THE MAKING OF A STATUE

Lost-wax Casting in Nepal

Axel Michaels
THE MAKING OF A STATUE
Lost-wax Casting in Nepal
THE MAKING OF A STATUE
LOST-WAX CASTING IN NEPAL

BY
AXEL MICHAELS

WITH 29 PLATES

FRANZ STEINER VERLAG WIESBADEN GMBH
STUTTGART
1988
PREFACE

The following description of the lost-wax casting process of Nepal is intended to provide a basic knowledge for the appreciation of this craft. It mainly tries to show how much skill, expertise and dexterity are required in sculpting and casting such statues. It is my hope that this publication will, in its modest way, contribute to the encouragement and furtherance of this endangered handicraft.

This booklet is a slightly altered but not updated translation of my article "Der Cire-Perdue-Guss in Nepal," which appeared in two parts in the journal Mitteilungen aus dem Museum für Völkerkunde Hamburg (part 1: vol. 15, 1985, pp. 77-105; part 2: vol. 16, 1986, pp. 173-202). The manuscript for the German version together with its translation is based on field work carried out during the years 1982-83. Due to a lack of time and to other commitments it has regrettably not been possible for me to study the development and changes in the craft since that time.

Unless otherwise indicated, all the non-English terms employed are from the Newari language. The following abbreviations have been used: Nep. = Nepali; New. = Newari; Skt. = Sanskrit; Tib. = Tibetan. The names of native authors are written in the manner cited in the publications, and those of other persons in the internationally accepted transliteration of Devanāgarī script. The names of well-known cities and countries are transcribed in their Anglicized form, and other, less known ones with diacritical notation. The pronunciation of Newari is complicated and, due to various problems in transliterating, not fully determinable from the script. The attempt will therefore not be made to give phonetic rules of thumb here, which would be of little help either to the specialist or to persons interested on the outside. In this context, the following work, whose chapter on lost-wax casting was prepared in collaboration with the author of this present booklet, should be able to clear up any terminological doubts: Gutschow, N., Kölver, B. and Shresthacarya, I.: Newar Towns and Buildings: An Illustrated Dictionary Newari-English (St. Augustin: VGH Wissenschaftsverlag, 1987).
Acknowledgements

I am deeply grateful to the many patient craftsmen who helped me, in particular Kāji Ratna Šākya, Šānta Bajra Bajrācārya and the curio dealer Boddhi Bajra Bajrācārya. Bishnu Prasad Shrestha deserves my sincere thanks for his valuable advice, untiring help and detailed knowledge of the subject, and Ishwarandanda Shresthacharya for his kind help in translating and transcribing the Newari terms. My special thanks are also due to Bill Templer and Philip Pierce for their painstaking and felicitous rendering of the German original into English. I would also like to gratefully acknowledge the considerable and diverse support given to me by former colleagues and associates at the Nepal Research Centre, in particular to Prof. Albrecht Wezler, Dr. Christoph Cüppers. G.B. Kalikote and Navraj Gurung.

Michael Hall, technical adviser of the World Bank for lost-wax casting in Nepal, Prof. Andráš Höfer and Ian Alsop have read the manuscript or parts of it and helped me with valuable suggestions. It goes, however, without saying that I am alone responsible for any shortcomings of the text.

Last but not least, I am indebted to the Ethnographical Museum in Hamburg for its permission to bring out an English translation and for providing the lithos of the plates. My special thanks are due to Dr. Gernot Prunner, curator of the Asian Department of the museum, for his kind cooperation in the collection of sample pieces and tools associated with the techniques described here. This collection has now been made available to the public, registered under the inventory numbers 82.61:1-42.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>5</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>7</td>
</tr>
<tr>
<td>Development of the Art</td>
<td>11</td>
</tr>
<tr>
<td>History of the Technique</td>
<td>17</td>
</tr>
<tr>
<td>Social Structure of the Craft</td>
<td>20</td>
</tr>
<tr>
<td>Technology and Ergology</td>
<td>25</td>
</tr>
<tr>
<td>Overview</td>
<td>25</td>
</tr>
<tr>
<td>The Wax</td>
<td>26</td>
</tr>
<tr>
<td>The Original Wax Model</td>
<td>28</td>
</tr>
<tr>
<td>The Matrix</td>
<td>33</td>
</tr>
<tr>
<td>The Wax Model</td>
<td>35</td>
</tr>
<tr>
<td>The Casting Mold</td>
<td>36</td>
</tr>
<tr>
<td>Melting of the Wax</td>
<td>40</td>
</tr>
<tr>
<td>The Crucibles</td>
<td>43</td>
</tr>
<tr>
<td>The Metals</td>
<td>43</td>
</tr>
<tr>
<td>Firing</td>
<td>44</td>
</tr>
<tr>
<td>Casting</td>
<td>48</td>
</tr>
<tr>
<td>Opening of the Mold</td>
<td>48</td>
</tr>
<tr>
<td>Cleaning and Smoothing</td>
<td>49</td>
</tr>
<tr>
<td>Chiseling and Engraving</td>
<td>54</td>
</tr>
<tr>
<td>Metal Designs</td>
<td>56</td>
</tr>
<tr>
<td>Ornamentation</td>
<td>59</td>
</tr>
<tr>
<td>Gilding</td>
<td>60</td>
</tr>
<tr>
<td>Summary Table of Newari Lost-Wax Casting</td>
<td>65</td>
</tr>
<tr>
<td>Plates</td>
<td>73</td>
</tr>
<tr>
<td>Acknowledgement of Illustration</td>
<td>78</td>
</tr>
</tbody>
</table>
Artistic casting in lost wax was, and still is, a familiar technique at various centers around the globe. The region of western Nigeria and Benin, with the ancient and famous commercial trade center of Ife at its heart, should be classified among these, as well as the area (previously Mexican) of the Quimbaya and Chibcha Indians in present-day Columbia. In South Asia, it is among other places in Nepal in particular, in the city of Patan located a short distance from the capital Kathmandu, where this art has been practiced for centuries. The Newars, the ancient indigenous people of the Kathmandu Valley, who constitute the predominant portion of the inhabitants of Patan, still work intensively today with the technique of lost-wax casting, and they are proud of their long tradition, the beginnings of which lie in India.

There, in the ancient urban centers of Indus Valley culture (3rd millenium B.C.), Mohenjo-Daro and Harappa, figures have been found which were very likely cast by the lost-wax technique. The famous figure of a dancing girl (National Museum, New Delhi) is an example of one of these earliest Indian bronzes (Figure 1). More recent expeditions near Daimabad have brought further specimens to light; these pieces date from the second half of the 2nd millenium B.C., and contribute to bridging the large time gap which extends down to the more extensive finds in the western foothills of the Himalaya (Gandhara, Hindukush, Swat and Kashmir). With these there begins a long history of Indian bronzes, though to treat this material here in detail would go beyond the limits of the present study (see v. Schroeder, 1981).

Direct connections with Nepal, or rather, to be necessarily precise, with the Kathmandu Valley, can only be established for the Gupta (3rd to 6th cent. B.C.) and, above all, the Pāla (750 -1200 A.D.) schools of style, developed in the northern Indian provinces of Bihar and Bengal, and named after the prevailing dynasties. This too, however, is
associated with certain difficulties: since the first unmistakably datable statue dates only from the late 6th century A.D. This is a standing Buddha Śākyamuni, with an inscription from the year 591 A.D. on its base. And although the alloy used in this statue argues against a Nepalese origin, since - contrary to customary practice - it is made of brass rather than copper, historical comparisons with Indian sculptures of the same period, as well as certain epigraphic considerations, make it appear highly probable that Nepal is indeed the land of origin (see v. Schroeder, 1981:299; Slusser, 1975/76:81ff.).

The hypothesis that casting was also done in Nepal even before this period employing the lost-wax technique thus remains based, at least for the present, on conjecture. Several Nepalese scholars, for example, have concluded from the ornamentation on sandstone figures dating from the Kirātī period (prior to the 2nd cent. A.D.) and the early Licchavi period (ca. 3rd-6th cent. A.D.) that this type of figure must also have been cast in metal (see S. Joshi, 1978: 1-2). However, they also admit the difficulties inherent in conclusively establishing the date of older statues, since these figures are generally located today in collections abroad, and, especially if in private possession, tend to be dated earlier than their actual age (L.S. Bangdel, 1971: 81). There have been only very few excavations to date in Nepal itself, although the Kathmandu Valley offers a number of particularly promising excavation sites. We thus must wait until such possibly quite justified expectations can be substantiated. The report of the Chinese pilgrim Wang Hsüan-ts'ê, who visited Nepal during the reign of King Narendradeva (ca. 643-657 A.D.), also provides only indirect evidence of the older Nepalese statues. It merely confirms the fact that, at that time, household goods were made of copper, though the question of whether they were cast or prepared by other techniques remains open.

In any event, there are an appreciable number of statues datable starting from the 7th century A.D.; beginning with this period, then, art-historical comparisons are on somewhat safer ground. In this connection, one can note that some Indian schools of style and influences have been preserved longer in the Kathmandu Valley than in their land of origin itself. It was most certainly the both secluded and nonetheless favored location on a significant trade route between India and Tibet which rendered the Kathmandu Valley open enough, on the one hand, for influences coming from outside, and, on the other, sufficiently closed off to allow for indigenous development.

In India, for example, only during the Gupta period was it common procedure to cast the statues with one or two
cones or rods attached to the feet, which were then fastened into a separate base in order to stabilize the figure. In contrast, this method has been preserved in Nepal down to the present time. The stylistic links to India can also be seen in ornamental projections behind the ears, which first appear on Pāla figures from the 8th, 9th and 10th centuries. Later on, bands hanging down from the ears to the shoulder were also added. This special feature is also found in older Nepalese figures, some of which can be dated back to the 8th century. But while this feature disappeared in the 12th century in India as a consequence of the Islamic invasions, it again has been preserved in Nepal down to the present day. Furthermore, the practice of mounting precious or semi-precious stones on the figure probably spread in the 9th century from northern India to Nepal, where it then flourished, particularly during the early Malla period (ca. 1200-1479), and from where the artisans of northern India took it up again.

Many of the early statues of Nepal influenced by India are now located in foreign museums or private collections. They are predominantly representations of the Buddha Śākyamuni with the uncreased robe typical also of northern Indian statues. The most famous statue of the 6th-7th centuries still remaining in Nepal is the life-sized Buddha Śākyamuni standing in a temple in Śānkhu at the northern edge of the Kathmandu Valley. Of the statues of the 8th-12th centuries, too, the majority are Buddhist: along with the Buddha one finds Tārā, Avalokiteśvara, Padmapāni, Mañjuśrī and the like. A number of early Hindu statues, however, have also been preserved: for example, Devī, Indra, Viṣṇu, Garuda, Umāmaheśvara and a four-faced Liṅga. Apart from the noted features, though, they hardly differ from the northern Indian statues of the period.

