CASTING OF DEVOTIONAL IMAGES IN THE NÉGLAYA 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 (1962:29), the earliest literary evidence for the process is the description contained in the Mahabodhi-jāla, as recorded in chapter 68 of the Abhandhāna, which is believed to have been compiled in the Gupta period (Shah, 1998, 11:190). Unfortunately, surviving cast-metal statuary from this period is rare, and Bhattacharya (1979:22) suggests that the extensive use of metal for sculpture in northern India may not have been earlier than the later Gupta period. From the late medieval period (7th to 12th century AD), more texts are found containing references to metal-casting techniques. Of particular importance is the Vīrabhairava-tānga-pūrṇa (11:3-4), which mentions both hollow- and solid-casting by the cire-perdue method (Reeves 1962:32). This text is well-known in Nepal (Par, 1970:2; 1461, 1905, 171:133). However, the best medieval description which gives detailed instructions as contained in the Abhandhāna is known as the Abhandhāna (also known as Abhandhāna or Abhandhāna) which was written in c. AD 1113 by King Jayadeva Indrakumara of the late Chakya dynasty of the Deccan (Bharadwaj, 1959:120; Reeves, 1961:32; Ram, 1974:2-1:2). The verses on the lost-wax process, as translated by Saraswati (1956:143), also specify that the ratio of bronze and copper to wax should be 60:1 (or, according to a variant reading, 61). By this time, hollow-casting had reached a degree of perfection which enabled artists to attempt very large images, for which the cire-perdue technique is generally preferred. The large (5.25 m high; 8 m long) copper Buddha (in the Birmingham City Museum) was cast in more than one piece by the hollow-casting method and it is very likely that the 1.66 m high Severo bronze bust (in the Museum, Kashi) was cast by the same method.

The History of Buddhism in India, written in AD 1560 by the Tibetan scholar Tenkha (1560) states that during Devakāla’s rule (c. AD 801-814) the work of two outstanding Bengal sculptors and architects, father and son named Shândak and Sítado respectively, gave rise to new schools of painting and metal statuary (Chattopadhyay, 1975:348). Reeves (1962:23) suggests that the resultant widespread use of the cire-perdue process was to influence the manufacture of copper images in Nepal and Tibet by the turn of the 10th century AD, particularly with respect to copper bell images which are still produced today. As in the past (Khandelwal, 1950:22), both solid- and hollow lost-wax casting methods are still used by Nepāl sculptors, the former for medium-sized bell (5-6 cm to 45 cm) images, the latter for small (1-3 cm) bells and sometimes medium-size images. The use of these two methods overlap for medium-size images ranging from 90 to 45 cm. There is no evidence to support Dagnan’s claim that in Tibet permanent moulds for sand-casting were more widely used than the method of cire-perdue casting (Dagnan, 1977:1:50). Range (1990:28) also appears to overlook the use of the lost-wax process in Tibetan statuary. In Tibet bells as well as images were made by the sand-casting method which requires the mould to be destroyed after casting. However, Par (1961) accepts that the "cowbells in Tibet were usually cast by the cire-perdue method". A careful visual examination by Sgredma (personal communication) of the 521 objects of flash lines, failed to show any evidence especially on the undercuts 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 Jñānabhadra at the Kumb Dzechet in Pāli (M.4.3506). This statue was hollow cast in bronze (1.7% zinc and 1% lead) by the lost-wax process, as shown by radiography which

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revealed the presence of a core held together by a metal armature (hours. 1900:36-58). This image, attributed to Pasi (1986:22, figure 8) to the 11th-13th century and regarded by Nagula (1977:98) as a copy of an 11th century Pashmiri "original", appears to provide the earliest evidence for the introduction of the lost-wax process into western Tibet.

