



Dhokra The Traditional Art of Metal Casting

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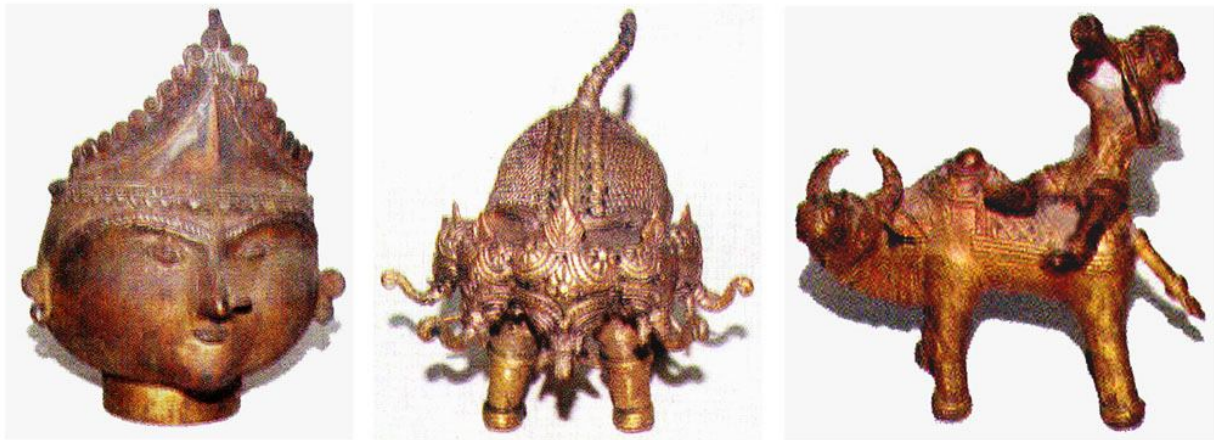
If the Mohenjodaro craftsman who famously cast the bronze figurine of a dancing girl some 4500 years ago were to visit central and east India today, he would undoubtedly feel at home. In the Dhokra metal-casting process he will recognize the lost wax technique he himself would have used in his time. It is this unbrokenness of tradition coupled with the intrinsic starkness and vitality of the art form that makes Dhokra a coveted collector's item in India and abroad for connoisseurs, scholars and laypersons alike.

The lost-wax technique, called *cire perdue* in French, is a metallurgical art form that is at once one of the oldest and the most advanced. Apart from India it was used in ancient Egypt, Mesopotamia, China and Greece. The technique flourished in the hands of the Aztecs in Mexico during 14th-16th centuries AD and in the Benin kingdom in south-central Nigeria during 14th-19th centuries AD. It has been a favourite of many modern-day sculptors, and for the last 100 years employed in dentistry and industrial manufacture.



Modern technology is the art of making things on the basis of explicitly stated principles of science. It is therefore amenable to improvements/modifications.

Traditional technologies, on the other hand, have been empirical in nature. They were brought to a satisfactory level of performance through trial and error and then more-or-less frozen. The empirical art of making things as handed down from generation to



Left: head icon container, Bankura, c. 1972, middle: five headed elephant, Bikna, right: piper on a buffalo, Bankura 2001

generation continues traditional crafts.

Traditional crafts can be discussed under three distinct categories:

1. Production of wealth, and trade (agricultural and animal husbandry implements, carpentry or smithy tools etc.)
2. Lifestyle (textiles, kitchenware, pottery, recreation, etc.)
3. Belief systems, rituals, creative urges etc.

Early India chronology

c.7000BC	Advent of agriculture, animal husbandry and settled life. Neolithic revolution
c.4000BC	Use of copper
c.3500BC	Making of bronze alloy by smelting copper and tin ore together
c.1000BC	Iron metallurgy
c.100BC	Zinc metallurgy. Making of brass alloy of mixing pure copper and pure zinc

Indian rural economy continues to depend substantially on traditional crafts and craftsmen. Yet ironically in the modern age it is the economically unessential traditional crafts that command value and price.



A traditional craft that has seen many vicissitudes in its chequered history is the Dhokra, the practitioners of which are also called Dhokra.

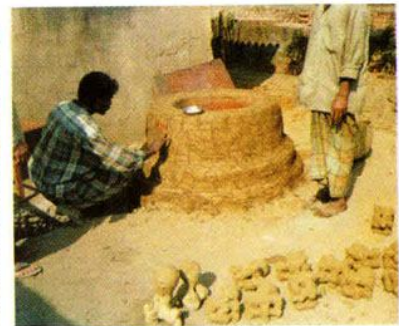
The Dhokra people are settled over a vast tract in the mineral-rich central Indian tribal belt covering



Polybonga, Bikna , 2001

the modern regions of Jharkhand, Chhattisgarh, Orissa and parts of Andhra Pradesh. They are also settled in the adjoining alluvial districts of Bankura, Bardhaman, Purulia and Midnapur in the westernmost part of Bengal. Though all Dhokras are ethnically related, they are variously classified as scheduled castes, scheduled tribes, or other backward classes, depending on the prevailing socio economic parameters.

