Beads are quite prominent in the lives of many Indonesian people, and the archaeological evidence suggests that in the past they may have been even more important. Because of their roles in modern society and their ubiquity in excavations, several papers have been written about beads in the archipelago. Much remains to be learned, however, a situation by no means confined to Indonesia.

Our knowledge of Indonesian beads is limited for several reasons. One is the lack of systematic research completed on them. Another is the newness of archaeology in the country and the necessity of channeling economic resources into development, which leaves the anthropological sciences with meager funds. A third is the increasingly alarming destruction of archaeological sites by looters, plundering the past before it can be preserved and studied. None of these problems is limited to Indonesia; they have their counterparts in many nations, particularly developing ones.

Because of these factors, we are in no position to present a comprehensive overview of beads in Indonesia. Rather, this paper is an attempt to clarify some issues that have been raised previously, to make some new observations, and to suggest avenues for further study.

While beads found at archaeological sites are the main subject of this paper, they are not the only beads of interest to be found in Indonesia. In addition to beads from archaeological contexts, heirloom beads—older beads currently in use—are also of interest. A study of those in Sarawak (East Malaysia) has been undertaken (Francis 1989a), and because many indigenous groups there have counterparts in Kalimantan (Indonesian Borneo), data from that work are incorporated in this paper.

**PREVIOUS STUDIES**

The Dutch were the first to write about beads in Indonesia, having introduced archaeology to their former colony. A study by Rouffaer (1899) discussed glass “mutisalah” beads, dating them to the fifteenth century and suggesting that they came from India; they had been first mentioned as early as 1702 (van der Sleen 1975:98; Indraningsih 1985:1). I have not seen this work, so cannot comment on his version of what mutisalah beads were; as we shall see, their identification has provoked some controversy.
Fig. 1. Map of Southeast Asia showing sites mentioned in text.
Nieuwenhuis (1904) discussed the cultural significance of beads, particularly those of Central Borneo. His wide summary of beads was an early attempt at such studies, but he tells us little about the origin of those in Indonesia except for the ones that were being imported at that time.

Molsbergen (1925: pl. 5) published a “bead necklace from a prehistoric grave,” with polychrome glass beads decorated with mosaic cane eyes, plain eye spots, or multicolored lines combed into loops. The eye beads have since been published often, from Sarawak (Beck 1930: K 18), Kuala Selinsing, Malaysia (Evans 1932: 111–112; see also Lamb 1966: 90), and Java (Seligman and Beck 1938: pl. IV. 10; van Heekeren 1958: pl. 13; Yoshimizu 1981: 58–59), and their age and origin have been discussed (van der Sleen 1975: 98–99; Liu 1985: 25).

The first analyses of Indonesian beads were done for van der Hoop (1932). Several scholars have considered Indonesian beads, but as van Heekeren put it (1958: 42), “the last word on the antiquarian beads of Indonesia has not yet been written.” Van Heekeren (1958: 40–43) described some beads and published a few analyses. Some he linked to the ancient Mediterranean, generally following other commentators. He uncritically reported the opinion of C. E. A. Harlo, of the Mines Department, who seemed to think the glass beads were made of clay and described their manufacture on that basis. Van Heekeren’s own discussion of bead making was more logical; I return to it below.

Raats (1958) wrote of four beads found in Flores, types also known from other parts of the country. Following Beck (1928), he identified them as Roman in origin. The four were made by three different methods: winding (wrapping hot glass around a mandrel), drawing (cutting a bead from a glass tube), and segmenting (constricting a glass tube and cutting the resulting bulges apart). One of the wound beads with eight facets paddled into the body is called a “twisted square” bead; another of similar glass has protrusions or knobs on the surface and is known as a “mulberry” bead. The drawn bead has corrugated layers of different colors and is called the “chevron” bead. This type of segmented bead was made of two tubes of glass, the inner one being coated with gold, and is known as a “gold-glass” bead.

Van der Sleen (1975: 100) dismissed the Roman identification of these beads and proclaimed all of them to be Dutch. We now know that the gold-glass beads were most likely made in Egypt in the Coptic and Early Islamic periods (Boon 1966; Francis in press a). The twisted square and mulberry beads are European, dating roughly from 1670–1780, and are likely Dutch (Francis 1987; Karklins 1987). Chevrons have been made in several European countries, but most are Venetian (Francis 1988a: 25–26, 46).

Van der Sleen (1975: 98–101), who attempted a global synthesis of bead history, had some beads from Flores and Bali analyzed, and found some to have heavy lead content. Though now regarded as a strong indication of Chinese origin (Francis 1989b: 11, 1989c: 6), this was dismissed by van der Sleen (1975: 99, 101) on the grounds that Chinese museum officials told him that China had never exported beads. Museum officials may well have told him that, but we know now that it is not true (Francis 1986: 32–34).

The most prolific recent writer on Indonesian beads has been Indraningsih (1982, 1983, 1985, 1986). Although she examined many beads and published some useful data, she failed to make basic distinctions between bead materials or between manufacturing types. This resulted in the publication of analyses of shell and clay beads as
though they were glass (Indraningsih 1985, 1986) and in lumping together possibly fossil dentalium or shell beads with other beads distinguished only by color or shape.

The latest research papers on Indonesian beads include two on beads from Muara Jambi in Sumatra by Soekatno (1985, 1988). These are well done; the glass beads were originally said to have been wound (1985:308), but this was later amended to say they were drawn (1988:224 n. 1). A good beginning on a larger scale was made in a thesis by Ernawan (1987) in which he supplemented his findings on excavated beads from Matesih with observations and interviews of local modern stone bead-makers and glassmakers.

The analyses of Indonesian beads that have been published so far are discussed in some detail below, in the section on glass beads. Before turning to glass beads, however, we shall consider some made of other materials.

**BEADS OF ORGANIC MATERIALS**

The earliest known beads are made of organic materials. Some of these (shell, bone) survive fairly well into the archaeological context, while others (plant parts) tend to decompose and disappear quickly. As more interest is focused on the earlier phases of Indonesian prehistory, one would expect more data on beads of this date to come to light.

