The Dhokra Artisans of Bankura and Dariapur, West Bengal: A Case Study and Knowledge Archive of Technological Change in Progress

David Smith, Newport, UK
Rajesh Kochhar, New Delhi, India

The project report describes the process of village renewal in the Bengal region of India. It deals with the replacing of an ancient traditional but inefficient metal-foundry technique in the village with another which is almost as ancient but more efficient. The impact of this apparently simple change on this dhokra practice has been both profound and rapid, leading to significant improvements in the creativity and prosperity of the dhokra artisans and their families. The project is set in me context of a wider exploration of the potential capability of multimedia as a tool for ethnographic research. Multimedia systems make it possible to use a full range of modalities of description, including video, sound, still image, conventional text and technical diagrams to develop adequate representations of skilled performance mediated by the craftsman him- or herself. It was therefore possible to produce a mediated record of change in progress. This provides the basis of an archival record which will help to correct acknowledged defects in the existing ethnographic literature of the artisan craft industries in India. It is also likely to prove a useful teaching resource, both in me field of cultural studies and as a means of throwing light on archaeological and other evidence of past metalworking practices.

1. Introduction: The Ancient Craft of Dhokra

The ancient craft of **dhokra** (*cire perdue, or lost wax*) metal casting was once widespread throughout India, but is now restricted to a small number of groups of traditional artisans in widely dispersed locations. One significant nucleus of me craft exists among related groups of families in Bikna Village (Bankura) and nearby Dariapur, in West Bengal, India. These communities have been the subject of an action research project initiated and coordinated by the *National Institute for Science, Technology and Development Studies* NISTADS within the *Indian Council for Scientific and Industrial Research* CSIR. It involved replacing an ancient traditional but inefficient metal-foundry technique with another which is almost as ancient but more efficient. The impact of this apparently simple change has been both profound and rapid, not only on the dhokra practice itself, but also on the material prosperity, self-esteem and creative confidence of the artisans.

The name 'Dhokra' or 'Dokra' was formerly used to indicate a group of nomadic craftsmen, scattered over Bengal, Orissa and Madhya Pradesh in India, and is now generically applied to a variety of beautifully shaped and decorated brassware products created by the *cire perdue* or 'lost wax' process. The craft of lost-wax casting is an ancient one in India, and appears to have existed in an unbroken tradition from the earliest days of settled civilisation in the sub-continent. The traditional themes of these cast metal sculptures include images of Hindu Or 'tribal' gods and goddesses, bowls, figures of people or deities riding elephants, musicians, horse and rider figures, elephants, cattle, and other figures of people, animals, and birds.

The first detailed study of *cire perdue* work in the Bankura District was carried out in the early 1960s by Ruth Reeves (1962) This work has been the primary source for many subsequent reports and academic theses (see, for example, Krishnan,1976; Pal, 1978). However, there has never been a detailed audio-visual record of the craft, and this current report aims to fill this gap in the record. It documents a period during which the people of Bikna are adapting their traditional way of working to the demands and possibilities both of a new technology and a new commercial environment. It therefore provides a unique contemporary record of a historic living tradition undergoing rapid and fundamental change.

Although there is a small but increasing demand for dhokra work from urban Indian families, as well as in the tourist trade, the craft is threatened with extinction. Most of the remaining dhokra communities are extremely poor, and their economic condition has caused many families to leave the craft to find wage employment in local manufacturing centres or in metropolitan centres such as Kolkata (Calcutta).

According to Sen (1994):

> "Perhaps the poorest craft group of West Bengal, the Dhokras are the most interesting and creative. In recent years, under the pressure of all-embracing industrialisation and changing social values, they have been forced by the loss of their natural rural market to diversify their products and are now seeking, with the help of the government and some voluntary agencies, a market among urban sophisticates, as creators of decorative ware. These efforts have met with only limited success".

Sen attributes the roots of this failure to

> "... Greedy dealers in handicrafts [who] took advantage of the failure of the government and the voluntary organisations to provide adequate price protection for the producers".
>
> However, as we shall show, the situation is far more complex than simply being a matter of economic exploitation.

The Cire Perdue Technique

The casting of finely detailed metal artefacts by means of the *cire perdue*, or lost wax, technique is almost as old as settled civilisation. The technique is simple to describe (but difficult to perfect). It involves six stages:

- **Core-making**: A clay core is made, slightly smaller than the final intended size of the artefact. The core may be hardened by firing or sun-drying;

- **Modelling:** A detailed wax model is built up around the core, to the thickness of metal desired in the finished object;

- **Moulding**: The wax model is coated with a thin layer of very fine clay, which will form an impression of every detail of the model. When this layer is dry and hard, further layers of clay are added to the mould. One or more pouring channels are provided, through which molten metal can run to fill the mould;

- **De-waxing**: The mould is pre-heated to melt the wax, and the molten wax is poured out (it may be recovered for subsequent re-use). This leaves a cavity which has the exact size, shape and surface contours of the intended artefact;

- **Casting**: Molten metal is poured into the cavity and the mould left to cool;

- **Finishing**: The artefact is broken out of the mould. Traces of baked clay are removed and surface blemishes and defects repaired.

There are many refinements and variations, but the above outline applies to most of the traditional styles of *cire perdue* work still extant. The sophistication of the process varies considerably, with the most advanced techniques employed in South India and Bastar in Madhya Pradesh (See Postel and Cooper, 1999 pp 81-97). The casting process used in Bankura and in nearby Dariapur appears to be the least technologically developed of all.