The artistic links to Tibet can likewise be illustrated using a few examples. Aside from the fact that certain motifs must clearly have been commissioned by Tibetan patrons, it is in particular the technique of gold painting which shows well both the Tibetan influences and the differences with Newar-Buddhist art. It is important to bear in mind that the Newars were accustomed, and still are, to carrying about their statues, as a rule, in connection with numerous rituals and festivals, and to bathing and decorating them. Tibetan statues, in contrast, would not stand up well to such ritual practices, since the gold would undoubtedly be washed away and rubbed off in the process. For this reason, the older Newar statues generally give the appearance of being even more ancient; or, to put it a bit differently, Tibetan statues of Nepalese origin have better preserved certain special features of older Newar statues. A further feature associated with a statue of Newar origin and Tibetan patronage is the use of turquoise and coral as
inlaid stones. In contrast, Newar patrons, as a rule, tended to prefer precious jewels, such as rubies, crystal or lapis lazuli.

Over the centuries links to Tibet were exceedingly intense, diminishing only with the exodus of large parts of the Tibetan population after the occupation of Tibet by China in 1959. Numerous Tibetans came to Nepal to learn Sanskrit or simply to worship the Svayambhūnātha Stupa, which was famed even in Tibet. And many Newari craftsmen went to Tibet to do contract work. Usually, on account of the religious and ritual nature of their work, they arranged to be paid not in cash, but expected, rather, offerings (Skt. daksinā), for example, silk, gold dust, turquoise etc., which were in great demand in Nepal (Tucci, 1980:278).

One of the earliest literary sources of the rich cultural exchange between Tibet and Nepal (cf. Macdonald/Stahl, 1979:31ff.) is the tradition that the Tibetan king Srong-btsan-sgam-po, who died in 649/650 A.D., married a Nepalese princess, and that she brought a number of statues to Tibet as wedding presents. Other sources from Tibet even mention several Nepalese artists by name, an example being the famed A-ni-ko (1245-1306), who was active not only in Tibet but also in China, and who by his work built up the reputation of the Newar craftsmen, as is made particularly clear by his purportedly having presided over a group of eighty of them (Petech, 1959:99ff.).

Among the statues cast between 1200 and 1500 A.D. by Newars under contract with Tibetan monasteries and private persons, the following ones deserve special mention: Heruka, Caturbhujā, Mañjuśrī, Mahācakravajrapāṇi and the seated Padmapāṇi (see v.Schroeder, 1981:333). From the 13th century on the Tibetans developed their own schools of casting even if the earlier Newar statues naturally continued to exercise a lasting influence.

The classification of statues based solely on stylistic criteria remains always a complicated task, if this cannot be confirmed by supplementary data such as inscriptions. Unfortunately, however, only five Nepalese statues are known to date which give an indication inscriptionally of their year (v. Schroeder 1981:303). For this reason, research must rely all the more on detailed studies which take into account the historical iconographic sources, especially when, as is the case in Nepal, the stylistic changes over centuries often involve only ornamentation. Such studies largely remain a task of the future. Although it therefore remains particularly difficult in Nepal to work out distinct - and temporally clearly distinguished - schools of style, there are nonetheless a number of nearly certain characteristic signs indicating the Nepalese origin of a metal statue.
There is, first of all, the circumstance that, until the 17th century, only the Newars cast almost all their statues in copper, while in India, as well as Tibet and China, the larger proportion of metal statues were cast either in brass or bronze (Riederer in: Mallebrein, 1984:231). Secondly, the only stylistic characteristic which can be cited for the creative originality of Newar craftsmen is the nimbus surrounding the head, a feature exhibited by many statues of the Licchavi and Thakuri periods, and one which makes it possible to attribute a definite Nepalese origin to two statues excavated in Nālanda in Bihar. To be sure, this nimbus should not be confused with the halo surrounding the entire figure (Skt. prabhā), which is common to both Indian and Nepalese statuary throughout all periods.

Beginning with the advent of the three city kingdoms of Patan, Kathmandu and Bhaktapur (1482-1768), considerable impetus was given to the development of all areas of art and culture, not least due to the rivalry which existed among the reigning Malla kings. One associated and decisive change which resulted from this was that now more and more statues were inscribed with a date, or images were made of royal or private patrons, thus allowing for an unmistakable and exact dating of the figure concerned.

In this period of Nepalese history, so fruitful for the flowering of the arts, a large number of figures were cast, some exceptionally large, and adorned with intricate ornamentation and numerous attributes; these figures served to enhance even further the already excellent reputation of the Newars as casters. Many new motifs were attempted, frequently encouraged by Tibet patrons, thus deepening the links between Nepal and Tibet. Several of the craftsmen even emigrated to Tibet and married or settled there for an extended period of time, so that it is often difficult to determine whether a Tibetan statue was cast in Nepal or Tibet, and whether by Newar or Tibetan artisans. It has even been said that a separate (mixed) caste (Uray) evolved out of this link to Tibet, namely, the male descendants issuing from a marriage between a Newar craftsman and a Tibetan woman (Rosser, 1966:105ff.).

At the end of the 17th century, the Newars also began to cast brass statues, not the least reason being because this has the double advantage (a) of being cheaper, easier to cast and more durable, and (b) of shining like gold, while copper almost always had to be gilded. This development was accelerated by the rule of the Gorkhā kings after 1768, since they did not choose to support, to the same extent, the extensive patronage of the arts which Newar craftsmen and artists had enjoyed under the Newar Malla kings; as a consequence, the craft was faced with serious problems in obtaining orders from patrons.
Nevertheless, the craft was able to survive the effects of this break in the traditional pattern of patronage, and has continued in existence down to the present time. In large part, this is due to the excellent time-honored ties with Tibet and India mentioned above; these connections have indeed proved their worth once again, precisely in more recent times, when the numerous Tibetan refugees placed many orders for statues from Newar craftsmen. The largest portion of statues outside Tibet in Tibetan monasteries indeed come from Patan, sculpted and cast by the hand of craftsmen active in that city.

Their adaptability has also been demonstrated by the more recent development that several modern Nepalese artists, who received a portion of their artistic training in the West, are now gradually turning toward working in this technique, though their number still remains small. They give the craftsmen modern, generally abstract plaster casts; these models are then copied by the craftsmen in wax, and subsequently cast. T.P. Mainâli is a prominent example of one such modern artist, and his sculptures are quite well known now in Nepal.

However, it was the factor of tourism more than anything else which served to stimulate the handicraft, and this indeed to such a degree that production is now in large part geared to the needs of this market. According to information supplied by the largest curio dealer in Patan, about 60% of production is for the local market; of this, Nepalese buyers themselves account for only approximately 10-15% of sales. About 40% of total production is for the export market. According to another dealer, up to 80% of articles produced are for export. His Majesty’s Government in Nepal is promoting this trend in various ways, and occasionally provides dealers and craftsmen with financial support, so that they can proffer their products in the international marketplace at trade fairs.

This enormous influence of tourism naturally also has its negative aspects. Work often is now not as fine and exacting as was previously the case. The tastes and desires of tourists tend to determine the breadth of selection of what is offered for sale, and also account for the occasional poor taste of what is available in the market. Increasingly, counterfeit imitations are being made of famous or particularly attractive pieces. Figures of couples in sexually explicit positions, and cast in a simple and cheap manner, are now also offered for sale.

However, the economic stimulus tourism provides is also conducive to an expansion of the possibilities open to small industry in Nepal; at the present time, these are, as it is, quite limited. Another important consideration is the fact
that tourism has provided an impetus to artistic creativity, since curio dealers involved in export purchase only well-crafted pieces of high quality. In particular, orders are placed by foreign connoisseurs of art, and even on occasion by museums, for an imitation to be made of some older statue; later on, additional copies of this are then often sold in the many small curio shops to be found in Patar and Kathmandu.

The task of producing imitations of such particularly fine artistic statues naturally demands craftsmen with the requisite high-level skills; several such craftsmen have indeed developed into genuine artists in their own right, and with their own unmistakable styles. At the present time, Siddhi Rāj Śākya and his brother Boddhi Rāj Śākya, as well as Mañjoti Śākya, are the craftsmen receiving the largest number of single orders for pieces of high artistic quality.

HISTORY OF THE TECHNIQUE

In the vast corpus of Sanskrit literature, there are sources which provide good documentation on the production of statues using the cire perdue or lost-wax technique. These are texts which deal principally with temple construction, and with the making of sculptures in all its many aspects. This body of knowledge, known as Śilpaśāstra, possibly goes back to the Gupta period; in any event, this is what the information contained in the texts themselves would seem to suggest. But the dating of Sanskrit works always remains highly problematical, since the texts are, to a substantial degree, in the nature of compilations, having been repeatedly supplemented or amended over the ages by various authors. An additional factor to be considered is that, as a rule, texts dealing with crafts were not composed by the craftsmen themselves - who were in large part illiterate - but rather by learned Brahmans, whose practice was to codify technical knowledge in written form only - if indeed at all - when such knowledge also had some ritual significance.

There are essentially four relevant texts:

a) Mānasollāsa, which was presumably composed by Someśvara III Bhulokamalla in the 12th century during the Cālukya dynasty of southern India, and which displays a number of notable links to Nepal (Michaels, 1985);

b) Mānasaśāra, a difficult anonymous text, which its editor, P.K. Acharya, dates to the 5th-7th centuries;
c) Śilparatna, a text dating from the 16th century; and
d) a section of the Kāśyapa-Jñānakānda, a Vaiṣṇava ritual
book presumably composed between 800 and 1000 A.D.
(Goudriaan, 1965:165ff.)

Nonetheless, archaeological finds offer ample proof that
the technological knowledge these texts contain must be of
great antiquity, even if the texts themselves perhaps are
not.

Thus we discover, examining these texts, that craftsmen
were required to cast statues according to the exact
canonical iconographic rules set down for the making of
figures and images of deities. We can assume that this was
no easy task, judging from the consequences which they (or
their patrons) were threatened with if mistakes were not
avoided. Thus, in one related text (Brhamasthitā, Chap. 58),
the craftsman is threatened with the wrath of the king
should the statue's arms be too large; if they turn out too
small, however, then the craftsman is destined to fall ill.
If the stomach of the statue is of insufficient size, the
craftsman will suffer from hunger as a consequence. If the
statue is too thin, he will suffer from a lack of material
possessions. Continuing on in this way, he is even
threatened with his own death or that of his wife, or with
blindness and the like.

In another text, (Mayaśāstra III,3ff.), faulty
workmanship is linked with even more dire consequences, such
as epidemics, the death of the king, and associated famines,
wars, etc. The iconographic rules involved are indeed so
minute and detailed that it was by no means an easy task to
keep them all. They pertain not only to the body position
(Skt. āsana) of the figures of the deities, but also to
their requisite attributes and ornamentation, and the
precisely stipulated norms for their dimensions and
proportions.

Seen from the vantage ground of a Western conception of
art, it is indeed fortunate that not all artisans adhered
strictly to these canonical śastric rules, so that a number
of schools of style and art could nonetheless in fact emerge
and develop. An additional factor is that, in the case of
metal sculptures, each individual statue was shaped and
sculpted by hand, so that no two are exactly alike.
Nevertheless, the numerous iconographic and ritual rules
suffice to allow one to form some picture of the degree of
mental strain and concentration under which these craftsmen
must have worked when they received commissions for ritual
purposes. The technical sequence involved in casting is
indeed in and by itself associated with a high degree of
strain and suspense.
The famous autobiography of the Renaissance artist Benvenuto Cellini communicates this only too vividly. Cellini relates in Chapter 6 of Book IV that in casting a large statue of the Greek god Perseus he almost died from aggravation and desperation due to the technical problems entailed. It was only his genius and determination as an artist which finally made it possible for him— from his sickbed—to complete the casting. This involved a skillful technical expenditure, including the sacrificing of some 200 of his own tin plates and bowls for the purpose of liquefying the iron.