One of the most significant finds of beads made from organic materials was a pierced specimen of Job's tears (*Coix lacryma-jobi*) found in Eastern Timor in a context dated to pre-3000 B.C. (Glover 1979:18). This fruit of the plant, often erroneously called a “seed,” is used worldwide for beads (Francis 1984:194–195). The plant has a long history as a cultigen, perhaps even preceding rice. Its origins were once ascribed to Manchuria, China, or Northeast India (Watt 1908:392–393), and more recently to the Indo-Malaya region, notably the larger islands (Vavilov 1950). This find is not only a remarkable case of preservation but the earliest known example of the use of Job’s tears for beads.

Shell is almost universally used as a bead material. Shell beads are reported from paleolithic sites throughout Indonesia, including Krai in old Surakarta, now in Central Java (van Heekeren 1958:164), Uai Bobo and Bui Cera Uato in East Timor (Glover 1977:43, fig. 7), Palawagan in Central Java, Kidangan and Kawengan in East Java, Gilimanuk in Bali, Liang Bua in Flores, and Camplong in West Timor (Indraningsih 1985).

Specific or generic identifications are not reported as often as they should be. Those found by Glover (1977: fig. 7) were identified as *Anadara*, *Trochus*, *Nautilus*, and *Oliva*. The *Anadara* and *Oliva* shells were used whole, being perforated only once. It would be useful to know how the perforating was carried out (Francis 1982a; 1989d). From the plate it appears as though the univalve *Anadara* was gouged or hammered, and that the *Oliva* shells were ground at their apices. The *Nautilus* and *Trochus* shells were cut into disk beads and spacers (with multiple holes for holding strands apart). At Gilimanuk, Bali (c. A.D. 50), the 1964 excavation uncovered 1900 shell disk beads. These appear to have been made by the heishi technique, in which flat shell is chipped into circlets, which are perforated and then strung together on a stick or fiber and rubbed across a flat or grooved rock, producing beads of similar diameter (or a tapered strand, if so desired). The technique is of
great antiquity, dating to the upper Paleolithic in India (Francis 1982b, 1989d:31). It is also very widespread, found, for example, in the Philippines, Taiwan, Thailand, for the shell money of the “kula trading ring” (Malinowski 1922), in the Americas, and in Africa. It would be valuable to trace the use of this technique within Indonesia and to try to determine its connections with other Southeast Asian and South Pacific shell-working methods.

STONE BEADS

Stones—more correctly rocks and minerals—are important raw materials for beads. Before the introduction of efficient drilling techniques, stones with a softness of less than about 5 on the Mohs scale were commonly worked; after that time harder stones, especially the quartz family of minerals (hardness 6.5–7), were used.

In the Neolithic, stoneworkers in Indonesia were highly proficient. Finely made adzes of chalcedony, jasper, and other hard stones are so often found in pristine condition that it has been suggested that they were barter or magico-religious items (Soejono 1984:59). These are still so used in Irian Jaya and Papua New Guinea (see also Hughes 1977:175).

Closely related to the adzes are bangles and rings made of the same hard stones (van Heekeren 1972:164; Soejono 1984:61). Parallels with these have been cited by van Heekeren from Thailand and Malaysia, though the comparison with the Chinese bi (pi) is not apt. By examining samples of these rings and wasters in the National Museum, Jakarta, we can tentatively reconstruct their manufacturing stages. A stone nodule of the right size was chipped into a crude shape called a “roughout.” It was next pecked (repeatedly hit by a point) into a finer shape and pecked in the center to make a concavity (Pl. I). The final hole was drilled, probably

Pl. I. A rough nodule from Belambangan, East Java, and two broken pecked blanks for carnelian rings from Tasi Kmalaya, West Java. (Courtesy National Museum, Jakarta.)
Various stages of finished carnelian rings and a horn reamer. The reamer was found at Tasi Kmalaya (West Java), the chalcedony ring at Cheribon (Java), and the other rings at Banten (Java). (Courtesy National Museum, Jakarta.)

with a bamboo and abrasives. A long conical object, possibly carabao horn, from Tasi Kmalaya, West Java, a site where many unfinished rings were found, appears to have been a reamer to smooth out the final hole. The last stage involved polishing the rings by means of abrasives and a piece of leather or something similar (Pl. II).

The major difference between hard stone beads and bangles is in the drilling of the hole or perforation. While bangles can be drilled by using an abrasive and bamboo, it is much harder to perforate hard stone beads of any length with anything but a hard drill bit. On the Indian subcontinent in Harappan and pre-Harappan times, drill bits of flint or jasper were used to perforate beads of carnelian and agate; apparently the granular variety of microcrystalline quartz is tougher than the fibrous variety (Francis 1982c:7–8; in press b). By the last few centuries B.C., southern Indians were using double-tipped diamond drills (Gwinnett and Gorelick 1988), which found their way to Rome (Gorelick and Gwinnett 1988) and China (Laufer 1915:28–35).

Stone-bead making requires raw materials. Raffles’s (1817:29) survey of minerals in Java listed no precious stones, but several semiprecious ones, none of which he noted as being worked at that time. No survey of the semiprecious stones of Indonesia has been published, but the O.T.C. Sukoco’s (personal communication, 1989) observations of Tisaky Emms, the leading stone-bead-making firm of modern Indonesia, provide valuable data on this point. Carnelian in Java is found southwest of a line drawn from Rangkabitung to Sukabumi (see Figure 2). This material is not of
the highest quality, tending toward a mottled orange. The central region of Java is devoid of semiprecious stones, except around Gombong, where some crystalline quartz, garnet, and tourmaline are found. South of Solo, south of a line drawn from Wonasar to Malang, there is better quality carnelian, as well as agate and chalcedony. This carnelian tends to be deep red in color, and is found in secondary Precambrian deposits. Chalcedony and Indonesia's best nephrite are found in northwestern Sumatra, and chrysoberyl in the southwest of that island.