3. The Origins of the Cire Perdue Craft in India

The earliest known examples of *cire perdue* work include the famous bronze 'dancing girl' found in Mohenjo-Daro in the Indus Valley (Agrawal, 1971). Even at such an early stage, this finely observed bronze figure already shows the highly developed creativity and mastery of the production technique typical of *cire perdue* at its finest. Lost wax casting subsequently spread, whether by communication or parallel invention, to most civilisations. The process of *cire perdue* casting has been very well documented in antiquity, and Krishnan (1976) and Pal (1978) both cite classical Sanskrit sources, such as Manasara, Silparatna and Somesvara, which give detailed descriptions (or even prescriptions), conceivably for the regulation of the craft. It was certainly pervasive throughout the Indian sub-continent, as demonstrated by an ample archaeological record, and examples exist in gold, silver, copper, bell-metal, bronze and brass.

Our specific focus here is on the production of the range of brass artefacts, commonly known as 'dhokra'. Welch (1986, pp 103-113), provides illustrations of examples of fine *cire perdue* dhokra work of ‘tribal' origin dating back as far as the 18th Century, from locations as disparate as West Bengal, Purulia, Maharashtra, Orissa, Bastar (Madhya Pradesh), Himachal Pradesh, Punjab and Bihar. The major contemporary centres of production are in West Bengal, Bihar, Madhya Pradesh, Andhra Pradesh and Kerala, though the numbers of families engaged is everywhere in decline. The craft has historically been particularly associated with the so-called 'tribal' peoples of India. Its heartland for many centuries was in the metal-rich region of Central India, covering the

modem regions of Jharkhand, Orissa, Chhatsigarh and parts of Andhra Pradesh. The practice was in the hands of family groups of non- Hindu semi-nomadic artisans, called' Dhokras'. Some of the Dhokra families appear to have migrated into the alluvial plains of Bengal, finally settling around centres such as Bankura, Burdwan, Purulia and Midnapur.

Despite its antiquity and wide geographical dispersion, it appears that the work of the dhokra makers was always marginal to the domestic economy of India, and did not achieve the importance and consequent security of, for example, the manufacture of water containers or cooking vessels. Dhokra making did not figure much in Birdwood's magisterial survey of 'The Industrial Arts of India' (1880), except, perhaps to be included in the following way (p.143):

> "Beside the village and sumptuary arts there are the savage arts of the wild tribes…"

Sen (1994) describes the traditional dhokra craft in West Bengal
and its typical products:

> "...they [The dhokra makers] used to move from village to village in the south-western districts, repairing old and broken utensils and selling small images of Lakshmi, her mount, the owl, Lakshmi Narayan riding on an elephant, Radha and Krishna in different attitudes, all made in a very strong and primitive folk style. These images were installed in the household shrines of newly married Hindu couples to bring prosperity and happiness. They also made and sold decorative caskets in different shapes and sizes, purchased by housewives for various purposes. They made and sold measuring bowls in different sizes. These were considered symbols of Lakshmi and were therefore highly prized by those villagers who could afford them. Ritual lamps in different designs were also popular items. Their other products included small models of animals and birds and a variety of trinkets and bells..."

4. The Dhokra Makers of Bankura, West Bengal and their Ethnography

One of the major remaining foci for the dhokra craft is some kilometres to the north of Bankura in West Bengal. Thirty six related families live in a close-knit clan community in Bikna village. According to Dhiren Karmakar, interviewed in September 2001, their forefathers were nomads who came from Chhota Nagpur. The actual caste origin of the Bikna artisans is obscure. This may be due in part to a process of gradual 'hinduisation' (see, for example, K.S. Singh, 1993), though their religious practices are far from the Hindu mainstream. Worship typically involves a simple open-air 'altar', at which offerings of terracotta figures are made. The offerings depend on the seasons, and may be related to the major Hindu festivals, such as Ganesha Chatthurti.

Any attempt to clarify the relationships and history of the dhokra makers of West Bengal suffers from the incomplete and fragmentary nature of the records. No records of this artisan industry survive from pre-colonial days, and the standard documentary resources,

such as Risley's monumental 'Tribes and Castes of Bengal' (1891) must be seen as reflecting both the anthropological fashions of their era and, perhaps more significantly, the "divide et impera" priorities of colonial administration. The colonial fascination with caste and social taxonomies may stem more from a pragmatic need to create distinctions than from meaningful structures in contemporary Indian society.

There is certainly a great deal of confusion in evidence when one attempts to track the forefathers of the Bikna community through the pre-independence census data for Bengal. Mitra (1953. p.2) shows that census reports reveal a tendency for caste designations to increase or decrease in number according to current thinking, leading to apparently arbitrary aggregation and subsequent disaggregation of 'caste' groups. Mitra (ibid. p.5) points very succinctly to the problem when he notes wryly that:

> "In the hands of a government which seeks to hold a country by force and guile, to rule by dividing the people, there can be few weapons as lethal as caste…"

Risley (ibid. Vol. 1 p. 236) defines 'Dhokra' as:

> "A sub-caste of Kamars or blacksmiths in Western Bengal, who make brass idols."

Risley subsequently points out (ibid. pp. 388 - 389), regarding the sub-castes of the metal working caste of Kamars that:

> "It is impossible at the present day to determine whether all of them are really derived from the Kamar caste; and it seems probable that some of them may be separate castes, which have been classed as Kamars on account of some real or supposed resemblance in their occupations."

