CASTING OF DEVOTIONAL IMAGES IN THE HIMALAYAS: HISTORY, TRADITION AND MODERN TECHNIQUE

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Both solid and hollow-casting by the lost wax process have a long history in Northern India. According to Reeves (1962:23), the earliest literary evidence for the process in the description contained in the Mahabharata-purāṇa, as recorded in chapter 68 of the Mahābhārata, which is believed to have been compiled in the Gupta period (Shulka, 1958:110)). Unfortunately, surviving cast metal statuary from this period is rare, and Bhattacharya (1999:12) suggests that the extensive use of metal for sculpture in northern India may not be earlier than the late Gupta period. From the very medieval period (7th to 12th century AD), more texts are found containing references to metal-casting techniques. Of particular importance is the Vīnāśāra-muktā-viśarjanaparvapravāna (11.4-7), which mentions both hollow- and solid-casting by the cire-perdue method (Reeves 1962:32). This text is well-known in Nepal (Pai, 1970:22; Idris, 1909, III:133). However, the next medieval description which gives detailed instructions as contained in the Ārya-Upsaṅga-cintamani (a text also known as Mahābārata or Mahābārata-Sāṃskāra) which was written in c. AD 1013 by king Bahu-pārva Indrakumara of the late Chāitya dynasty of the Deccan (Saravasti, 1956:129; Reeves, 1960:32; Rukham, 1974:2,1,3). The version on the lost-wax process, as translated by Saravasti (1956:43), also specify that the ratio of brass and copper to wax should be 10:1 (or, according to a variant reading, 8:1). By this time, hollow-casting had reached a degree of perfection which enabled craftsmen to attempt very large figures, for which the exposed technique I-termally generally preferred. The 2,225 n. high Sattangad copper Buddha (in Nanjing City Museum) was one of more than wax cast by the hollow-casting method and it is very likely that the 1.80 m. high Sivas Sarasvati bronze baseplate (in Springer Museum, Kashi) was cast by the same method.

The History of Buddha in India, written in 1068 by the Tibetan scholar Tshon Chagduden (1175) states that during Boddhisatva's rule (c. AD 601-616) the work of the two outstanding Bengali painters and sculptor, Fauno and his son respectively, gave rise to new schools of painting and metal statuary (Chot-pa-pa-praśasti, 1970:348). Reeves (1962:23) suggests that the result of this widespread use of the cire-perdue process was to influence the manufacture of copper-joined in Nepal and Tibet by "the turn of the 10th century AD, particularly with respect to copper gilt images which are still produced today. As in the past (Khanda-Lavish, 1959:22), both solid and hollow lost-wax casting methods are still used by Nepalese sculptors, the former for smaller sized (15 cm to 35 cm) to large (from 45 cm) images, the latter for small (15 cm or less) and sometimes medium sized images. The use of the two methods overlaps for medium sized images ranging from 20 to 45 cm. There is evidence to support Dāgān's claim that in Tibet permanent molds for lost-casting were more widely used than the method of cire-perdue casting (Dagshel, 1977:550). Range (1990:269) also appears to overlook the use of the lost-wax process in Tibetan art. As well, weaves were made by the sand-casting method which requires the mold to be destroyed after casting". However, Pai (1969:14) accepts that the "methods in which lost-wax were usually cast by the cire-perdue method" - a careful visual examination by Credon's (personal) communication of the 521 inscriptions of flash lines, failed to show an evidence especially on the underside of the bases. It seems probable that both techniques of casting were used in Tibet. The earliest evidence for the introduction of the lost-wax process into Tibet is probably provided by a western Tibetan rājaguhī at the Kardo quimet in Pahari (M.19346). This statue was hollow cast in stone 11.7 cm and 1% lead by the lost-wax process, as is shown by radiography which
revealed the presence of a core held together by a gelatin armour (Hours, 1900:95-98). This image, attributed by Palič(1988:22) to the 11th-12th century and regarded by Nagasawa (1977:49) as a copy of an 11th century Khmer "original", appears to provide the earliest evidence for the introduction of the lost-wax process into western Tibet.

