CHAPTER 9

THE POTTERS OF DEIR MAWAS, AN ETHNOARCHAEOLOGICAL STUDY

by

Paul T. Nicholson

9.1 Introduction

[Note that Tables 9.1–9.5, and the corresponding Figures 9.16–9.22, are placed at the end of the Chapter].

The Deir Mawas potters were first visited by the writer in March 1987, at which time they were working outdoors, in an unfenced area, beside the canal-side road in the south-western part of the town. The rear of this working area was bounded by houses, one of them their own. At this time, the workshop comprised a potter's wheel, standing in the open yard, and two kilns, one of approximately 2.0 m diameter, which had partially collapsed, and one of approximately 1.5 m diameter, which was still in use. Sketches of the vessels produced were made by Andrew Boyce, and a short interview conducted using Abdul Shaefi, a workman from el-Hagg Qandil, as an intermediary. The overall impression was of a rather marginalised workshop, unlikely to survive for very long, though preserving a number of interesting features.

Following the excavation of a potters workshop at Amarna in 1987, and study of the material from it, it was decided to build a reconstruction of one of the kilns [2984] during the 1988 season, ready for experimental firings the following year (see Chapter 8 of this volume). In order to assist with these firings it was considered useful to make some observations of professional potters at work, and to record their firing methods. Such a study had already been made at Deir el-Gharbi, in Upper Egypt, by H.L. Patterson and the writer (Nicholson and Patterson 1985, 1989), but the kiln used there was much larger than that excavated, and the clay was of a very different type. It was therefore decided to make a further visit to the Deir Mawas workshop with a view to recording the firing, and to making a fuller ethnoarchaeological study, should conditions prove favourable.

This second visit was made during February 1989, when it was found that the workshop had shifted its location to an enclosed courtyard surrounded on three sides by houses (one of them that of the potter's family) and on the fourth by a covered area of the workshop opening on to a side road overlooking fields. Figure 9.1 shows the layout of the workshop.

This workshop had a more permanent appearance than the previous one, and, though not as orderly or as large as those studied in Upper Egypt, it seemed to offer a useful contrast. This view was quickly confirmed with the discovery that the potter and his family were the ideal subjects for such a study, in that they were friendly, willing to answer questions, and, most importantly, unconcerned by our presence. This latter is especially important for ethnographic work, since it is well known that people often behave very differently in the presence of outsiders. The Deir Mawas potters, however, once they understood our interest in pottery, simply continued their work around us, apparently making no special allowance for our presence.

Having arranged to record a firing using a thermocouple, and having established that the workshop was a suitable candidate for ethnoarchaeological work, an overall research strategy was devised. This was based on the lessons learned from work in Upper Egypt. It was decided that particular attention should be paid to firings, with records of temperature, and, where possible, the actions of the potters kept (this would then assist with the experimental kiln firings to be carried out at Amarna). Full records should be made of raw-material procurement, clay preparation, vessel forming and finishing, material discard areas, and so on. A detailed sociological study was not possible in the absence of a fluent interpreter, and so verbal questions were kept simple. Observation and recording by photography were used as the main research tools, the interpretation of observations being checked with the potters for validity. Similarly, where specific questions were asked of the potters, their answers were checked by observation whenever possible,

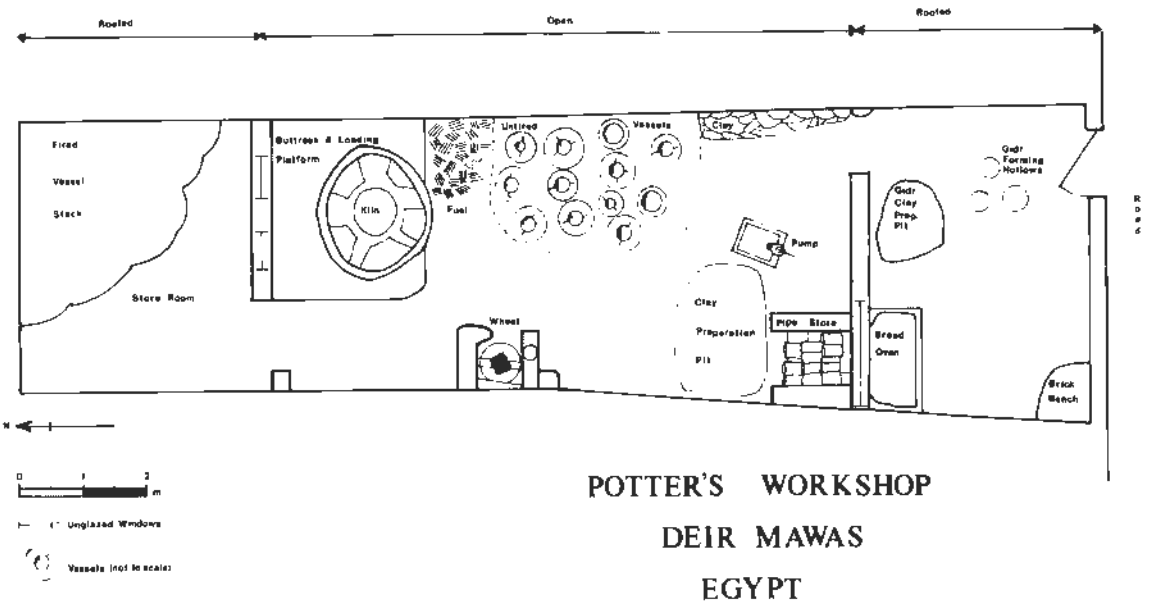

Figure 9.1. Plan of the potter's workshop at Deir Mawas which shows the main features of the establishment.

discrepancies recorded, and further clarification sought. Work in 1989 concentrated on firing and *gidr* forming, 1990 on clay procurement, and 1992 on firing and unloading. No work took place in 1991 due to lack of time.

Like the Upper Egyptian potters, who produce Ballas jars, the Deir Mawas workshop preserved a tradition with a long history, though how far back it can be traced is uncertain. It was definitely current in the early part of this century, when Winifred Blackman made studies of various traditional crafts and of social organisation. Though she apparently did not visit Deir Mawas specifically, it is clear, from the photographic archive material held in the School of Archaeology and Oriental Studies at Liverpool University, that she did visit Minya province, as well as Asyut province, and found pottery-making which used the techniques still practised at Deir Mawas. Blackman's archive and her book (Blackman 1927) provide a valuable record of the industry and can fairly be said to represent a pioneering attempt at ethnoarchaeology.

To date, the present study has concentrated primarily on the technology of vessel manufacture and particularly on the firing regime employed. Future work will concentrate on the vessels themselves, their uses, selling prices, etc.

9.2 Clay procurement

Clay for use at the workshop is obtained from a locality known as Tinuub, about fifteen to twenty minutes drive (over poor roads) north-west from the workshop. This is in an area of fields, presumably belonging to the inhabitants of Deir Mawas. The clay comes from one of the large irrigation canals in the area, and, so far as could be discovered, was free of charge save for the cost of transport. The clay is moved by pick-up truck and, on the occasion when we visited the site, about half a load was taken. This may not have been typical, though to have taken more would have made driving difficult on the uneven trackways and might have posed storage difficulties at the workshop.

The clay was divided by the potters into two types, though both come from the canal. The first of these, known as *asrag*, comes from the lower part of the large clay bank which comprises the accumulated dredgings from the canal. This bank is approximately two metres high at its maximum, and four to five metres wide at the base. The potters expressed a preference for clay

from the lower part of the mound, which was said to be finer, and was certainly more free of organic material. It was said that this lower material was about fifteen years old, though no great reliance can be placed on this figure. This is the clay used for bowls, sewer pipes, etc.

The second type of clay, known as *asfar*, is used for *gidr*, and comes from the actual bank of the canal. This was more crumbly in appearance than that from the mound, and perhaps finer as a result of deposition on the banks by the flowing water. It is presumably a more recent deposit than much of that on the mound. On the occasion of our visit, this clay was not collected, so it was not possible to be sure whether the division between types of clay for specific types of vessel was strictly adhered to. A small amount of desert clay is also mixed with the silt clay from Tinuub. However, we did not see this being collected, and have never seen it piled in the workshop. It is therefore assumed that this is used only in small quantities, and perhaps irregularly.

The quality of vessels produced at Deir Mawas is not high, and, although the clay is prepared with some care, specific mixtures of clays may not be as closely adhered to as the potters might suggest. Similarly, despite some perfunctory removal of material, large shell fragments sometimes remain in the clay and are visible in the finished products. Several shells were collected from the clay and submitted to the Natural History Museum, where they were examined by Dr J. Cooper and Dr D.S. Brown, to whom I am indebted for the following information: from the *asfar* clay came the species *Cleopatra bulimoides* (Olivier), *Melanoides tuberculata* (Müller), *Lanistes carinata* (Olivier), and *Valvata nilotica Jickeli*; from the *asrag* came *Cleopatra bulimoides* (Olivier) and *Mutela dubia nilotica* (Cailliaudi); from a sample of *asfar* collected at the workshop came *Corbicula fluminalis consobrina* (Cailliaudi).

The *Mutela* and *Corbicula* are bivalves which live in rivers and in rivers and lakes respectively, and are, therefore, perhaps originally derived from the Nile. The others listed are all prosobranch gastropods which would be expected in more or less perennial water bodies with fully aquatic vegetation. The *Corbicula fluminalis* was thought not to be found in modern Egypt, though it was known at the headwaters of the Blue Nile in Ethiopia. However, the species has evidently been introduced in many areas of Africa in recent times, so that its current distribution is not fully known. Hence the clay sample from the workshop need not be from a source other than that claimed by the potters.

9.3 Clay preparation

Whatever the clay mixtures, preparation is undertaken with some care. Once at Deir Mawas, the clay is dumped near the corner of the side street in which the workshop stands, and most of it then carried into the workshop itself where it is piled up near the clay preparation pits.

The complete process of clay preparation has not yet been observed. However, it would seem from those stages seen, and from information given by the potters, that the clay is first put into the outdoor trampling pit near the pump in the workshop courtyard. Here it is wetted and trampled by the potters themselves. Unlike in the larger workshops of Deir el-Gharbi, oxen are not used. In fact, the location of the pit would make their use at Deir Mawas difficult. If two types of clay are mixed together then it must be done at this stage. Before wheel working some of the trampled clay is taken from a pile prepared at the edge of the pit and kneaded, by hand, in the pit by one of the assistants. Here the larger pieces of aplastic material are removed, though the process is not very thorough.

The *gidr* are an exception. They have a different clay mixture because chopped straw (*tibn*) is added to it. It seems that the basic clay mixture from the outdoor pit is placed in the smaller pit in the covered area of the workshop where it is mixed with the chopped straw. The pit is sprinkled with straw and the clay kneaded in it, more straw being continually added. Then the clay is given a very thorough working on a stone anvil, and more straw added. This clay, worked on the anvil in this way, is gradually made into rough cubes from which the *gidr* will be shaped. For the largest size of these vessels the blocks measure approximately 36 x 31 cm.

9.4 Specific vessels (Figure 9.12)

Gidr are probably the most interesting vessels made at the workshop. They were first described to us as "refrigerators not made of iron", which well summarises their function as water coolers. They are, in fact, the local equivalent of the more sophisticated Ballas jar, though they employ a very different technology. They occur in a range of sizes, only the largest of which is called *gidr*, the smaller ones being known as *fakshia*. The vessel form is globular, with an out-turned rim which has a slight lip for pouring and has two or three handles, the smaller *fakshia* having two.

The vessels are formed in two distinct operations, the first of which takes place in the covered area of the workshop, near the entrance door. Here are located a series of hemispherical hollows, corresponding in size to the external dimensions of the *gidr* or *fakshia* to be made. The clay to be used in their manufacture is prepared by an assistant into the rough cubes described above. Normally two or three of these will be prepared in readiness while the forming process is taking place. The making of these vessels is usually undertaken during the afternoon.

The first stage in forming these vessels is hand manufacture and, as many studies have found, is usually undertaken by women, though the master potter, a man, occasionally takes part. The appropriate hollows in the ground (*nuubaraa*) are first cleaned out, since when not in use they are filled with debris and form part of the workshop floor. Indeed, they are part of the pathway between the street door and the courtyard. The clay lining of the pits is then wetted and any necessary repairs undertaken before sprinkling the hollow with chopped straw. One of the anvils used in vessel forming may be used to help in repairing the lining.