By the middle years of the twentieth century, the Bankura dhokra makers were being described as 'Mal' or 'Malars', according to Risley (Vol. II p. 45-50):

> "...A Dravidian cultivating caste of Western and Central Bengal..."

Which could just conceivably refer to large sections of the entire population of Bengal!

Ruth Reeves (1962) refers to the Bankura Dhokra as 'Kainkuya Mal' (which possibly derives from association with the traditional measuring vessels known in Bengali as 'kunke'). In doing so, she is following SK Ray's contribution to A. Mitra's ethnological analysis of the 1951 Census of India. In his treatment of 'The Tribal Group of Craftsmen', Ray asserts that:

> "...We can divide the Mals readily into two groups:
> (i) the Sanakar Mals or painters and (ii) the Kaikuya [NB it is possible that this variant of the name is simply a typographic error] Mals or brass

> workers... They have an occupational system similar to that found among the Mala of South India, namely the Loom-Mala, the Cart-Mala, the Hammer-Mala, the Doll-Mala etc. As a matter of fact, the form of caste system that prevails among the aboriginal and backward classes of West Bengal can be called the Mala-system."

Reeves (ibid. p.36) also refers to the Bankura dhokra makers as 'Dheppos' described by Ray, (ibid. p.302) as:

> "...wandering artisans belonging to aboriginal stock [who] maintain a tradition of metal craft in a primtive manner...

Ray, however, seems to imply that this latter group was not associated with the *cire perdue* tradition. In any case, earlier attempts to locate migratory dhokra makers (whatever their caste) in the region seem to have failed (see Reeves, ibid. p.37), perhaps indicating that the migratory way of life had ended some time before these groups attracted the attention of the great and good. Nevertheless, the evidence of this report will show that the essential metal founding technology used by the people of Bikna village was more appropriate to a migratory than a settled way of life, and the problem may be one of a confusion of terminology.

Mitra (ibid. pp.1-3) helps to explain much of this confusion by detailing the changing practices in recording caste adopted by the Census of India between the 1901 Census and the first Post- Independence census in 1951 (when caste distinctions were legally abolished). In any case, as he points out (ibid. p. 6):

> "...caste has not been so immutable... as one is too willing to imagine, but a live and pliant force, sensitive to change, as any function of society must necessarily be."

The fairly recent adoption of the 'sanskritised' caste designation 'Karmakar' by the Bankura dhokra artisans must be seen in this light, reflecting the villagers' sense of social progression and a degree of approximation to the mainstream of Hindu society in West Bengal. It may, however, be analogous to the widespread adoption of surnames by English villagers during the sixteenth and seventeenth centuries. If this is the case, 'Karmakar' might be closer in sense to the surname 'Smith' than to the location in a traditional social structure which a true caste designation might imply. However, the Dhokra Karmakars of Bikna never made eating or cooking vessels, and this would imply a historic caste limitation. Despite their apparent annexation into the Karmakar caste, the dhokra makers are still socially and economically marginalised. On the following page, we show one of the artifacts created by these artisans in their village.

5. The Dhokra Making Tradition as Practised in Bikna Village

5.1 The Creative Process

Despite its stability over many centuries, the dhokra craft has not remained entirely static. As Sarkar (1998) points out from his analysis of the artisan Kansari (braziers) in Bengal:

> "...technology in Indian artisanal industry did change in response to market demands. If such changes appear rather timid and slow, it was because a radical transformation of the technique of production was never a pressing and unavoidable need in India."

The period of nearly four decades between the publication of Ruth Reeves' study and the initiation of this project in November 2000 witnessed a number of changes in the creative aspects of the dhokra craft as practised in Bikna. This is part of a long process of change, which Rajesh Kochhar (2001) characterised as falling into four phases:

"Phase I is defined by the original Dhokra repertoire, which is simple and stark, in keeping with the makers" life style and philosophy:

Phase II came into being when the Dhokra artisans took to settled life and started making new items consistent with the demands of a food-surplus economy: Their work now included rather ornate icons of Hindu gods and goddesses. Interestingly, in their own shrines, the Dhokra artisans 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 non-vegetarianism.

Phase III is characterised by two major developments: patronage extended by state and socialites; and interaction with creativesculptors like Meera Mukherjee and Pradosh Das Gupta. These artists successfully imbibed in their work techniques and motifs of the Dhokra art and, once accepted as insiders, introduced the Dhokra artisans to new forms. It was during this phase that, under state patronage, the well-known Bankura Horse, a stylised, decorated horse with long upright neck and pointed ears, which hitherto had been a preserve of the Khumbkars (clay artisans), was successfully adopted for casting in metal.

Phase IV, a recent phenomenon, has been thrust upon the Dhokra artisans by the demands of the cheap souvenir market. This phase is characterised by some 'novelty' items, such as a Ganesh with an umbrella. Most of the work, however, is pure kitsch. Since the price paid to the artisans is exploitatively low, they seek to indirectly enhance their wages by compromising on the quality of the inputs as well as craftsmanship".

Even in the course of a few months, the action research described here has now led to a further phase:

"Phase V; in which creativity levels have risen to match the technology available. Not only has the quality of realization improved but the artisans themselves have found a new creative confidence, and have thought of and created new artefacts not seen before."

If the creative content of Bikna dhokra work changed over time, their technology, on the other hand stayed remarkably constant - at least until the year 2001. Beautifully adapted to the conditions of the original nomadic lifestyle, the dhokra technology did not adapt to the settled way of life. The failure of the Bankura Dhokra Karmakars to modify their technology probably contributed to their creative and economic decline over the past fifty years.