The continuous presence of metal sculptures in Tibet is attested in Tibetan and Western sources from the 7th (Moruo and Turkevich, 1972:143; Agnoli, 1937, I:35) to the 20th century (Wu, 1924:1124; Firth, 1939:196 and 307-30). The career of Arjuna, a Newar artist who was sent to Tibet at the head of a team of eighty artists in AD 1600 (Ivic, 1895, III:187; Patchett, 1939:19), but see Tirtha and others who give the figure twenty-four, probably mistranslating Ivič's French "groupe-vingt-quatre" is only one example. Arjuna was subsequently invited to the Mongol court in China, where he was put in charge of the principial metal-wares, and received posthumous honours. Beeswax and copper are listed by the Kumbal Thangka ji (see below, p.85) amongst the materials used by Arjuna (Khare, 1975:35). For every subsequent century, the presence of Newar sculptors is documented in various parts of Tibet. Newar communities resided at Jalsa, Dlghara, Gantse, Shangri and Metang. Although the figure of 20,000 Nepalese refugees in Tibet (Nepal, 1949:52) is certainly exaggerated, what matters rather than their numbers are their social and anthropological features. They all belonged to the three Newar castes among which metal sculptures are still to be found: Kay-dakya, Sikya and Udā. During the early 17th century in particular, their activities extended from Guga (Therre, 1905:467; see Ivič, 1905, I:149-50) to Bhutan (Janewall, 1977:246-65), which is still supplied by the Newar metal sculptors of Kathmandu. The number of Nepalese metal images in Tibetan temples was legion and Newar sculptors have also been active producing statues in Tibetan style (Lo Rues, 1979 and 1981). Even if, however, no historical evidence than Tibetan metal sculptors ever worked in Nepal. Furthermore, the current absence of local Tibet-naxi statuary manufactured from Bhutan, Ladakh, and the Tibetan areas of Nepal, including the Tibetan refugees settlements where there are quite a few outstanding practitioners, suggests that Tibetan lost-wax metal statuary depended heavily upon Newar sculptors well into the 20th century (Lo Rues, 1979 and 1981). For these reasons, and in the absence of living Tibetan lost-wax metal sculptors on site as assurance, I have thought it acceptable to base the following sections on fieldwork which I carried out in 1977 and 1978 among Newar sculptors working in Tibetans in Nepal. A pioneering study by M. de Loblattre (see Anthony Aria) on lost-wax metal casting in the workshops of Jagat Kun Kheda in Gau Rafael, Nepal, was published in Kashi in 1973. Another study by Alpay and Chariton was published in Contributions to Nepali Studies later the same year. The following sections are intended to sum up the knowledge of the contemporary techniques of Newar lost-wax casting and its chief; at supplementing these earlier studies with more detailed information, especially with regard to the timing of investing and casting.

Wax model

The composition of the wax used in modelling varies according to season in the Nepali valley. The light "brown" was used with a mixture of 50% beeswax, bought from Tharuish living in the hills surrounding the Nepal Valley, and 50% oil, a raw resin imported from India. Beeswax (1962:133) retarding, perhaps with the aid of a Terai translation, the defective (Saraswati, 1938:140) Kieran's text of the 5th chapter of the Mātraṇī, define the author used to manufacture this was as the residence of the old tree. Now the oil, or Shamar Roberts, obsolete in the sub-Himalayan region, including the Nepalese Terai, of the light "brown" was 40-60% oil (1:266-67, Nepal, 1962:21) of
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Although apprentices may be involved in all moulding operations connected with the kaolin, the modelling of the prototype is carried out by the sculptor alone. Finally, musicians, tailors and members of the cloth trade contribute to the finished product. The sculptor shapes the kaolin into a rough model which is then fired, and the fired model is then encased in a slip cast of clay. The slip cast is then fired to a higher temperature than the kaolin, and the finished product is then decorated with kaolin slips and slips of various colors. The finished product is then fired again to a higher temperature, and the final product is then polished and glazed. The finished product is then fired again to a higher temperature, and the final product is then polished and glazed. The finished product is then polished and glazed. The finished product is then polished and glazed. The finished product is then polished and glazed. The finished product is then polished and glazed. 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are part of the accoutrements of his textile duties. Once a wax model of its parts are complete, a wax mold is filled to their original size; the mold will become porous when the wax is melted away.

During the whole process, the artist makes use of a pan filled with water to cool and harden the wax as necessary, and of a small pot filled with molten wax for smoothing and joining. It should be noted that he does not use forms at any stage of the modeling, although a core is automatically formed when investing the wax in hollow molds.

Investing the Wax

The invention of the wax is carried out by the sculptor or an apprentice. Or by a specially hired clay worker, as was the case with the investing of a number of small and medium size wax images which I observed in one of Kulu Kun's workshops in the summer of 1978. The investing of Kulu Kun's molds by this method was carried out during four days of sunshine. This account follows a chronological sequence to give an idea of the time invested in the various operations.