The region around Sukabumi is currently a center for stone working and bead making, though there seems to be no especially long tradition for it there. West of Yogyakarta at Punung, bead making is carried out in a traditional manner. In Sumatra agate beads are roughly tumbled and drilled at Pakanbaru. The antiquity or histories of these industries have not been thoroughly investigated.

As for the past, the fairly large number of deep red carnelian pieces found in various archaeological contexts in Indonesia and neighboring countries might suggest the exploitation of the deposits south of Solo. Bead making is attested to at Demak around the tenth century or so by the uncovering of two roughouts of square bicones in carnelian (Ambary et al. 1977:46).

It has long been assumed that India, the major stone-bead-making center of Asia (Francis 1982c), was the source of semiprecious stones uncovered in most archaeological contexts in Southeast Asia. Certainly this would be true of particular types, such as the soda-etched bead uncovered at Leang Buidane in the Talaud Islands (Bellwood 1985:307–309), and it may well be true for the fancy faceted carnelians found there as well. On the other hand, there is growing evidence that stone-bead making also took place in other parts of Southeast Asia, including Mantai in Sri Lanka, Klong Thom in Southern Thailand, Oc-eo in Vietnam, Kuala Selinsing in West Malaysia, and Bukit Maras in Sarawak (Francis 1989b:23–24). It would come as no surprise, then, to discover that Indonesia, especially Java, once had a large and flourishing stone bead industry; research along these lines should be pursued.

**SOME GLASS BEADS FROM ARCHAEOLOGICAL CONTEXTS**

Beads of organic materials were most likely locally made within Indonesia. The picture is less clear in the case of hard (quartz family) stone beads; some of them were imports and others were locally made. For some glass beads, which have received the most study of any beads in this region, we are able to make more definite statements about their origin, trade, and chronology.
Mutisalah

*Mutisalah* is the Bahasa Indonesian/Bahasa Malay word for “false pearl.” Mutisalah beads do not resemble true mollusk pearls, but the term suggests an analogy to several other languages—including Latin, Greek, French, and German—in which the word for “pearl” is cognate with “bead.” The root of the word, *moti*, is Sanskrit for “pearl,” but is often used in modern Hindi to mean “glass bead” as well.

*Mutisalah* (or *muti tanah*, meaning beads from the ground) is the name used in the Lesser Sundas, especially Timor and Flores, to mean any small glass bead of opaque red or orange. Such beads are highly prized. In Flores, they may be owned only by the chieftains and are displayed on ceremonial occasions; common people are forbidden to wear them (Rokus Due Awe, pers. comm., 1989). It apparently makes no difference if the beads are drawn or wound, as long as they are the right size, color, and presumed antiquity (Sumarah Adhyatman, pers. comm., 1989).

Drawn mutisalah are Indo-Pacific beads (Francis 1990a). *Mutisalah* is commonly used by most Indonesian archaeologists in this sense, as it was by Lamb (1965a, 1965b). Wound mutisalah are “coil beads” (Francis 1989b:14–15; n.d.), and are the beads van der Sleen (1966, 1975) considered the “true” mutisalah.

Indo-Pacific beads (drawn mutisalah) were made first at Arikamedu, India, in the third century B.C. and thereafter at various sites in India and Sri Lanka and farther east, especially in Malaya. The western (Indian subcontinent) branch of the industry continues to this day, while the eastern (Southeast Asian) branch ceased production about A.D. 1200. The coil beads (wound mutisalah), with a heavy proportion of lead, are Chinese in origin and were made from the ninth or tenth centuries until the sixteenth century or so. In sites in the Philippines and Sarawak, coil beads all but completely replace the Indo-Pacific beads around A.D. 1200.

One of the earliest occurrences of Indo-Pacific beads in Indonesia was at Gilimanuk, Bali, with nine radiocarbon dates averaging 1872 ± 86 B.P. (Bronson and Glover 1984:41). Among the glass beads, there are also some “collar” beads, made by heating a glass tube, flattening it, and constricting the ends to make small handles or “collars” around the apertures. Collar beads are a distinctive Indian type (Francis 1988b). Glass ones were made in quantity at Arikamedu, and in the Indian context they are mostly gone by A.D. 300. The presence of the collar bead and Indo-Pacific beads and the early date of Gilimanuk suggest importation from Arikamedu itself, though Oc-co, Klong Thom, or Mantai could have supplied the Indo-Pacific beads.

There are a few hints that some sites in Indonesia may have made Indo-Pacific beads. Some chips and bits of glass found around Demak (M. Wayono, personal communication, 1989) are suggestive of this, but do not constitute firm proof.

At Muara Jambi, near Palembang, Sumatra, Indo-Pacific beads were found with a few drips and spatters, which would indicate glassworking; some small clumps of beads, which melted together when they were being reheated to smooth off the sharp edges of cut segments; a black bead with a clogged perforation; and a piece of glass formed by the melting together of apparently unperforated beads of black, red, and green. All of these pieces are typical bead-making waste of the Indo-Pacific industry, though this group alone is not necessarily indicative of bead making as such (Francis 1990a). Similar waste products are found, for example, at Laem Pho Chiaya, Thailand, but there is no further indication that bead making took place there. The explanation seems to be that Takua Pa, a contemporary site across the
transpeninsular route from Laem Pho, was a bead-making center and that beads were shipped in bulk to Laem Pho, where the people stringing them discarded the waste materials.

Is this what happened at Muara Jambi? Did the beads come in bulk from some Malayan Indo-Pacific bead-making center and were only strung in Sumatra, with the nonbead waste being discarded? The beads were found in the courtyard of a temple, hardly a place for a bead or glass furnace to be located. But the presence of glass waste has to be explained in some way. Unfortunately, this was the one site from which requests for samples for analyses were inexplicably denied; the analyses potentially could have added a new chapter to the history of beads in Indonesia.

As for the wound mutisalah beads, the Chinese coil beads, there is not yet enough evidence from excavated contexts to suggest when they may have first come into Indonesia. In Sarawak they are present in small numbers at Kian Hitam (the Painted Cave), Niah, in about the ninth century. This is contemporary with the earliest date for them in Korea (Francis 1985a:22). Their period of greatest popularity was between c. A.D. 1200 and 1500, after which time they were on the wane. There is little evidence to show when they entered Indonesia or when they attained heirloom status in the Lesser Sundas.