A cube of prepared clay is then repeatedly dropped into the hollow and so rounded. It is then struck on the uppermost face with the anvil (known as a *haaga* = thing). This is shaped like a cottage loaf, the smaller part forming the handle, the larger the working face. The workshop has several sizes of these anvils used in making the different sizes of these vessels. Their dimensions are as follows:

Use	Max. dia. cms	Height cms	Weight kgs
Gidr	13.9	14.0	1.7
Fakshia	12.1	13.0	1.5
	17.7	13.0	1.2
Small *fakshia*	8.0	8.0	0.4

Table of anvil dimensions.

The pounding of the anvil into the face of the cube opens it up (Figure 9.2) and, by revolving the block and carefully using the anvil, the clay is gradually deformed into the shape of a very thick, rather irregular, bowl (Figures 9.3 and 9.4). The exterior of the shape is governed by the hollow. The upper edge of this thick bowl is continually pinched with the fingers to ensure that it does not split.

Once the bowl has reached sufficient size the paddle (known as a *tara*) is used, a tool made from part of the side of an agricultural riddle (*korbaal*). This is not simply convenience at this workshop, but seems to be the traditional item re-used in this way, and was recorded by Blackman in the 1920s. This wooden paddle is curved and so does not make markedly square facets on the vessel as would more conventional paddles (cf. Scott 1954: Fig. 228). It also helps in revolving the vessel in the hollow, serving as a curved extension to the hand. That examined had a length of arc of 36.5 cm.

The technique used is to slap the walls of the thick bowl with force and rapidity, while continually turning the vessel in the hollow (Figure 9.5). The potter's free hand is used inside the vessel to help in revolving it and to prevent unwanted deformation of the walls whilst using the paddle. The anvil is then used to thin the walls further and to help to shape the bowl into a globular shape, that is, to bring the upper part inwards so that the rim, continually pinched, becomes narrower than the maximum diameter of the vessel. At regular intervals more chopped straw is sprinkled into the hollow and on to the vessel, so that as it revolves and is struck with

Figure 9.2. One of the female potters opening out a cube of clay as the first stage in making a *gidr*.

the paddle the straw becomes embedded in the clay.

Though the rim is pinched, pie-crust fashion, the vessel has considerable flexibility and can be seen to deform each time it is turned, so that its overall appearance is like that of a bag. As the globular shape nears completion, its maker continually checks the width of the opening, which, for a *gidr*, is approximately one outstretched palm span (Figure 9.6). Once the desired width is achieved and the walls are considered well enough shaped, the rim is again pinched and the completed globe carried outside to dry in the sun. Since it would deform if placed on a flat surface, it is stood in one of a number of pre-prepared hollows in the ground. The lady then returns to the workshop and begins the forming of the next vessel. Ten or more of these vessels might be made in an afternoon and put to dry in the sun.

The next day, having dried hard enough to be handled without deforming, they are ready for the next stage of the process. This is carried out on the wheel, and, as other studies have usually shown, is the work of a male potter. A woman was never observed to work at the wheel although women carried out all other tasks, including the heavy work of preparing the clay cubes and wielding the heavy clay anvils used in forming the vessels.

To form the upper part of the vessels, the rims, the potter first lutes a ring of unfired clay on to his wheel-head (Figure 9.7), though this is frequently adjusted, as seen in the photograph. This allows the round-based pots to be stood securely on the wheel (Figure 9.8). He now takes a long roll of clay (Figure 9.9), and, with the wheel revolving very slowly, pinches it around the opening of the vessel to make a thick, low collar (Figure 9.10). This clay has no added straw, and is used very wet so that it is very pliable. This consistency of clay is that usually used for wheel-work at

Figure 9.3. Using one of the anvils to work the clay further for a *gidr* into an open shape.

the workshop.

Having attached this collar of clay, the speed of the wheel is increased slightly and the collar drawn up and outward to make a flaring rim (Figure 9.11). With the wheel stopped a finger is used to make a lip in the wet clay. Where the rim meets the vessel walls the potter smoothes some of the soft, wet, clay to cover the join, leaving a smooth band just below the rim. The vessel is then removed from the wheel head by an assistant and returned to its hollow to dry.

Later in the afternoon, or sometimes on a subsequent day, the women will remove the vessels from their hollows and, with great speed, add handles (*widn* = ear) to the vessels. These extend from the lip of the rim to the shoulder, and usually have a hole through them just big enough to get one or two fingers through. They are then either returned to the hollows to dry, or, if there are many of them, they are taken into the street outside, so clearing the workshop for other tasks. Handles may actually be applied out in the street if the workshop is particularly busy, since only a small amount of clay, again without added straw, is needed. As part of the handle-making process, any drying cracks between neck and body are smoothed over with wet clay to repair and improve the appearance of the vessel.

Once dry some of the vessels are slipped. The only colours of slip used at Deir Mawas are a dark haematite red and a lighter pink, this latter being a fugitive slip. The pre-firing slip is prepared by the women using a red powder, made from ground haematite which they buy in small packets from the local market. This is mixed with water and a small amount of clay and rubbed on to the surface of the pot with a rag.

Once dry, the now slipped vessel can be fired. Since vessels of all kinds are fired together, this stage of the operation will be treated separately below.

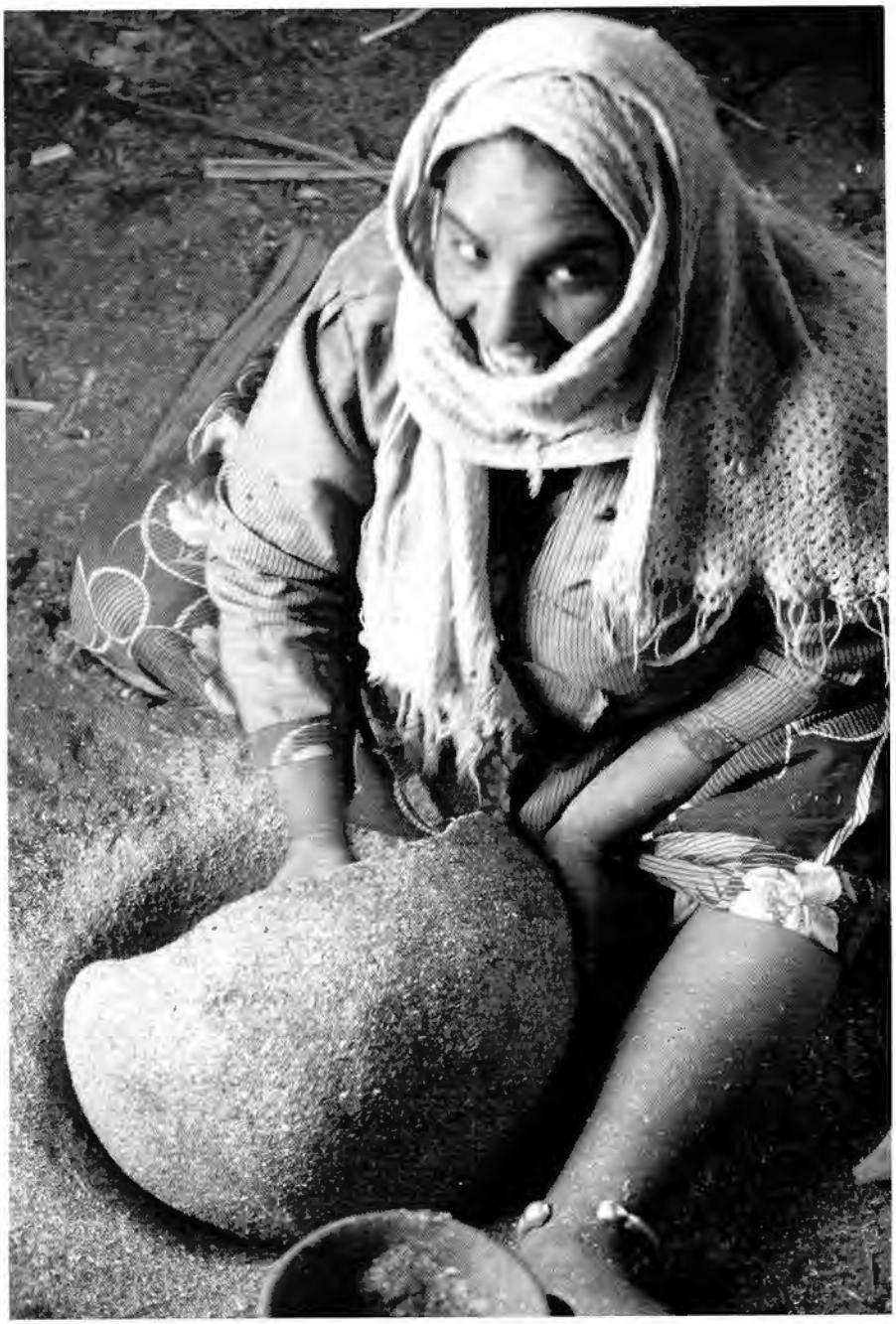

Figure 9.4. The open shape of a partly completed *gidr*.

After firing, the *gidr* are removed from the kiln and examined. Any which show signs of cracking due to pressure from vessels piled above them, or slight over-firing, are put to one side. These are not treated as "wasters", as archaeologists might assume, but rather are repaired. The cracks are filled with bread dough and the vessel then slipped with a mixture of haematite, water, and gypsum, along with a very small amount of clay. This is rubbed over the vessel surface, obscuring any small cracks and defects and covering the dough used in repairing major cracks. The vessel is then saleable.

Figure 9.5. Using the paddle to thin the walls of a partly made *gidr*. The vessel is revolved during this process.

From an archaeological perspective, this has important implications. Once sold, the post-firing (fugitive) slip quickly comes off, and is easily washed off if wetted. Over time, the dough will also be lost, leaving a vessel which, if found on an archaeological site, might well be classed as a waster. This often leads archaeologists to speculate that there might have been a kiln site nearby, since no one, it is assumed, would buy a waster vessel and transport it to a purely domestic site. In fact, people do buy "wasters" unknowingly, and, on some occasions, they are knowingly taken for use as building material. The context of such a discovery is all important. Vessels other than *gidr* are also repaired in this way, notably the bowls which often show splits on their bases or rims, sometimes as a result of shrinkage before firing.

Bowls occur in a number of different forms. They can be of the large flat-based type with slightly flaring sides and thickened rim, or of a deeper type with more flaring rim (both apparently called *madra*(?)). These are used for washing water and for feeding hens. Alternatively, they may be small bowls with steeply flaring sides which serve as lids for *gidr*. These are *ratta* and occur in sizes suited to the *gidr* and *fakshia* they serve. They can be used either side up.

All of these vessels are thrown on the wheel using clay without added straw. The clay is used soft, and the wheel turned relatively slowly. It is often stated by archaeologists that coarse clay mixtures which contain, for example, large pieces of organic matter, small stones, and the like cannot be wheel-thrown because of the damage they would do to the potter's hands. This is not true. If the clay is used as described, and the wheel revolved relatively slowly, coarse material in the clay is pushed into the clay itself and may not be noticed by the potter. A graphic example of this is provided by a vessel purchased from a firing in 1989 which, when examined, was found to contain a steel sewing-needle approximately 5 cm long. Where very coarse material is detected by

Figure 9.6. The "pie-crust" rim is checked and repaired to strengthen the vessel during the thinning with the paddle.

---

the potter, it is picked out of the clay whilst on the wheel-head and thrown away.

Large bowls are formed on bats. These are discs of fired, or at least thoroughly dried, clay which sit on the wheel-head and revolve with it (see further, Chapter 10). The bat is placed on the wheel-head and any clay from previous use scraped off using a metal tool. The bat is then dusted with ash from a bowl kept beside the wheel. A lump of prepared clay is now centred on its surface. Once the vessel has been formed, the bats can then be lifted off, taking the vessel with them, and stood to dry on the ground. When the vessel is sufficiently dry, it will be lifted off the bat, or can be cut off it with a wire.

Smaller bowls (*ratta*), intended for use as lids, are thrown "on the hump". In this technique, the clay is placed on the wheel-head as a mound and the small vessel made out of the top part of the mound. It is then pinched off with the fingers, usually leaving a thick, irregular mass. It is then placed on a board, or bat, to dry. Larger lids may sometimes be made on bats.