5 September 1978
A paste made of fine clay (Sep, मांसोमद्रेप; Hw. 나安全保障;), water and cow dung in equal proportions is applied to all the less accessible parts of the model. Pedestalantly afterwards, a more liquid, creamy solution of the same composition is splashed and poured over and, where appropriate, piled up wax nodes or its parts (Plate 5). To improve access to the interior of a hollow model a small window may be cut in the wax and the paste pushed through to form a core. The window may be pressed before entering the outer surface with subsequent layers, or may be filled with clay and only closed with a piece of outer sheet after casting is complete. The excess creamy solution is then shaken off and the clay left to dry in the workshop for about twenty-four hours.

6 September 1978
A thick paste made of yellow clay (Sep, गुणसीम; Hw. 황화절;), water and rice bran is applied to top of the first layer. The resulting models are then put on a roof terrace to dry in the sun for a couple of days. Clay and rice bran are kept separately and mixed with water in a large clay pit as required.

8 September 1978
One or more iron nails are driven through the outer layers into the wax and the inner layers of clay to act as chapels, so that during the melting of the wax the core of hollow statues will not be displaced and thus hinder the molten metal from reaching all parts of the mould. A thicker layer of clay is subsequently pasted onto the woods, which are finally left to dry completely (Plate 6)

Removing the Wax

drawing and the subsequent operations will be described here in a time
sequence referring to the casting in copper of the images whose investment
has been described above. They took place in the small courtyard (200 on a
210 cm) and porch of Kulu Kun's old house, on the evening of 12 September,
1978. The evening was chosen because casting is obviously more bearable in
colder conditions. Kulu's son, Rajesh, directed the operations, which involved
four other workers, including his own brother-in-law, two other assistants

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Firing the mould and melting the copper

5:00 p.m. The fire in the kiln is re-established with paper, dry corn-cobs and small bits of wood and then the draught from an electric fan is directed into the door. Charcoal is added and once it is burning well the fan is switched off.

5:40 p.m. Coal is placed in the hearth of a furnace built like the stove and the kiln, from bricks and yellow clay, and located in the corner opposite the kiln. Its measurements are 76 cm x 76 cm x 66 cm. Coal is not found in Nepal (Imperial Gazetteer of India, 1901:19) and is now imported from India, but it does not appear to have been charred in the past. As a fuel it has probably replaced charcoal for casting, whereas wood is still used for firing moulds (Hoop and Charlton, 1973:59). In Tibet, coal was available in the eastern part of the country (Copper, 1851:48); Saunders, in Tunison, 1800:606; Dunbar, 1854:19). Combustion is aided by directing an electric blower into a pipe protruding 15 cm from an opening in the lower compartment of the furnace. The blower is linked to the tins with clay.

5:55 p.m. Cross-hatched crucible tongues are brought into the courtyard (Plate 10). Their length varies from 117 cm to 143 cm and their flue inside is located so as to allow the maximum gap when placing the crucible. Their ends are semi-circular so as to fit almost all the way round the crucible. Glowing coal is transferred from the furnace to the kiln in order to reach a higher firing temperature.

5:59 p.m. The coal in the furnace is burning with a flame 60 cm high, undoubtedly because of the draught from the electric blower.

6:00 p.m. The crucible containing the metal is placed directly on the coal in the furnace and a brick chimney is built around it. The chimney is one brick thick and leaves the upper portion of the crucible visible. Pieces of copper stick out of the crucible to a length of 15 cm. The crucible is not fixed in position, but rests on the coals which are continually topped up.

6:10 p.m. A convex iron lid is placed over the furnaces chamber. Charcoal is added to the receptacle of the tin and moulds are placed on it for firing. They will have to be brought to a temperature close enough to the melting point of copper (1080°C) to prevent the metal from starting to solidify before the mould is completely filled, and the mould itself from cracking.
during pouring. No thermometers or other form of temperature control or measurement is used by noisy shovellers even today.

6:17 p.m. The lid is red hot and four sheets of scrap copper hammers of equal size and weight are laid around it, leaving partly or the temporary brickwork of the chamber. More copper scraps, ronny and pitted, recovered from previous castings, are broken and cool, is spread into fragments.

6:30 p.m. The kiln receptacle is filled with cedar and a slate is put in as a roof over its three walls, while a temporary wall of bricks and clay is raised in front of it to seal off the square in a chamber. The scrap copper sheets which were being heated on the top of the furnace are harnessed while hot to a frame to fit the crucible.

6:40 p.m. The furnace lid is on red as to appear almost transparent. A large ceramic boat, measuring 30 cm in height and 82 cm in diameter, is filled with water in preparation for cooling the crucible after casting.