The continuous presence of Newar sculptors in Tibet is attested in Poto and western sources from the 7th (Murru and Turushkia; 1972:143; Dagar, 1977:1:93) to the 20th century (But, 1924: 11:244; Pata: 1978:196 and 103-7). The career of Anjou, a Newar artist who was sent to Tibet as the head of a team of eighty artists in AD 1060 (Siu, 1905: 111:187; Patach, 1980:59; but see Pari: and others who give the figure twenty-four, probably mistranslating Siu's French "groupe de tailleurs") is only one example. Anjou was subsequently invited to the Nepalese court in China, where he was put in charge of the imperial metalwork, and received posthumous honours. Reesaw and copper are listed by the Kumbai in the 11th century (p.35) among the materials used by Anjou (Kavacs, 1975:23). For every subsequent century, the presence of Newar sculptors is documented in various parts of Tibet. Newar communities existed at Jassa, Shigatse, Guant, Shaka and Utsa. During the early 17th century in particular, their activities extended from Urga (Urga, 1906:167; see Legé, 1905:1:79-80) to Bhutan (Account, 1977:245-6), which is still supplied by the Newar metal sculptors of Bhutan.

The number of Nepalese metal images in Tibetan temples and Newar sculptures have also been active producing statues in Tibetan style (Lo, 1979 and 1981). Even as, however, no historical evidence that Tibet and Newar sculptors ever worked in Nepal. Furthermore, the current absence of local lost-wax statues in Nepal (most of the images are said to be of Indian of Nepalese origin) suggests that Tibetan lost-wax metal statues depended heavily upon Newar sculptors well into the 20th century (Lo, 1979 and 1981). For these reasons, and in the absence of living Tibetan lost-wax metal sculptors to act as informants, I have thought it acceptable to base my following sections on fieldwork which I carried out in 1977 and 1978 among Newar sculptors working in Tibet and Nepal. A pioneering study by M. De Labbe (the Anthony Alice) on lost-wax metal casting in the workshop of Jagat Man Anjou in Onu (Bhutan, Bhutan, 1975:197) was published in Kathmandu in 1975. Anthropology by Alex and Cusack was published in Contributions to Nepalese 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 will be supplemented by those 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 Nepalese Valley. The light "wax" was made with a mixture of 50% bees- wax, bought from Thapaha in the hills surrounding the Nepalese Valley, and 50% soda, a white resin imported from India. Reesaw (1901:105) states that peroxide of soda was introduced in the late 19th century and used at the workshops of the Kumbai and the Kumbai, but with the introduction of the "wax" was not used at the workshop of one (1021 = 216 commas). One (214 = 31:603 gms. Nagula, 1980:21) of
manner. 1.5 to 2 pia (27 to 36 times) of sja and about 0.5 pia (9 times) of vegetable glue extracted from the seeds of the tree, Mucuna bryaza (Krause). The glue is discarded if the mixture is not homogenous after 24 hours and the mixture is not clear. The glue is then used in the next step of the process.

The next step is to mix the glue with the vegetable fibers to form a pulp. This pulp is then mixed with the vegetable fibers to form a paste that is then molded into the desired shape. The paste is then dried and fired to create the final product.

Although apprentices may be involved in all modeling operations connected to the final product, the actual making of the tool is left to the sculptor alone. Finally, the worked and polished teeth are assembled in the desired way, the backsaw of a block stone obtained from Tibet, carved in low relief with the "fossil" mounts of a number of religious attributes and ornaments which
are part of the accouterments of his textile duties. Once a wax model of its parts are complete, a wax thread is lifted to their utmost edge, ice rods will become sprues when the wax is melted away.

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

Investing the wax

The investment of the wax is carried out by the sculptor or an apprentice. 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 Kaly Kuma's workshops in the summer of 1978. The investment of Kaly Kuma's models by this artist was carried out during four days of workable. This account follows a chronological sequence to give an idea of the time involved in the various operations.