The Śilpaśāstras are also full of similar technical tricks. In the Uttarabhaga of the Śilparatna (II.2.32ff.), we can find exact indications regarding where the best clay is to be had—and with what other substances it must be mixed, and in what ratios—all along with rules regarding the type of wood the tools must be made of. There is also an exact description of the sequence of casting procedures. And in another Śilpaśāstra, viz. the Mānasollāsa, one can learn, for example, how the fire must be prepared so as to facilitate the best melting of the alloys.

To be sure, these texts give rise in turn to questions of their own (Michaels, 1985): A detailed analysis of their language indicates that they were composed either by craftsmen unversed in Sanskrit (Mānasāra) or by scholars knowledgeable in the technique only from simple observation, if that (Mānasollāsa, Śilparatna). Nevertheless, the sum of individual bits of information from the Śilpaśāstra texts provides a good picture of the technique of lost-wax casting practiced at that time. What is astounding is that the work done in India and Nepal today is, with only minor deviations, in accordance with the knowledge encapsulated in these texts.

Of course, the craftsmen not only had to pay attention to a number of technical details, but to a large number of ritual rules as well. Thus, the modelling of the wax figures could only be commenced on an auspicious day; the individual pieces had to be repeatedly purified with holy water, flowers and sacred powder; and the wax figure had to be shown now and then to the Brahman priests, so that they might check it in respect to its iconographic correctness. And subsequent to casting, even before cleaning and chiseling of the statue, it had to be carried in a procession through the village, accompanied by musicians, decorated with flowers and annointed with sandalwood paste. These and similar procedures are prescribed in detail in one of the best-known Śilpaśāstras, the Mānasāra (Chap. 68). Here too, the person who fails to heed such rules is threatened with serious consequences: the loss of material rewards or religious merit, which the given craftsman (Skt.
sthapati) and organizer of the sacrifices (Skt. vajamāna) have accumulated over the course of many incarnations.

SOCIAL STRUCTURE OF THE CRAFT

The art of cire perdue casting is a family craft. It has been passed on from father to son for generations. During a visit to the craftsmen in Patan, one can observe the children sitting on the laps of their elders from the time they are very young, while these artisans then proceed, for example, to model the wax figure (Pl. 4a). This is the way the children - and quite naturally, principally the sons - learn the craft, almost as if it were a form of play, which helps to explain in part something of the dexterity the artisans possess.

In addition to the actual members of the extended family, who work without directly getting paid in wages, there are also generally several apprentices and a number of assistants in a workshop. They either receive a daily wage or a percentage of the sales. The tasks are almost always carried out working together in small groups, even if there are specialists for the various individual areas. Thus, the master craftsman, who is frequently - though not always - the eldest male in the family, prepares the original wax model or replica, i.e. the wax mold from which the reproduction matrices are then made. The younger members of the family who already possess the requisite skills then carry out the next stage of the process, and assemble the individual wax pieces. The grandfather, or another family member who is no longer able to perform the more difficult tasks, prepares the crucibles (Pl. 15a). The assistants prepare the wax, mix the clay or fire the ovens.

The family craft is embedded in a more encompassing system of social relationships. Not only are there close consanguineous kinship ties between individual families by reason of the network of caste - the occupational specialization of the castes and ethnic groups also hardly allows for others from the outside to penetrate into this system.

The metal-casters and the majority of their suppliers belong almost exclusively to the Newar population. According to a census in the year 1971, the Newars constitute over 50% of the Kathmandu Valley inhabitants, and thus are the dominant community in this region of Nepal. The Kathmandu Valley - about the size of Hamburg - is a fertile region thanks to its comparatively abundant water supply; and due to its location and geographical characteristics it forms the cultural and political center of Nepal. The Newars are famed for their densely populated city settlements (cf.
of which, from among the approximately forty larger settlements, the cities of Kathmandu, Bhaktapur and Patan stand out. The group frequently engages in trading both in and outside the Valley, and in many cases even beyond Nepal's borders. Of primary importance, for the previously mentioned reasons pertinent to art history, are their traditional ties to Tibet. The Newars are also famed for their handicrafted products, not only those of metal-casting but also of wood-carving, pottery-making and weaving. Their private, public and religious architecture, unique by reason of their manner of inhabiting the city, also deserves to be mentioned. Many-storeyed brick houses with artistically carved windows stand closely abutting on one another; cities such as Bhaktapur or Kirtipur thereby offer a self-contained city layout such as is seldom found any longer — in many respects equivalent to that of medieval European cities. Nevertheless, the Newars are predominantly oriented to agriculture, a fact clearly reflected, for example, in the festivals of their calendar year (Toffin, 1977:189-195; Gutschow, 1982:10-11).

The metal-casters have settled for the most part in Patan, which is situated close to Kathmandu and is becoming more and more connected with it in terms of settlement. The population of Patan, for its part, consists 80% of Newars (Nepali, 1965:24).

According to an earlier census, more than half the Newars engage in farming, while nevertheless living principally in the cities. The Śreṣṭha constitute the second largest caste with approximately 20%; third in line are the Bajrācārya, or Bare (approx. 10%); and the fourth spot, with approximately 5%, is held by the Uray (craftsmen), among whom most of the craftsmen (stonemasons, carpenters, coppersmiths etc.) are included (Rosser, 1966:85f.). The metal-casters are called, reflective of their form of labor, Thākahmi (from thāiyā=‘filling’, ‘casting’). They belong predominantly to the Śākya caste, which traditionally dominates the craft of metal-casting and goldsmithing.

The metal-casters are thus comparatively high up in the caste hierarchy. Whereas metalsmiths are more likely to be assigned in South Asia to the lower stations of life, and are even counted as Śūdra in normative Sanskrit law texts, the Newari metal-casters, according to certain criteria of commensality and intermarriage, have the same rank under Brahman priests as, for example, traders (Śreṣṭha) (Rosser, 1966:89; Nepali, 1965:250).

The Śākya claim descent from the clan of the historical Gautama Buddha. They differ from the Buddhist priests (Gubhājya or Bajrācārya) only in not being able to take on any priestly functions. For the rest, however, there
are no restrictions placed on their relations to the Bajrācārya with respect to eating and marriage. The social status of the Šākya suggests that Newari metal-casting was formerly in the hands of Buddhist monasteries, and that many monks were actively engaged in the craft.

With the exception of a small number of Šrestha (originally merchants) and Jyāpu (farmer) families, nowadays only Šākya are involved in metal-casting, and this both in respect to the aspect of craft as well as that of trade. They are situated principally in two bahā, Ubahā and Nāgbahā. A bahā (Skt. vihāra) is, among other things, a group of houses built around a shrine or temple, in which a deity is worshipped which is associated with the families living in proximity to the shrine. Until a few years ago, aside from a small number of tailors, shoemakers and doctors, all the families living in Ubahā were engaged in the crafts and trades mentioned (see Alsop/Charlton, 1973:27f.)

Over and beyond this larger ethnic-or caste-or-kin-related - circle, there are numerous links and ties extending out from every workshop to other craftsmen or suppliers of material. The chiselers are generally a subgroup of the Šākya, as are the gilders. The metal comes from the Tāmvah, and the clay from the Jyāpu-Kumāḥ farmers; the coal and firewood, as well as the wax, are supplied by Tamangs, and the iron tools are made by the smiths (kau, Nep. kāmi). Materials were, and still are, frequently obtained from far afield: the wax from Burma, coal and metal from India.

Such a network naturally entails economic dependence of various types. The prices of the materials are determined by the market, and are thus subject to the corresponding fluctuations and risks. Thus, Höfer reports that in 1966, for example, Indian metal dealers halted supplies to Nepal for a certain period of time in order to increase the level of prices; the upshot of this was a situation where the few craftsmen who had metal in store could demand extremely high prices for their articles, while others were at a disadvantage (Höfer 1980:42)

The current economic situation of the craft is even more unstable. Various factors have contributed to this. For one, the prices of coal and firewood have been rising just as rapidly as have wages for the assistants and helpers. The tension between the dealers and the artisans has increased as a result, especially since it is the artisans above all who tend to feel the pinch of market fluctuations, more so than the dealers; this is because the latter can evade the effects of such fluctuations by a change in their stock inventories. After a short boom in the 1970s, the number of
tourists went on the decline, and the curio shops found themselves overstocked with goods. Many Newars who made the switch over the last decade from the jewellery trade to metal-casting have helped contribute to a situation of over-production, which is now once again having its impact on the weaker links in the productive chain. And those are precisely the individuals with too little of their own capital and means of production to be in a position to make themselves independent of the dealers.

Just how difficult it is for the craft to function under such conditions is illustrated by the following cost statement for a Śaḍākṣarī Lokeśvara statue; this figure has been used in the present study as an example for the sequences involved in the work process, and is now deposited with the Hamburg Museum für Völkerkunde (Inv. No. 82.61:21, see title page). Comparisons with similar statements of cost (Höfer 1980:41; Alsop/Charlton 1973:42; de Labriffe 1973:188-189) allow the observer to conclude that the economic situation of the craft has, in general, worsened, even if a small number of craftsmen and associated dealers have not been affected by this trend as a result of good business connections.

Thus, the following prices were in effect in Maṅgal Bazaar in Patan on July 4th, 1982:

<table>
<thead>
<tr>
<th>Material</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>scrap brass</td>
<td>80 Rs. per kilo</td>
</tr>
<tr>
<td>copper</td>
<td>90 Rs.</td>
</tr>
<tr>
<td>zinc</td>
<td>33 Rs.</td>
</tr>
<tr>
<td>beeswax</td>
<td>112 Rs. per dharni (2.2 kg.)</td>
</tr>
<tr>
<td>resin</td>
<td>54 Rs.</td>
</tr>
<tr>
<td>plant oil (Nep. ciuriko ghiu)</td>
<td>48 Rs.</td>
</tr>
<tr>
<td>light clay (mhesicā or masimcā)</td>
<td>5 Rs. per load (Nep. dhoko=30-40 kg)</td>
</tr>
<tr>
<td>red clay (mhāsucā)</td>
<td>7 Rs.</td>
</tr>
<tr>
<td>dark clay (gathicā)</td>
<td>10 Rs.</td>
</tr>
<tr>
<td>charcoal</td>
<td>120 Rs.</td>
</tr>
<tr>
<td>firewood</td>
<td>28 Rs.</td>
</tr>
</tbody>
</table>

N.B.: These are the average prices negotiated by a Nepalese associate. Details on the various materials will be treated separately in the following chapters below.
Computed in terms of the statue mentioned, we then arrive at the following statement of cost, as based on data supplied by master craftsman Kāji Ratna Śākya; the cost of wages for the assistants has also been included:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>metal</td>
<td>40 Rs.</td>
</tr>
<tr>
<td>wax</td>
<td>12 Rs.</td>
</tr>
<tr>
<td>clay</td>
<td>4 Rs.</td>
</tr>
<tr>
<td>assistant help for the casting mold</td>
<td>20 Rs.</td>
</tr>
<tr>
<td>assistant help for the wax model</td>
<td>50 Rs.</td>
</tr>
<tr>
<td>charcoal</td>
<td>7 Rs.</td>
</tr>
<tr>
<td>firewood</td>
<td>3 Rs.</td>
</tr>
<tr>
<td>assistant help for casting</td>
<td>30 Rs.</td>
</tr>
</tbody>
</table>

---

206 Rs.

These costs are in part estimated, i.e. computed on the basis of total costs which arise when, for example, the oven is fired for several casting molds and crucibles, as is the customary practice. The final price given is thus only an approximation, and does not contain adjustments based on additional factors which may have to be either added or subtracted. These include loss during casting, breakage or defects and errors in working the statue, costs for various means of production, such as ovens, rent for the workrooms, craft tools, etc.