6:50 p.m. The position of the crucible is adjusted with a long iron bar through an opening in the temporary chamber wall, and the lid lifted. The copper in the bottom of the crucible must have started melting because the level of the red hot copper scrap visible above the rim has dropped. They are further pressed down with an iron bar. Boil copper scrap are poured into the crucible from a ladle, 9 cm in diameter and 27 cm long, provided with a wooden handle.

6:57 p.m. The crucible is red hot and more coal is added to the chamber by hand. Rear coal and scrap copper are tipped in metal buckets.

6:45 p.m. The furnace lid is lifted to add more scrap copper to the crucible. After retorting part of the temporary front wall, Ramlj puts five more moulds into the kiln chamber and adds charcoal.

6:50 p.m. The crucible is tipped again to add more bits of scrap copper.

7:00 p.m. More charcoal is added into the kiln chamber.

7:10 p.m. The crucible is tipped again to add more bits of scrap copper.

7:30 p.m. The coal chamber is tipped again. The kiln is fanned again.

7:40 p.m. A wall two bricks high is built on the ground in the porch to support the fired amorphous material.

7:45 p.m. The temporary front brick wall of the kiln chamber is dismantled and the fired clay moulds are placed on the ground leaning against the ten-layer brick wall. They are red hot and stand upright down with the opening, i.e. the neck of the tripod, pointing upwards, ready to receive the gelled molten metal.

7:50 p.m. The copper in motion and casting begins. Lajem stirs the molten copper with an iron bar to check that melting is complete before pouring it into the opening of the mould. A certain amount of spilling occurs, probably because the open glazed crucibles are difficult to handle, so precaution is taken to ensure that the air escapes from the mould. Consequently acid-castings are not rare, as I saw the following day when the tripod-shaped tuyres were seen off the bottom of the copper as castings and parts of statues.

The above time-table shows that it took one hour and fifty minutes for the copper in the crucible to melt and one hour and thirty-five minutes for the clay moulds to be fired. The copper castings are allowed to cool and harden for about fifteen to thirty minutes. The cooling is speeded by pouring cold water over the mould, which exerts huge amounts of steam. Finally the entire mould is placed in a large jug of water to complete the cooling process (Aiken and Donatelli, 1973:39).

The casting operations for copper were not very different from those for casting brass, as I had observed them in the house of the sculptor Banu Raji Delya on 12 September, 1976. Production started there at 6 a.m.

Both his kiln (71 cm x 71 cm x 120 cm) and his furnace (91 cm x 91 cm x 132 cm)
are located in the porch adjacent to the courtyard. Sami Kaji’s farm is larger than Kulu Kuma’s and has a 14 cm high x 14 cm window to admit the sunlight located 25 cm from the floor. The sculptor and his assistants were casting medium size images of pages (itak, Tibet, and a Benna style "kowii". Lotus bases, bodies and head-dresses were cast separately. The crucibles were oval and 24 cm high with a short neck near the bottom. They were completely sealed to prevent loss of fluid from the alloy. These crucibles are made by the artists themselves and, according to Krishnan (1951:31), withstand only one melting operation. After the crucibles had been sufficiently heated for the brass to melt, they were removed from the furnace and their apertures scooped with an iron rod. Brass melts at a lower temperature than copper and appears more fluid and easier to cast: the molten alloy was poured into the moulds without the spilling noticed in Rajaguri’s workshop.

After casting, Sami Kaji dropped each hot clay mold into a cast iron basin full of water, with considerable sneezing and bubbling. The molten remains in the water for a few minutes and were then taken out to be broken with an iron bar (Plate 13). The first step was to peel off the metal statues slowly and, as is to be expected with brass, Sami Kaji’s casting had a higher rate of success than Rajagur’s in copper.

Cleaning up and assembling the cast

After removing the clay from the casts, the thirty are each seen off and the statues are then cleaned and polished for hours with the help of Tiger (Plate 12), sandpaper and rags. None of the operations described above has to be performed by the artist, although most sculptors do their own casting. Finally the statues are assembled, mostly by means of clamping and riveting although in the past split pins were also occasionally used. The bones of the neck, shoulders and wing attachments of Kulu Kuma’s 46 cm high copper statue, made in c. 1971, provide a fine example of clamping combined with riveting and dovetailing. The head is held in place by fitting it between the shoulders and driving a rivet between the shoulder-blades into the neck. The neck ornaments enclose the junction and the continuation of the neck into the shoulders so that the rivet is hardly noticeable. A crack in the dovetail joining the right wing and shoulder-blade of the 46 cm high copper statue (inv. No. 529) on loan to the Victoria and Albert Museum reveals that the rivet is also provided with a tamarind nut fastened into a corresponding hole in the shoulder-blade (Plate 13). The latter type of fitting is usually used to join medium or large size figures to their base or vehicle. The bottom of the figures and their baseplates are provided with tenon with fit into corresponding sockets in the base or vehicle (Plate 14 a-d). The casting of an image in several parts has the advantage of reducing to a minimum wastage due to miscasting, besides allowing the sculptor to model wax surfaces which, being smaller, are relatively easy to handle. Newar and Tibetan sculptors adopted this technique from an early date, as may be seen from a 9th century silver and copper image of Maitreya, composed of four pieces by the lost-wax process and regarded by von Schroeder as an example of the Sino-Tibetan School of style (ibid., 1971:16-8, pl.9K).