Java Beads

It is all but certain that some glass beads were made in central or eastern Java around or before the ninth to tenth century, including some of the most spectacular glass beads found anywhere in Asia at this time. There are several different types of these beads, which can be related on the basis of certain shared characteristics.

The beads are generally large—2, 3, or even 6 cm or more in diameter. In shape they are oblates. Most important is the fact that they are made on cores of poorly fused waste glass, often of mixed colors, or reused beads. Precisely how they were made remains to be learned. Technically they can be divided into two major types and several subtypes.

Type I. These beads often have poorly fused cores of fritty glass, and straight perforations. Onto this core have been fused thin slices of complex mosaic "eye" canes (rods of glass built up in such a way that all through the canes is a design of various colors). The result is a mosaic eye bead (Pl. III). One such bead was found at Kuala Selinsing; some are circulating in Sarawak, as noted above; and some were found in south Sumatra. The majority have been found in Java (van Heekeren 1958: pl. 13).

Type II. These differ from Type I in that the core is made differently and they are decorated in another manner. The cores are rarely, if ever, of fritty glass, but rather of glass that had been molten and flowed. Unlike most Type I beads, there is an irregular bulge or concavity at the center of the perforations, marked by deep parallel grooves running perpendicular to the orientation of the perforation. This must be a result of the manufacturing technique, but at this point it is not understood what caused this feature. Four varieties of this type have been noted:

Type II A. These are eye beads but, unlike the mosaic cane eye beads of Type I, they are decorated with spots of white surrounded by a deep, rich green-blue (Pl. IV).

Type II B. These are decorated with several colors of glass laid down in lines, and
A mosaic eye bead (Type I), presumably made in Java. The interior of a similar bead, though with a different pattern, reveals its grainy or "fritty" nature. (Center for Bead Research Collection.)

then combed into a wave pattern by running a stick or wire through the glass while it was still hot (Pl. Va).

*Type II C.* These have a bright monochrome yellow exterior (Pl. Vb).

*Type II D.* These beads are smaller than the others, with diagonal lines of white, green, yellow, and red.

Pl. IV. Broken plain eye bead (Type II A) found at Jatiagung, Central Java. Some of the exterior white and blue-green glass is mixed in the core and there are perpendicular striae in the center of the perforation. (Courtesy National Research Center of Archaeology, Yogyakarta Branch.)
Three lines of evidence suggest that these beads were made in central or eastern Java: their distribution, their unusual method of manufacture, and a possibly identified manufacturing site. As for their distribution, they are commonest in Java, and next in Sumatra and Borneo. Outside of the Greater Sundas, they have so far only been found at Kuala Selinsing.

Their method of manufacture is peculiar. The cores are either reused beads or scrap glass. Cores of some of the yellow beads (Type II C) contain scraps of mosaic eye canes (Sumarah Adhyatman, personal communication, 1989). Plain eye beads (Type II A) have been found with scraps of their exterior in the core. While beads with cores decorated externally with other glass are not unknown, such beads are almost always wound beads. These, however, were not simply wound, and the method of making them has not been documented from anywhere else.

The precise cause of the concavity in the perforations of the Type II beads is elusive. The diagram in Van Riet Lowe’s (1955:13) report on Mapungubwe, South Africa, is reminiscent of these beads, though personal examination of his “garden roller” beads do not reveal them to be much like the Javanese beads. The “garden roller” beads of Mapungubwe were made in thin clay molds, discarded after each bead was made (though the published reconstruction needs confirmation). No molds are reported for the Javanese beads, but some sort of molding process might have been used for their manufacture (pl. IV).

Another possibility is that the cores were formed on a stick with a wide joint (not bamboo), in order to hold the bead to be further decorated, with the stick being burned out later. Van Heekeren (1958:42) has previously suggested the same possibility.

In any case, the manufacture of these beads is unusual, if not unique. That would indicate a locally devised bead-making process, rather than one that came from some
established traditional bead-making site elsewhere. It would also seem that some of the glass was not made locally but imported. The mosaic canes for the Type I beads resemble some known from the Islamic West, and they may have been imported and used locally on these beads.

The third line of evidence is the tentative identification of Jatiagung, East Java, as a manufacturing site for the Type II beads. As with the other arguments here, the evidence is circumstantial, and given the heavily looted nature of the site, we may never know much more about it than we know now. No beads of Type I have been found there, but many of the other types have. Included among those are a great many fragments, which may indicate bead manufacturing. There were also a number of beads that had been perfectly formed, but were overheated and slumped to their sides (Pl. VI).

Finally, there is the question of the dates of these beads. They have been found in several dolmens, but the terminal dates for dolmens are not known with precision. Estimates by Indonesian archaeologists who discussed this question in relation to these beads run from the fifth to the tenth century or somewhat later. Jatiagung is estimated to date to about the tenth century. Kuala Selinsing, where one bead was found, is dated roughly from the sixth to the tenth century. We may tentatively suggest a date in the ninth or tenth century for the beads.

No other class of beads holds as much interest, mystery, or importance for Indonesian archaeology as do these, since they were most likely locally made by pro-
cesses not known elsewhere. At this point we have far more questions than answers about them. We do not know exactly how, where, or when they were made, or even if the two types are contemporary. To begin to solve these problems, we need analyses, controlled excavations and precise dating, experimentation, and more information on their distribution.

GLASS BEAD ANALYSES

Several authors have published analyses of glass beads found in Indonesia. There is a general discussion of the use of glass analyses in an earlier paper in *Asian Perspectives* (Francis 1989e). The following remarks are often hampered by incomplete descriptions of the analyzed beads in the literature reporting them. Nonetheless, some broad trends can be seen, and the beads are grouped here according to their analytical contents.

The first analyses were done for van der Hoop (1932). These were later published by van Heekeren (1958:71-72) and Tornati and van der Sleen (1960:20), from whom these data are taken. Three beads were involved; they are listed in Table 1 as an opaque red drawn Indo-Pacific bead, a yellow bead, and a blue-green bead.