The larger bowls (*madra*, or *hamam*, as they are sometimes called) are shaped only fairly crudely during throwing. The rim may be completely finished, but the walls and base are usually left very heavy and thick. After being allowed to dry to leather-hard condition, they are then trimmed. The trimming takes two forms: turning and scraping. Turning takes place on the wheel-head. The green-hard vessel is inverted on the wheel-head and revolved slowly, while a tool of some sort, usually a metal blade, is used to pare away excess material. The coarser material contained in the clay invariably leaves marks during any such scraping process, and these can be quite distinctive. If the blade has been held steadily against the sides of the vessel as it revolves, the lines run around the vessel as a series of roughly parallel scrapes. Turning can often be seen on vessels by a sudden change in the angle of their walls. The base shows concentric circles if turned. Because turning is a process distinct from throwing, it should be carefully differentiated and not used as coterminous. A wheel-turned and wheel-thrown vessel imply very different things.

Scraping is similar to turning, but does not employ the wheel. At Deir Mawas, the green-hard vessels are placed between the feet of one of the women potters, usually in the clay preparation

Figure 9.7. A ring of dried, but unfired clay is placed on the wheel head so that *gidr* can be stood on it. This has to be adjusted occasionally, as here.

---

pit or on a polythene sack, while she sits on the ground. She then scrapes off excess clay from the vessel using a curved piece of metal (*shamba*) while holding the vessel between her feet, revolving it in an interrupted motion every so often. This produces drag lines which do not extend continuously all around the vessel, but rather occur as patches. Also they may run at an angle from the base toward the rim rather than being parallel to it. The base also shows lines running across it rather than concentrically. As with turning, the angle of the vessel wall is often markedly changed. Minor repairs to the vessel caused by scraping out large aplastic inclusions or by other means are also repaired with the green-hard clay at this time. The clay removed in scraping and in turning is thrown back into the clay preparation pit for re-use.

The employment of turning allows the potter to throw vessels more roughly and quickly so that they can be finished either by himself, or, more commonly, by an assistant later on. It is especially necessary on vessels produced on a bat, where the base is often left very irregular where it joins the bat.

After firing, bowls, particularly the large ones, might be given a fugitive slip. Pre-firing slips are not usual. The slip is often applied by taking a handful of gypsum and dipping it into a pot full of water mixed with iron oxide and then forcing the paste into any imperfections. Another assistant will then spread slip over the rest of the vessel, using a cloth soaked in the mixture. It is specifically these defective vessels which are chosen for slipping, a fact which is presumably not known to customers.

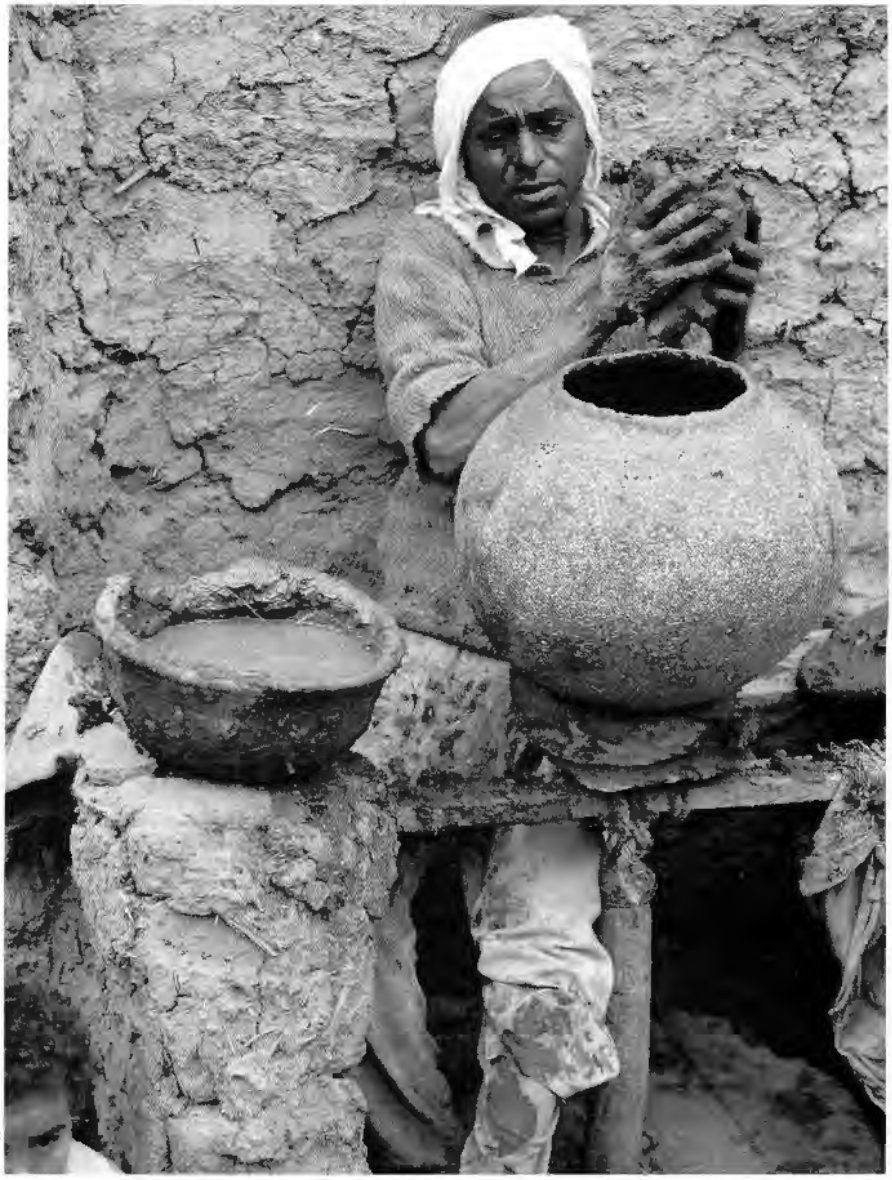

Figure 9.8. A lump of clay is prepared for forming the rim of a *gidr*. Note the "pie-crust" rim, a feature remaining from the hand-made stage of the vessel.

A class of small, cylindrical bowl (*zafrah*) with thickened rim is also trimmed and frequently slipped. It, too, serves as a container for hen food.

Drums (*tabla*) are another particularly interesting class of object. They comprise a lower cylindrical section and an upper flaring section, and, like *gidr*, are made in two stages, though both are carried out on the wheel. First the upper section is made. This is formed on the hump as a wide-mouthed cup with in-turned rim. It is then cut from the hump with a wire and is placed on a board to dry. The next upper is then made from the remaining portion of the hump. Once sufficiently dry, the upper part is returned to the wheel, this time inverted, and the lower part is drawn up, adding more clay as a ring, into a cylinder to make the final form of the vessel. The "joining" of these two parts is not always executed with great care, so that lop-sided drums are common.

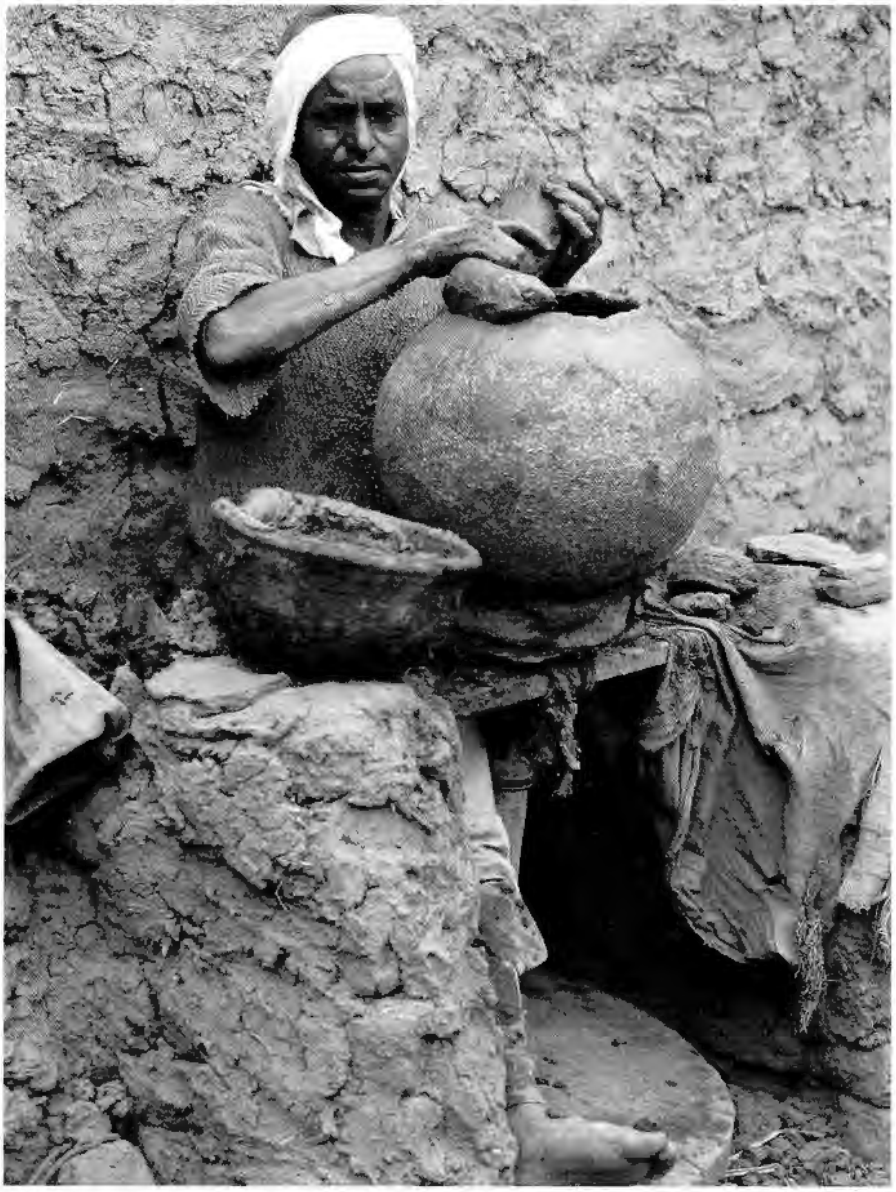

Figure 9.9. Applying the length of clay to the *gidr* rim. The wheel is revolved so slowly at this stage that its main use is as a turntable.

After firing, the drums need some re-working. Since the clay is used very wet, the rim of the drum often has small lumps left on it where the wet clay remained uneven, and these are chipped off using a metal knife. The rim of the instrument is now coated in a flour-and-water paste ready to be given a skin. This is made from a piece of paper from a discarded cement sack and is also coated with flour-and-water paste. This renders the paper semi-translucent. It is then stretched on to the wide end of the drum and a little way down the sides. As the flour-and-water paste dries, so the skin shrinks on to the drum and sticks to its sides. The paper is not cut into a circle but simply torn to a rough approximation, any great excess being removed during application. Drums are often given a fugitive slip which may also cover part of the paper where it laps onto the sides of the vessel.