Separate casting is favoured for both medium size and large images, but is also separately used in cast compositions such as the base, backpack, attributes or smaller statues, sometimes in different alloys or metals, according to circumstances and taste. Although specialists in Tibetan and Newar art tend to be suspicious of figures were analysis has revealed a different composition from that of the base, backpack or plate in this, it should be noted that such differences are not necessarily evidence of forgery or restoration work. Bases and backpacker may be cast, or evenhammered, several weeks after the figure to which they belong, for a number of reasons, such as division of labour, availability of metal, delays due to weather conditions, life of year (Newar metalworkers are extremely reluctant
to work during the numerous festivals of the Lunar calendar, and mica-casting. Because of the use of copper in the alloy, it is not surprising that brass castings of different parts of an image made only a few days apart in the same workshop may give significantly different results in the composition of the alloy. Furthermore, availability of metal and taste may also account for the use of different alloys for different parts of the same image, as in the case for a c. 17th century Tibetan copper image (Ma-yu) depicting an image of a horse in a brass base (British Museum: 1908-6.13; p.106, no.36) and for an 18th-19th century Japanese water jar (1972). Figure 11: The technique applies to other pieces, like a Tibetan copper stature of Shakyamuni sitting on a brass base (British Museum: 1908-6.13; p.106, no.41), the 15th century Sino-Tibetan statue of Padmasambhava illustrated in Christia's catalogue of their sale on 19 February, 1980 (p. 19, no. 79), and various other pieces. Although the possibility of later restoration work cannot be excluded as an explanation of the use of different metals in the same image, it is important to stress the role played by chance and taste in composite metal statuary from Tibet and the Himalayas. The same observations apply to original reconstruction work, where different metallurgical data from the same statue only prove that the statue has been assembled at different periods, and 'casting as a casting' can be recombined for further research and information.

