century AD, namely while Bujang Valley was under the auspices of the Srivijaya Kingdom. The bead producers in Bujang Valley might have come from Kuala Selinsing, Perak or there were producers who had already settled in Bujang Valley.

The producers from Southern India were the people responsible in introducing the Indo-Pacific bead industry in the Archipelago. This is because of the migration of these bead producers from their country of origin which was Arikamedu in Southern India to Sri Lanka and other countries in the Archipelago since 200 BC because their place of origin was attacked by the barbarians and Arikamedu was destroyed in the war. Even though there are scholars who are of the opinion that the recipe to produce the beads was a secret, after a long period of time the industries was also successfully dominated by the

local people. The industry's development in the Archipelago was for quite some time which was for about 1000 years, hence, it is not impossible that the local people were also involved in the bead making industry with the guidance from the producers or makers from Southern India.

Although, the majority of the beads found in Bujang Valley are the Indo-Pacific beads, there are also beads from other types, namely polychrome beads, semi-precious stone beads and metal beads. These types of beads were trade goods obtained from outside especially from India, the Middle East and other areas in Southeast Asia such as Thailand and Myanmar that were popularly known for their carnelian stone beads. So far, there is no strong evidence to state that these types of beads were produced in Bujang Valley and even though there is evidence, this occurred in small quantities and the raw materials were imported from outside.

With the discovery of beads in large quantities in Bujang Valley not including the ones in Kuala Selinsing, Perak, it is high time that a Bead Museum is built in Malaysia because of the contributions of these two areas in the Indo-Pacific bead industry to the world since the 4th century AD. Research on beads in Malaysia should be extended further and all the interesting bead collections should be exhibited for all to see. Apart from intensifying archaeo-tourism, museums should also play the role as places of educational entertainment and information for the public.

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