5 September 1978

A paste made of fine clay (Sep. mahīnā mēra; Bih. mūjān chāl), water and cow dung in equal proportions is applied to all the less accessible parts of the model. Immediately afterwards, a more liquid, creamy solution of the same composition is splashed and poured over and, where appropriate, inside the wax model or its parts (Plate 5). To improve access to the interior of a hollow model a small window may be cut in the wax until the paste pushed through to form a core. The window may be exploited before entering the outer surface with subsequent layers, or may be filled with clay and only closed with a piece of paper 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. gōhēnī mēra; Bih. mek chāl), water and rice stumps is applied on 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 stumps are kept separately and mixed with water in a large clay pot 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 chapel, so that during the melting of the wax the core of hollow models will not be displaced and thus hinder the molten metal from reaching all parts of the mould. A thinnest layer of thick clay paste is subsequently placed over the moulds, 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 or 310 m²) and porch of Kaly Kuma's old house, on the evening of 12 September, 1978. The evening was chosen because casting is obviously more bearable in cooler conditions. Kaly's son, Rajesh, directed the operations, which involved four other workers, including his own brother-in-law, two other inhabitants
Firing the mould and melting the copper

5.00 p.m. The fire in the kilm is retracted with paper, dry corn cobbs and sawdust, and the smoke from the waste products from the electric fans is directed into the door. Charcoal is added and once it is burning well the fan is switched off.

5.05 p.m. Coal is placed in the hearth of a furnace built like the stove and the kilm is fired with charcoal and yellow clay, and located in the corner opposite the kilm. The dimensions of the kilm are 75 cm x 75 cm x 55 cm. Coal is not used in Nepal. (Imperial Sugar Beet, 1994:19) and is now imported from India, but it does not appear to have been heated in the past. As a fuel it has probably replaced charcoal for casting, whereas wood is still used for firing moulds. (Duncan 1964:19). In Tai, coal was available in the eastern part of the country (Duncan 1964:19). In Tai, coal was available in the eastern part of the country (Duncan 1964:19). 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 inserted in the pipe with clay.

5.55 p.m. Cross-shaped crucible holes are cut into the kilm in the courtyard (place 10). Their length varies from 117 cm to 142 cm and their diameter is located so as to allow the maximum grip when holding the crucible. Copper is placed in crucible with a non-floating temperature. The crucible containing the metal is placed directly on the coal in the furnace and a brick chamber is built around the crucible.

6.00 p.m. The crucible containing the metal is placed directly on the coal in the furnace and a brick chamber is built around it. The crucible is one brick thick and has a maximum of 100 cm long. 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 coal which is continually topped up.

6.10 p.m. A convex iron lid is placed over the furnace chamber. Charcoal is added to the recompact and moulds are placed on it for firing. They will have to be covered in a temperature close enough to the melting point of copper (1085°C) to prevent the fumes from starting to solidify before the mould is completely filled, and the mould itself from cracking.

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during pouring. No thermometer or other form of temperature control or measurement is used by wary wikilizers even today.

6:12 a.m. Blue flames 15 on long spigot horizontal from beneath the furnace lid.

6:17 a.m. The lid is red hot and four sheets of scrap copper hammered to equal size are put around it, leaving partly the temporary brickwork of the chamber. More copper scrap, mostly sulfur recovered from previous castings, are beaten, and coal is heaped into fragments.

6:20 p.m. The kiln receptacle is filled with coal and a slate is put 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 equino in a chamber. The scrap copper sheets which were being heated on the top of the furnace are heaped while hot to a size to fit the crucible.

6:20 p.m. The furnace lid is on red as to appear almost transparent. A large ceramic bowl, measuring 30 cm in height and 51 cm in diameter, is filled with water in preparation for cooling the molten after casting.

6:30 p.m. The position of the crucible is adjusted with a long 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 crucible visible above the rim has dropped. They are further pressed down with an iron bar. Small copper scrap are poured into the crucible from a ladle, 9 cm in diameter and 27 cm in length, provided with a wooden handle.