These analyses are peculiar in several ways. Concerning the red drawn Indo-Pacific bead, Lamb (1965a:98) remarked, "There is something strange about this pioneer analysis" and pointed out that there is no other reference to glass having nearly half its weight in iron. Indeed this is unusual, as is the very heavy potassium content of the blue-green bead. It is difficult to comment more on these anomalies. It may be that the red drawn Indo-Pacific bead was not glass at all or that the analyses were not done very skillfully. However, it is clear that the other two beads are of lead glass, though we do not know exactly what sorts of beads they were.

More complete analyses of Indo-Pacific (drawn mutisalah) beads are listed in Table 2 as follows: a bead from a sarcophagus in the Pasemah Plateau, South Sumatra (van Heekeren 1958:41); the mean average of seven beads from megaliths at Manteshi, Central Java; the mean average of three glass beads from stone cists at Kidangan and Kawengan, East Java (Indraningsih 1985:8, table 4); the mean average of six beads from a settlement layer at Gilimanuk, Bali, with a radiocarbon date of 1900 B.P. (Indraningsih 1985:8, table 5); an orange drawn bead from Flores published by Tornati and van der Sleen (1960:23, #30) and dated by them to A.D. 400-800. The seven beads from Manteshi were not identified by Ernawan (1987:124), but those at
TABLE 2. ANALYSES OF INDO-PACIFIC OR DRAWN MUTISALAH BEADS IN INDONESIA

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>COMPOSITIONAL COMPOUNDS</th>
<th>SiO₂</th>
<th>Na₂O</th>
<th>K₂O</th>
<th>CaO</th>
<th>Fe₂O₃</th>
<th>Al₂O₃</th>
<th>CuO</th>
<th>MgO</th>
<th>PbO</th>
<th>Other</th>
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<tr>
<td>Pasemah Plateau, Sumatra</td>
<td></td>
<td>53.34</td>
<td>24.00</td>
<td>1.79</td>
<td>2.88</td>
<td>3.52</td>
<td>8.95</td>
<td>4.72</td>
<td>0.75</td>
<td>0.53</td>
<td>0.00</td>
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<tr>
<td>Mantesih, Java</td>
<td></td>
<td>68.39</td>
<td>3.13</td>
<td>6.71</td>
<td>11.21</td>
<td>2.77</td>
<td>0.00</td>
<td>3.04</td>
<td>0.00</td>
<td>4.74</td>
<td>0.00</td>
</tr>
<tr>
<td>Kidangan and Kawengan, Java</td>
<td></td>
<td>61.80</td>
<td>14.93</td>
<td>2.25</td>
<td>4.67</td>
<td>3.78</td>
<td>8.72</td>
<td>1.57</td>
<td>1.58</td>
<td>0.47</td>
<td>0.00</td>
</tr>
<tr>
<td>Gilimanuk, Bali</td>
<td></td>
<td>62.65</td>
<td>10.72</td>
<td>4.98</td>
<td>5.41</td>
<td>3.87</td>
<td>9.21</td>
<td>0.45</td>
<td>0.82</td>
<td>2.13</td>
<td>0.00</td>
</tr>
<tr>
<td>Flores</td>
<td></td>
<td>56.51</td>
<td>10.70</td>
<td>1.67</td>
<td>3.13</td>
<td>10.23</td>
<td>5.88</td>
<td>1.57</td>
<td>1.58</td>
<td>0.47</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Note: Numbers represent percentages by weight of each compound.

TABLE 3. ANALYSES OF LEAD GLASS BEADS IN INDONESIA

<table>
<thead>
<tr>
<th>BEAD TYPE</th>
<th>COMPOSITIONAL COMPOUNDS</th>
<th>SiO₂</th>
<th>Na₂O</th>
<th>K₂O</th>
<th>CaO</th>
<th>Fe₂O₃</th>
<th>Al₂O₃</th>
<th>CuO</th>
<th>MgO</th>
<th>PbO</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange coil (wound mutisalah)</td>
<td></td>
<td>34.40</td>
<td>1.46</td>
<td>9.95</td>
<td>4.47</td>
<td>2.49</td>
<td>2.83</td>
<td>4.50</td>
<td>1.24</td>
<td>37.92</td>
<td>0.47</td>
</tr>
<tr>
<td>Wound orange</td>
<td></td>
<td>39.61</td>
<td>0.88</td>
<td>13.16</td>
<td>4.16</td>
<td>1.79</td>
<td>2.28</td>
<td>1.60</td>
<td>0.00</td>
<td>26.00</td>
<td>0.51</td>
</tr>
<tr>
<td>Wound translucent red (a)</td>
<td></td>
<td>45.87</td>
<td>1.10</td>
<td>3.37</td>
<td>0.56</td>
<td>0.15</td>
<td>0.70</td>
<td>0.00</td>
<td>0.23</td>
<td>47.58</td>
<td>0.06</td>
</tr>
<tr>
<td>Wound translucent red (b)</td>
<td></td>
<td>41.37</td>
<td>tr</td>
<td>6.63</td>
<td>0.77</td>
<td>0.11</td>
<td>0.65</td>
<td>tr</td>
<td>tr</td>
<td>50.40</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Note: tr = trace.

Some figures were rounded off from thousands.

Also looked for but not found: SnO₂, SO₂, Cr₂O₃, CuO, FeO. Small amounts of TiO₂ were found in all beads, and MnO in the orange coil and wound orange beads. Traces of Au were found in the wound orange and wound translucent red(a) beads.

Numbers represent percentages by weight of each compound.

the National Center for Research on Archaeology are Indo-Pacific beads. This group was remarkably homogeneous. The three beads from Kidangan and Kawengan are not quite as homogenous as the Mantesih beads, but reasonably so. The six beads from Gilimanuk are the least homogeneous group.

In general, these analyses are similar to others performed on Indo-Pacific beads, showing little or no lead, and high aluminum and soda contents (save for those from Mantesih). A more detailed program of analyses should help form some idea of which Indo-Pacific sites produced beads found at which importing sites.