In Bastar district of Chhattisgarh Dhokra work is done by a metal-working caste, called Kaser (after Kansa, bronze) or Ghadwa (meaning pot-maker). Two caste groups engaged in Dhokra work in Mayurbhanj district of Orissa are the Thetari Ranas and Thetari Naiks. The Bengal Dhokras retain memories of having migrated from Orissa. They believe that they originally came from Bastar. It is not clear whether this is a genuinely preserved tradition or a repletion of what they have been told about themselves. They are now called Karmakars , an obviously successful attempt at sanskritization. Earlier literature lists them as Mals or Malars, or as Dhokra Kamars (as distinct from say Ghatra Kamars, who make kitchen utensils). Interestingly, even though the Dhokras and the Ghatras have started inter-marrying, the latter are not welcome into the Dhokra club.



Left: transforming the impression from dhuna to fine wet clay, middle: setting up a make-shift furnace(extreme right), which will be covered with stores(middle), To extreme left is the fuel: cow-dung cakes, right: the new pucca furnace that has replaced the old arrangement.

Lost-wax technique

Dhokra craftsmen are artists first and metal workers later. It is bees-wax and not metal that permits them to give material shape to the creative images they form in their mind. The actual process can be summed up in six essential steps:

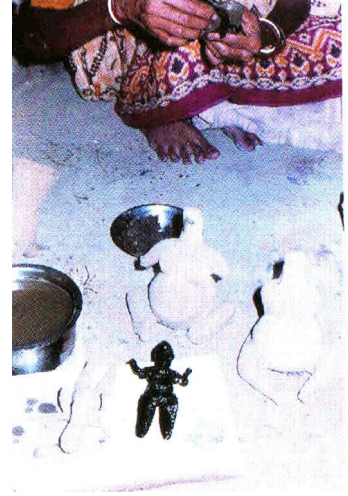
Step 1 Using rather coarse clay the shilpi makes a core vaguely resembling the end product. The clay core is hardened either by drying in the sun or by mildly firing in an oven.

Step 2 determines the artistic quality of the work. Drawing the bees-wax into stripes and thin wires, the artist wraps them around the clay core to produce a replica that is smooth and expressive. Bees-wax is often mixed with *dhuna*, that is the resinous gum of the sal tree (*Shorea robusta*), and boiled in mustard oil. The mixture also is called *dhuna*.

Step 3. The replica is coated with a very thin layer of very fine wet clay. All the fine details of the wax replica are now impressed upon clay. This layer is sun dried and further layers of clay added. The mould is now ready. The artist must now become a metal worker. A clay funnel is added for molten metal to flow inside the mould.

Step 4. The mould is carefully heated so that the wax melts and is lost (hence the name lost-wax technique) leaving behind a cavity.

Step 5 involves actual casting in a furnace. The cavity is filled with molten metal, and the mould left to cool.



From clay core (left) to replica (right)

Sanskrit texts

The technical aspects of the lost wax technique have been discussed at length in three old Sanskrit texts, in the context of solid or hollow casting of idols.

- (i) *Manasollasa*: A 12th century text attributed to King Bhulokamalla Somesvara of the western Chalukya dynasty of Kalyani
- (ii) *Silparatna*: A 16th century work by Srikumara who wrote it at the instance of King Devanarayana, ruler of Ambalappuzha (central Kerala).
- (iii) *Manasara*: A few selected verses in this text deal with the lost-wax process, termed Madhuchchhist a Vidhanam. This text still serves as a practical guide for Sthapatis of Swamimalai in South India.

Step 6. The clay mould is broken and the artifact taken out for cleaning and polishing. A new artifact has been created out of metal scrap.



The Dhokra shilpis often work with brass (copper + zinc) or bronze (copper + tin). If the tin content is high, the alloy is called bell metal. Unlike in the case of potters, where traditionally the

turning wheel is reserved for men, all parts of Dhokra work can be done by either men or women. Children learn the craft through imitation and instruction.



Figurine elephant, Bikna, 2001

Continuity embedded in change

We should be grateful to the Dhokra shilpis for preserving this priceless civilizational heritage on behalf of the whole world. If they or their children were to give up their profession, we shall be the losers, not they.



Ganesh, Bikna, 2001

Continuity can be sustained only if it is embedded in change. Traditional technical processes are inherently stable. Any suggested change or improvement must not be disruptive. It must take place in small incremental steps, each step leading to the establishment of an intermediary equilibrium stage. Technology can be a snake or a ladder. If overwhelming it can inhibit creativity; if absorbed, it can enhance. Any initiative to help the rural shilpis must simultaneously

operate at three levels: (i) Benefit of social networking; (ii) help with marketing; and (iii) technological assistance. Of these three factors, technology is probably the least important!

The technology of the Dhokra shilpis is essentially a throwback to times of their nomadism. Till very recently, every time a family wished to do metal casting, it would hastily set up an open furnace. The shilpis were fully aware of the shortcomings of the arrangement. The furnace was fuel inefficient and caused air pollution. In addition it restricted the casting to small objects. What hurt the shilpis the most was the evaporation of metal which pushed up the input costs by as much as 20 percent. Also,



Decorative container, Bankura, c.1972

because of the non-uniformity of temperature the rejection rate was unacceptably high. However, it was not sufficient merely to point out the solution to then shilpis; they must be gently led to it.