6:37 p.m. The crucible is red hot and more coal is added to the chamber by hand. Both reel and scrap copper are topped by large hoppers.

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

6:50 p.m. The bricks are put back and the flames in the kiln chamber are formed with a piece of straw seating.

7:10 p.m. The furnace lid is lifted again to add more bits of scrap copper.

7:30 p.m. More charcoal is added to the kiln chamber.

7:35 p.m. The coal level in the furnace chamber is topped up. 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 articles during casting.

7:45 p.m. The temporarily front brick wall of the kiln chamber is dismantled and the first clay models are placed on the ground, leaning against the brick wall. They are red hot and stand upright with the opening l.e., the end of the tripod pointing upwards, ready to receive the molten metal.

7:50 p.m. The copper in molten and casting begins. Lajah removes the molten copper on an iron bar to check that melting is complete before pouring it into the opening of the mold. A certain amount of spilling usually, probably because the open glazed crucibles are difficult to handle, so precision is needed to ensure that the air escapes from the smolde. Consequently air-castings are not rare, as I saw the following day when the tripod-shaped sprues were taken off the bottom of the copper teapot and part of the statues.

The above 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 molds 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 smolde, which enables bags amount of stone. Finally the entire mold is placed in a large jar of water to complete the cooling process" (Alone and Chakravarti, 1973:39).

The casting operations for copper are not very different from those for casting brass, as I had observed them in the house of the sculptor bunu Raja sappy on 12 September, 1978. Production started there at 3 a.m.

Both his kiln (71 cm x 71 cm x 120 cm) and his furnace (61 cm x 91 cm x 132 cm)
are located in the porch adjacent to the courtyard, Senu Kaji’s farm-house larger than Kulu Kona’s and has a 14 cm window to admit the light located 25 cm from the floor. The sculptor and his assistants were casting medium size images of Rajarajé, Balakas and a Burmese style Bajahari. Lotus bases, boots and head-dresses were cast separately. The crucibles were oval and 24 cm high with a short spout near the bottom. They were completely sealed to prevent loss of alloy from the alloy. These crucibles are many by the artists themselves and, according to Krishnan (1976:3), 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 pierced with an iron rod. Brass melts at a lower temperature than copper and appears more fluid and easier to cast. The melted alloy was poured into the moulds without the spilling noticed in Rajagrih’s workshop.

After casting, Senu Kaji dropped each hot clay mould into a closed basket full of water, with considerable simmering and bubbling. The mould remained in the water for a few minutes and were then taken out to be broken with an iron bar (Plate 1A). The first layer came off the metal statues easily and, as is to be expected with brass, Senu Kaji’s casting had a higher rate of corrosion than Rajagrih’s in copper.

Cleaning up and assembling the cast

After removing the clay from the casts, the surfaces are even off and the statues are then cleaned and polished for hours with the help of files (Plate 1B), sandpaper and rasps. 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 cropping and riveting although in the past split pins were also occasionally used. The back of the neck, shoulders and wing attachments of Kulu Kona’s 41 on high copper Ganga, dated 10 C. 1971, provide a good example of cropping combined with riveting and dowelling. The head is held in place by fitting it between the shoulders and driving a rivet between the shoulder-blade into the neck. The neck ornaments conceal the joint and the continuation of the neck into the shoulders so that the rivet is hardly noticeable. A crack in the dome-tail joining the right wing and shoulder-blade of the Anjan Collection Ganga (inv. No. 1979) on loan to the Victoria and Albert Museum reveals that the wing is also provided with a base fastened into a corresponding hole in the shoulder-blade (Plate 13). The latter type of fitting is always used to join medium or large size figures to their base or vehicle. The bottom of the figure and their backplates are provided with barbs with fatal protruding somewhat in front or vehicle (Plate 14 a-e).