5.2 The Casting Technology prior to August 2001

Core-making

Cores were made from local clay. The fine clay-loam found around the roots of bamboo was specially favoured. The clay was dried, sieved through sacking and then mixed with uncrushed sand. This sand-rich clay was mixed with water to an appropriate consistency, and used to make suitable core-figures. The cores were slowly sun-dried over three or four days.

Modelling

The fine detail of the object to be created is built onto the core using wax or some other suitable medium.

Ideally, wax ('mom') is the best modelling medium, but the Bikna Karmakars prefer to use 'dhuna', which is based on a natural plant resin extracted from the Sal tree (Shorea robusta) mixed with mustard oil. Dhuna becomes very plastic when warmed, but holds its shape very well, even in high ambient temperatures.

As an economy measure, many of the Karmakars had taken to using hydrocarbon pitch as an inferior substitute for mom or dhuna. This had a number of serious defects, which contributed to the decline in both creative and metallurgical quality of the final product.

Moulding

The completed model is covered in a layer of a very fine clay which takes an impression of all its surface details. This layer is then sun-dried. When the first layer was dry, a second layer was built onto it. The clay used for the second mould coat was usually mixed with sand.

At this stage, one or more channels were created in the mould to allow the flow of molten brass into the space which would be left when the modelling medium had gone. Traditionally, a split bamboo rod was used to bore through the dried first layer. A large casting might need two or more channels.

The bamboo was held in place with clay and the second coat of the mould then completed. This involved building a cup-shaped structure around the "flow channel". The clay of the mould was built up until the cup was held firmly in place and then the bamboo

rods were removed. The cup would eventually act as a melting crucible, holding the brass for melting. At this stage, several moulds could be combined, sharing a single crucible – especially if the casting was a small one. This economised both on the labour of producing the 'crucibles', and, eventually, on fuel through minimising the number of separate items to be heated.

The final stage involved the completion of the 'crucible' part of the mould. The 'cap' of the crucible was made separately and sealed in place with clay after the crucible had been charged with brass. The metal used was scrap brass, which had been rendered brittle by heating on the furnace and then broken up into small pieces. Recently, attempts were made to cut costs by adulterating the brass with, for example, aluminium. The result was a very inferior product and the practice only resulted in an even lower unit price for dhokra items.

A special panel was built into the crucible to provide an easily breakable 'window' to let in air so that the brass would flow into the model space. After charging the crucible and sealing the cap, the mould was given a final coat of clay prior to firing.

De-waxing

The closed system moulding used by the Bikna Karmakars made it impossible to recover the wax (or dhuna), which was therefore either vapourised and burnt or else absorbed into the clay of the mould. This is vividly contrasted with the practices in Bastar and South India, where a high level of wax recovery is achieved. The loss of the modelling medium might not have been problematic for forest-dwelling nomads who would have harvested natural products for themselves in the course of their travels, but became a serious cost inefficiency in the process once the dhokra people had adopted a settled way of life.

Casting

A crude furnace was built in a convenient open space, using loose bricks. The fire was made using cowdung and bought charcoal.Completed moulds were laid in the fire, with the cup downwards. When the mould was judged to be ready, it was removed from the fire using tongs or a pair of green sticks. It was inverted, so that the metal cup was at the top, allowing molten brass to run down into the mould space. The special weak 'panel' in the metal cup was broken through with a stick or oilier suitable implement.

The traditional furnace was inefficient in two ways:

Firstly it was wasteful on fuel. Each furnace was specially built for a single batch production. Fuel was wasted heating the furnace and the moulds to casting temperature, and there was no gain from multiple firing in the same oven, thereby conserving heat. Again, this would not have been a problem to forest-living nomads with ready access to free wood, but was immediately disadvantageous once the dhokra had settled down.

Secondly, it was more or less impossible to control the firing temperature of the furnace. This meant that metal, particularly zinc, was lost by sublimation when the moulds were broken open.This could be seen in the colour of the fumes after opening. The loss of metal led to serious metallurgical degradation of the brass, as well as being another source of cost inefficiency; Another side-effect is that many of the people of Bikna suffer from eye problems, probably due to heavy metal irritation.

Discussions with the craftsmen showed that they were aware that metal was being wasted, but felt powerless to prevent this.

5.3 Becoming an Artisan: growing up in Bikna

Like most traditional craftspeople, the dhokra artisans of Bikna have no formal system of apprenticeship: craft training as such does not exist. The craft is, to coin a phrase, "learned by being". Children in Bikna grow up in an environment where the dhokra craft is everywhere around them. Every spare corner of the village is taken up by drying moulds or artefacts in various stages of preparation, and the routine of the craft is part of the daily rhythm of the village. Small children soon learn to imitate their elders, playing with clay, making cores and eventually graduating to detailed modelling in dhuna (or pitch). The fastest learners soon become useful additions to a family team. Indeed, 13 year-old Anant, whose father is sick, supports his family by working as a wage-labourer for other Karmakars.

The Karmakars agree that it is difficult to make a living at all unless the family are fully engaged in the craft, and those with small families or who have no children are at a disadvantage. This militates against extended education. This is not to say that the Karmakars are completely uneducated. Most children manage to attend two or three years of schooling, whilst young women marrying into the village often have several years of elementary education. But the appeal of joining the adult world or work is very alluring and the social pressures to contribute are great.

Over the years, attempts have been made to introduce elements of formal training into the craft. The initiative in this respect has been taken by the West Bengal Crafts Commission, who have been proactive in organising creative and technical workshops for dhokra artisans.