With the polishing of the casting, the task of the sculptor is completed; for chasing, engraving and inlaying are carried out by the carver, who also deals with the underside of the statue with a sheet of brass copper after the completion of the image, and may inlay semi-precious stones where necessary. Although the first two operations are selective for the final appearance of a metal image, the techniques and motifs of the carver (Ragab, 1997; 11: 84-7, 96-98) are rather different from those of the sculptor, and chasing, engraving and inlaying, as well as statuesque enrichment, deserve separate treatment. Suffice it to say that the chasing gently beats the surface of the casting with the aid of a little hammer and punch, before engraving it with a hammer and chisel. Copper is soft and relatively easy to chase and engrave, whereas brass is hard and brittle, so that chasers challenge that medium with more than an average performance. Typical examples include: a Buddhist goddess statue (Victoria and Albert Museum, I.3.25-1960; no. 725 on p.106 above). Copper is also more suitable for mercury-gilding than brass, particularly the leaded brass commonly used by Nepalese metalworkers (see p. 59). The materials used for inlay work in copper are usually silver and gold, but copper is also used for inlaying brass. Gilding is seldom associated with inlay work, although I have seen one example of gold and silver inlay in a partially gilded copper statue of Dikpalas. This combination of techniques finds an antecedent in at least one example of a post-Gupta gilded metal image, whose eyes are inlaid with silver (Majumder, 1926: 425). According to Kandakia (1995: 18-29), 'the practice of decorating statues of crowned and crowned images was in semi-precious stones mostly, derived from late 12th century temples ...' and the practice of gliding Nepalese copper images is also borrowed from Pala metal sculpture, where gilded images are frequently seen. Even earlier, however, stone and 'pearls' are reported to have decorated statues in the four pavilions of a temple in the ancient capital of the Nepal Valley at the time of the Vajrayana period (see p. 80). However, the term 'gilding' is not described in detail by any of the Tibetan sources used for this introductory study. Ryp (1986:115) refers to a text of the Kabila Tashi
In the valuable Kinrara manuscripts collections of the Narayana of Nepal. This was written in Gupta character and copied in the fifth century A.D. In this tantra we find allusions to the composition of copper into gold with the aid of mercury. It is possible that mention of such a transaction in Indian and Tibetan slokas is merely descriptive of fire-gilding. Mercury is referred to in connection with copper in the Kadambapitakadha, a text which was translated and included in the Tenjuri, and is therefore older than 1530 A.D. The Thangka by Pema Karpo Phosum (1560-1646) of the Tibetan version of verses 17 and 18 concerning copper and mercury appears as a painting at fire-gilding on copper. But it is, to say the least, extremely rare. The word for "gold" does not appear once in the correspondence Tibetan verses. On p. 30 of the Thangka Naluka, a record of the materials used by artisans of the Manjha court between 1340 and 1370, at a time when copper was scarce, there is mention of an image being "decorated with Tibetan liquid gilding" (Karmy, 1972-73), which is perhaps a reference to mercury-gilding. In the Gyal Valley, mercury-gilding has been used from the 13th century (see p.38) and newer artists have always preferred this gilding technique on metal sculpture almost to the exclusion of any other, even after 1975 when electro-gilding was first introduced. The Nepalis probably derived this gilding technique from India, although few examples of gilded northern Indian statuary have survived. Magadha (1531-1738) documents that the S. of a tall standing Mahakapici from the ancient city at Kathmandu (Baga District, Kangrei) was Mercury-gilded. However, he recommends himself in regarding the image itself as "not earlier than the 17th period" (Karmy, 1972-73). This may indicate a shift to the Gota period (1542-76). S.K. Sarawali, who owned the piece, calls it "the best-looking and most gilded" (Sarawali, 1971-72), by which he means to have understood fire-gilding. He describes its time gilding, as "now that an egg shell" was used, in explanation, brief quotes in an account of contemporary Nepal fire-gilding (Sarawali, 1971-72). Antiquities (1957) at Kathmandu indicate that the site continued to flourish after the Gota period and, since very few surviving metal images can be unquestionably given a Gota date, it may be safer to assign the statue to the post-Gota period. This view finds support in Bolt (1948) and Aker (1936). Although the method of fire-gilding became very popular in the Gyal Valley for the gilding of cast or repoussé Buddhist and Hindu india images (Bolt, 1948-1949), there is no evidence that all copper statues from Nepal been gilded or were meant to be gilded. Form-gilding appears in Nepali statuary from at least the 18th century, and it looks as if aesthetic reasons rather than an economy motive, as the bulk of the image often retained its original polished (Khandekar, 1961-1965). A 15th century stupa gilded image of a metal statue preserved in a twentieth century, the front of the statue, with the exception of the hair, was distinctly gilded and polished. Sometimes the main figure was gilded and the accessories left ungilded, which is to say that the image was polished and repolished in subsequent centuries. The statue and all its parts were cast in bronze (Bolt, 1948-1949, no. 117). Examples of mercury-gilded brass from an early period are less common but brass was being cast in Nepali statuary from the 13th-14th century (since 1959, gilding for aesthetic purposes has occasionally been carried out on copper statues made for the Western and Tibetan market). This was also a common practice among the older Buddhists and Sikhs of Tibet and Sino-Tibetan regions and was followed in Nepal. The technique of gilding was also adopted by both the front and back of a figure, with the inclusion of hair, were gilded, and the garments, if parts of them, were less gilded, or else were applied to both the front and back of a body. Garlands, decorations and other objects meant for Tibetan customers. 51
Never attempt to wash away the difficulty of fire-gilding bronze and of the impossibility of fire-gilding ledges bronze (参阅[24]), but it is uncommon how far they were acquainted with the process from an early period. Tibetans probably learned from there, as is suggested by a fire-gilded bronze statue dated to c. 1500 (Ulim 1979:100 and 193, no. 107). The alloy of that image contains only 0.16% lead and 0.42% silver, the percentage of these two elements probably having been kept low in order to avoid any adverse behavior of the alloy when exposed to heat during the fire-gilding process.

Cold gilding is mentioned by Padma-dkar-po as being used to gild the statues of Tibetan kings during a period corresponding to the 18th century (Padma-dkar-po, 1971, II:301,1). Cold gilding may be done by the application of gold leaf to the surface of the statue, either by brushing it on, or by using an adhesive. It seems, however, that the most common technique for cold-gilding statues is painting. Traditionally, gold paint is prepared by mixing ready-made lenta-yang drops of gold dust with gum. The exact method of preparation of these drops is still a secret known only to the makers, and in Tibet only a few Newar goldsmiths residing in Lhasa possess the technique, the names of their establishments being "well known to the painters of Central Tibet" (Zenkoff, 1970:332). However, one way of making finely powdered gold is by cutting sheets of gold leaf into small ribbon-like strips, mixing them with powdered stone and glass and grinding them with a little water (Zagag, 1971, I:45).