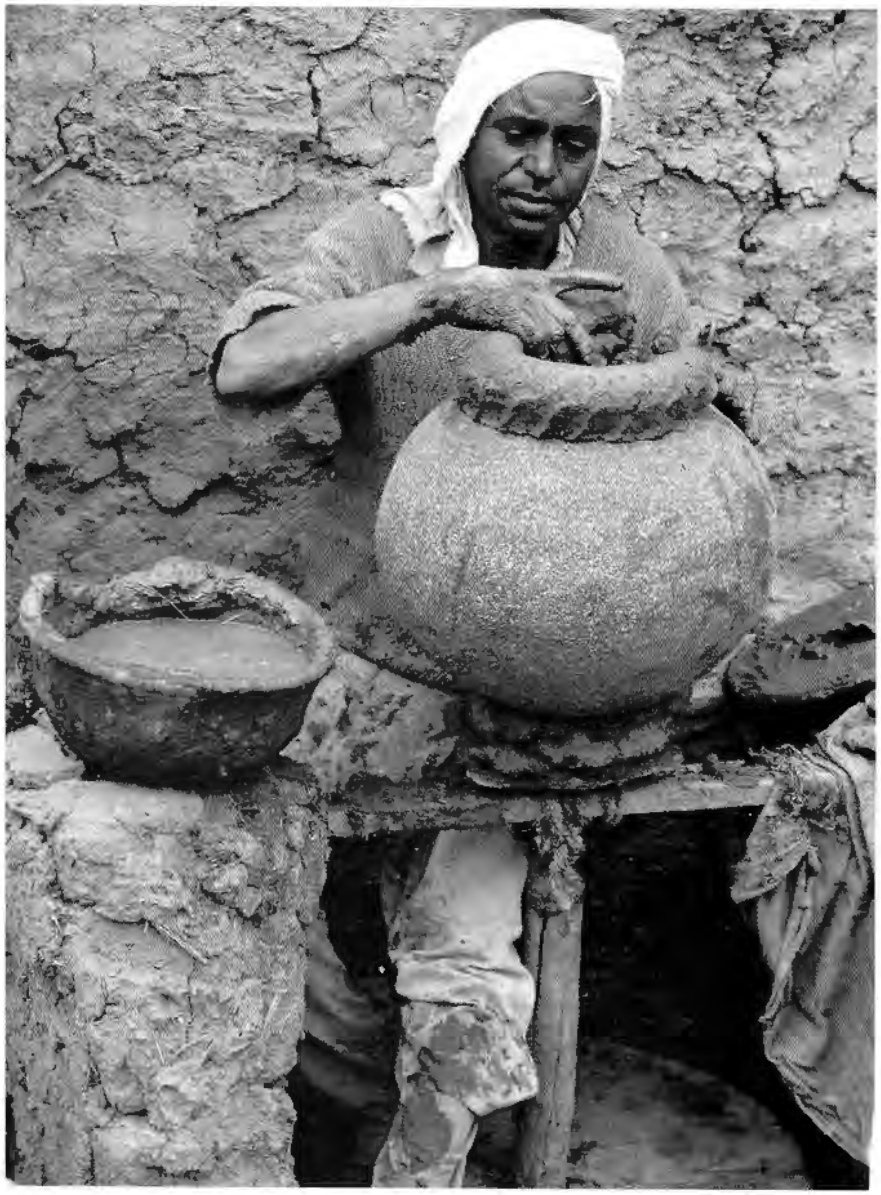

Figure 9.10. The completed rim, before drawing up.

Steamers (*gadooz*). The manufacture of these vessels has not been observed during the course of this study, and they do not appear to be a common product of the workshop. They consist of a large round-bottomed bowl pierced with holes. They are hand-made, and those observed have a diameter similar to the larger *gidr*. It can be suggested that they are shaped using the hollows employed for *gidr*-making. Often the rim is far from circular, perhaps implying deformation from a lack of strength when removed from this hollow. The holes are pierced from inside to out, so that the underside is rough from the raised edges of these pierced holes. The vessel is designed to fit over a pan or pot of boiling water in the same way as the steamers used in Europe. Further study is needed to elucidate fully the manufacture of these vessels.

Drainage/sewer pipes (*guttariya*). These vessels are commonly found in stock at the workshop, but their manufacture has not been observed and they do not seem to find a ready market. They are wheel-made cylinders with one end flared and given an elementary out-turned

Figure 9.11. Drawing up the rim into a flaring neck by revolving the wheel sufficiently to use centrifugal force.

---

rim while the other end is roughly finished. In use, this rough end is supposed to fit into the broader end to join the pipes. In practice, this would not be easy since the pipes are rarely circular and effective joins would be difficult to make. The pipes show a marked bulge about half way up their profile; this is probably the result of manufacturing them in two parts so that both ends can have a rim of sorts.

Hen feeders. These, too, seem to be an uncommon product of the workshop and their manufacture has not been observed, although it can be inferred. They seem to be made as if forming a hollow cone, rather like the lower part of a Ballas vessel. This is finished off at the top to give a simple rim and the piece put to dry. Once leather-hard, the base is scraped, often giving it a slightly rounded profile, and three roughly oval openings cut in the vessel wall starting about one third up the profile. The grain (or water) for the hens will thus rest in the lower part and be

accessible to the hens via the holes without being prone to blowing away or being accessible to other animals. The potters themselves seemed to disagree as to what these should be called, so that no Arabic name has been given here.

Children's toys (*howll*). These are a very common product of the workshop and must surely be one of the most simple toys known. The toy is in two parts. The lower part is a saucer about 12 cm in diameter, with a smaller raised portion at the centre, of about 6.5 cm, from the centre of which comes a tall finger of clay. The upper part comprises a tapering ring of clay, with a base diameter roughly the same as that of the central boss of the saucer and pierced with a hole of about 3cm diameter which fits over the tall finger. To this ring is attached a simple lug handle, so that it resembles a magnifying glass in plan. The upper part is simply fitted over the lower and the lug handle used to revolve the ring around the central finger. Despite the small size of these pieces, they are perhaps among the best made of the wheel-thrown products and the saucer element is often very nearly circular. Although very simple, they seem to enjoy great popularity with the potter's younger children and, given the numbers in which they are produced, at market.

General. The sizes of vessels manufactured at Deir Mawas are, in many cases, subject to a great deal of variation, and it is proposed to measure a statistically valid sample of them in the future. Some work has already been done in this respect for certain classes of vessel. This has given the following results for fired vessels:

	Rim Dia. Cms.	Weight kg
Small *fakshia*	12.00	1.13
Fakshia	16.75	2.37
Gidr	20.83	5.22
Large bowls	32.26	3.57

The vessel types currently manufactured at the workshop and described here are shown in Figure 9.12.

9.5 Firing

Firing takes place on selected afternoons, when it is judged that a sufficient number of vessels have been made. All those firings observed in 1989 took place on Wednesdays, that recorded in 1992 on a Tuesday. However, on several occasions the kiln was still warm from a previous firing, so it appears that at least two firings are made each week, usually on specific days. Firings are undertaken by various people, though usually it is done by the potter's eldest son. The potter himself rarely takes an active part in the firing, other than to offer advice, and this is one of the rare periods when he rests from his work at the wheel. His wife sometimes fires the kiln, showing that, unlike work at the wheel, this critical stage in potting is not the exclusive preserve of males.

The fuel used in firing is a mixture of sugar-cane stems, chaff, and oil. Most of this mixture seems to come from the forecourt of the local filling station, or engineering workshop, and this is what we were told. It is, quite literally, rubbish, and may contain rags, pieces of cardboard, and occasionally medical refuse, such as hypodermic needles. All is scooped from the workshop floor by hand and thrown into the kiln. Because the floor of the courtyard is itself covered in the remains of fuel and other debris, the actual fuel heap cannot easily be differentiated from it, making measurement of the quantity of fuel used impossible. As well as being thrown into the kiln, some fuel, especially when viscous from large amounts of oil, is placed on the lip of the stoke hole and allowed to burn from there. The strong updraught is most noticeable at such times, drawing the flame into the firebox and upward.

The kiln itself (Figure 9.13) is of simple updraught type: a lower chamber in which the fire is set, separated by a perforated floor from an upper chamber in which the unfired vessels are placed. It stands approximately 2.00 m high, and the oval top of the structure measures about 1.54 x 1.83 m. The distance between the top of the kiln and the surface of the perforated floor is c.1.25 m, and it was at this depth that a thermocouple was always placed when recording firings. The upper part of the kiln, facing into the workshop, is bound by a chain to help cope with the thermal expansion of the structure. However, the chain (added since 1989) does not cover the

Figure 9.12. The range of vessels produced at Deir Mawas. 1: hen feeder (Arabic name not known); 2: lids (*ratta*); 3: water coolers (*gidr*); 4: small water coolers (*fakshia*); 5: sewer pipes (*guttariya*); 6: steamer (*gadooz*); 7: drum (*tabla*); 8: child's toy (*howll*); 9: small bowl (*zafrah*); 10: large bowl (*madra*).

whole circumference of the structure, and is supplemented by rope on the rear (north) side. The structure is roughly mud-plastered on the exterior. Despite its relatively small size, the kiln can hold a large number of vessels. The sill of the stokehole is made up of loose bricks. This means that, after the kiln has been unloaded, these can be removed, the firebox raked out, and the bricks replaced for the start of a new firing.

Loading of the kiln takes place immediately before firing, and is a relatively rapid operation. Large vessels, such as the large and medium sized bowls, are loaded first, using occasional drums and smaller bowls as packing between them. *Gidr* are next, to be followed by other large and medium sized vessels. Drums are placed more or less randomly to fill in gaps in the stack, and

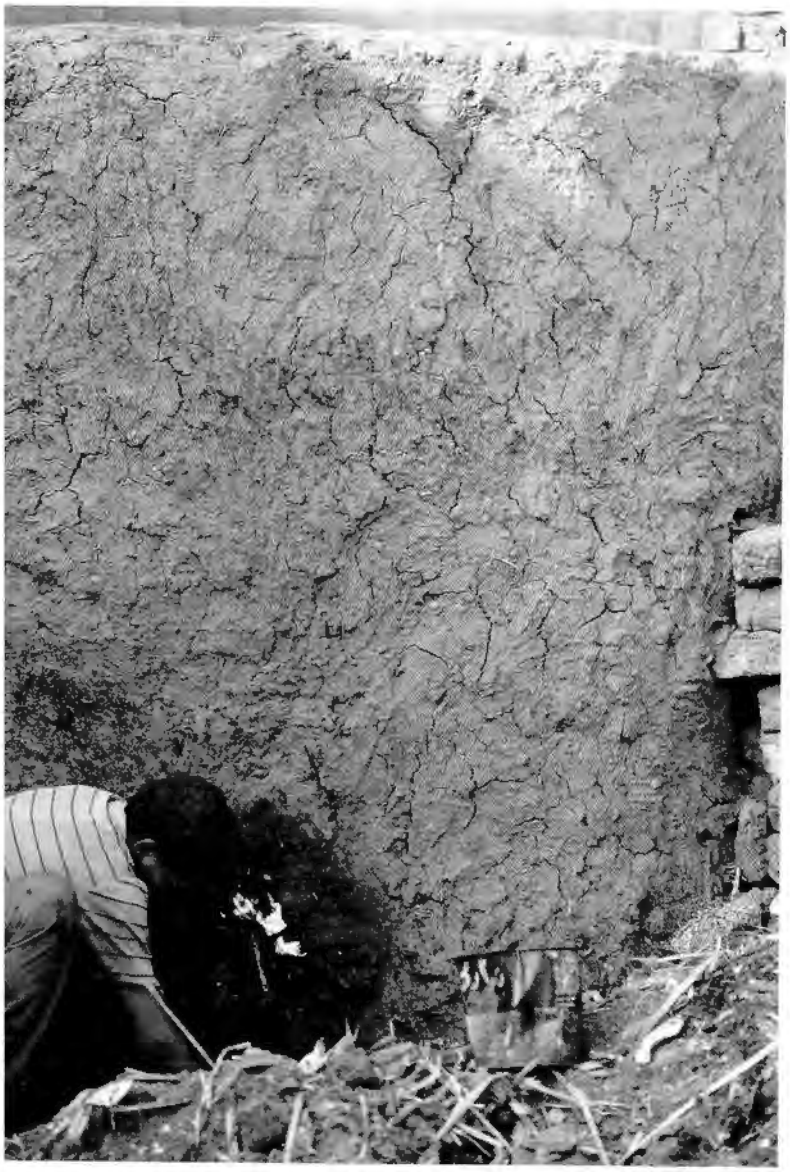

Figure 9.13. The kiln in use.

small vessels, such as the children's toys and small lids/bowls, are literally tipped in among the other vessels. Large open forms, such as steamers, may be put at the top to assist in covering the kiln (Figure 9.14). Unlike the packing system used by the Ballas potters, here there are no clearly defined layers in the stack, the only rule apparently being: largest vessels to the bottom, hollow forms (bowls and *gidr*) inverted. During loading, the assistant stands in the kiln, on the green-hard vessels when necessary. This is a common practice among potters, for the green-hard vessels are very resistant to such stress. The kiln may be filled to the brim, or finish two to three courses of brickwork below it. The whole is then covered with broken sherds.