5.4 Modelling Problems

The fact that the cire perdue process followed in Bikna does not permit wax recovery is a significant factor undermining the potential profitability of the craft. The finest medium for cire perdue modelling is, as the name itself would suggest, beeswax (Mom). The Bikna artisans' preferred medium is Dhuna (a mixture of the resin of the sal tree and mustard oil). This is almost as good as wax but rather cheaper. Risley (op. cit. p. 48) speaks of a specific 'sub-caste' of'Dhunakata Mal', who collected dhuna by tapping sal trees (and might therefore have supplied the resin), but both wax and dhuna are natural forest products, and would most probably have been collected by itinerant craftsmen in

the course of their travels. The lack of wax recovery was therefore acceptable whilst the 'Kainkuya Mal' were still living as nomads

The situation changed when the dhokra artisans settled down. Whereas artisans in other parts of India (notably in Bastar and Tamil Nadu) developed efficient means of wax recovery, the Bankura artisans did not. This added to the uncontrolled costs due to the metallurgical problems associated with the traditional furnace. Some of the more prosperous Bikna artisans continued to use dhuna, but others tried to cut costs by replacing the dhuna with 'pitch' (coal tar). This was not a good move. Not only is 'pitch' a coarser modelling medium than either wax or dhuna, but it appears to cause "gassing" of the molten brass in the mould, leading to pitting ~d erosion of the cast surface. The false economy of using pitch simply resulted in a further degradation of quality.

6. The Impact of a New Technology on the Dhokra Craft

6.1 The new furnace

The story of the Bikna dhokra craftspeople took a different turn, when NISTADS became involved on their behalf. NISTADS funded Bengal Engineering College to design and develop a fuel-efficient permanent furnace under the management of Dr. A K. Mukopadhya, NISTADS Resident Scientist in Bankura. The new technology was adopted by Netai, a brazier from Petrasayer in Bankura District, West Bengal. In 1997, NISTADS helped Netai to obtain a bank loan to modernise his facilities. He was subsequently able to obtain substantial production orders for dhokra items: a fact which was well known to the Bikna artisans.

However, despite this knowledge, and despite Netai's obvious prosperity, the Bikna families made no move to adopt the new technology. It would have been all too easy to attribute this to a kind of laggard conservatism, but a field visit to Bikna and Petrasayer in November 2000 by Rajesh Kochhar of NISTADS and David Smith of University of Wales College, Newport (UWCN) revealed a different, more interesting and more complex picture.

Designed in collaboration between NISTADS and the Bengal Engineering College, the improved process effects substantial reduction in fuel consumption for melting brass in a low cost furnace, of capacity 8-12 kg /batch. The furnace lining is made with locally available burnt rice husk and clay. The rated coal metal ratio is 1.7 in case of single heat and 0.6 with 4 successive heats as against 2.9 in the process traditionally used by the artisans. The clay mould is also modified to facilitate open pouring from the furnace. Alternatively, the traditional clay moulding process can be substituted by green sand moulding. A variety of specialized tools were also introduced to facilitate effective and safe use of the furnace.

6.2 Netai Kannakar's 'Factory'

In comparison with the primitive working conditions at Bikna village, Netai's set-up was effectively a "micro-factory". At the time of the first field visit, the workshop was given over to batch production of brass drinking beakers, using a modem oil-sand investment moulding technique and using scrap water pots as the source of metal. A small electric grinder had been installed for finishing the products, and the business appeared to be flourishing, supporting three families in Petrasayer.

Netai still makes dhokra to order. These are mainly relatively large objects, with less fine detail than the Bikna work. Netai arranged a demonstration of dhokra casting, using an open mould rather than the traditional closed mould used in Bikna. This was an extremely interesting experience, because the clay mould was clearly too weak and 'leaked' molten brass as the metal was poured. It seems possible that there is a real problem with the suitability of locally available clay for the construction of moulds for open casting of dhokra articles. It is worth noting that artisans in South India and Bastar reinforce their moulds with iron wire, as well as firing ('biscuiting') them before moulding (Krishnan,1976)

6.3 Art, craft or industry?

The reasons for the reluctance of the Bikna artisans to adopt the furnace technology with which Netai Karmakar had been so successful may be far more complex than simple conservatism or entrenched caste tradition.

Firstly there is the issue of poverty. No detailed study has been carried out of the micro-economics of dhokra production at Bikna, but such evidence as there is points to the fact that the nett money earnings of the artisans are very low indeed. They could not raise the finance to pay for a permanent furnace except by borrowing from a local moneylender at interest rates of around 2% per day.

Secondly is the question of the sociodynamics of the craft (See Rogers & Kincaid, 1981). Despite his evident prosperity, Netai was not regarded by the bulk of the craft community as a good role-model. His craftmanship was not admired in any case, but his location in Petrasayer, many hours' journey from Bikna, put him outside a tight-knit circle of closely related families. In fact, the Bikna people regard him not as a true 'Dhokra Kamar' like themselves, but as an inferior outsider. Netai's family certainly appear more completely 'hinduised' than the people of Bikna.

A third factor concerns the extent to which the Bikna Karmakars' sense of identity is invested in the integrity and status of their craft. Netai's success ultimately rests on the abandonment of the dhokra craft as such. Although Netai still makes dhokra items to order, the bulk of his income comes from the mass-production of low craft-content industrial items. The identity and self-esteem of the artisans of Bikna is deeply invested in their craft. Over the years, of course, an increasing number of individuals and their families have ceased to be dhokra artisans and have moved into Bankura and other towns to work as wage labourers. Nevertheless, the core group of families at Bikna remained

committed to dhokra making. Any change which effectively meant the death of the craft was almost unthinkable.