The casting of an image in several parts has the advantage of reducing to a minimum casting defects due to cold-casting. Besides allowing the sculptor to model was possible which, being smaller, are relatively easy to handle. Newar and Tibetan sculptors adopted this technique from an essay date, as may be seen from a 13th century gilt and copper image of Kalidasa, re-cut into four pieces by the last-mentioned period and regarded by von Scherer as an example of the new-Rajak school of style (1974:168-9, no.8). Separate casting is favoured for both medium and larger images, but is also extensively used in cast components such as the base, backplates and attributes of smaller statues, sometimes in different alloys or metals, according to circumstances and taste. Although specialists in Tibetan and Kajai- yan art tend to be cautious of figures where analysis has revealed a different composition from that of the base, backplate or halo, it should be noted that such differences are not necessarily evidence of forgery or restoration work. Bases and backplate may be cast, or even hammered, 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, lack of year (Newar metalworkers are extremely reluctant
to work during the numerous festivals of the lunar calendar, and mico-casting.

Because of the use of scrap 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 17th century Tibetan copper image of Maitreya-famed as dancing on a brass base (British Museum: 1905.5-19.11, p.105, no.38) and for the 18th-19th century sedanpers (Wenner, 1972: Plate 1); the alloy used applies to other pieces, like a Tibetan copper statue of Sakyamuni sitting on a brass base (British Museum: 1885.120, p.101, no.61), the 15th century Ta on high Tibetan statue of Padmasambhava illustrated in Christie’s catalogue of their sale on 19 February, 1980 (p.19, no.70), 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 statutory from Tibet and the Himalayas. The same observations apply to original restoration work, where different metallurgical data from the same statue only prove that time has elapsed between the first and second casting, but cannot quantify when in terms of days or centuries, unless other evidence is available.

With the polishing of the casting, the task of the sculptor is completed; for chasing, engraving and inlaying are carried out by the ‘chaser’, who also seals the underside of the statue with a sheet of brass solder after the completion of the image, and may inlay semi-precious stones where necessary. Although the first two operations are exclusive for the first appearance of a metal image, the technique and tools of the chaser (Segal, 1977, Il. 51-52, 71a, 65-69 and 79) are rather different from those of the sculptor, and chasing, engraving and inlaying, as well as statuary rehousing, deserve separate treatment. Suffice it to say that the chaser 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 and few chasing challenges that metal with more than an average performance, though such was the case for a brass Taotao (Victoria and Albert Museum, 1.2.21-1900; no.121 in p.109 below). Copper is also more suitable for mercury-gilding than brass, particularly the leaded brass commonly used by Newar metalworkers (see p.59). The materials used for inlay work in copper are usually silver and gold, but copper is 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 Ol Roman. This combination of techniques finds no antecedent in at least one sample of a post-Gotama gilded metal image, whose eyes are inlaid with silver (Wajnord, 1926:425). According to Khandalavala (1950: 24-25), ‘the practice in Nepal of setting precious and crowns of images with semi-precious stones... derived from late 7th century art... ’. The practice of gilding Nepalese copper images is also borrowed from Pala metal sculpture with gilded images are frequently found in, for instance, bronze ‘statues of Maitreya and pear’ at the ancient capital of the Kicking Valley at the site of Tazes in the alpine Mi-fan-tea in AD 6478 and 977 (Lévi, 1905, p.157 and 159 and Il.164-5). Tibetans traditionally prefer turquoise and coral for inlaying their metal images.