The next set of beads is grouped together because of high lead contents (Table 3). They were published by Tornati and van der Sleen (1960:23) and again by van der Sleen (1975:100). They are as follows: a dark opaque orange coil (wound mutisalah) bead from Flores; a wound opaque dark orange oblate about 4 mm in diameter from Bali; a wound elliptical bead about 8 mm in diameter of translucent red (van der Sleen says wine-red) from Flores; and a wound translucent red bead from Bali.
The analyses in Table 3 are indicative of Chinese glass. The heavy lead content is a good marker of Chinese manufacture, as lead glass was rare anywhere else in the world until relatively recently. Also important is the choice of potassium (K₂O) over soda (Na₂O). Among several "recipes" for Chinese glass that have survived, the use of lead and potassium (expressed as salt peter or nitre, KO₃) is most common. Chau Ju-Kua (Zhao Rugua) in A.D. 1225 said the Chinese make glass "by burning oxide of lead, nitrate of potash, and gypsum" (Hirth and Rockhill 1911:227). In 1637 Sung Ying-Hsing described glass making in Shandong Province, long the Chinese glass-making center, by "smelting [and casting a mixture of] nitre, lead, and pearl fragments" (Sun and Sun 1966:307). The Imperial Glass Workshop in Beijing between 1740 and 1753 used a formula of 7.5 percent feldspar, 28.0 percent salt peter, 13.3 percent borax, 5.1 percent white lead, 5.1 percent arsenic, and 2.0 percent fluorite (Brown and Rabiner 1987:76).

Assuming that these really are old beads similar to those found elsewhere in Southeast Asia, the question arises as to how the translucent red color was achieved. Only copper and gold could have been used in glass of any age to make the "ruby" color. Tornati and van der Sleen (1960:23) assumed gold was coloring the glass, but only one of their beads had a trace of gold. Copper is the coloring agent of two beads from fourteenth- to sixteenth-century contexts in Singapore and the Philippines, as recently confirmed by David Killick and this author using x-ray fluorescence at the McKay Laboratory at Harvard University. Also interesting is the lack of tin in these beads. While tin is not absolutely necessary for gold or copper ruby glass, it is very difficult to make either without it (Weyl 1959:380–386, 425–429).

The last group of beads (Table 4) was published by van Heekeren (1958:41). It consists of: a large, round monochrome wound green bead from a dolmen near Besuki, East Java; a similar bead in yellow from a temple in Ulu Sungai, Kalimantan; a similar bead in red from Ulu Sungai; an eye bead of Type II A (see above) with a core, white eyes, and a green-blue field (van Heekeren calls it deep green), from a dolmen near Besuki; a mosaic eye bead of Type I (see above) from a different dolmen near Besuki; a hexagonal bicone of translucent green from Ulu Sungai; and another hexagonal bicone, but of dark translucent blue.

There is not enough lead in these beads to consider them "lead glass" beads, but the tin contents are of interest. Tin and lead in the wound yellow bead from Ulu Sungai were probably responsible for the opaque yellow color, assuming they were in the form of PbSnO₃ (Biek and Bayley 1979:9). The tin and lead in the wound red bead from Ulu Sungai may have helped the copper to dissolve to yield opaque red, but this is unlike the formulas used for red Indo-Pacific beads. The use of the tin in the two polychrome eye beads that we assume were made in Java is most significant. Tin is found in Indonesia (today mined mostly on Banka and Belitung [Billington] Islands and in the Riau group). It melts rather easily into glass up to concentrations of 10–15 percent at temperatures as low as 1050 °C (Turner and Rooksby 1961:1). Its primary use in glass is to opacify it, a use that became common about the middle of the first millennium (Turner and Rooksby 1959, 1961). The high amount employed in the mosaic eye bead from Besuki may provide a clue to its origin.

The two translucent beads are very similar in their composition. Wound and pressed hexagonal bicones, although usually shorter in length than these specimens, are known from a number of Southeast Asian sites, dating mostly from the first half of the first millennium (Francis 1989b:15, 19). An analysis of a green hexagonal
TABLE 4. ANALYSES OF GLASS BEADS IN INDONESIA (VAN HEEKEREN 1958)

<table>
<thead>
<tr>
<th>BEAD TYPE</th>
<th>COMPOSITIONAL COMPOUNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SiO$_2$</td>
</tr>
<tr>
<td>Wound green</td>
<td>52.24</td>
</tr>
<tr>
<td>Wound yellow</td>
<td>53.94</td>
</tr>
<tr>
<td>Wound red</td>
<td>59.85</td>
</tr>
<tr>
<td>Eye bead (Type II A)</td>
<td>45.64</td>
</tr>
<tr>
<td>Mosaic eye bead (Type I)</td>
<td>53.10</td>
</tr>
<tr>
<td>Translucent green</td>
<td>61.94</td>
</tr>
<tr>
<td>Translucent blue</td>
<td>63.16</td>
</tr>
</tbody>
</table>

Note: Numbers represent percentages by weight of each compound. All samples contained some TiO$_2$, ranging from 0.53 to 0.12%.

bicone found at Oc-eo (Malleret 1962:467) revealed a pattern rather similar to the two beads of van Heekeren, but their true similarities remain to be established.

In sum, the analyses of the 33 beads summarized in tables 1–4 show considerable differences between them. By far the most homogeneous group are the 19 Indo-Pacific beads in Table 2, but this was perhaps to be expected. The lead glass in the beads of Table 3 identifies them as of Chinese origin from the Song period onward, but the question of how the translucent red was achieved remains open. The use of tin in several beads in Table 4 is important, particularly the heavy amount in the presumed Javanese eye bead. The precise significance of this is not yet known. The two translucent hexagonal bicones in the same table form a class of their own, and may be related to similar beads found elsewhere in Southeast Asia. A program of analyses of beads from Indonesia and other Southeast Asian countries being prepared in hopes that some of our problems will be solved, including those of the origins and trading patterns of Indo-Pacific beads, the coloring of the ruby glass, and the constitution of the Java beads.