The Lokesvara statue was passed on by the master to the chiseler for the price of 250 Rs., or was bought directly by the dealer. This would indicate that the actual profit involved is extremely small, and even this is only attained if most of the family members also take part in the production process. On the basis of these figures, one can also anticipate that with rising costs the statues will indeed become so expensive that the craft will no longer be profitable and worthwhile for a great many artisans. The consequence is an all-too-familiar disastrous alternative: mechanization or decline.

In particular, the lack of sufficient capital in the hands of the craftsmen must be viewed as the greatest single problem behind their insecure and unstable economic situation. As a result of this lack of capital, they are unable to purchase and store materials in large quantities. They generally buy only as much metal and fuel as are needed for one firing, which is associated with considerable risk: viz. if a large number - or possibly even all - of the figures are cast with defects or are spoiled, then the wages for an entire month's work are lost. Such a reversal can only be covered by borrowing funds from a dealer, which leads in turn to further economic dependence.
A number of artisans attempt to improve their own situation by producing household vessels and other utensils in large quantities; the inherent risk associated with these articles is not as great, and production is considerably simpler. However, such a temporary solution is being increasingly endangered by the supply of comparable products manufactured more simply and inexpensively, and using cheaper materials. Thus, for example, the traditional water jug (Nep. gāgrī), which is beaten and soldered from brass sheets, cost between 250 and 600 Rs., depending on the size, in July 1982, while an aluminium jug of comparable size and form was available in the market for between 80 and 120 Rs. Household vessels cast from brass, such as the small water jug with or without pouring handle (karuvā or ṣmḵhora, Pl. 12b), or the cooking pot (Nep./New. kasaurī) are increasingly being displaced by articles made of plastic, iron or aluminium.

A consequence of this development is now that numerous artisans are abandoning their traditional craft and turning to other sources for their livelihood. Since prospects for an improved economic situation are - based on the structural problems described - not in sight on the horizon, cire perdue casting in Nepal must be viewed as a craft threatened to such a considerable extent that it is indeed quite possible it will all but have disappeared from the scene within the short span of a few more years.

TECHNOLOGY AND ERGOLOGY

Overview

As the name suggests, a wax figure is made for the technique of lost-wax casting; after having been coated with a cover (or jacket) of clay as a casting mold, this figure is subsequently 'lost' again when the molten wax is drained from the casting mold. One then pours the various metals to be used into this casting mold, after they have been prepared by liquefying them in crucibles in an oven. After casting, the molding mixture (i.e. the casting mold) is broken away, and the cast statue emerges. This is then cleaned, filed, smoothed and embellished with various metal decorations. Occasionally it is also fire-gilded.

However, in order to assure that every wax figure does not have to be formed anew each time by hand, the artisans prepare negative molds (reproduction matrices) from a harder wax; these are taken from the original wax model, i.e. the first model or replica. They then press a softer wax into these matrices. The individual pieces are subsequently
assembled to form a new wax figure, and then fused together. All the stages in the process which then follow are identical for both the original replica and the i:produced wax model (cf. also the summary table of Newari lost-wax casting in the appendix).

The Wax

The wax is brought to market by the Tamangs; it comes largely from the northern areas of the Kathmandu Valley, and occasionally from the west and north of the Nepal-Himalaya, though never from the south. The craftsmen then purchase the wax in the market, unless they have arranged to be supplied directly. Well-known places of origin for wax are Trisul, Barhabise, Pokhara or the Arun Valley. The beehives are frequently situated on steep rocky slopes, which are not easily accessible, but therefore safe from bears and monkeys though not from the orange-rumped honey-guide (Indicator xanthonotus), the only bird to include wax in its diet. I obtained this information from a letter sent by the zoologist Alexander Duncan to Ian Alsop, who kindly allowed me access to it. Duncan describes the plate of wax as being approximately 1 1/2-2 1/2 m wide, and identifies the wax as being that of the bee species Apis dorsata. He also observed that the Arun Valley populace collects and carries the wax off for metal-casting purposes, the orange-rumped honey-guide having shown them where it is to be found.

The substance involved here is beeswax (si), which is then mixed, according to the intended purpose and the season, with other components in order to prepare the wax model. Thus, the winter mixture is made to a softer consistency than the mixture used in the summer, since the softer wax can be worked more easily, but becomes too soft more rapidly when exposed to the sun. Different amounts of resin (silay) from the sal tree (Pinus sp.) are added in order to harden the wax; this resin was previously imported in a reportedly better quality from Burma, but now generally comes from northern India or Dharan in eastern Nepal.

The Newar craftsmen have differential mixture ratios depending on their level of skill. The better they can model, the harder the mixture can be. Most frequently, the winter wax mixture (cikulasi) consists of one part resin and four parts wax, to which several drops of a smooth vegetable oil are also added; this oil is extracted from the fruits of the trees Bassia or Madhuca butyracea. The intended function of this vegetable oil (Nep. ciuriko ghiu), of which, as a general rule, 1 to 1 1/2 parts are admixed to 12 of the mixture, is to prevent the wax from adhering too much to one's fingers during modelling. The summer wax (tapla si)
mixed harder, in a ratio of 1:3, likewise with the addition of a small amount of vegetable oil. Skilled and experienced craftsmen, however, work throughout the entire year using only one wax mixture.

The mixing ratio for the reproduction matrix is even harder, viz. 1:1 or even 2:1. The purpose of this hard mixture is so that the matrix can stand up to the strain when the summer and winter wax is pressed into the mold (see below).
The mixture is prepared in the following manner: some water is first boiled in a flat pot, into which the wax, resin and oil are then poured. This result in a viscous substance, which is filtered through a cotton cloth (Pl. 2a), rolled and then pressed into sheets or thin plates (Pl. 2, 3). According to requirements, large pieces can then be separated from these plates. The summer wax is light-brown in color when newly prepared; the winter wax is dark-green to dark-brown, and the matrix wax is almost black. However, the wax released and thus 'lost' from the casting mold is generally reused again and again. This wax is in all cases black in color, since it contains dispersed particles of soot.

The Original Wax Model

In order to prepare the original wax model (replica), the mixed wax cake is initially pounded until soft on a flat stone approximately 1/2 m in size (mālhvam; mā, 'mother', lhvam, 'stone') using a small and extremely hard round stone (macālhvam; macā, 'child') (see Pl. 3). This smaller stone, as the craftsmen say, has been cut from the core of a large stone, and then ground and polished; in the process, a goodly number of iron instruments for grinding are rendered dull. It is thus correspondingly expensive, and good stones can only be obtained by going to some expense. In addition, its quality is dependent on the extent to which the wax adheres to it during pounding. The wax cake is turned again and again during the pounding process, and is finally formed into plates approximately 3 mm in thickness. The artisans then form the individual parts for the model by hand from these plates.
The original wax model is prepared principally using some example as model, viz. older statues, photographs (taken in part from modern illustrated volumes on art and from exhibition catalogues), the artisan's own sketchbooks and - even if the practice nowadays has become extremely rare - from sketchbook manuscripts. Some craftsmen employ a compass, a measuring string or a centimeter tape in measuring out the proportions, while others rely solely on their own sense of proportion, measuring only with their fingers or the span between them on the basis of a human-body-oriented, 'anthropocentric' estimation. Thus, for example, Kâji Ratna indicated that for a standing statue the body must be eight times the length of the face. To be sure, only really excellent craftsmen have such an iconometric sense of proportion that they can shape the wax replica to an exactness within millimeters of the example used as a model. Even minor miscalculations can result in the entire figure's being misproportioned.

The original wax model is sculpted by hand. To do this, the wax - summer or winter variety depending on the season - is initially heated over a small charcoal oven (milāycā; Pl. 2b). This flat or round oven is made of dark clay (gathicā) and has an opening on one side (Pl. 4a lower left) through which air is blown by a small Indian mechanical bellows when lighting the charcoal. For this purpose, bellows made from the stomach of goats (khasibhau) were previously used. Once the charcoal has begun to glow, fresh air is blown in only occasionally, using a wooden fan; Master Kâji Ratna used an old ping-pong racket as such a fan.

The original wax model is formed solid from wax, but can also be hollow. This is done in various steps or stages. The head, limbs, torso and decorative ornamentation are thus each modelled separately. This process is known as jyānā dayke in Newari, ‘to create something (by hand)’. The individual elements are formed as follows: the master craftsman, who is almost always entrusted with this particular task due to its special importance, warms a piece of wax over a milāycā clay oven and then presses his fingers and thumb into the wax in order to bend it (Pl 4c). He uses a rather long sculpting spatula (silāykū; Pl. 4d and 7a) for the contours; this spatula has been cut from the center of the horn of a water buffalo cow, and then polished. One side of this spatula has been rounded off to a flat edge, and the other tapers to a sharp point. During the modelling process, the spatula is repeatedly placed in the mouth in order to warm and moisten it, so that the wax in turn is also warmed; in this way, the wax can be more easily worked and does not adhere to the spatula. In a like manner, the individual wax parts are also moistened and kept warm now and again by the application of saliva (Pl. 4b).
The shaping of the individual parts is done in an extraordinarily rapid alternation between the use of this spatula and the fingers or fingertips. Generally the master presses his thumb against the wax on the inner surface, alternating with his middle finger, while the index and ring fingers are pressed against the wax from the outside, so that the thin wax sheet can be bent and manipulated in all directions. For smaller kinds of ornamentation, such as
garlands (mālā), hair and the like, a piece of wax is rolled by means of a horn tool (Pl. 7b) on the flat stone (mālḥvām) into thin strands; these can then be quite easily pressed onto the wax model from the outside (Pl. 5b). Sometimes they are pressed onto a slab of brass having rows of holes in various sizes resembling something like a chain of pearls (Pl. 5a and 7d).

The projecting edges of extraneous material are then cut off nearly in a clean straight line using a blunt, flat iron knife (Pl. 7c). This knife (chalāmcā) is heated beforehand over the oven so that the projecting wax can be
separated without breaking pieces off from the model element. The resultant edges are then completely smooth and soft, especially if the knife is heated to a high temperature.