Cold gilding is particularly suitable for statues made of materials other than metal, and the 18th century clay groups of Srong-btsan-sgam-po and his two wives preserved in the temples (Smallgrove and Richardson, 1986: 154; Stein, 1956:287 and pl. opp. p. 200) and the Jo-khang (15c and 16c; [1951] 110 and 117-9) are certainly gilded by that technique. Gold paint is still used by Tibetan and Newar artists to give the faces and necks of Tibetan images their characteristic matt golden colour. This practice is very common in Tibet of metal statues, whether fire-gilded or not, and in the former case the gold paint is applied over the mercury-gilded surface of the face.

Finally, mention should be made of the use of gold as an offering in the alloy of statues of metals, as is revealed by Newarian copper and bronze images with a gold percentage higher than about 0.51%, although Werner suggests a lower limit of 0.25% (Werner, 1972:166, table 9.6, no. 197, 173 and 189). The 25 or high bronze statues of Sangen-put (Werner, 1972:166, no. 173 and no. 240; 1972:166, no. 87) has a gold content of C.1, although it is not clear whether the result of the analysis may have been biased by the fact that the main user of the alloy was its backplate and base, and that only 0.12% and 0.008% of gold in the alloy. However, the detection of pieces of gold leaf beneath the surface of various bronze statues at Sanga (Smallgrove and Richardson, 1986: 154) by means of an infra-red viewer, suggests that gold may have been similarly added to statues made for purely religious reasons. It is possible that this circumstance contributed to the creation of the myth of the "octo-alloy" (see above, p. 33).

The surfaces of ungilded copper images made nowadays by Newar sculptors are often finished by scoring them with mustard seed oil or even sand polish in order to give them a patina. The use of this is not necessary to make them look antique. The technique of waxing metal images is very ancient in Tibet and may be due to aesthetic reasons or to the realization that it was a good method of preventing oxidation. The fire-gilded images made at the time of King Srong-btsan-sgam-po were described by A. R. (Padma-dkar-po, 1972:1, 197, 199) in a term translated by Tucci (1958:165) as "metal or gossy material". Similarly, the statues made during the reign of Chetsün-1se-brtan were "waxed with alo rtsi" (Padma-dkar-po, 1972:1, 301,11; and Newar statues made during the Ming dynasty were actually waxed with sho rtsi) (Padma-dkar-po, 1972:1, 304,1,5). This literally means
"nudas version", although Lucas (1968:196-7) translated the corresponding expression from his anonymous manuscript as "red".

Antiquing

The antiquing of images in the Nepalese Valley started in the nineteenth century as a result of the growing demand for Tibetan and Mesoamerican images in the western art market, and it is now carried out by a few specialists in Pottan and Khamdo. The artificial aging of works of art is forbidden in Nepal and this makes it very difficult for the researcher to get in touch with professional forgers who, in any case, are not ready to disclose their trade secrets. Some artists, like Kala Rupa, can work larger in order to avoid trouble with the Department of Antiquities of Nepal, which issues the permits and bills necessary for the legal export of all works of art. The export of such works over one hundred years old being now forbidden, however, this does not prevent some Western dealers from having artificially aged a large number of the statues bought from modern artists. Various methods of antiquing have evolved during the last two decades. In the nineteenth century, dealers were generally happy with discoloring stone images by heating them at a high temperature, thus blackening a black stain on the metal surface. In the 1970s and 1980s, small heating of oil lamps, but it is doubtful whether such a method was ever popular, for the most would come off the stone surface easily and gain the touch of any potential customer, thus defeating the purpose. I understand, however, that a chemical method was used to age paintings. Occasionally oxidation is induced by burning the statue with acids and labo-
rifics (1973:120) says that some statues were smeared with a mixture of lemon and salt and kept in a damp place surrounded by cloth for a period varying from six to twelve months. She also mentions another method, consisting of smearing the statue with liquid mercury, ashes, salt and cow-dung and burying it in the ground for a year, in order to obtain a corroded surface. However, such relatively primitive methods of oxidation are now seldom used, perhaps because collectors have realized that ancient works and Tibetan metal images are never damaged from archaeological sites, but those from temples and shrines where they are reasonably well protected and corrosion is minimal.

A green patina on a lama's statue is almost certainly the result of i.d.遭 (1961: 194-39).