Finally, and perhaps decisively there was an ingrained suspicion of “initiatives". It emerged that the Bikna artisans were owed the (for them) huge sum of 1.75 Lakh Rupees (1 Lakh = 100,000) for goods previously supplied to official Crafts Emporia.

6.4 The introduction of the new furnace into Bikna

After a field visit in November 2000, Rajesh Kochhar of NISTADS initiated a project to develop an efficient furnace for Bikna village. Accompanied by Dr. Mukopadhyay, he met Juddha and Mahdav Karmakar, two of the most senior and highly respected artisans in the village, and also arranged meetings with Netai. The object was to collaborate with the craftsmen in achieving a design which would not only be technically appropriate, but where there would be a sense of ownership. An experimental furnace, based on Netai's, was built in Bikna during December 2000. NISTADS agreed to finance the development, but Rajesh Kochhar made it a condition that the furnace should be a community resource, rather than the property of a single artisan or his immediate family.

A permanent furnace needs to be protected from the weather. Fortunately, protection was available in the form of three large shelters build some years previously under a West Bengal regional development. The new furnace was built in one of these shelters. Experience showed that the first prototype was too large and would be too expensive to operate in the long run. The design was therefore modified to create a smaller furnace. This proved to be a complete success, and over the next three months, a further five were built, so that there were two in each of the three village shelters. All of them were used as communal resources. It is interesting that this development has its parallels in the historic development of metal working in India. Sarkar (1996) argues that, irrespective of their origins, traditional blacksmiths were nomads, using a form of open-air furnace (sal) which was very similar to the old Bikna furnace. As these smiths settled and adopted permanent furnaces, they also developed well-built workshop structures (Kot-Sal). Those smiths who remained itinerant were accorded very low caste status.

6.5 How the craft has changed (August 2001 and subsequently)

It was expected that the introduction of a new furnace technology would catalyse major changes in the dhokra craft at Bikna. What was not anticipated, however, was the speed and extent of this change. The advantages of the new furnace were so apparent to the Bikna artisans that the old traditional way of doing things was changed within the space of a few months. Whereas it had been anticipated that take-up of the new furnace would follow a classic technology transfer profile, with 'early adopters', 'laggards' etc., the new furnace was adopted almost immediately by all of the families. Completely unexpectedly, the inefficient 'nomad' furnace was relegated to the secondary role of pre-firing charcoal for charging the new furnace heating scrap brass (this makes it brittle and easier to break up), and, interestingly, for baking the moulds.

Other changes were significant, but relatively minor. For example, the practice of making a flow channel using a split bamboo has been replaced by the partial firing of the first mould layer, and then using a simple hand drill to bore through the clay. The 'crucible is then built up around the channel, and melted pitch or dhuna poured in to make a full connection with the inner mould. One change in practice was particularly striking. Parts of Bikna had been wired for electricity supply at the same time as the shelters had been built. One ingenious 'bricoleur' discovered that it was now possible to run a (rather ramshackle) lead from a mains point to drive an electric fan which could be used to speed up firing of the furnace. The effect has to be seen to be believed!

As the location of the furnace has moved from the open air to the cover of the shelters, the production process has followed suit. Most of the work is clustered around the furnaces. This allows for fuel efficiency since as soon as the furnace is finished with one batch of moulds, it is cleared and re-charged, making use of the heat stored in the body of the furnace and reducing fuel requirements: The furnace can also be used for secondary purposes, such as baking moulds or pre-heating scrap brass.

In collaboration with Dr. Mukopadhyay; the Bikna artisans have developed a range of new tools appropriate to the improved processes. However, they have not followed the example of Netai and changed over to open crucible casting. They acknowledge that this would probably be more efficient, but they feel cautious about the safety aspects of handling molten brass. Also, as Raneswar Karmakar pointed out, they are not sure whether the moulds would be suitable. Our observation in Netai's workshop suggests that this caution is probably well justified.

6.6 A new creative confidence

The introduction of the new furnaces has had an immediate beneficial impact on the output of the better artisans. It is now possible to maintain effective control over the casting of artifacts containing relatively large amounts of brass. New products have been created, such as the “polybonga" (based on a popular terracotta form). This has encouraged a renewal of creative confidence, and craftsmen like Dhiren have begun to develop quite stunning works of original artistry. Equally importantly, however, they are able to concentrate once more on the quality of their products. They see this as more important than developing new products. Dhiren Karmakar is happy making the traditional dhokra repertoire, and believes there is a market for it if high quality can be maintained. He remembers that training courses were held some years ago [by the West Bengal Crafts Commission] to help develop new products, but there was never very much demand for these. He will make them from time to time if there is an order.

6.7 New Opportunities

In parallel with the development of the new furnace technologies, NISTADS actively catalysed a range of developments intended to move the artisans' business methods in line with their new commercial opportunities. In a series of village meetings, Professor Kochhar persuaded the senior craftsmen to reactivate a defunct village Cooperative

Society. This would give them access to 'soft' loans through the formal banking system, rather than high-interest 'hard' loans from local moneylenders.