The edges of the individual pieces are warmed with the aid of the hot knife and then pressed together in order to assemble the model. There is always a small vessel containing liquid wax next to the oven (Pl. 6b); lying in this is a thin wooden stick with a piece of cloth wrapped around its point (sīkathicā). The sīkathicā is also used like the knife for welding the seams (Pl. 6b and 7e). In this manner, the craftsmen assemble the individual elements of the model; in the process, these elements are constantly checked, even during modelling, in respect to their beauty and correctness.

The head, in this connection, has a special significance, since it is considered to be the aesthetically most important piece, that element in which everything is expressed. After the larger parts have been assembled, the master retouches and models the finer ornamentation and contours. Finally, smaller, highly fragile attributes are added (Pl. 8).

Even if the statue is to be cast solid, the inner hollow cavities are filled with soft wax, and the respective halves pressed together. If the figure to be hollow, it is filled with soft clay, which is shaken out after the casting. In this case iron nails are driven into the wax model (usually on the backside) at one or more spots, depending upon size; these are intended to prevent the inner
clay core, which is without support once the wax has drained out, from coming into contact with the outer covering of clay, and so possibly causing holes to form in the statue. In recent years it is mainly hollow statues which have been cast, as transport costs for export are reduced due to their lesser weight.

Depending on the size of the statue, the modelling sequence takes a total of several days, sometimes a week, and in the case of very large statues, even months. Most of this time, relatively speaking, is devoted to the modelling of the head, but even the correction and removal of smaller defects and finger marks takes at least several hours.

If the statue has been commissioned for ritual purposes, then only in rare cases is a matrix, i.e. a negative mold from which further statues can be prepared, made from the original wax model, and then only with the express consent of the person who has commissioned the figure. When such an order for ritual purposes is involved, the original wax model is first checked by the priests and others in respect to its iconographic correctness before it is cast. It is not unusual for a statue of this type to be rejected because of iconographic errors, or to be returned to the craftsman for corrections.

The modelling process is thus always accompanied by a certain degree of suspense and tension. Colleagues occasionally drop by from neighboring houses to join in and offer their expert opinions on a model being made, especially if it is a new one. Once the original model has finally been completed to everyone's satisfaction, the older craftsmen sit down together and treat themselves to a hookah or a cup of tea.

The Matrix

In contrast to the practice previously, craftsmen now prepare several copies of an original, as long as it was not expressly commissioned for ritual purposes. This entails the making of a negative mold, the matrix (thasā, Pl. 9) from an original wax model, or from a figure already cast. It is formed from extremely hard wax, so that it will be strong enough to withstand the pressure when softer wax is pressed into it later on.

To prepare the matrix, the limbs and base are first separated once again from the original wax model using a knife. Then the hard wax, which has been softened beforehand in the manner described, is carefully pressed onto the outer surfaces of the individual parts. The edges are trimmed smooth with the knife, and then moistened in order to prevent the back part, which has been pressed on
following the same procedure, from fusing with the matrix. The more the wax must be pressed later on into the matrix, the thicker the walls of the matrix have to be.

Once the wax has cooled, the master craftsman separates the two halves from one another by pressing lightly with his fingers against the seams. He subsequently corrects any pressing defects in the matrix using the sculpting spatula.

In this manner, the matrices for the torso, limbs and base are prepared one after the other. The individual parts are then besmeared once more over their outer surface with a second, somewhat softer wax mixture for strengthening.

As a rule, the making of the matrix is in the hands of the master himself, since the artistic quality and number of statues which can be made from it depend on this matrix. A
matrix generally lasts for only 50-100 wax models, but occasionally even more; this number does not depend on the size and nature of a given figure, but rather on the degree of sensitivity and skill with which the craftsman presses the wax into the matrix. The more pressure he applies, the shorter the time the matrix lasts. When a matrix has become unusable, it is melted down and then reused for preparing new matrices.

The preparation of reproduction matrices from figures already cast requires less skill. This, however, is unfortunately not possible with all statues, but rather only with those which do not have a great deal of ornamentation. For this reason, this procedure is employed more frequently in the manufacture of simple and plain household vessels than in the casting of statues of deities.

The Wax Model

In principle, the wax model from a matrix is prepared like the original wax model, with only one essential difference: it is not sculpted anew, but rather is pressed into the matrix (Pl. 10). The pieces projecting over the edge are removed with a knife and smoothed. Then the artisans assemble the individual parts, just as in the case of the original wax model. In the wax model from a matrix, however, the figure generally is left hollow inside, and the strength of the wax varies depending on the metal to be cast later on. In the case of brass, for example, the wax need not be as thick as for a copper casting.

Of course, smaller parts, such as appended attributes and ornamentation, are not formed in the wax model using a matrix, but rather are fashioned by hand for each individual statue. At the finish, if the statue is to be hollow, the inside of the wax figure is smeared with soft clay (mhāsucā).

Just as in the original wax model, pouring channels (runners) made of wax are attached below to the base, and occasionally to the sides as well, in the case of most medium-sized and larger statues; these are then shaped into a pouring funnel (Pl. 11c). These channels, with a diameter of approximately 0.5 to 1 cm, serve to accelerate the actual casting process, so that the metal is distributed more rapidly throughout the entire hollow mold. The craftsmen call this piece naupvāh, i.e. 'funnel'. The pouring channels and funnel are later sawed off from the cast figure, and are thus merely auxiliary pieces designed to facilitate casting.
The Castina Mold

After the wax model is ready, a new stage in the process begins. One of the craftsmen carefully takes the wax figure and carries it over to another location, where in the meantime the clay has been prepared for applying the clay coat or jacket. The craftsmen use the term bhune ('to cover something') for the process of coating the wax figure with clay, an expression also used for getting dressed. The wax figure is now coated with a number of layers of clay, applied one after the next.

The first layer consists of liquid mhesicā clay, admixed with finely ground cow dung. The clay is a fine, yellow variety, of the type which is also used for coating the walls of houses. It is extracted from the second stratum of certain fields in the Kathmandu Valley. Equal
parts of clay and cow dung are stirred with water in a tub until a viscous substance is formed.

The wax figure is then dipped into this mixture (Pl. 11a). Air bubbles are formed in the process, and these are removed using a small brush, such as a shaving brush. The larger the statue, the more often this immersion process is repeated. Normally twice is enough, and approximately eight times is the maximum.

This coating basically has a double function: the cow dung promotes proper adhesion of the layer of clay to the wax, and the mixture facilitates a good regulation of the temperature during baking. The nitrogen in the cow dung
provides additional heat, thus preventing a too rapid cooling. At the same time, the mixture is porous enough to allow for heat to escape, so that the metal can solidify rapidly after it has been poured. The Newari metal-casters therefore do not need a system of runners.

After the initial immersion, the figure is coated additionally by hand or with a brush in difficult-to-reach places, so that all points, both inside and out, are then coated with clay. The figure is then placed outside in the shade to dry, and care is given that it does not receive any direct sunlight, since this could result in cracks in the layer of clay (Pl. 11b). The application of the first layer of clay must be done with exceptional care, since it is this layer after all which constitutes the mold into which the metal is poured. It thus supports the entire weight of the wax figure. For this reason, the wax must not be damaged during the application of the clay coating. Not a single point on the figure must be overlooked, no matter how small, since otherwise there will be a small hole at that point in the cast mold. One must also make sure that the water in which the clay is stirred is not too salty, because otherwise the metal of the statue might turn out too porous, due to the fact that the water evaporates, but not the salt.

The second layer of clay is applied after the first is dry (Pl. 11c). It is called the mhāsucā layer, because now a clay is used having this name; it is darker and more solid than the first type of clay. It is mixed with crushed paddy husks, and more of these are used in the first mhāsucā layer than in the subsequent ones. Like the cow dung, the paddy husks serve to increase the adhesiveness of the individual layers of clay and to regulate the heat. The clay is applied using wet hands, two to five times, depending on the size of the statue. Some generally apply the mhāsucā layer only twice, but then use a great deal more clay each time. After the clay has been applied, the figure - which now appears quite voluminous and bulky - is placed in the shade to dry. Only during the winter can the figure occasionally be exposed to a bit of direct sunlight.

Normally only these two types of clay are employed. Occasionally, however, depending on the confidence of the master in his own abilities, the value of the statue, and its size, a third layer of gathicā is applied; this is the same clay used in making the small clay oven mentioned above. This especially dark clay is regarded as the most heat-resistant variety, and is the best to prevent a bursting of the deeper layers of clay, and thus of the entire mold. It is more costly than the two other types of clay, and often comes from the southwest of the Kathmandu Valley, from Cāpāgāū for example. It is also applied in the manner described.
The casting mold (sāy), which is dried once again after this, now appears bulky and corpulent (Pl. 12a), since the individual layers taken together have a thickness of 1.5 to 3 cm. The contours of the original wax figure can hardly be recognized now.

If it is a hollow statue, then clay is also applied to the inner surfaces. Mhāsucā clay is used exclusively for this purpose. This is applied in a rather thin layer, in order to prevent uneven cooling during baking.

Covering of the wax figure with various types of clay is a time-consuming operation, which occasionally takes up to two months. In this connection special attention must be paid to make sure there is sufficient and even drying. For this reason, such a process can hardly be carried out during the monsoon, for example, since the high relative humidity impedes proper drying. Each error made in applying the clay or in drying will either render the figure totally worthless, or require corrections, which remain visible for the life of the statue.
A brief survey of the different casting molds according to the method of casting can now be given:

a) Hollow casting (pl. 13a)

Inside a thin layer of clay is smeared onto the wax figure; the 2-3 outer layers are thicker and are mixed with, among other things, paddy husks. Both levels are secured by metal pins so that they do not come into contact with one another after the wax has been melted off.

b) Solid casting (Pl. 13b)

A clay layer is not applied inside, so that metal pins are not necessary. The wax model for its part can be either hollow or solid.

c) Clay-core casting (Pl. 13c)

Brauen (1980) reports on a type of casting with a clay core. Here the figure is modelled with wax over a roughly modelled core of clay. The further steps in casting correspond to the other methods.

Melting of the Wax

Once the casting mold has been satisfactorily dried, the wax is drained out. In order to do this, the craftsmen proceed to the place where the various ovens are located. This spot is often even a separate house.

Pl. 13
The oven used for draining out the wax is called *si-lhvaygu-gah* (Pl. 14a). It is flat and rectangular in shape, and has an air vent on one side. The charcoal is brought to a glow, and the casting mold is then heated on both sides over it, being rotated constantly in the process.
By shaking the mold with tongs the master senses when the wax is molten. The casting mold is then removed from the oven with the aid of tongs or a stick, which is pushed underneath the two-to-three-armed pouring channels. The mold is then placed vertically on two iron rods, which are put over a tub. A hole is then made underneath in the funnel of the pouring channels, and the wax drains out (Pl. 14b). Approximately 50% of the wax is lost in the process, since some still remains inside the casting mold. The remainder is reused for new wax figures. The casting mold is subsequently stood vertically for cooling; several days may now elapse until baking.
The Crucibles

In the meantime, other craftsmen prepare the crucibles (bhocā). These are small crucibles approximately 20 to 25 cm in height, with a diameter of approximately 12 to 15 cm. The layer of clay is about 2 to 3 cm thick. They are formed by pounding over a thick rounded club (Pl. 15a). The inner layer is worked first; it consists of dark, heat-resistant gathicā clay, which has been mixed with flat paddy husks. The lid (kvapu) is initially left for later. Then this layer is covered over on the outside with a layer of mhesicā clay, on which in turn a layer of medium-dark mhāsucā clay is applied (Pl. 15c). A small round bulge is then pressed out using the fingers; later on, after the metal is molten, a hole is made in this bulge in order to facilitate better pouring of the metal (Pl. 15d).