Gilding

Fire-gilding or mercury-gilding, that is gilding by means of a mixture of mercury and gold, is mentioned by Padma-sambay as being used in Tibet from the 7th century (see p.58). However, textual references are also mentioned. The technique is not described in detail by any of the Tibetan sources used for this introductory study, Rgy (1986:115) refers to a text of the Kagyu Tengpa
"In the valuable Khotanese collections of the Museum of Nepal, this was written in Gupta script and dating about the 6th century AD. In this tantra, we find allusions to the transmission of copper into gold with the aid of mercury. It is peculiar that mention of such a transmission in Indian and Tibetan alchemical literature is merely descriptive of fire-gilding. Mercury is referred to in connection with copper in the Mahabodhi Buddha, a text which was translated and included in the Tengyur, and is therefore earlier (20th CE, 133). The Tengyur by Khari Kalzé Rinpoche (Tan., 1950; 499) of the Tibetan version of verses 17 and 18 concerning copper and mercury interprets it as fire-gilding on copper, but it is to say the least, extremely free. The word for 'gold' does not appear once in the corresponding Tibetan verses. On p. 30 of the Tengyur, Kalzé cites the materials used by artists of the Mongol court between 1280 and 1320 at a time when silver was scarce there, which is made of an image being 'adorned with Tibetan liquid gilding' (Karmay, 1972:23), which is perhaps a reference to mercury-gilding. In the Nepal Valley, mercury-gilding has been used from the 14th century (see p.28) and Nepalese artists have always preferred this gilding technique to metal statuary, to the exclusion of any other, even after 1597 when electro-gilding was first introduced. The Nepalese probably derived this gilding technique from India, although few examples of gilded northern Indian statuary have survived. Mayrayer (1964:427) assumes that "the sacred standing Buddhas from the ancient city at Mathurā (Bagra District, Mathurā District) was mercury-gilded. However, he contradicts himself in regarding the image first as "not earlier than the 13th-15th century" (Kajawat, 1950:403), then assigning it to the Gupta period (13th-15th). S.K. Sircar, who knew the piece well, called it "of definitely Gupta workmanship" and "gold-gilded" (Sircar, 1952:36), by which he seems to have understood singsing. He describes its "heavy gilding, heavier than an egg shell," and, in explanation, briefly quotes on an account of contemporary copper-gilding (Sircar, 1961:20). Antiquaries living at Mathurā declared that the city continued to flourish after the Gupta period and, since very few surviving metal images can be unquestionably given a Gupta date, it may be safer to assign the statue to the post-Gupta period. This view finds support in Boal (1954) and other (1960:62).

Although the method of fire-gilding became very popular in the Nepal Valley for the gilding of cast or enameled Buddhist and Hindu copper images (Boal, 1954:132), there is no evidence that most copper statues from Nepal were gilded or were ever supposed to be gilded. Even gilding appears in Nepalese statuary little at least the 17th century. As far as we can see from the aesthetic response of the gilding, the backs of the images are full of gilded and ungilded sections, as the back of the image often retained ungilded (Ehrenberg, 1924, 1925:21) and was painted realistic. This kind of pan-red-gilding was very common in Nepal in subsequent centuries. The front of the statues, with the exception of the hair, was almost always gilded and polished. Sometimes the main figure was gilded and its accessories left ungilded, wildschmitt (1965: 320) and Werner (1970:21). Figure 27 illustrate an 18th-century gilded image of Padmapani seated on an unadorned throne with an ungilded ceremonial throne and canopy. This statue and all its parts were cast in bronze (Werner, 1970:55-5, no. 1.3 a)). Examples of mercury-gilded bronze from the early period are very common, but brass were being used in Nepal statuary from the 20th-11th century (since 1959), pan-red-gilding for aesthetic purposes have occasionally been carried out on copper statues from the Western and Tibetan regions. This was also a common practice in southern India and Sino-Tibetan brass bhumya statues from the 15th century onwards. Usually the hair was cast and mingled parts of a figure, such as the exception of the hair, were gilded, and the garments, at parts of them, were left ungilded, as was done for copper. This was then applied to both the front and back of the statue. Pan-red-gilding has also been used on repoussé wall work from at least the 15th century and in still very common, particularly on decorative and ritual objects meant for Tibetan customers."