Firing normally lasts for one and a half to one and three quarter hours, which seems quite short in comparison to industrial practice in Europe. Raking of the firebox during firing is undertaken, using two long metal rods with right-angled blades like a common or English hoe. The head of one of these instruments is not properly secured, nor has any attempt been made at repair during the years of observation of this study, despite the apparent inconvenience of its

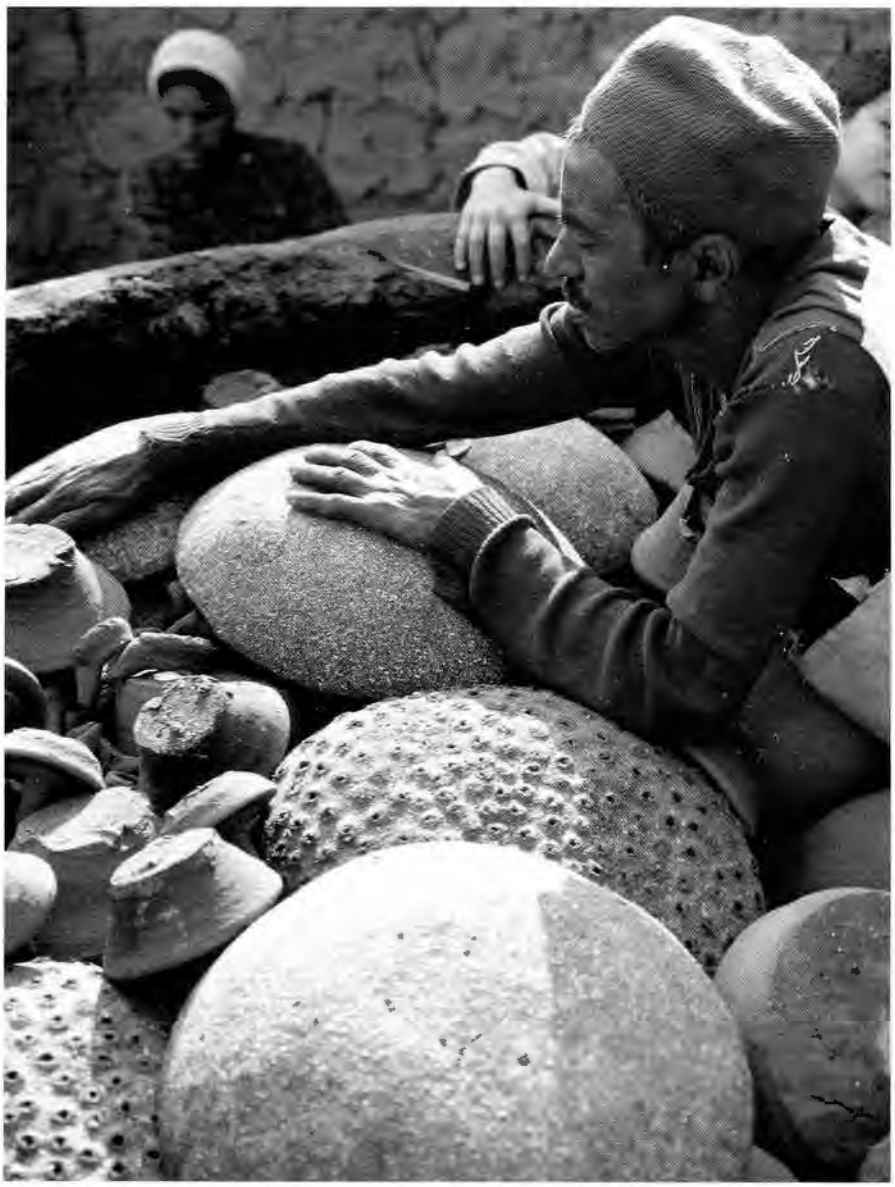

Figure 9.14. The uppermost level of vessels in the kiln, before firing. Steamer vessels can be seen alongside large open bowls of a type observed only on this occasion, and smaller vessels which serve as lids. The whole load will be covered with sherds before firing.

---

continual movement. Sometimes a stoker will deliberately exchange one rake for another, though both are used in the same way. It may simply be that the handle of one has become too hot to hold comfortably. During raking it is common for there to be billowing clouds of dark grey or black smoke.

As firing progresses and more fuel is thrown, or "flicked", into the fire, there is sometimes a "blow-back" from the firebox, with flames appearing from the stoke hole immediately after each handful has been thrown in. Stokers sometimes protect their clothing and legs from such eruptions of flame by covering them in an old sack or similar piece of rag. During the course of fuelling, the stokers' hands and lower arms become covered in thick black oil. Late in the firing, flames may break through the top of the kiln, rising a little above the sherd covering. The last stage of

firing is marked by the blocking of the stoke hole. This is done whilst the fire is still raging in the fire box. A large *gidr* is placed in the stoke hole and packed around with bricks or large sherds, or the opening is itself bricked up. Finally clean straw or *boosa* is thrown on to the top of the kiln where it ignites immediately. This serves to decarbonise the top of the kiln where soot has collected on the sherds, and more importantly on exposed areas of the vessels.

The short firing duration is to be explained by the clay fabric itself. All of these vessels are coarse, the *gidr* especially so, on account of the large amount of organic matter included in the clay. This means that the clay bodies are relatively "open" and that hot gases are able to penetrate quite easily, and, equally importantly, that moisture, in the form of steam, can easily escape from the fabric . This ease is reflected by the firing regime employed. Contrary to what is often considered normal ceramic practice, there is no period of "water smoking", the initial stage of firing which involves a slow and gradual rise in kiln temperature to allow steam to escape from the vessels, so preventing bloating or explosion of the vessels. Here temperatures in excess of 100°C can be reached in about three minutes, and in excess of 200°C in about four minutes (Figures 9.16–9.22, and Tables 9.1–9.5). Similarly, in comparison to the firing temperatures of much modern (factory or craft) pottery, the peak temperatures achieved in these firings are relatively low. Of the five firings recorded, the maximum reached by any was 934°C, the most common maxima being in the low 700s to low 800s (all quoted without correction for air temperature, since this was fairly constant). Peak temperatures generally occur in the later stages of the firing, and there is no prolonged soak time around this peak. It is difficult to speak of a "typical firing", since temperatures fluctuated markedly between them, but the overall trend is one of rapid initial temperature increase followed by a fluctuating period above 600°C, a peak, and a fairly rapid decline. Alternatively, the initial rise may be decreased in speed but gradually build to a peak before declining.

This pattern of firing leaves the thicker-walled vessels (and often some of the thinner ones, too) with a marked core when broken. This is typically black at the centre surrounded by a purplish-red, and then the outer surface colour, a terra-cotta or brick red-brown. This is a pattern observed on much ancient siltware pottery also. I would suggest that much of the pottery found at Amarna was fired for similarly short periods and at low temperatures. This is to some extent borne out by experiments using a reconstructed kiln based on excavated evidence (this volume, Chapter 8). It is further suggested that much ancient Egyptian siltware pottery was also fired in a manner similar to that still observed at Deir Mawas.

The end of firing marks the end of the working day, and the master potter, who normally takes very little part in the firing save to check the kiln periodically (Figure 9.15), washes and puts on a clean galabea over his working clothes.

9.6 Unloading

Despite the rather slip-shod manufacturing and firing techniques, the majority of the vessels fired survive in saleable condition. These vessels are generally unloaded early on the morning following a firing. The layer of burned *boosa* thrown on at the end of firing is not systematically removed, but simply allowed to fall through the stack or to blow away as the sherd covering is removed. The small vessels, particularly the children's toys, are removed first to prevent them falling through the stack, the large vessels are then removed until a new level containing a mixture of large and small products is reached. The small are again removed first, and so on. Small items are stacked around the rim of the kiln while *gidr* and other large vessels are stood on the raised platform behind and at one side of it. From these locations, assistants are able to carry the vessels away. Drums are sometimes loaded straight into a plastic sack to make carrying them less tiresome. Unloaded vessels are then stacked in the empty clay preparation pit and elsewhere around the courtyard. The different classes of product are stacked separately so that the different operations needed for each (fugitive slipping, skinning of drums, patching, etc.) can be carried out more efficiently. They will be taken to market or moved away later.

Estimates of breakage are hard to determine because of the rapidity of loading and unloading the kiln. But of approximately 196 items removed from firing no. 5, only about six items were unsaleable. These were thrown on to a small heap behind the kiln where their sherds would later be used to cover future firings. In this way no large waster heap is produced. Similarly, the fuel

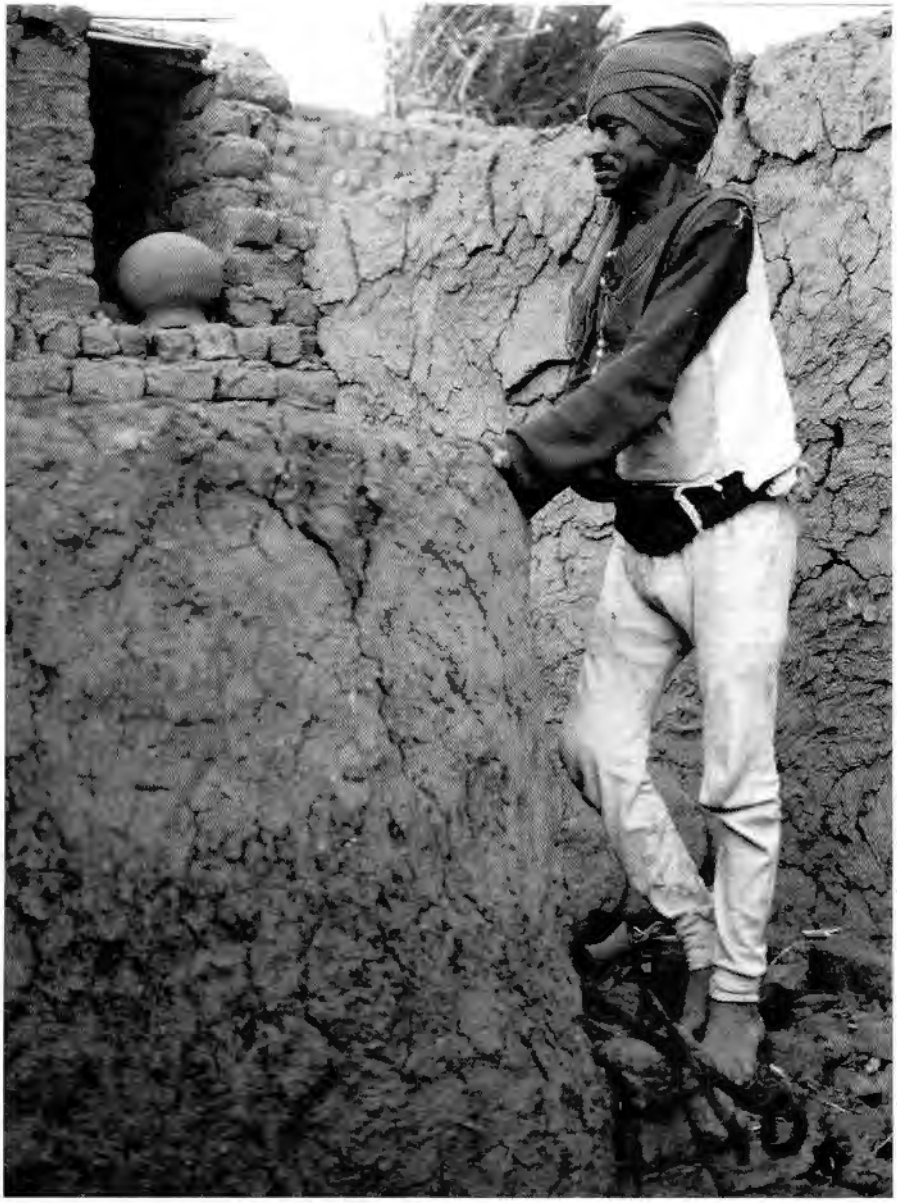

Figure 9.15. The master potter checks the top of the kiln during firing. This is generally his only function during firings, the active roles usually being taken by one of his sons or by his wife.

---

burns very effectively, leaving relatively little ash. Some of this inevitably blows away, whilst the rest is used for dusting bats, the wheel head, and so on, during normal potting activity. This lack of wasters and lack of large ash mounds is consistent with excavated evidence from potters' workshops at Amarna. It is not, however, consistent with contemporary marl-clay pottery production in Upper Egypt. The difference is to be explained by the relatively limited occurrence of good marl clays, the more specialised properties of those clays, and consequently of the industries using them. It might be suggested that when an ancient marl-clay workshop is eventually discovered and carefully excavated, it will prove to be a much more specialised industry than the largely siltware workshops so far found.