The cover or lid is formed separately from gathicā clay mixed with paddy husks, and is then fitted to the main section of the crucible. Here too, the various admixtures serve to regulate the temperature. The reason the main layers of the crucible are worked from the hard gathicāi clay is because the crucibles must later be removed by tongs from the qven and shaken vigorously; this makes it necessary for them to have additional durability (Pl. 17c).

Before the lid is put in place on top of the main section of the crucible, the metal - in small pieces - is filled in up to the rim (Pl. 15b). Its volume, to be sure, will be reduced later on by melting to approximately one-third the original. Finally, the lid is put in place and mixed with mhāsucā clay admixed with paddy husks. After this, the entire crucible is once again given a coating of the same clay mixture.

After firing, another occupational caste, viz. the Dhūsah, buys the empty crucibles and extracts the remaining metal from them.

Not all craftsmen employ such closed crucibles; some use an open type, though this practice is more rare.

The Metals

It is extremely difficult to determine on the spot the alloy used in a given Nepalese statue. There are only a few instances of precise studies for Nepal. The investigations on the technology of materials collected by Ludwig von Schroeder show that older Nepalese statues were almost exclusively cast in copper; among other things, this was probably also due to the fact this raw material was readily available in the country (v. Schroeder, 1981:51). Studies of
more recent statues confirm that nowadays brass is the principal metal used for castings (Bauer 1970:204).

Traditional mixtures of metal, such as are familiar from Sanskrit sources (Skt. pāncadhatu, astadhatu), were evidently used only in very rare cases. Still, two Nepali statues of a larger size appear to have been produced in this manner, though even the Nepali authors making this claim leave the question hanging whether their conclusions are based on scientific tests of the metal or on pertinent historical written sources (Jośi, 1978:55; Gajurel/Vaidya, 1984:9).

The problem associated with the technology of materials directly on location derive principally from the fact that pure metals are generally no longer used, even when filling the crucibles; rather, it is a mixture of scrap and fragments from older statues and household vessels, along with pure metals. Moreover, the differing units of measurement as well as the imprecise terminology make for additional difficulties. Thus, the Nepali term dhalot does not only designate brass alloys, but is used for any kind of alloy.

Along with brass (an alloy of copper and zinc), casting is also done nowadays particularly in bronze (copper/tin), copper and bell-metal (brass with a higher tin content). Now and then one also runs across statues cast in silver, white metal (brass/nickel) or iron.

Copper casting, previously quite common, remains, now as before, an extremely difficult procedure, since it requires a great deal of heat; one must be careful, however, that there is not too much heat, due to the fact that copper oxidizes rapidly. The craftsmen who do not have a good mastery of the skills required for this type of casting nowadays call in copper specialists, if necessary, though only for the actual casting of the metal.

Firing

The firing of the casting mold and crucibles is done either outside in an open place or in a separate room. Various ovens are employed for this purpose.

Along with the sī-lhvaygu-gaḥ oven described above, which is used to melt and drain away the wax, there are mainly two other ovens in use in this phase of the process: the bhvamcaḥ and the sāya-gaḥ (Pl. 16). The former is a two-storeyed brick oven covered with a thick layer of gathicā clay. It has a large opening through which the crucibles are pushed into the oven using special tongs (Nep./New. cimṭā, New chali). The opening is then closed shut by means of a large stone plate, likewise covered over
with clay; this plate has a small ventilation hole in the center, which also serves to facilitate the removal of the plate.

Pl. 16
As a rule, this oven is fired with charcoal and firewood two hours beforehand. One of the helpers repeatedly blows fresh air into the oven through the air.
vents using large manual fans in order to maintain a constant temperature. Only if the casting molds are very large, therefore requiring all the more heat, are they also placed at the same time as the crucibles into the oven for firing.

In firing the crucibles, care must be taken that a large amount of heat is not generated right at the start, because the clay layers of the crucibles must be baked solid before the metal begins to liquefy. Otherwise the crucibles might break. The required temperatures lie around 1000°C depending upon the composition of the alloy.

During the process, the cover over the opening is repeatedly removed in order to check whether the crucibles have already been brought to a red glow. They are then agitated with tongs to test (a) whether the metal is liquefied and (b) in order to enhance the intermixing of the various types of metal. The master craftsman determines the exact moment for removing the crucibles. He says he can tell by smell, presumably from the odor of the vaporization of the tin. On the average, the crucibles remain in the oven four hours. Other craftsmen say they recognize the right moment by the color of the flame (Shrestha, 1983:33; cf. also Hauser, 1972:49).

Two hours after the first oven has been heated, the second oven is also fired; the casting molds have been previously placed in this oven. It is also two-storeyed, and has bench-like structures on the floor of the upper chamber for supporting the molds. There are several air vents down below.

As a rule, this oven is fueled only with firewood, since the wood burns with longer flames, which then also reach the tips of the casting molds. These are fully baked and ready when they begin to emit a red glow. Then they likewise are carefully removed by tongs from the oven, and are leaned up in a row against a support, of bricks for example (Pl. 17d,e). At the same time, one crucible after the next is removed from the first oven (Pl. 17a). The casting now can begin.

Some craftsmen have only one oven, the thāyāyaugah, instead of the customary two. This high oven has all vents down below, the combustion chamber above them, a chamber for the crucibles on top of that, and an uppermost chamber for the casting molds. Although such an oven is more economical, because of the fact that it requires less total fuel, it no longer enjoys much popularity nowadays,
since it is poorly suited for larger statues; its height also makes removal of the casting molds an uncomfortable procedure.

**Casting**

After the crucibles and casting molds have been sufficiently fired, the suspenseful phase of actual casting of the metal begins. A hole is made using a small pick in the bulge of the crucibles. Then one of the artisans quickly takes the crucible and brings it over to the casting molds (Pl. 17c). Before the metal is poured into the casting molds, another artisan throws a small ball of resin about the size of a pea at regular intervals into the funnel opening of the casting molds (Pl. 17d). The purpose of this technical trick is to create an oxygen vacuum, so that during pouring the metal does not oxydize in contact with the air and thus become more difficult to distribute throughout the casting mold. The ball of resin, which binds the oxygen and thus has a deoxydizing effect, produces a high jet of flame, through which the metal is then poured into the mold.

In a rapid, well-coordinated alternation, one crucible after the next, and one casting mold after the next, are removed from the oven, and the metal poured. The master observes everything very carefully and intently, but only rarely does he interfere. The atmosphere is tense. The doors of the casting house remain closed during casting, so as to prevent the entry of a disturbing gust of wind. The air inside is increasingly stifling and filled with smoke. All those taking part are black with soot and dust. But in the span of only a few minutes, all the molds have been cast. The doors can now be opened.

**Opening of the Mold**

As a rule, the casting molds are cooled in a bucket of cold water immediately after casting (Pl. 18a). A hissing cloud of water vapor rises. The master craftsman sits nearby, seemingly no longer intent on what is happening, although the decisive moment is now about to begin.

The cooled layers of clay are now broken away carefully with a hammer. How will the statue look? Has the wax model been worked well? Has the metal been sufficiently liquefied? Have the layers of clay been carefully applied? Are there any cracks in the metal? These and other questions will now be answered, and on them depends the reward for weeks of labor. The clay jacket is broken away in large pieces (Pl. 18b). A black figure covered with burned bits of clay emerges into view. It is cleansed immediately. Following this, the pouring channels and
funnel are sawed off (Pl. 18c). The master craftsman inspects the figure carefully. If everything is all right, he sits down, relieved and satisfied, with his fellow workers to enjoy a smoke of the hookah, and looks on quietly as the others free the remaining figures from their clay jacket.

Cleaning and Smoothing

After casting and the breaking away of the clay jacket, the statue is carefully cleaned. Many craftsmen do this phase of the work themselves, but some also pass the statues directly on to the chiselers, who are given the figures to be worked later on in any case.

First the clay is scraped and scratched off the statue. For this purpose, various scrapers (sumicā) of differing
sizes and shapes are used (Pl. 19a). Most frequently, a long iron scraper bent toward the outside on both sides is employed. The scraper surfaces are of differing size, so that one can also get at and scrape away the clay adhering in the corners and convolutions of the figure.

In addition, the craftsmen also use nails which have been bent in a concave fashion; these are especially suited
for scraping the round parts of the body. Depending on the degree of curvature of the arms, legs, etc., the selection of scraping nails is correspondingly large. These scrapers are placed from above at a sharp angle onto the parts of the body, and are then pressed or beat in a downward direction, either with the hand or using a small, simple hammer (mugah).

Once the roughest clay has been removed, the statue is sanded with a fine sandpaper (Khālsī) (Pl. 20a); in this way, the greyish layer which is caused by firing is removed, and - in the case of a brass casting - the statue then gradually takes on a yellowish, golden hue. The points on the figure which are difficult to get at are then polished fine using files, which generally come from India (Pl. 20b).
These thin files (vahcā) have either a triangular, round or half-round form, so that they can be adapted to the particular curvature involved (Pl. 19a).

Filing and cleaning is a time-consuming process. With a medium-sized statue, a craftsman is busy for about one day with cleaning and two to three days with filing. No point, no matter how small, must be overlooked and missed. Every bit of ornamentation and every flourish must be worked in detail. For some spots, a thin shaft of iron wrapped around with sandpaper is used, since this is the only way to get at areas that are particularly angular.

But even after cleaning and filing, the figure still does not have a clean, smooth surface. This is because even the finest clay leaves a granular surface structure in the wax, and this naturally reappears on the figure during casting. For this reason, the statue must still be smoothed. The craftsmen employ various dies (katā) for this purpose; these are all blunt or flat on one side, and on the other have a form which is adapted to the individual areas and points on the figure (Pl. 19b). They thus have various curvatures or planes which can be placed against the individual parts of the body. The craftsman then pounds on these dies, thus smoothing out the irregularities. He repeats this operation, constantly alternating among the large number of tools, and rotating the statue in all directions in the process. In order not to damage the figure as a result of the pressure of the hammer on the dies, the craftsman places the figure on a wooden block (tvāka), which absorbs some of the impact (Pl. 20c-d).
The smoothing operation, which is actually a form of cold-work forging, is of considerable importance, especially for copper statues, due to the presence of copper oxides. A properly smoothed statue often increases the value of the figure by several hundred rupees, depending on the amount of time expended. Because of the particular surface structure of copper, which is especially porous and uneven after casting, such statues are occasionally offered for sale in their unfinished form as supposedly very old figures; the surface imperfections are then presented as phenomena reflective of the age of the object. Along with judging the object from the vantage point of art history, however, the connoisseur often needs but to take a look at the sawed-off seams of the pouring channels in order to at least exclude the possibility that the figure in question is a very old one.