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Never art have more drawbacks of the difficulty of fire-gilding brass and of the impossibility of fire-gilding leaded brass. But it is uncertain how far they were acquainted with the problem from an early period. Tibetans probably learned from the Chinese, as is suggested by a fire-gilded brass shadow-cast dated to c. 1500 (Wu, 1979:180 and 193, no. 107). The alloy of that image contains only 0.18% lead and 0.04% zinc, the percentage of these two elements probably having been kept low in order to avoid any adverse behaviour of the alloy when exposed to heat during the fire-gilding process.

Cold gilding is mentioned by Padma-drup-po as being used to gild the statues of Tibetan kings during a period corresponding to the 6th century (Fademkar-po, 1973, 1:301,1.3). 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 lentil-shaped drops of gold dust with glue. The exact method of preparation of these drops is still a secret known only to the masters, and in Tibet only a few gilders know making these possessed the technique, the names of their establishments being "well known to the painters of Central Tibet" (Zenkau, 1976:322). However, one way of mixing finely powdered gold is by cutting sheets of gold leaf into small ribbon-like strips, mixing these with powdered stone and glass and grinding them with a little water (Geoghe, 1977,1:45).

Cold gilding is particularly suitable for statues made of materials other than metal, and the 6th century clay groups of Shro-Tsang-ge-lha-po and his two wives preserved in the Tashilhunpo (Leigh and Richardson, 1968: 134; Stein, 1906:47 and pl. opp. p. 267) and the Je-khang (Iid and Vemisti) (1987:110 and 177-9) are certainly gilded by this technique. Gold paint is still used by Tibetan and Bhutanese to give the faces and necks of Tibetan images their characteristically matte golden colour. This practice is very common in Tibetan metal statuary, 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, as is revealed by海淀an copper and brass images with a gold percentage higher than about 0.75%, although Werner suggests a lower limit of 0.05% (Werner, 1977:165-6, table 9.6, nos. 197, 173 and 200). The 25 or more bronze statues of Padma-drup-po (Werner, 1972:166.5, no. 173) and six (no. 6) has a gold content of 1.1%, although it is not clear whether the result of the analysis may have been falsified by the fact that the main image is actually gilt, but none of its backplate and base have only 0.01% and 0.004% of gold in the alloy. However, the detection of pieces of gold leaf beneath the surface of a few 5th-10th century images,照片 by means of an infra-red viewer, suggests that gold may have been similarly added to statuary metal 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 unalloyed copper images made nowadays by newer sculptors are often finished by smearing them with mustard seed oil or even some polish in order to give them a patina. The sin of this is not necessarily to make them look antique. The tradition of using 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 Shro-Tsang-ge-lha-po were covered with amy rtsis (for the paper) (Padma-drup-po, 1973, 1:300,1.6) a term translated by Tucci (1938:116) as "resin or greasy material". Similarly, the statues made during the reign of King Srong-lde-rtsom "were smeared with amy rtsis" (Padma-drup-po, 1973, 1:300,1.5). This literally means
"corroded" version, although Lucis (1969:156-7) translated the corresponding expression from his Mongol manuscript as "red*. Antiquing
The antiquing of images in the Nepalese Valley started in the ninetwomodernities as a result of the growing demand for Tibetan and Nepalese antiques in the western art market, and it is now carried out by a few specialists in Nepal and Kathmandu. The artificial ageing 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 Kung, work their images in order to avoid trouble with the Department of Archeology of Nepal, which issues permits and fines for the illegal export of all works of art. The export of items over one hundred years old being now forbidden. However, that does not prevent some Western and Western dealers from having artificially aged a large number of the statues bought from modern artists. Various methods of antying have evolved during the last twenty decades. In the nineteenth-twenties, dealers were generally happy with increasing their image by heating them at a high temperature, thus obtaining a black coating on the metal surface. In 1917, 1929, 1939, 1949, and 1959, heating over oak lamps, but it is doubtuful whether such a method was even popular, for the most while coming off the metal surface easily and stain the hands of any potential customer, thus defeating its purpose. I understand, however, that a similar method was used to age paintings. Occasionally oxidation is induced by burning the statue with smoke and labris (1959:170) says that some statues were aired 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 covering the statue with liquid mercury, salt, salt and bronze 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 of Tibetan metal images are never excavated from archaeological sites, but come from temples and shrines where they are reasonably well protected and corrosion is minimal. A green patina on any dimunitive statue is almost certainly the result of forgeries (1931, 1941:35-350).