Acknowledgements

I am grateful to Pamela Rose for her help in recording firings, and, most especially, for helping to interpret for me. Catherine Powell assisted in the recording and provided interesting information on clay procurement. The making of the black-and-white photographic record was assisted on several occasions by Gwil Owen. Special thanks are due to Willeke Wendrich who kindly undertook the video filming of much of the work. Dr John Cooper and Dr David Brown kindly provided identification and information on shell specimens from the potter's clay. My work has been funded in part by the Science and Engineering Research Council, and, most recently, by the award of the De Velling Willis Fellowship at the University of Sheffield, both of whose support is gratefully acknowledged here. The help and hospitality of the potters themselves is greatly appreciated.

References

Blackman, W. (1927). *The Fellahin of Upper Egypt.* London: Harrap.

Nicholson, P.T. and H.L. Patterson (1985). "Pottery making in Upper Egypt: an ethnoarchaeological study." *World Archaeology* 17 (2): 222–39.

Nicholson, P.T. and H.L. Patterson (1989). " Ceramic technology in Upper Egypt: a study of pottery firing." *World Archaeology* 21 (1): 71–86.

Scott, Sir L. (1954). "Pottery." In C. Singer, E.J. Holmyard and A.R. Hall, eds. *A history of technology* I. Oxford: Clarendon Press: 376–412.

[On the following pages]

Figures 9.16–9.21: firing temperature graphs from the firings recorded at the Deir Mawas workshop. These are shown to the same scale but are uncorrected for air temperature. Air temperatures were relatively constant throughout firings and represent only a small percentage of the total temperature (see tables).

Tables 9.1–9.5.

Thermocouple located on west side of kiln
Firing begins as 16.25
Air temperature 31°C

Minutes	Temp.	Action
0	31	Oily rag pushed into stoke hole and lit.
2	35	More fuel put on. Fire audible. Grey smoke.
3	113	Vigorous "flicking" of oil straw into flames.
4	209	Denser dark grey smoke. Poker removed from fire. Continued flicking of oily straw.
5	301	Fire rages in kiln. Stoker moves from front to west side of kiln to avoid heat.
6	338	
7	350	Fire blows back from stoke hole. More oily straw gathered from ground. Infant runs up to assist.
8	305	
10	294	
12	292	
13	284	
15	303	
17	329	Raking using small hoe rake. Very dense black smoke.
18	317	More fuel brought by small girl.
19		Raking ceases. Fuel dragged (in tub) nearer fire. Oily rag thrown in and large handfuls of fuel.
20	311	
22	348	
25	331	Raking, done by small child. More dense smoke.
27	437	Courtyard becomes noticeably warmer during raking.
30	374	
32		Raking ceases.
34		Raking by older child. Thick black smoke.
35	423	Raking ceases.
36		Stoker moves to east side, continues fuelling.
38	445	Fuel allowed to mound up on stoke hole threshold, drawing effect clearly visible.
39		Raking. Thick black smoke.
40	523	
43	507	
48	514	
50	605	
51		Large rake used. Older child prevented from raking. Denser black smoke than any previous time.
53	602	
55		Rake used to lift broken bowl from flames. Thrown into water. Raking ceases. Fuelling resumes.
56	671	
57	707	
58		Date palm frond used as brush to rake away fuel from near stoke hole.
59	734	
60	666	Slightly oily rag and oily hose from mechanical pump brought in. Hose not used as fuel at this time.
65	621	Piece of *boosa* used to push fuel into fire.
66		Raking. Thick black smoke. Stoker moves to west.
67		Master potter inspects kiln top.
70	690	
72		Fuel thrown in with a little more rapidity than normal.
73		Small rake used by older child. Black smoke. Soot falls in courtyard.
75	693	
76		*Tishi*-load of dry, oil-free, *boosa* brought in and placed near kiln.
78		Small amount of clean *boosa* placed in reach of stoker. Raking ceases.
80	557	Small rake used again. Armful of clean fuel brought.
81		Tray of clean *boosa* taken to rear of kiln.
83		Clean fuel pushed in en masse. Blocks stoke hole then bursts into flame. Pale smoke only.
84		Medium sized *gidr* used to block stoke hole. END OF ACTIVE FIRING
85	628	
88	574	
90	550	*Boosa* from *tishi* put on kiln top - ignites on contact. Yellow/white smoke, clean yellow/orange flames.
91		Some poking of kiln top to fully burn *boosa*.
95	515	
98		Kiln stoke hole flames die away.
100	480	
101	474	End of recording.

Duration of active firing 84 mins (1hr 24 mins)
Peak temperature 734°C achieved in 59th minute

Table 9.1. Deir Mawas Firing 1, 8-2-1989.

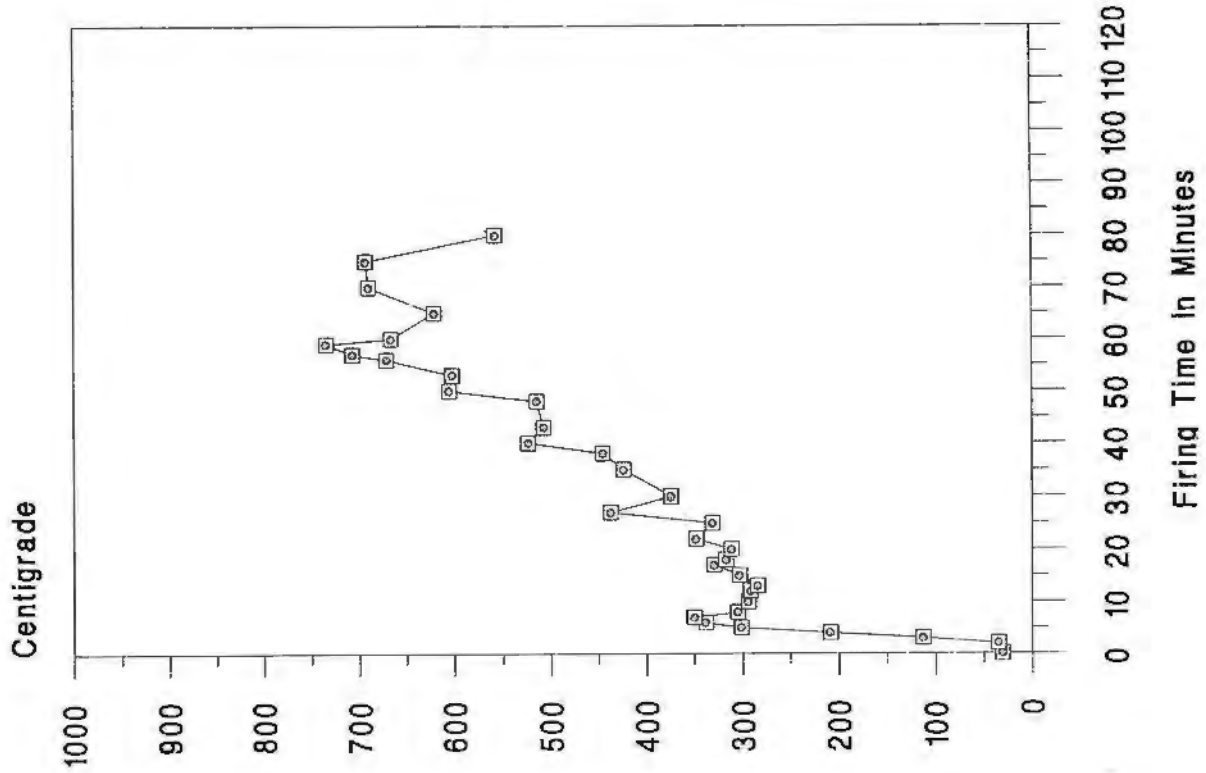

Figure 9.16. Firing 1 at Deir Mawas. The thermocouple is on the west side of the kiln extending to a depth of c.1.25 m down the kiln wall.

Thermocouple located on west side of kiln
Firing begins as 16.16
Air temperature 27°C

Minutes	Temp.	Action
0	27	Fire lit. Small rake used to insert oily rag. Boy sits directly in front of stoke hole to shield it (?) Lazy fire. Bricks balanced at stoke hole to shield fire from wind.
2	96	Grey smoke. Fire audible. Rake with rag still burning waved in fire. Some fuel thrown in.
4	231	Raking ceases. Stoker sits on west side of kiln. Flicks handfuls of oily *boosa* into fire. Master potter inspects top of kiln. Dark grey smoke. Fuelling virtually continuous, but less easy action than stoker in firing 1. Handful every 30 secs. Much talking.
6	281	
8	366	
10	403	
12	386	Small rake used. Audible roar from fire. Dark grey smoke.
13		Raking ceases.
14	545	Woman digs up more fuel from heap, pulls it toward stoke hole. Sits near fire.
16	458	
18	509	Master potter sits on east of kiln and fuels it.
20	568	
21		Master potter uses small rake.
22	552	
24	569	Boy on west of stoke hole resumes fuelling fire.
26	529	
27		Master potter feeds fire.
28	506	
29		Master potter uses small rake.
30	514	
32	632	Thick black smoke as raking continues — potter hands over to small boy.
33		Raking ceases.
34	655	Older boy who began firing moves to east of stoke hole, takes more fuel from heap. Fuels from east side.
36	648	
38	726	
40	803	
42	750	
43		Small rake straightened out with brick, then used by small boy. Thicker grey smoke.
44	797	
45	818	
46	782	
47		Rake removed from fire and quenched in water. Pulled straight using edge of trough, then reinserted.
48	799	Raking continues.
49	836	
50	769	Boy goes to look at top of kiln.
51		Everyone warms hands around fire. Fuelling continues.
52	699	
54	776	
56	751	
58	801	
59		Rake used by master potter. Thin smoke. Potter touches kiln wall with hand.
60	826	
62	776	
64	825	Woman fuels fire from west side. Fire draws well from file on stoke hole lip. No attention paid to fire.
66	831	
67		Small boy uses rake. Thick grey smoke. Audible roar from fire.
68	779	*Tishi*-load of clean *boosa* brought in and placed behind kiln. Raking still in progress.
69		Armful of clean *boosa* brought in and thrown near kiln.
70	778	
71		Raking ceases. Woman fuels from west with oily fuel.
72	747	
73		Boy looks at top of kiln. Smoke issues rapidly.
74	761	

75		Boy uses rake. Thick black/grey smoke.
76	738	Brick removed from flames — presumably thrown in with fuel by accident. Brick quenched in slip bowl — red steam — for prolonged period. Rake straightened again and used. Thick black smoke.
78	875	
79	934	
80	768	Boy examines kiln top.
81		Raking ceases. Fuelling recommences.
82	726	
84	757	
86	733	
88		Boy looks at kiln top.
89	634	Rake straightened again, used by older boy. Thick black smoke.
91	678	
92		Rake removed from fire, glowing red hot at join with blade. Reinserted and used vigorously. Pale grey smoke.
94	770	
95	643	Clean *boosa* thrown on top of kiln. Stoke hole blocked with large *gidr* and sherds. Flames on kiln top from *boosa*. Yellow/white smoke. Fire still visible behind stoke hole blocking.
		END OF ACTIVE FIRING
		Woman puts two green-hard vessels near stoke hole.
98	631	
99		
100	607	
102		Aluminium cauldron placed on kiln top to boil water.
104	572	
107	534	
109	515	
111	495	
112	484	

Duration of active firing 95 mins (1hr 35mins)
Peak temperature 836°C achieved in 49th minute

Table 9.2. Deir Mawas Firing 2, 15-2-1989.