For the smoothing operation, an experienced artisan needs approximately two to four days with a statue of medium size. After smoothing, the helpers then polish the statue, using pieces of cloth to wipe away the scratches left by the sandpaper. In doing so, they first use small bits of a black polish (Nep. korā polish), which they apply to the cloth and which they then wipe briskly over the surface of the statue, in a rapid movement back and forth. This polish initially gives the figure a rather dull appearance, but it removes the fine, barely visible scratches. After that, the same procedure is repeated once again using lāl polish, a red polish which leaves the statue shining.
Chiseling is an exceptionally important step in the finishing of a statue. A good chiseler - and of these there are only a small number - corrects the flaws and errors of the craftsmen, insofar as this is possible. The time expenditure required for his work is very great, so that this also contributes to increasing the value of the statue. The effort and care invested in this work is particularly in respect to details. A good chiseler works several days on a medium-sized statue, and at times even as long as several weeks. Many dealers are no longer concerned about good chiseling work, since, as they see it, this increases the price of the statue without increasing its value. Such an attitude results in a situation where the few really good chiselers can demand even higher prices for their work.

The chiseler works on a statue while rapidly alternating among his many tools. In the process, he constantly turns the statue, and also engraves as well when necessary. The figure lies on a wooden block (tvāka), while the craftsman, squatting and holding the figure between his feet, chisels in the various designs (Pl. 20c). The most suitable places for these latter are the back, knees, base and garments (Pl. 23d and 25b). For this purpose, he
employs punches (jaki) with various designs on their face of impact, as well as a large number of chisels (tuphayagu) and graving tools.

Metal Designs

The chiseler has extensive liberty in his choice of designs, but certain kinds of ornamentation are obligatory on certain parts of the body. In Nepal nowadays, the principal types of ornamentation in use are as follows: Group symbols, such as the eight auspicious symbols (aṣṭamaṅgalabuṭṭa; buṭṭa = 'design') in various versions (Pl. 21), or other auspicious symbols (Pl. 22). Just as popular are animal and flower designs (svāmphobuṭṭa), such as lotus, jasmine, elephants, wild game or peacocks (Pl. 23). Of nature symbols, that of the cloud (Pl. 24) is used almost to the exclusion of others. Among the monograms, the Chinese sign for long life (shou) and the Indian swastika (svastikā) stand out (Pl. 25). No less impressive, though lacking any particular symbolism, are the numerous garlands and background designs used occasionally to decorate either an entire garment or merely the edgings or dress seams.

Pl. 24

Pl. 25

56
A majority of these ornaments are of Tibetan origin, or at least very popular among Tibetans, as they also turn up, for example, in Tibetan carpets (Cf. Kuløy, 1982:44ff.)
Only rarely do the craftsmen follow any sketchbooks or models for imitation when working on these designs, although there are several such books, including some quite old ones. They learn these ornamental designs directly from their teachers and master craftsmen, and go on to master them without having to refer to models for copying.
Ornamentation

In addition to metal decoration, the statues are frequently embellished by other types of ornamentation and painting. Thus, at particular points on the figures, such as crowns, garlands, hands and bases, precious and semi-precious stones may be mounted. Principally involved here are turquoise and coral of the type which is so popular in the Himalayan region. If larger stones are to be mounted, the necessary shallow recessed points into which the stones are subsequently to be set are already preformed in the wax model. In the case of small stones, it is sufficient if the points for setting are chiseled in after casting. Occasionally, bands and small discs of silver, and even gold, are set into the statue as ornamentation, similar to an intarsia inlay.

Parts of the statue are frequently also painted. These are generally Buddhist statues, in which the head ornament or hair is painted navy-blue. One also uses blue, white, and occasionally red paint to decorate eyebrows, the pupils and white of the eye, and for eye-shadow.

The face nowadays is quite frequently painted with gold. For this purpose, the craftsmen purchase so-called 'gold tablets' in the market; these tablets are soluble in water. They are extremely costly, and are supposedly made only by a single family, which keeps the nature of the composition a secret. The Indian and Tibetan artisans are also unaware of how they are made, and thus also obliged to buy from this family.

Another form of color alteration is accomplished by applying black liquid shoe polish to the entire statue with a piece of cloth, and then smoking the figure over a kerosene stove (Pl. 27). After this procedure is completed, the larger surfaces of the figures are either wiped off again or left the way they are. The first variant is designed to dull the polished metallic shine. In the process, bits of shoe polish remain in the corners and on the edges of the figure, so that the statue no longer gives the appearance of having been freshly polished. Foreigners in particular are not very keen on statues with a shining surface, since they give the impression of being new. For this reason, some tend to confuse this dulling process with the much more complicated procedure of forging and faking statues, a practice about which it is exceedingly difficult to obtain any direct information. The second variant, in contrast, does not attempt to simulate anything, but rather only has the stylistic purpose of blackening a statue.
Gilding - which in Nepal is exclusively fire-gilding - is an exceptionally sophisticated technique. It has become
increasingly endangered in recent years, not the least as a result of the large fluctuations in the price of gold, fluctuations the craftsmen and their customers have not been able to offset and absorb. Many artisans are therefore now abandoning this particular craft, since the orders are generally no longer sufficient to make a proper living. In June, 1982, the price of gold was pegged at approximately 2500 Rs. a tola (about 11.6 g). Even for a small statue, some 3 to 4 grams of gold are required, so that this naturally entails an enormous increase in its price. On the other hand, many tourists remain cautious about what the dealers tell them, and may, for example, think that a presumably gilded brass statue is one that in reality has only been polished to a particularly high sheen.

Copper statues generally continue to be gilded, now as before, since copper fuses particularly well with the mixture of gold and mercury used, according to the artisans who were questioned. The statues are first completely worked and finished, and are then brought to the gilders, who are likewise principally Śākyas or Bajrācāryas. The statues are first immersed in a bath of dilute sulphuric acid to remove any residues of dirt and grease. An assistant then besmears them with an amalgam consisting of mercury, salicylic acid, coal and salt. The salicylic acid (cupāu) is purchased in the market; it is extracted from lemons which are cut into small pieces and cooked for 24 hours. The mercury mixture is prepared in a large mortar according to a procedure similar to the one described later below.

After the statue - which now appears black because of the particles of coal contained in the amalgam - has been coated with this paste, it is immersed once again in the dilute sulphuric acid; this causes the components of coal, salt and salicylic acid to sink to the bottom or to be etched into the metal, so that the statue takes on a whitish-silvery color. It is then washed once again in clear water, dried with a wad of cotton, and rubbed clean.

Now the statue reaches the hands of the master gilder, who in the meantime has been busy grinding the amalgam with a pestle in a large stone mortar. To this he adds one tola of thin gold foil sheets, along with an equal amount of mercury. The mercury is initially poured into a thin cotton cloth, and then pressed out by squeezing, so that it spreads itself in the form of tiny balls over the bottom of the mortar. The master then pours in a quantity of small stones, not quite the size of a pea (Nep. phatkir, New. cyāphi envam) and proceeds to pulverize these against the edge of the mortar into particles the size of a grain of sand. Finally, he adds another 18 to 20 drops of salicylic acid to the mixture, and commences with the grinding.
Pressing down hard, he vigorously grinds the pestle back and forth, adding some water from time to time to make the mixture more viscous (Pl. 28b). Finally, he pours in an entire cup of water in order to dissolve the paste adhering to the edge of the mortar, so that the individual components, including the valuable gold, sink to the bottom. He then carefully proceeds to draw off the water, using a sponge.

This process of grinding and pulverization is repeated several times, each time adding the identical components in the ratios indicated. A strong and muscular artisan generally repeats the procedure about five times, one who is weaker seven to eight times. The mercury (pālāḥ) and the gold generally come from India, the other components from Nepal.

The amalgamated gold is now placed in pure salicylic acid on a small plate, and is applied neatly in a thin layer to the surfaces to be gilded; these have previously been covered with the mercury paste which contained no gold (Pl. 28c). The master gilder, who alone performs this task, uses some 2 to 3 brushes of varying size for the larger surfaces, and a small spatula for the crevices and corners. Certain parts of the figure, such as the head ornament, are left free of gold, so that these will later reappear after heating in the reddish color of the copper; they will thus furnish an attractive color contrast to the gold. The salicylic acid, into which the gold amalgam is placed, is - according to the master gilders - intended to keep the mercury in the first layer from combining too easily with that contained in the second; this would result in a poor surface distribution of the gold.

The statue is then washed off once again with water and rubbed dry with cotton wad. These pieces of cotton wad are carefully preserved, and then sold to the Dhūṣah caste mentioned above, who then extract the meager bits of gold residue. For a fee, this caste also removes at certain intervals the top layer of the clay floor when these procedures are carried out during uncertain weather in a well ventilated room; or they sweep the roof terrace with extreme thoroughness, if during good weather the gilding has been carried out there. They also then extract bits of gold residue from this clay or dust, which they subsequently sell either to the goldsmith or the gilders.

The statue, which still retains a silvery appearance, is now heated over a kerosene stove; this causes the mercury to vaporize, and the statue slowly takes on a dully gold hue (Pl. 28d). This step of the procedure quite naturally is highly injurious to health. The craftsmen protect themselves from the noxious fumes by placing a mask made of
cloth and cotton wad over their mouths and, if at all possible, by working outside against the wind. When smaller statues are involved, however, they often do not take any such precautions. Previously it was the practice for gilders to put a small ball of raw buffalo meat or goat meat (kacilā), which had been kneaded and minced for some two hours, into their mouth; this meat then turned black during the heating process and was subsequently spat out (Höfer 1980:54). Nowadays the gilders say that their former colleagues found this necessary in order that they might obtain a bit of meat cheaply, because usually it was the case that some of the meat was left over after the heating procedure; and the person who had commissioned the order had naturally supplied all the meat. A further protective measure involves washing out one’s mouth with local brandy (which is of course subsequently swallowed); this supposedly takes away the unpleasantly flat taste of the mercuric vapors (Pl. 28e).

In spite of these precautionary measures, the health situation of the gilders is not particularly favorable, even if only a few complain about serious maladies. However, all say that they suffer from poor teeth and eyes, as well as a chronic cough as a result of their occupation. They also like to engage in talk about older fellow craftsmen who became very ill. The gilders also report about certain dealers who have suffered from similar diseases, since they often observe the gilding process directly in order to prevent the gold which they must supply from disappearing, or from being used in too small quantities.

The heating itself is carried out in a very careful manner. The master turns the statue repeatedly with iron tongs, wipes off various points with cotton wad, and occasionally adds some gold amalgam, should he notice that an insufficient amount has been applied in certain places. In the case of a smaller figure, the mercury has completely vaporized after approximately five minutes. The figure is then washed in water and passed on to the assistants for burnishing.

For this they make use of a burnishing stone (hakīb), presumably agate, which is attached to a brass stylus (lasām; Pl. 60). The dull layer is thus removed by briskly rubbing with the stone over the large surfaces of the figure; in the process, the burnishing stone is dipped again and again into a vegetable alkaline solution (hatham). The craftsmen use a small brush and files for the crevices and corners.