SOME OTHER GLASS BEADS

This short section deals with some beads found in Indonesia belong in the archaeological context, whether or not they come from controlled excavations. Several are discussed in greater detail in a previous paper in Asian Perspectives (Francis 1990b). More recent glass beads, some of which are also known from archaeological contexts, are discussed in the final section of the present paper, dealing with heirloom beads.

**Pinched beads.** These are wide diameter monochrome beads made by pinching off the ends of thick drawn tubes. They were made as a byproduct of the Indo-Pacific bead-making industries at least in Mantai (Sri Lanka), Oc-eo (Viet Nam), and Sungai Mas (Malaysia). They have a wide distribution in Southeast Asia and as far north as Korea throughout the first millennium A.D. They are recognized by the striations which run longitudinally at the equators and then curve in toward the apertures at the ends.
Fig. 3. a. Sketch of the “bird bead” (black or dark blue ground, white design); b. Sketch of an exterior and interior fragment of a fused mosaic cane bead (from Sungai Mas, Malaysia, but visually identical to beads found in Indonesia). (Both sketches by Jacqui Steinberg.)

Drawn beads with longitudinal stripes. Again, these are subsidiary products of the Indo-Pacific bead-making industries. The color combinations differ, but the commonest are white stripes on black or blue. Mantai and Takua Pa in Thailand are two confirmed production sites of these beads. They are relatively widespread, but not as common as the pinched beads, and are found through the first millennium A.D.

Bird beads. These are black or dark blue beads in oblate and ellipsoidal tubular shape. They are generally decorated on one side in white with a standing bird and on the other side with a sunburst (Fig. 3a), though squirrels and flowers are also known. They have been found at Oc-eo and several sites in Malaya and Thailand. They are no doubt Asian, but it is not known exactly where they were made; their temporal distribution is the latter half of the first millennium A.D.

Gold-glass beads. As discussed above, this type of segmented bead was probably made in Egypt. They are known from a number of sites in India, at Mantai (Thailand) and Oc-eo (Viet Nam), and in royal graves in Korea. They have been found at Jatiagung (East Java), in about a tenth-century context. Similar beads, but without gold, formed by putting an amber-colored tube over a milky white one, were made in Takua Pa (Thailand). In Malaya, at least, they are commoner than true gold-glass beads (Francis 1990b).

Fused mosaic cane eye beads. These beads are made by joining short sections of mosaic cane and fusing them into a round bead. They are unlike the Java mosaic eye beads in that they have no cores. Two major types exist. One is a small bead with various complex combinations of colors; these are known from Europe and the Middle East and are products of the Islamic West. A simpler type has canes of black
or dark blue with one or two concentric circles of white as the decoration (Fig. 3b).
Fragments of this type of bead are so common at Sungai Mas (in Kedah), Malaysia, that they may have been made there of imported canes from the Islamic West. Both of these types are found from about the ninth to eleventh century.

HEIRLOOM BEADS

Heirloom beads are ones that remain in circulation, generally among the more isolated ethnic groups. They are of considerable importance to the people who own them, and are highly valued. They fulfill many different and often overlapping functions. They are a store of value, a means of deferred payment, and a unit of account, but are rarely used as currency. Their social functions include distinguishing between different groups of people, and within a group along the lines of gender or wealth, marital status, or other life stages. Their presence is sometimes required for ceremonies important to individuals or the group. Some communities invest them with magical powers; they are not always considered magical in and of themselves, but confer power upon their owners. Of course, they are also decorative.

A recent study of heirloom beads in Southeast Asia concentrated on those of the Philippines and Sarawak (Francis 1989a). The similarities and contrasts between these two regions were striking, and the data from Sarawak can be profitably applied to the study of heirloom beads in Kalimantan. The Sarawak-Kalimantan border is a recent political invention, and many highlanders share genealogies and customs with their kin across the watershed. A few notes on the results of the Sarawak/Philippines study are, therefore, appropriate in a discussion of Indonesian beads.

The most important difference between the heirloom beads of Sarawak and the Philippines is the higher value and greater age of many of them in Sarawak. One factor that may account for this is the difference in burial practices between the two regions. In Sarawak, beads were common burial goods in the Niah Cave complex until the ninth century, but by Song times (A.D. 960-1279) we see a different pattern. At the Tanjong Kabor and Tanjong Tegok cemeteries along the Sarawak River, despite thousands of potsherds recovered, only 46 and 2 beads were found, respectively (Solheim 1983:38, 47; Cheng 1969:14-15). In the Philippines, cemeteries at Bolinao and Calatagan, both on Luzon (c. A.D. 1300-1600) yielded no fewer than 129 of the 178 provenienced bead types from that period, often in great numbers. It seems that the Filipinos continued to inter beads with the dead until Islam or Christianity took hold. Why the Sarawakians ceased this practice and began keeping beads is not known.

Two types of heirloom beads in Sarawak are known from the excavations at Bukit Sandong, in Kuching District, from the fourteenth to sixteenth century. One is an opaque red barrel bead called the “ghost bead.” It is not especially valued; the Kelebits put it on stakes in the fields to ensure a good crop, while Kayans throw it out the window after a bad dream or when someone is sick (Harriss on 1950:212; Munan-Oettli 1981:21-22). The other is a black wound barrel bead with longitudinal stripes always in the same pattern: red, yellow, red, two greenish-white, red, yellow (or green), red, and two greenish-white (see Munan-Oettli 1987:91). A longer, thinner, newer bead with the same pattern is circulating in Sarawak and Kalimantan. A good match to the older beads is found on sample cards of Francis Greil, a Venetian beadmaker of the late nineteenth century (observed at Peabody
Museum, Harvard University). Most of the beads from Bukit Sandong seem to be Chinese. In the case of the striped bead we appear to have a later European imitator.