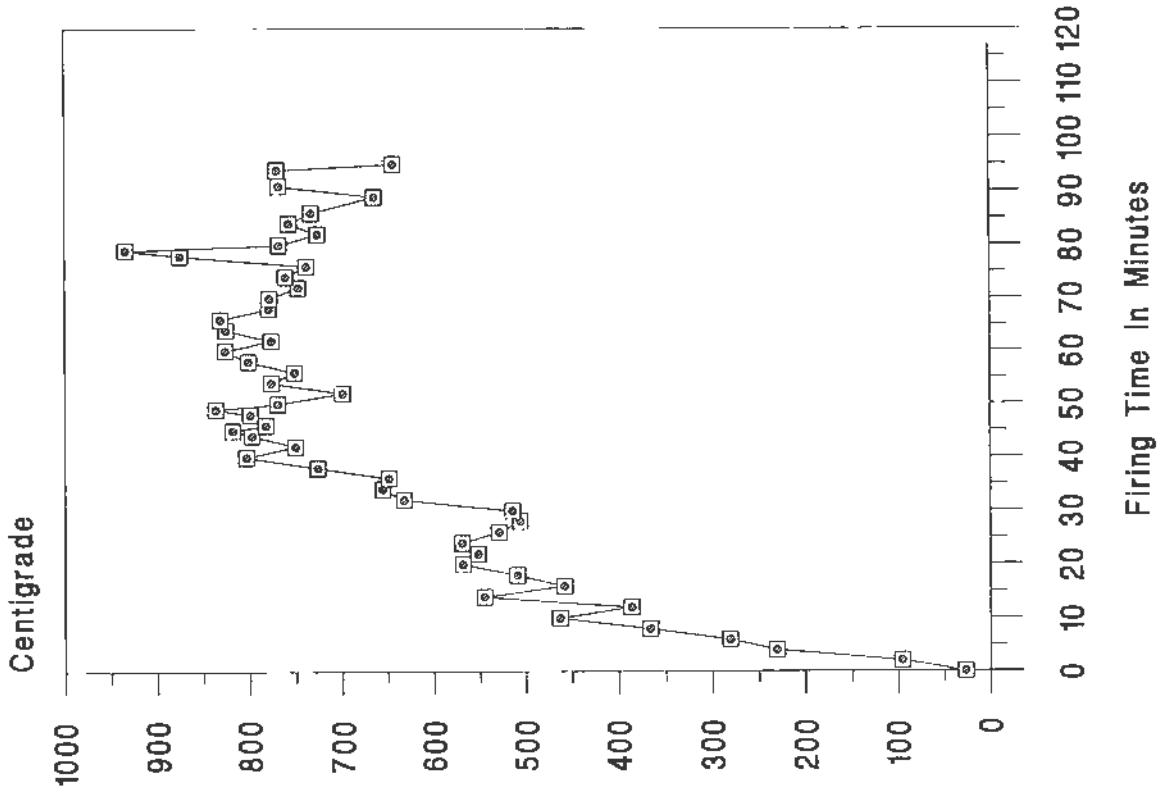

Figure 9.17. Firing 2 at Deir Mawas. The thermocouple is on the west side of the kiln extending to a depth of c.1.25 m down the kiln wall.

Thermocouple T1 located on west side of kiln, T2 on north
Firing begins at 15.49
Air temperature 27°C

Minutes	Temp. T1	Temp. T2	Action
0		47	Fire lit. Audible flame. Stoked from west.
1	38		Grey smoke.
2			Rubbish thrown nearer kiln from pile on east petrol/paraffin (?) poured over pile.
3	47	192	
5	51	248	
6		364	
8	62	466	Raking using small rake.
10		486	
11	82	440	
12			Raking using small rake.
13	85	437	
15		480	
16	97		
17		497	
18	104		
19		512	
20		510	
21	117		
23		468	
25	127		
26		480	
27			Raking ceases.
28		526	Handfuls of dung put on lip of stoke hole and allowed to burn.
30	137	524	
31			Piece of *korbaal* used to rake up fuel.
32		544	
33			Woman takes over firing. Seated at west, draws fuel toward her.
34		594	
35	150	578	
37		603	
38		608	
40	176	596	Woman picks out grains of corn from mass of fuel, puts them into dish as hen food.
42		569	
44		644	
45	202		Fuelling and corn-collecting continue.
46		657	
48		760	
50	433	710	
52			Raking. Dark smoke.
53		614	
54			Raking ceases. More fuel gathered.
55	460		
58		712	
60	530	687	
62		742	
65	561	684	
70		554	
72		682	Raking.
73			Raking ceases. Master potter and son go to look at kiln top. Return almost immediately.
75	528	615	Very oily *boosa* put into stoke hole, formerly using fairly dusty rubbish with some *boosa*. Dark grey smoke, vigorous fuelling.
80	690	852	
85	757	833	
89			Raking. Thick black smoke. *Tishi* of clean fuel brought in.
90	765	732	
95	707	705	
100	763	673	
103			Audible flames. Dark smoke.
105	813	776	
109	844		Raking. Temperature drops as raking proceeds.
110	826	666	
111	760		Stoke hole blocked with *gidr* and sherds. END OF ACTIVE FIRING
112			*Boosa* thrown on kiln top - ignites.
115		633	
117	670		
120		600	
123	605		
125	580	579	
130	544	553	End of recording. Fire out.

Duration of active firing 111 minutes (1hr 41mins)
Peak temperature (T2) 852°C achieved in 80th minute

Table 9.3. Deir Mawas Firing 3, 8-3-1989.

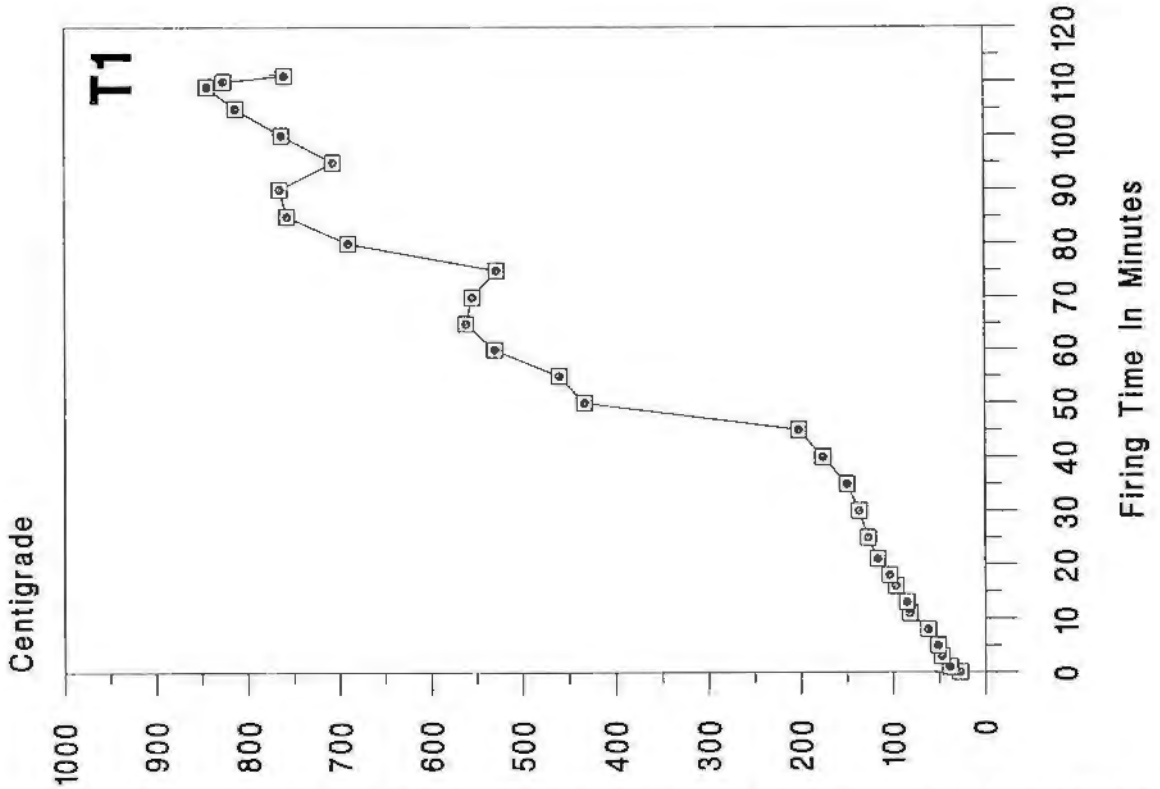

Figure 9.18. Firing 3 at Deir Mawas. The thermocouple T1 is on the west side of the kiln extending to a depth of c.1.25 m down the kiln wall.

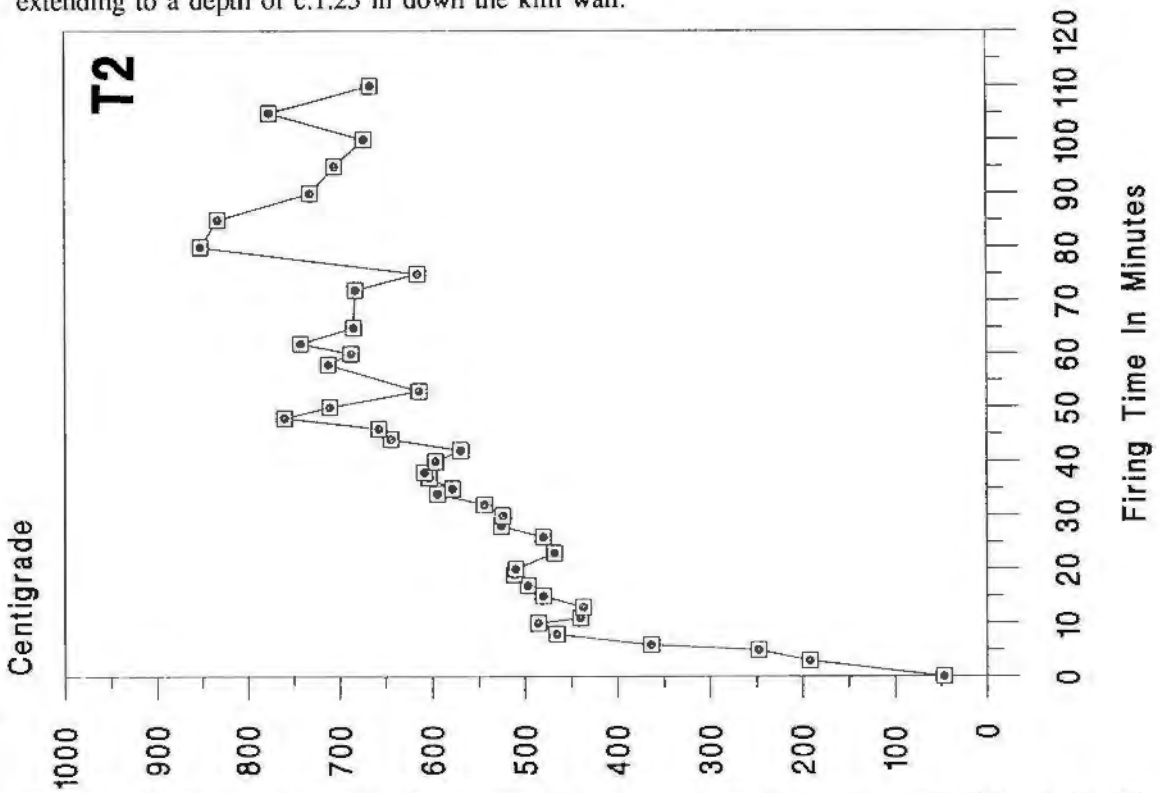

Figure 9.19. Firing 3 at Deir Mawas. The thermocouple T2 is on the north side of the kiln extending to a depth of 0.76 m down the kiln wall.