In addition, a variety of commercial opportunities were opened up. NISTADS Director Professor Kochhar took advantage of the Indian CSIR (Council for Scientific and Industrial Research) Foundation Day 26th September 2001, to raise the profile of the Bankura dhokra industry. Artisans from Bikna were invited to travel to Delhi (no minor undertaking in itself) and showcase their products. The event was extremely successful. Substantial sales were achieved and some good orders were taken. In addition, the artisans were invited to present their wares at an event to be held at the 'Dilli Haat' craft market. It remains to be seen if this is the hoped-for breakthrough, but the omens appear to be very good.

7. The Future of the Dhokra Craft in West Bengal

7.1 The dhokra trade in Dhiren and Raneswar

Interviewed in September 2001, Dhiren Karmakar and his relative Raneswar Karmakar were ambivalent. They felt that they themselves were better off than their fathers. The market for their products is good, and they are able to have two square meals a day so there is no hunger any more. They do not save - they do not think in that way at all. Any money that is accumulated is spent on social events or medical treatment. Both Dhiren and Raneswar saw a reasonably secure future for themselves in the dhokra trade. If they can get capital, they felt they could cope with changing market conditions. But they cannot accumulate capital, and rising costs cause problems, because they have to finance production by borrowing at high interest rates, which just leaves them with bare subsistence.

All the same, they felt that they are better placed than those who have left the craft to take up wage labour in cities and towns such as Bankura. Although wage labourers have more secure incomes, they do not have the prestige of the independent craft artisans, and this is important They also saw themselves as better off than the braziers (Kansari) who traditionally made household utensils, since these articles are becoming too expensive for the market, and there is now no money at all in that trade, though previously braziers were quite prosperous. In the end, however, they were quite clear that there was no long-term future in the dhokra trade, either, and they would prefer it if the young people of the village had some other alternatives - other than becoming wage-labourers.

7.2 Education and the way forward

Dhiren and Raneswar were agreed on the importance of education. They felt that their fathers had no power as a result of having received no education. They believed that even with just a little education, their generation was more empowered than their parents. Dhiren has four sons and a daughter. He has not been able to afford to give them a good education, and they chose to le:tve school and join the dhokra trade after class four. Dhiren said that so far, no child from the village has gone for a job [meaning high status

'office' employment]. He tho:ught that it would be better if future generations were able to become educated, even if that meant they wouldlleave the craft. Apart from opening up a way out of the dhokra trade, he thought that educated young people would be able to keep proper accounts and be more businesslike. He saw education very much in terms of empowerment.

7.3 Anant Karmakar: the new generation

When interviewed in 2001, Anant was about 13 years old. He was identified by the elder craftsmen of Bikna as the most gifted of the younger generation. His father was ill, and unable to work regularly, so Anant supported his family by working as a wage labourer for other artisans in Bikna. Anant had attended two years of primary school. He could read and write Bangla (Bengali), but he did not read books, and he spoke little or no Hindi. If he had a choice between working and continuing his education, he would prefer to go to school. He would like "a job" [meaning office work] rather than continuing as a dhokra artisan.

Since the above interviews were carried out in September 2001, the Bankura artisans have become financially better off and socially more assured. Their art and craft can now provide them with security and status greater than they might expect outside of the dhokra craft. It remains to be seen how this new-found prosperity will impact on the attitudes and opinions of the artisans – and especially on young people of Anant's generation.

7.4 Dariapur: Extending the Experiment

The success of the action research in Bikna led to the extension of the intervention to Dariapur village, some two hours by road from Bankura, where about 20 dhokra families live and work. Dariapur is not only sociologically more complex than Bikna, in the sense that the better connected members of the community have been exploiting the others, but also artistically poorer – a sad decline from the days when the sculptor Meera Mukherjee was involved with the dhokra artisans of Dariapur.

To date, NISTADS has built two furnaces at Dariapur. Other actions have included repairing both the large community shed and the village tube-well and obtaining medical treatment for a young girl suffering from tuberculosis. These social actions have helped to enlist the enthusiasm of the villagers, winning their confidence and making technical initiatives more acceptable. NISTADS was also able to have the Dariapur initiative formally inaugurated by an influential West Bengal State Government minister. This high level patronage has brought local government officials into the village to extend educational and other forms of support to the community.

7.5 A Multimedia Knowledge Archive

As Smith and Hall (2001) demonstrated, multimedia technologies make it possible to develop adequate representations of skilled performance mediated by the craftsman him-

or herself. Particularly valuable in this respect is the capacity of multimedia systems to use a full range of modalities of description, including video, sound, still image, conventional text and technical diagrams. This technology makes it possible to present very complex information in a variety of formats and contexts.

As part of a wider exploration of the potential capability of multimedia as a tool for ethnographic research, it has been possible not only to track and record the processes of change in Bikna but also to develop an active archive of aspects of the artisans' changing knowledge base. A detailed photographic and digital video record was made of the dhokra craft processes. In addition, individual and group interviews and discussions were recorded. These were carried out and translated by Rajesh Kochhar, and Pradosh Nath of NISTADS and by Mr. Adip Dutta of Kolkata. All multimedia resources were edited and authored at UWCN. A preliminary record was published on the Internet as 'bankurahorse.com' and a more comprehensive multimedia program is under development.

The research has provided valuable raw material for development of the theory and practice of the use of new interactive media in the archiving and management of tacit knowledge. This is significant in our understanding of ways in which tacit knowledge can be represented and transmitted when traditional channels of communication are lost or disrupted (Smith 2002). Its particular value lies in providing a concurrent account of a craft response to rapid technological change. It also provides the basis of an archival record which will help to correct acknowledged defects in the existing ethnographic literature of the artisan craft industries in India. It is likely to prove a useful teaching resource, both in the field of cultural studies and as a means of throwing light on archaeological and other evidence of past metalworking practices.