During my visit to the Nepalese Valley in the nineteen-twenties, I met 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 in carried out for many days with cloth which may be rubbed with any kind of greasy material, including milk, milk butter, and even rice. The heating of corroded-metal images was associated with the use of a solution of sodium chloride, which was, according to Buchanan Hamilton (1819:270) an item exported from China to Nepal in the 18th century partially to destroy the gilding, and give the effect of mild corrosive which successfully doped many copies of Tibetan and Nepalese antiques. Finally rubbing and other ritual substances may be smeared on the forehead or other sacred parts of the statue, and the final touch of "authenticity" to the image. As if it had just been anointed with oil. In some cases forgeries are left incomplete to attract less due to age. The most sophisticated methods of antiquing are used for statues which are especially commended to con- tingators by Western dealers, in the understanding that no other image will be produced from the same clay. A dealer produced in only one or two examples 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 dealers would be particularly suitable of black or green corroded "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 seem to regard the direct application of offerings to their surface as not for YORK of sacrifice. A good example of the contrast Tibetan and Nepali attitudes toward Buddhist images is kept in Tibetan monasteries of the Nepali Valley is provided by a large copper repoussé image of Bha-vish-ta-vas (plate 16) which in about 1975 used to be protected by lead foil paper framed in this image shown at 16 by Navar Density. 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 Nepali Valley, where they are exposed to the intense dryness of the monsoon. From July to September the Valley receives most of the annual rainfall of 107 cm to 140 cm. Thus, as a rule, Tibetan antiques are in a better state of preservation than Nepali antiques would have to believe.

The problem of establishing whether Newar metal images are ancient or modern is sometimes difficult. Newar images are quickly worn by worshiping and the organic ritual 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 antiqued gilded images will retain sufficient traces of gesso-chloride 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 so far as Newar antiques are 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 statutory techniques used by Tibetan and Himalayan sculptors to this day. They still manufacture their own modello tools and they model clay and wax as a traditional manner. Their investment techniques find a parallel in the use of different grades of clay as described in various Indian texts (Heeren, 1962:31), including the Maha-bhaka. Apart from the use of coal, the only improvement made in fitting the molds and melting the metal is the modern use of electric fans and blowers by some sculptors, instead of hand-erected bellows. No innovation has been applied to the seemingly difficult problem of maintaining the temperature of the clay moulds before pouring the molten metal into it. Artists 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 Silwaghoo Buddha—occasionally and sick statues, whether hollow or solid, may still be cast in one piece (Alcock and Clouston, 1973:60). A few minor changes have occurred in the fitting techniques; terracotta tends to be bigger than in the past and can no longer be bent, and embellishments are no longer used. However, examples of unsecured bases in ancient statues are not rare. Sealing and silver- 2000cording are nowadays used to repair timer damageings of both techniques appear to have been introduced in Newar statue after 1975. However, chasing, engraving, filing and milling are still carried out with the traditional techniques, and it may be concluded that Himalayan metal statues have 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 Nepal.
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MAṣJUŚRI

Western Tibet, 11th-12th century

By the courtesy of the Trustees of the British Museum
MATHEVA (♀)
18th-19th century A.D. Brass with red pigment on lips; imitation gold paint on front of figure. Ht. 6.6 cm. O.A. 1924.6–20.10.

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Tārā


*By the courtesy of the Trustees of the British Museum*


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