The gilding of statues is also occasionally done by an electrolytic process, as is often the case when coating with silver. But the durability of the gold layer which results from this procedure is markedly limited, so that the Nepalese craftsmen - and their customers even more so - maintain a rather low opinion of the value of this method.
The most important stages of Newari lost-wax casting end with the fire-gilding. In consideration of their complexity, a summary of the separate technical steps would appear to be in order. The following table is intended to supply such an overview.
### SUMMARY TABLE OF NEWARI LOST-WAX CASTING

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Materials</th>
<th>Tools &amp; implements</th>
<th>Time expenditure (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wax model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wax cake</td>
<td>Filtering, stirring</td>
<td>Wax, resin, plant oil</td>
<td>Pot, linen cloth, water tub</td>
</tr>
<tr>
<td>Summer wax</td>
<td></td>
<td>3:1 (wax:resin)</td>
<td></td>
</tr>
<tr>
<td>Winter Wax</td>
<td>4:1</td>
<td>1:1, 1:2</td>
<td></td>
</tr>
<tr>
<td>Matrices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wax plates</td>
<td>Kneading</td>
<td>Wax cake, plant oil, water</td>
<td>Stone slab, kneading stone</td>
</tr>
<tr>
<td>Matrices</td>
<td>Modelling</td>
<td>Wax plates (matrix wax)</td>
<td>Spatula, coal oven, fan, knife, horn tool, measuring tape, compass</td>
</tr>
<tr>
<td>Wax model parts</td>
<td>Modelling</td>
<td>Wax plates (winter or summer wax)</td>
<td>Spatula, coal oven, knife, horn tool</td>
</tr>
<tr>
<td>Wax figure</td>
<td>Fusing, pressing</td>
<td>Wax parts, liquid wax</td>
<td>Knife, wooden stick with cloth wad</td>
</tr>
<tr>
<td>Pouring channels and runners</td>
<td>Rolling into shape and attaching</td>
<td>Winter wax</td>
<td>Stone slab, horn tool</td>
</tr>
</tbody>
</table>

---

1 The Śāḍakṣarī Lokeśvara statue is taken as the basis for this description (cf. page 23).
2 Insofar as possible, the time one person spends working is measured. Usually, however, several craftsmen work on a statue together.
<table>
<thead>
<tr>
<th>Casting Mold</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lumps of clay</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Liquid clay</strong></td>
<td>Stirring</td>
</tr>
<tr>
<td><strong>Soft clay</strong></td>
<td>Kneading</td>
</tr>
<tr>
<td><strong>Hard clay</strong></td>
<td>Kneading</td>
</tr>
<tr>
<td><strong>Clay coating</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1st layer</strong></td>
<td>Dipping</td>
</tr>
<tr>
<td></td>
<td>Drying</td>
</tr>
<tr>
<td><strong>2nd layer</strong></td>
<td>Besmearing</td>
</tr>
<tr>
<td></td>
<td>Drying</td>
</tr>
<tr>
<td><strong>3rd layer</strong></td>
<td>Besmearing</td>
</tr>
<tr>
<td></td>
<td>Drying</td>
</tr>
<tr>
<td><strong>Melting of the wax</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heating</td>
</tr>
<tr>
<td><strong>Opening the mold and letting out the wax</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hammering, boring</td>
</tr>
<tr>
<td><strong>Cleaning the channels</strong></td>
<td>Boring, scraping</td>
</tr>
<tr>
<td>Opening the casting mold</td>
<td>Hampering, scraping</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Pouring channels, Sawing</td>
<td>Scaping, filing, sanding</td>
</tr>
<tr>
<td>Cleaning</td>
<td>Smoothing</td>
</tr>
<tr>
<td>Polishing</td>
<td>Rubbing</td>
</tr>
<tr>
<td>Metal design</td>
<td>Chiseling, chasing, engraving</td>
</tr>
<tr>
<td>Other designs</td>
<td>Painting</td>
</tr>
<tr>
<td>Gems</td>
<td>Setting</td>
</tr>
<tr>
<td>Blackening</td>
<td>Coating, heating</td>
</tr>
<tr>
<td>Crucible</td>
<td>Production Modelling</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Filling</td>
<td>Weighing</td>
</tr>
<tr>
<td>Sealing</td>
<td>Besmearing</td>
</tr>
<tr>
<td>Firing</td>
<td>Lighting the oven</td>
</tr>
<tr>
<td></td>
<td>Firing</td>
</tr>
<tr>
<td></td>
<td>Firing</td>
</tr>
<tr>
<td>Casting</td>
<td>Removing</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Casting aperture</td>
</tr>
<tr>
<td></td>
<td>Pouring</td>
</tr>
<tr>
<td>Process</td>
<td>Activity</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
</tr>
<tr>
<td>Purifying</td>
<td>Bathing in acid</td>
</tr>
<tr>
<td>1st paste</td>
<td>Pulverizing, grinding</td>
</tr>
<tr>
<td>Cleaning</td>
<td>Washing</td>
</tr>
<tr>
<td>2nd paste</td>
<td>Pulverizing, grinding</td>
</tr>
<tr>
<td>Cleaning</td>
<td>Washing</td>
</tr>
<tr>
<td>Heating</td>
<td>Statue</td>
</tr>
<tr>
<td>Polishing</td>
<td>Rubbing</td>
</tr>
</tbody>
</table>
Bibliography


Brauen, M., 1980: Herstellung von Statuen aus Metall, Booklet (Tibet/Nepal) of the Völkerkundemuseum of the University of Zurich, September 1980.


Kāśyapa-Jñānakāṇḍa, s. Goudriaan.


Mayaśāstra, s. Bose.


Śilparatna of Kumāra, ed. by K. Sāmbaśiva Śāstri, pt. II. Trivandrum (Trivandrum Sanskrit Series, no. 98).


PLATES


2. Preparation of the wax cake.
   a) The mixture of wax and resin is filtered through a cotton cloth.
   b) The pressed wax cake is warmed before the wax figure is modelled.

3. The wax is pounded soft on a large, flat stone slab (mālḥvaṃ) with a small, round stone (macālḥvaṃ).

4. The modelling of the wax.
   a) Master caster Kāji Ratna with his sons sitting around the milāyca oven.
   b) A fragment is moistened with saliva.
   c) Small pieces are modelled by hand.
   d) The contours are fine modelled with the aid of spatulas.
   e) Modelled pieces are assembled.

5. The production of wax garlands.
   a) Strands of wax are pressed into a mold.
   b) The strands are pressed onto the larger wax figure.

6. The cutting (a) and fusing (b) of the edges of wax pieces.

7. Modelling instruments.
   a) Modelling spatulas (silāyku); b) Horn tool;
   c) Knives (chalamcā); d) Swage block for garlands;
   e) Liquid wax with wooden stick (sīkathicā)

8. Assembly of the wax pieces.

   a) All the matrices of the Lokeśvara statue
b) Detail (feet and thighs)

10. Soft wax is pressed into a matrix.

11. Coating the wax figure with clay
   a) The first, liquid layer (mhesicā) is applied.
   b) The wax figure with the first layer of clay, still wet.
   c) The second, thicker layer of clay (mhāsucā) is applied.
   d) The pouring funnel (nauphā) is formed.

12. The casting of (a) the Lokesvara statue (Inv. No. 82.61:7), (b) a water jug.

13. The various casting molds: (a) Hollow mold; (b) Solid mold; (c) Clay-core mold (from: Herstellung von Statuen aus Metall. Booklet of the Völkerkundemuseum of the University of Zurich.)

14. The melting and draining of the wax
   a) The oven for melting the wax (sī-lhvaygu-gaḥ)
   b) The wax flows out of the heated casting mold into a tub.

15. Making the crucible
   a) The crucible is formed from clay around a knobstick.
   b) The crucible is filled up with scrap metal.
   c) After an old clay cover is laid on top, the entire container is coated with a hard layer of clay.
   d) A neck for (later) pouring out the metal is formed in the clay coating.

16. The firing ovens
   a) bhvamcā-gaḥ (left) and sāya-gaḥ (right)
   b) bhvamcā-gaḥ with crucibles
   c) bhvamcā-gaḥ with covering plates
   d) sāya-gaḥ with casting molds
   e) sāya-gaḥ with covering plates
17. The casting

a-b) The crucible and casting molds are taken out of the ovens with tongs.

c) A hole is made in the neck of the crucible (cf. Pl. 15d).

d-e) The metal is poured into the casting molds, while pellets of resin are thrown at the same time into the pouring funnel.

18. Opening the casting mold

a) The completely cast forms are cooled in a bucket of water.

b) The clay coating is knocked off.

c) The pouring channels are sawed off.

d) The unfinished statue, freed of its clay coating and washed (Inv.-No. 82.61:5).

19. Cleaning and chiseling tools

a) Scrapers (sumicā) and files (vaḥcā) for cleaning

b) Dies (katā) for evening out the statue’s metal surface.

20. Refining the statue

a) Sanding; b) Filing;

c) Chiseling; d) Chasing

21. Metal designs: auspicious symbols I.

a) The eight auspicious symbols (āṣṭamaṅgala): śrītvatsa (endless thread); dhvaja (banner); padma (lotus); pūrnakalāśa (overflowing jar); matsuṣya (fish); śaṅkha (conch); cakra (wheel), chattrā (parasol). (All designations: Skt.)

b) A predominantly Tibetan influenced variation of the āṣṭamaṅgala: vādyatūrya (music instrument, esp. small cymbals); ādarsā (mirror), sindūra (a heap of minium or cinnabar); bilva (leaves)/=śrīphala; śaṅkha (conch); kalāśa (jar); rocana (light); padma (lotus). (All designations: Skt.)
22. Metal designs: auspicious symbols II.
   a) Corrupt representations of various auspicious symbols, e.g. the Chinese 'eight treasures' (pa-pao)
   b) Flying scarf (Tib. dar-dpyangs); lightning bolt (Skt. vajra; Tib. rdo-rje); crossed lightning bolt (Skt. viśva-vajra; Tib. sna-ts'ogs rdo-rje).

23. Metal designs: flower and animal designs
   a) Peony
   b) Lotus
   c) Leopard and tiger
   d) Chinese dragon

24. Metal designs: nature symbols
   a) Clouds
   b) Fire

25. Metal designs: monograms.
   a) Chinese sign for 'long life' (shou)
   b) Chinese brocade design
   c) Swastika (Skt. svastikā)

26. Metal designs: background designs.
   a) Flower design (for large surfaces)
   b) Geometric edging designs

27. Blackening the statue.
   a) The statue is coated with a liquid shoe polish and
   b) then turned over the flame of a burner.

28. Gilding
   a) The components of the amalgam of gold and mercury are weighed.
   b) The amalgam is produced by crushing action in a mortar.
   c) It is applied with a brush to the statue.
d) The statue is heated over a kerosene burner so that the mercury vaporizes and the gold comes through with a dull gleam.

e) A swallow of spirits is said to help avoid the effects of the poisonous mercury vapor.

f) The dully gleaming statue is polished to a shine with a burnishing stone.

29. The Lokesvara statue, refined to its finished state (Inv. No. 82.61:21).
Acknowledgement of Illustrations

Plate 1  National Museum, Delhi

13  Martin Brauen, Völkerkundemuseum of the University of Zurich, 1980.

21, 22a+c, 25a+b  Drawings by Š.B. Bajrācārya

12a, 18d, 29 (and cover page) Völkerkundemuseum Hamburg

All other plates by the author.