We have documentary evidence on the origin of one heirloom bead, the light to dark blue (sometimes green) barrel beads, which the Kelebit prize and call Let. Although Harrisson’s experience (1950:209–211) shows that similar beads were made long ago and far away, we can trace the origin of the Let bead. Similar beads excavated from ninth- or tenth-century sites at Tanjong Kubor, Sungai Jaong, and Niah were analyzed and found to have far less lead content than the Let beads now circulating (Harrisson 1968:127–130). Parallels from the Philippines, from c. A.D.1450–1600, however, have high lead contents (Francis 1989c:14).

The historic data for these beads were furnished by John Saris, the first Englishman to sail to Japan, who around 1600 lived in the thriving port of Bantam (Banten), now a mere village west of Jakarta. In separate documents he described a certain blue bead:

I have many times certified your worships of the trade the Flemings [Dutch] follow to Soocadanna [Sucadana, Kalimantan] which place yieldeth great store of diamonds, and of their manner of dealing for them for gold principally which comes from Banjermasen [Banjurmasin] and blue glass beads which the Chinese make and sell 300 for a [piece] of eight, and they are there worth a mas a 100 which is [3 shillings] and sometimes more sometimes less according as gold doth rise and fall. (Danvers 1896:221; emphasis mine)

[Commodities vendible and in request at Sucadana include] all sorts of small Bugles [tubular glass beads], *which are made in Bantam of colour blue*, and in fashion like a Tunne [a barrel], but of the bignesse of a Beane, and cost at Bantam four hundred a Riall of eight, with at Soocodanna, a Masse the hundred, the Masse beeing three quarters of a Riall of eight .... (Purchas 1625:3:513–514; emphasis mine)

Saris was a keen and accurate observer, discussing the same bead in both passages. It was blue, barrel shaped, the size of a large bean, and valuable in Borneo. It was made by Chinese living in Banten, Java. This must surely be the Let bead (Francis 1985b). Munan-Oettli (1981:19–20), who had long suspected this bead was made in Southeast Asia by emigrant Chinese, agrees (personal communication, 1986).

Even older than these beads are some that came from the Islamic West, several of which have been discussed above. These include fused eye beads, and folded beads (made by heating a plaque of glass and folding it over a wire to fuse the two ends). A “checker” bead, made by fusing four plaques of checkerboard mosaic canes into a ring and finishing the ends with a strip of glass, is also from this source. As we have noted, the mosaic eye beads with poorly fused cores made in Java in the ninth or tenth century are found in Sarawak. Somewhat more recent are wound imitations of the true chevron beads. They are most likely Chinese and date from the sixteenth and seventeenth centuries.

Not all heirloom beads are of such antiquity. Many are of Venetian, Bohemian, or Chinese manufacture of the last few centuries. At least one heirloom glass bead was made in Borneo. At Tanjong Selor (Tandjung Seilor), Kalimantan, H. Mohammed Saleh set up a factory in the 1920s or 1930s to crush yellow European glass beads in a mortar, pour the powder into clay molds, and bake them in an oven, piercing them while still hot (Tillema n.d.). These beads are mottled in color, poorly fused, and have rough perforations (Pl. VII).

The foregoing notes on heirloom beads in Sarawak and Kalimantan should suffice
Pl. VII. Collapsed specimen of the plain eye bead from Jatiagung. (Courtesy National Research Center of Archaeology, Yogyakarta Branch.)

Pl. VIII. Heirloom necklace from Kalimantan. Most of the beads are Venetian of the last century or so, but the yellow disks were made at Tanjong Selor, Kalimantan. (Courtesy Adam Malik Museum, Jakarta.)
to indicate the wide range of beads that fall into this category. The heirloom beads of other parts of Indonesia have not even been considered (save the mutisalah from the Lesser Sundas). At least as much research remains to be done in this field as in the archaeological context, and work in the two fields on this subject will be complementary.

CONCLUSIONS

The story of beads in Indonesia is just beginning to be pieced together, and this paper is offered more as an analysis of what needs to be done than as a comprehensive overview of what is known. Indonesia is a vast country, and its various constituent islands did not always share the same historical backgrounds. While there are threads of similarity running through their pasts, there are also great differences. Properly studied, beads provide an important body of evidence for sorting out the movements and interplay of goods, people, and cultural traits that characterized earlier periods.

Beads of organic materials are still being used by some people, and a full documentation of their use, especially of plant parts and other perishable substances, is sorely needed. Shell was an important bead material for a very long time, and it remains to be learned in what ways the shell-bead industries of prehistoric Indonesia were linked to or contrasted with those of other peoples in Southeast Asia and the Southern Pacific.

It seems likely that stone beads could have been a major product of early historic Indonesia, especially Java and Sumatra, and perhaps Borneo. Much more work along these lines is needed to identify possible sources of raw materials, manufacturing sites, and the internal and external distribution of such beads.

Glass assumes a very important place in the story of beads in nearly every country. The identification and documentation of imported glass beads can help in tracing the lines of communication and transportation used in commerce and other forms of intercourse in the past. The likelihood that Java was the center for the manufacture of some very spectacular beads needs to be investigated in much more depth. More precise descriptions of beads and a well-considered program of glass analyses are also needed.

The use of heirloom beads is a rich source of information. In this part of the world it clearly overlaps the realms of the ethnographer and the archaeologist. Not only is it important to trace the origins of beads and to identify the people who use them, but also it is useful to study both the physical and social uses to which the heads are put. The importance of beads to many peoples of Indonesia is undeniable, and this alone should be incentive for a systematic ongoing study of them as cultural artifacts.

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NOTES

1. The translators of this text consistently rendered the term lii-li as “lapis lazuli.” Some, but not all, authorities believe that the Chinese word liu-li was derived from the Sanskrit vai/., which means “gem,” and probably specifically “lapis lazuli.” However, liu-li usually means opaque glass in Chinese, contrasted with po-li, which is translucent glass, though this distinction was not always made. In Sung’s text it is clear that liu-li means “glass” and not “lapis lazuli.” It is compared to quartz crystal in that it is lustrous and transparent and comes in many colors. The Chinese imitate it (presumably because they could not make very clear glass) by the recipe quoted in this paper.

2. If these are percentages by volume, the lead will weigh much more than this by weight. If they are by weight, this is not really lead glass.

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