During my first visit to the Nepalese Valley in the nineteenth century, I made several cautious attempts to get in touch with professional forgers, but only managed to create suspicion and fear amongst my informants. Although antiquing methods vary, they can be reduced to two basic techniques: rubbing and heating with a chemical agent. Rubbing is carried out for many days with clothes which may be made from any kinds of material, including silk and

The meaning of certain related images varies with the nature of the image in question (e.g., a lama's face), but it is generally agreed that they destroy the glazing, but give the effect of mild corrosion which successfully dupes many buyers of Tibetan and Mesoamerican images. Finally, some and other ritual substances may be smeared on the forehead or under the sacred part of the statue to impart the look of "authenticity" to the image. As if it had just been sanctified from the other side. In some cases forgeries are left incomplete or simulate loss due to age. The most sophisticated methods of antiquing are used for statues with especially complex expressions and Depictions by Western dealers, in the understanding that no other images will be produced from the same clay. A method introduced in the 1950s to one or two images is obviously more expensive and I understand that the professional artificial aging of a statue may cost up to 100 U.S. dollars, but the investment must be worthwhile for some dealers are ready to pay.

Western collectors are usually particularly sensitive of black or brown encrusted "Tibetan" metal images, for anyone who is familiar with the way
they are kept ought to be aware of the generally good state of preservation of their surface. Tibetans have a less physical contact with their images than Hindus and thus regard the direct application of offerings to their surface as not very evil of sacrilege. A good example of the contrasting Tibetan and Newar attitudes toward Buddhist images kept in Tibetan monasteries of the Nepal Valley is provided by Rama Singh Lama's 360 cm high fire-gilded copper repoussé spha-nyo-thob-ge (plate 16) which in about 1975 had to be protected by glass panels from the offerings thrown at it by Newar devotees. Other climatic conditions in Tibet, where precipitation is generally less than 25 cm per year, also contribute to the better preservation of metal images more than in the case in the Nepal Valley, where they are exposed to the intense dampness of the monsoon. From July to September the Valley receives most of the annual rainfall of 127 cm to 140 cm. Thus, as a rule, Tibetan antiques are in a better state of preservation than forgers would have to believe.

The process of establishing whether Newar metal images are ancient or modern is sometimes difficult. Newar statues are quickly worn by worshiping and the organic rite substances deposited on them do not provide a clue to dating by chemical or carbon-14 analysis because their application is perfectly compatible with contemporary worship. Furthermore, it is doubtful whether antiques gilded images will retain sufficient traces of specimen chilung on their surface to be detected by chemical analysis. It is likely that the considerable demand for Himalayan antiques will lead to the perfecting of artificial aging methods, particularly as far as Newar statuary is concerned, and especially where those methods are encouraged and supervised, if not actually practiced, by Western dealers.

Conclusions

Apart from the methods of forgers, it appears that very few technological innovations have occurred in the statuary techniques used by Tibetan and Himalayan sculptors to this day. They still manufacture their own modelling tools and they model clay and wax in a traditional manner. Their investment techniques find a parallel in the use of different grades of clay as described in various Indian texts (Beaver, 1965:181), including the Bhagavata Purana. Apart from the use of coal, the only improvement made in firing the molds and melting the metal is the modern use of electric fans and blowers by some sculptors, instead of hand-operated bellows. No innovation has been applied to the seemingly difficult problem of controlling the temperature of the clay mold before pouring the molten metal onto it. Artisans obviously feel confident enough to rely exclusively on their own experience.

Casting of separate parts of the same statue is not a novelty, as is shown by the instance of the Saktakali Durga. Occasionally golden size statues, whether hollow or solid, may still be cast in one piece (Allop and Chetcuti, 1973:30). A few minor changes have occurred in the fitting techniques: terrons tend to be bigger than in the past and can no longer be bent, and application is no longer used. However, examples of un-secured base in ancient productions are not rare. Sealing and silver soldering are nowadays used to repair sitesix-separations and both techniques appear to have been introduced in Newar statuary after 1975. However, chasing, engraving, filigree and inlaying are still carried out with the traditional techniques, and it may be concluded that Himalayan metal statuary has undergone few technical changes since it was introduced into Tibet from India and Nepal and that it is still practiced by ancient methods by Newar sculptors in Phan.
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MAṆIṆIṆRĪ

Western Tibet, 11th-12th century

*By the courtesy of the Trustees of the British Museum*
MATTEYA (♀)
18th-19th century A.D. Brass with red pigment on lips; imitation gold paint on front of figure. Ht 4.6 cm. O.A. 1924.6-20.10.

By the courtesy of the Trustees of the British Museum
TĀRA
Nepal, A.D. 1076. Brass. Modelled by Bahab Kaji Yajunanaya; engraved by Rukra Bahasur Sakya HL. 16.6 cm Victoria and Albert Museum 18.21.1868

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