Under its TARA programme (Technological Assistance to Rural Artisans), NISTADS has been working since 2000 with all of 35 Dhokra families in Bikna (near Bankura) and 22 families in Dariapur (district Bardhaman). Bikna, just outside the Bankura town, is new on the Dhokra map. Dhokra families from Rampur (within bankura) and elsewhere were settled here in 1983. Both Bikna and Dariapur have been provided with a number of pucca community furnaces where the shilpis can monitor the temperature. Shilpis have been trained to modify the composition of the brass alloy as also in brazing (soldering with brass itself). More fundamentally, they have been introduced to the concept of levelling and measurement.

Phases of development

Even though the Dhokra shilpis have been operating within the rigid technological framework provided by tradition, their art form has not remained static. Over the years, they have responded to newer and newer forms and motifs. We can identify five major phases of development in their art.

Phase I is defined by the original Dhokra repertoire, which is simple and stark in keeping with the maker's lifestyle and philosophy.

Phase II came into being when the Dhokra shilpis took to settled life and started making new items consistent with the requirements of a food-surplus economy. Their work now included rather ornate Hindu gods and goddesses. Interestingly, in their own shrines, the Dhokra shilpis of Bikna have retained worship of their own creations (horses, elephants, etc.) in addition to Bhairon, who is a form of Shiva and a deity consistent with nonvegetarianism.



Figurative crab, Bikna, 2001

Phase III is characterized by two major developments: patronage extended by the state and the social elites; and interaction with creative sculptors like Meera Mukherjee. She successfully imbibed in her own work techniques and motifs of the Dhokra art and, once accepted as an insider, introduced the Dhokra shilpis to new forms. It is during this phase that the stylized Bankura horse, hitherto a preserve of the Kumbhakars (clay shilpis), was successfully adopted for casting in metal.



Votive icon, Bankura, c.1972



Kunke, traditional bowl, Bikna, 2002

Phase IV, a relatively recent phenomenon, has been thrust upon the Dhokra shilpis by the demands of the cheap souvenir market. This phase is characterized by such “novelty” items as a Ganesh with an umbrella. Much of the work is pure kitsch. Such has been the impact of this phase that shilpis now describe their creations not in their own words but in the vocabulary given to them by the traders. Very often, when the traders descend on the shilpis’ village to make purchases they pay exploitatively low prices. In such cases the shilpis seek to indirectly raise their wages by lowering craftsmanship and compromising on the quality of the inputs. Thus they may use inferior quality of scrap and substitute coaltar for *dhuna*.



Scorpion, Bikna, 2001

Phase V, ushered in at Bikna and Dariapur by NISTADS in 2001, is defined by technological improvements accompanied by an enhanced sense of worthiness and Help in marketing (thanks to support from Cottage Emporium, Tribes and Manjusha). Remarkably, creative levels have risen to match the technology available. Not only are the shilpis making bigger and better artefacts, they have also added new forms and motifs on their own.

Acknowledgement: The text and the images have been taken selectively with the permission of the author from the Brochure released on the occasion of the inauguration of Nistads Dhokra Museum, New Delhi, National Institute of Science, Technology and Development Studies, 2003.



About the Author

Professor Rajesh Kochhar is currently a CSIR Emeritus Scientist at IISER: Indian Institute of Science Education and Research Mohali. He obtained his M.Sc. Honours School in Physics in 1967 and Ph.D. in 1973, both from Panjab University, Chandigarh, where he began his career as a lecturer. He was a Professor at Indian Institute of Astrophysics, Bangalore, in 1999, when he moved over to New Delhi to take charge as Director NISTADS: National Institute of Science, Technology and Development Studies, New Delhi (CSIR). He has been Professor of Pharmaceutical Heritage in NIPER: National Institute of Pharmaceutical Education and Research, Mohali. He has lectured extensively in India and abroad including Harvard, Cornell, University of Texas at Austin, Belfast, Brighton, Royal Dublin Society, Tübingen, Copenhagen University and National Museum Copenhagen. Professor Kochhar has been a Jawaharlal Fellow, a Fulbright Visiting Lecturer, a Visiting Scholar at University of Cambridge Department of History and Philosophy of Science; and honorary professor of History of Science and Technology at National Institute of advanced Studies, Bangalore. Professor Kochhar has published original research in a number of fields: history and sociology of science & technology; science and education policy; ancient Indian history; and modern astronomy and astrophysics. His views have been sought and published by magazines like Science and Nature as also by BBC Radio. Professor Kochhar has been interested in various aspects of Modern Science and the Non-West in historical and contemporary contexts. As a conceptual framework for historical studies Professor Kochhar has enunciated a Principle of Cultural Copernicanism according to which no cultural geographical or ethnic group or area can be deemed to constitute a benchmark for evaluating or judging others. Professor Kochhar has endeavored to develop and popularize a Trans-Cultural Civilizational Perspective whereby modern science is seen not as Western science but as the current phase of a human cultural cumulus to which contributions at different times have come from different parts of the world.