Thermocouple T1 located at depth of 1.25m, and T2 0.44m on west side of kiln
Firing begins at 16.32
Air temperature 38°C

Minutes	Temp. T1	Temp. T2	Action
0	40	38	Fire lit. Eldest boy firing from west uses pile of fuel brought close for use. Pale grey smoke.
2	40		
3	48		Old, but clean, cement sack put on fire as slow to burn. Petrol(?) poured on fuel pile. Fuel thrown on in handfuls as usual. Audible fire. Dark smoke.
4	48		
5			Opaque grey smoke.
6	74		Denser black smoke. Stoker fuels from east side.
7			Small rake used. Pale smoke.
8	140	298	Raking ceases. Fuelling resumes. Dark smoke.
10	223		
11			Very dark smoke.
12	265		Slight lull in fuelling.
13			Fuelling resumes.
14	300		
15			Thick dark smoke.
16	343		
18	368	369	
19			Raking.
20	379		
21			Raking ceases. More fuel pulled from pile and brought nearer to kiln. Dark smoke.
22	366		
24	369		
26	434		Eldest boy looks at kiln top.
27			Eldest boy returns, fuels from west.
28	470	425	
29			Fuels from east. Thick grey smoke. Desultory stoking.
30	507		
32	533		
34	551		
36	559		
38	542	468	Stoking still desultory.
39			Raking.
40	492		Raking ceases. Kiln top inspected.
41			Fuel raked from pile to stoke hole using *touriah*.
43	542		Thick black smoke.
44	547		Stoking desultory.
46	539		
48	550	536	Woman takes over firing.
50	567		
52	565		
53		569	
54	594		
56	616		Eldest boy checks kiln top. Woman continues firing. Eldest boy leaves.
58	649	623	
59			Raking. Vigorous pale grey smoke. Audible fire.
60	614		
61			More fuel raked toward stoke hole.
62	606		Fuel thrown on. Oily smell.
63		632	
64	660		
65			Flames lick through kiln top. Desultory fuelling continues.
66	699		
68	717		
70		675	
74	684		Master potter inspects kiln top. Woman rakes. Thick black/grey smoke.
75			Raking ceases. Pots on west side are glowing, those on east are not.
80	642	537	Said that more time needed for pots on east side.
85	587	473	
89			Raking. Thick black smoke.
90	555	449	Woman checks kiln top. Rake left in fire. Master potter checks kiln top.
91			PTN checks kiln top. Sooting on sherd covering only. All pots glowing. North of kiln very hot.
92			More fuelling, small quantity only.
93			Stoke hole blocked with bricks. END OF ACTIVE FIRING
95	514	446	
96			*Tishi* of clean *boosa* brought in, thrown on kiln top. Ignites.
97	496		
100	516	437	
105	483	432	Aluminium vessel of water put to warm on kiln top. Master potter later uses it for washing in.

Duration of active firing 90 minutes (1hr 30mins)
Peak temperature (T1) 717°C achieved in 68th minute

Table 9.4. Deir Mawas Firing 4, 22-3-1989.

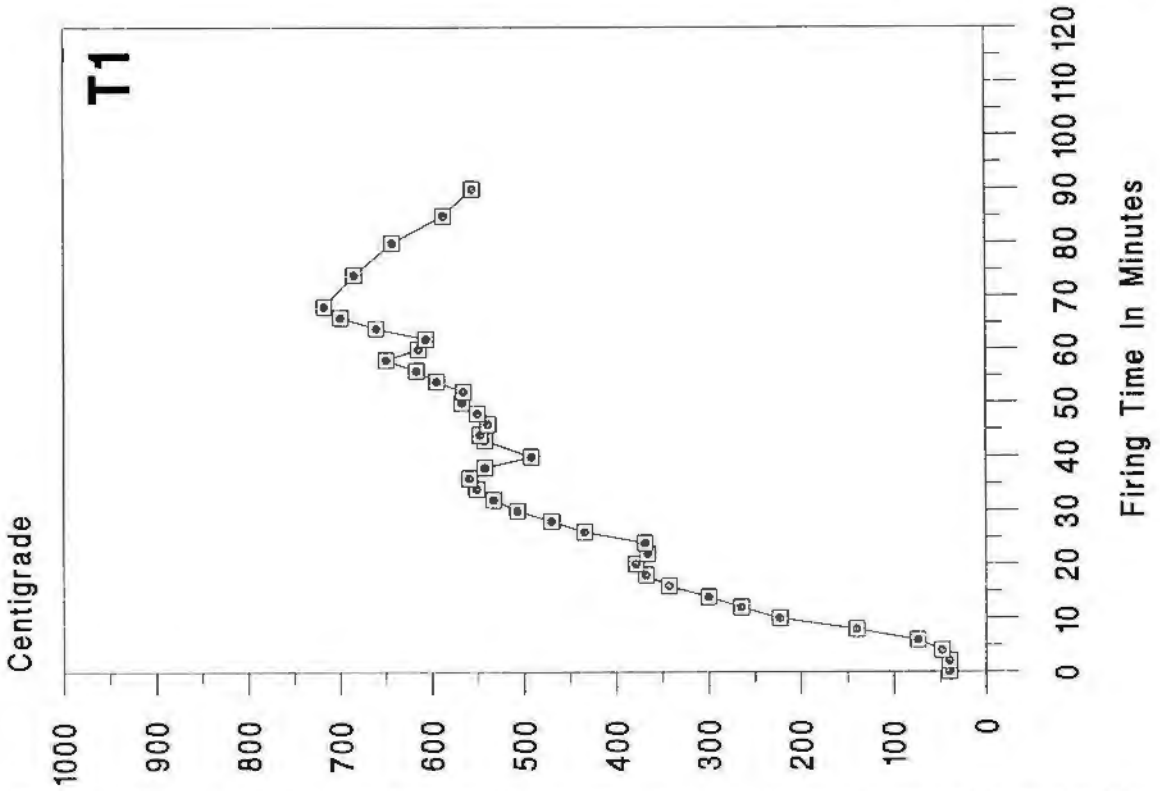

Figure 9.20. Firing 4 at Deir Mawas. The thermocouple T1 is on the west side of the kiln extending to a depth of c.1.25 m down the kiln wall.

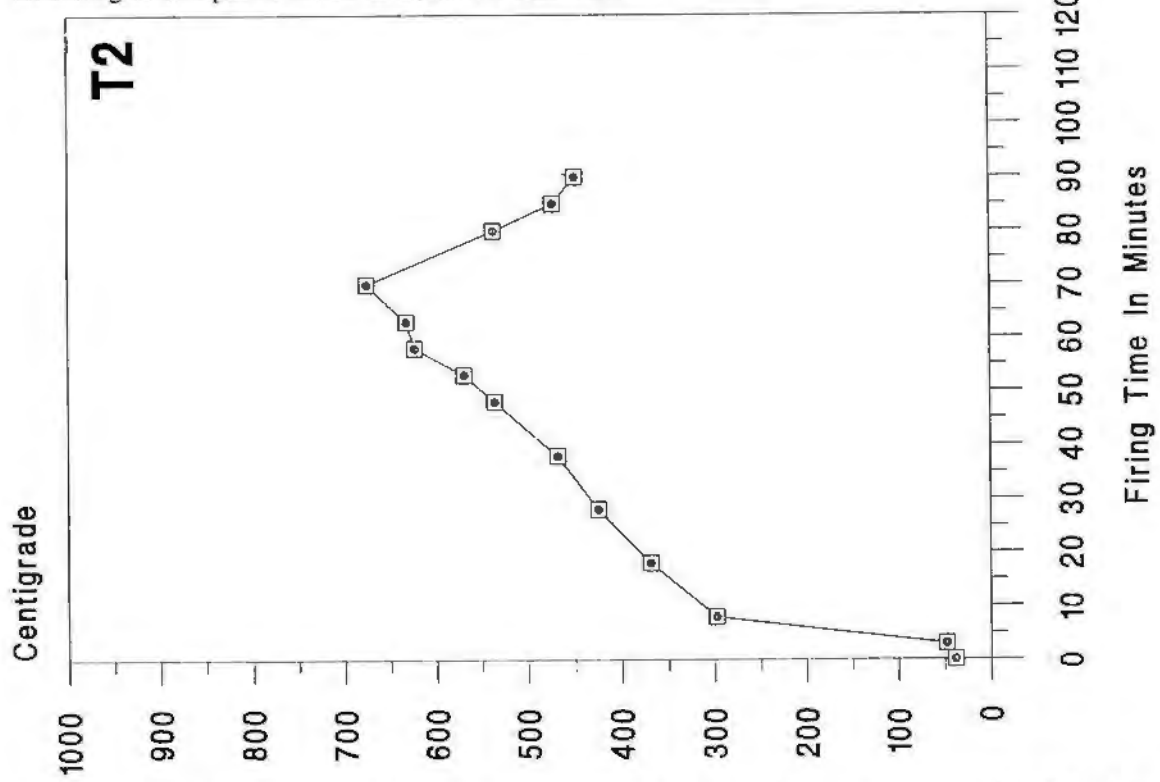

Figure 9.21. Firing 4 at Deir Mawas. The thermocouple T2 is also on the west side of the kiln extending to a depth of 0.44 m down the kiln wall.

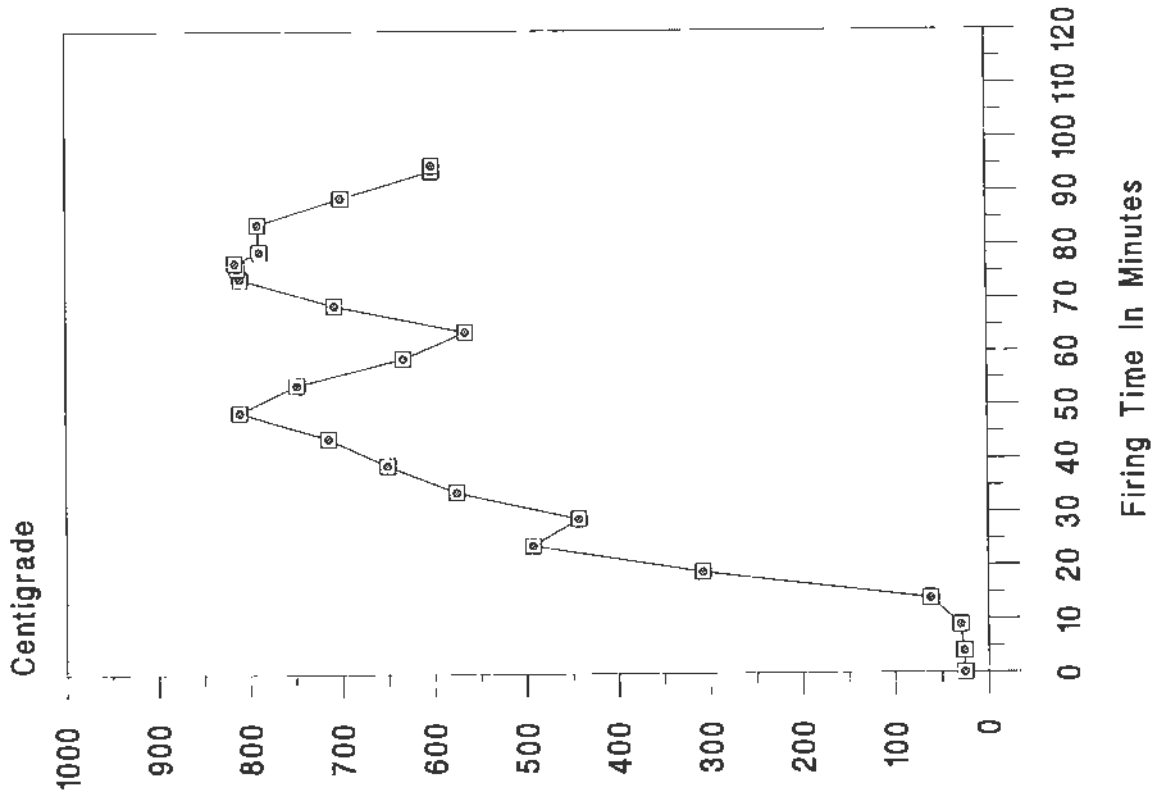

Figure 9.22. Firing 5 at Deir Mawas. The thermocouple is on the west side of the kiln extending to a depth of c.1.25 m down the kiln wall.

Thermocouple located on west side of kiln
Firing begins as 16.06
Air temperature 25°C

Minutes	Temp.	Action
0	25	Fire lit.
2		Oily rag inserted.
4	26	
9	30	
14	62	Thick black smoke.
19	308	Thick black smoke.
24	493	
29	443	Rapid temperature rise while smoke is thick (reducing fire).
34	575	
39	650	
44	714	
49	810	
54	748	
59	633	
64	565	
69	707	
74	809	Clean fuel for kiln top brought in.
76	812	
77	815	
79	788	
84	790	
89	700	
94	601	
95	601	Fuel thrown on top.
		END OF ACTIVE FIRING
99	544	

Duration of active firing 95 minutes (1hr 35mins)
Peak temperature 815°C achieved in 77th minute

Less precise notes were kept on this firing since the main object of this visit was to film a firing.

Table 9.5. Deir Mawas Firing 5, 10-3-1992.