8. Conclusions: Passing the Tradition on

The ancient craft of the dhokra artisans of West Bengal is in the balance. The new furnace technology developed under the auspices of NISTADS has eliminated a major source of in efficiency from their work, which should therefore become more profitable. There is now a better market and better margins for dhokra artefacts from Bankura and Dariapur. In addition, a new professionalism is beginning to be apparent in the artisans' trading practices, thanks largely to the advice, support and guidance of NISTADS. None of this could have been achieved without the

power of intervention and patronage which NISTADS was able to deploy as a high status state agency. Given effective leverage, relatively small financial investments have brought about enormous changes which may eventually guarantee the creative and economic survival of the dhokra communities. It is difficult to see this being achieved by other agencies. NISTADS is now setting up a dhokra museum in its premises at Delhi, and it is hoped that this will draw informed interest in this ancient yet living craft.

All this, coupled with the creative confidence and attention to quality documented here, means that the immediate future for the dhokra craft is reasonably assured. In the long

term, however, the artisans face serious decisions about the craft. On one hand, they may choose to follow the route to industrialisation, illustrated here by the case of Netai Karmakar. On the other hand, and this is what they appear to prefer, they can develop towards a consumer market based on high quality high aesthetic value artefacts. This could possibly be found supplying high craft content artefacts to a growing tourist and indigenous middle class market. The continuation and development of the dhokra industry depends on the artisans finding a stable market niche for themselves and their products. Whatever it proves to be, this market needs to be developed and supply chains established. It is easy to demonise the middle-men, but if the economic conditions of the Karmakars become less marginal and their terms of trade can be improved, then there is no reason at all why existing middle-men may not have a major role to play in this market development, though equally well, the further development of bankurahorse.com could eliminate the middleman by providing direct access to new markets. In the end, this is not simply a matter of marginal economics. Kocchar (2001) wrote:

"Financial support to the dhokra craftsmen, not as charity but as a good price for their artefacts, will ensure that quality of work improves, creativity is encouraged and the tradition is cheerfully passed on to the next generation for continuation and enhancement."

It is a measure of the success of the project that this hope appears to have been realised in an unimaginably short timescale.

The dhokra artisans of West Bengal represent an ancient craft which has been in continuous production for thousands of years. These artisans are not 'primitive': they are twenty first century people who happen to have been trapped in a cycle of poverty. Neither are they exhibits in a cultural theme park. They must be free to determine their own future. At the same time, they embody countless generations of knowledge, and this knowledge is part of the cultural heritage not only of India but of humankind. Whatever direction the craft takes in the future, it would be tragic if all this knowledge and the accumulated wisdom of millennia were to be lost.

To finish the chapter we print here another artefact of our artisan friends.

Acknowledgements

Part of the work carried out by David Smith was supported by a grant from the UK Arts and Humanities Research Board (AHRB).

References

Birdwood, GCM (1880) The Industrial Arts of India. Chapman and Hall, London.

Kochhar, R (2001). Dhokra brass artefacts from Bankura Pamphlet published for CSIR Foundation Day, 2001.NISTADS, New Delhi.

Krishnan, MV (1976). Cire Perdue Casting in India. Kanak Publications, New Delhi

Mitra, A (1953). The Tribes and Castes of West Bengal. Census of India 1951: West Bengal. West Bengal Government Press, Alipore.

Pal, MK (1978) Crafts and Craftsmen in Traditional India. Kanak Publications, New Delhi.

Postel, M and Cooper, Z (1999). Bastar Folk Art: Shrines, figurines and memorials. Project for Indian Cultural Studies Publication VIII, Mumbai. ISBN 81-900184-5-0

Ray, SK (1953). The Artisan Castes of West Bengal and their Crafts. In Mitra A (1953) The Tribes and Castes of West Bengal. Census of India 1951: West Bengal. West Bengal Government Press, Alipore, pp. 296-306.

Reeves, R (1962). Cire Perdue Casting in India. Crafts Museum, New Delhi.

Risley, HH (1891) The Tribes and Castes of Bengal. Government of Bengal, Calcutta

Rogers, EM and Kincaid, D L (1981) Communication Networks: towards a new paradigm for research. Free Press, New York, ISBN 0-02-926740-4

Sarkar, S (1996) The changing face of the craftsman: Blacksmith in colonial Jharkand. Calcutta Historical Journal 18 (2)pp. 67-85.

Sarkar, S (1998) Indian craft-technology: static or changing – a case study of the Kansari's craft in Bengal, 16th to 18th Centuries. Indian Journal of History of Science, 33 (2) pp. 131-142.

Sen, P. (1994) Crafts of West Bengal. Mapin Publishing, Ahmedabad

Singh, K.S. (1993) Hinduism and tribal religion: an anthropological perspective. Man in India 73, I, pp. 1-16

Smith, DJ and Hall, J (2001) Multimedia know-how archiving in aviation industry training. In Proceedings of the 7th IFAC Symposium on Automation Based on Human Skill: Joint Design of Technology and Organisation ed. Brandt, D. and Cerenetic, J., Elesevier, Oxford.

Smith, DJ (2002) Communicating Tacit Knowledge across cultures: a multimedia archive of the Bankura Dhokra craft industry of West Bengal as a case of the artificial. In Negrotti M (ed.), The First Yearbook of the Artificial. Peter Lang, Berne.

Welch, SC (1986) India) Art and Culture. Mapin Publishing,New Delhi.