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SOUDAN



The archaeological excavations at Kerma (Sudan)

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*Preliminary report
on the 1986-1987
and 1987-1988 seasons*

The University of Geneva's Mission to the Sudan conducted two new campaigns at the site of Kerma (Northern Province). The research programme was appreciably expanded with the discovery, in the eastern necropolis, of a settlement predating those of the Kerma cultures¹. We are indebted to the Director of the Antiquities Services, M. Nigm Ed Din Mohamed Sherif, whose efforts did much to facilitate our task. We would like to be allowed, at the time that he is leaving his post, to express to him our gratitude for the friendship with which he has honoured us over more than twenty years. His successor, M. Ussama Abdel-Rahman El Nour, has already offered his support and we are delighted with this new collaboration. We should also mention the fruitful exchanges we have had with the French Section of the Directorate of Sudanese Antiquities, most particularly with M. J. Reinold, whose excavations at the neighbouring site of Kadruka have yielded much information on the pre- and protohistory of the region.

We should like to express our sincere gratitude to the different institutions that have given us financial support: the Swiss National Fund for scientific research, the Geneva Museum of Art and History, who in addition to its subsidy, undertook the responsibility for the restoration of the archaeological material, and the H.-M. Blackmer Foundation. Our thanks are equally extended to our colleagues of the Excavation Commission of the University of Geneva for the interest they have shown in our studies².

In the necropolis, two Middle Kerman sectors were excavated, while in the town, the research that was focused on the defensive system located, in particular, bakeries dating from 1700 to 1500 BC. In addition, several rescue excavations were made necessary by the urbanization of the modern town of Kerma. These were undertaken under the direction of M. Salah Eddin Mohamed Ahmed, Inspector of the Antiquities Service of the Sudan and doctoral student at the University of Lille III. A Christian cemetery and a second Napatan building were found.

Finally, work on the restoration and protection of the site was continued.

The excavations took place from 5 December 1986 to 30 January 1987 and from 3 December 1987 to 27 January 1988. Our two *rais* from Tabo, Gad Abdallah and Saleh Melieh, directed the team of 60 to 85 workmen with their habitual skill. M. Abdallah el Nesir, Inspector, also took part in the excavations. The expertise of the different members of the Mission was once again invaluable. The archaeological material was the responsibility of M^{lle} B. Privati who also participated in the work on the necropolis. M. T. Kohler directed the clearing of the structures in the ancient town, while M. Salah Eddin Mohamed Ahmed was concerned with the study of the development of the town after the New Empire. MM. L. Chaix and Ch. Simon examined the animal and human bone remains. M. P. de Paepe, of the Geological Laboratory of the University of Gand, brought us a better understanding of the regional geology with his ceramic analyses. The photographic record was made by M. D. Berti, who also took part in the archaeological work. M^{me} M. Berti took charge of and restored the objects.

The pre-Kerma settlement

The cleaning of sector CE 12, in the centre of the eastern necropolis, revealed pits which clearly differed from the usual funerary arrangements. Examination of the ceramics found in their fill suggested analogies with Group A ceramics from Lower Nubia, confirming that we had here remains that predated the Kerma graves. However, prudence was cautioned by the rarity of Egyptian imports and the regional character of some of the pottery, and we preferred to use the term "pre-Kerma" rather than "Horizon A" to define this new culture³.

There are also numerous affinities between the Lower Nubian Group C and the Kerman cultures, even though they are independent. It is thus necessary to establish if Horizon A extends southwards, or if, as our first discoveries suggest, we have a distinct population whose territorial limits have yet to be defined.

To date, an area of approximately 55 m by 20 m has been cleared. The area has been fairly badly disturbed by the digging of the Middle Kerma period tombs. The pre-Kerma pits are relatively small (between 0.7 and 1 m in diameter)

and have variable depths, sometimes exceeding a meter. However, nowhere were occupation levels discovered. The southern extremity of the cleared area, where the level is close to that of the surrounding plain, had suffered particularly badly from erosion. To the north the remains were better preserved. Successive sweepings and cleanings also exposed numerous post holes.

Nearly a hundred pits were excavated; they were more densely distributed in the north than in the south and their organization was not clearly discernable. However, it is certain that the sector studied represents only a small part of the settlement, whose surface area must without doubt be close to that of Khor Daoud or of Afieh, the two important habitation sites located in Lower Nubia⁴. The pits are not themselves inter-cut but are often partially destroyed by the tombs. They do not all belong to the same period. Some of them had been carefully sealed with alluvium, and post holes had been cut into this layer. The presence of two jars still *in situ* in one of these hollows leads us to suppose that they were granaries or stores for liquid products, as seems to have been the case at Khor Daoud. The sides of some of the pits were reddened by fire, while others were coated with a layer of alluvium. Nevertheless, not a single grain was discovered in the fill which, moreover, yielded only a very few animal bone fragments⁵. We should also note the presence of two fragmentary clay objects, of which one could correspond to the cuneiform extremity of an anthropomorphic figurine.

The post hole settings formed traces of fairly large circular structures as well as of a rectangular one. In the centre of the excavation, where the ground was less eroded, there were fairly numerous recuttings, which demonstrated the succession of several huts on the same site. Today, one estimates that this type of construction in wood and straw would scarcely last 15 or 20 years. If one ignores those connected with the rectangular structure, post holes are rather rare in the zone where the greatest concentration of granaries is found. Towards the south, the upper layers had been lost through erosion and only the oldest or deepest traces remained.

The presence of circular huts with diameters generally between 4.30 and 4.70 m was demonstrated in several parts of the town. The posts, set from 0.20 to 0.35 m apart, were fairly strong (0.10 to 0.20 m in diameter) and we propose the interpretation of these remains as habitations⁶. In the pre-Kerma settlement, while several huts were between 4 and 5 m in diameter, others could reach up to 8 m. The measurements taken on the posts were as follows: a diameter of 0.20 m and a spacing of 0.40 to 0.50 in the smallest structures; diameters of 0.10 to 0.15 m and spacings of 0.20 to 0.40 for the largest. In the rectangular structure, the distance that separates the posts varies between 0.40 and 1 m. These first results give us the incentive to continue clearing the site in order to better document a type of structure that has been little studied.

Three hearths must also be mentioned. We first considered them to be pottery kilns which, according to carbon 14 analysis of charcoal, could belong to an early phase of the settlement⁷. However, not a single potsherd was found in the destruction levels and the general form of the hearths shows very little correspondance with the kilns studied up until now.

The first sweepings of *sector CE 15* of the necropolis revealed post holes similar to those of *CE 12*. These two sectors are separated by a distance of 100 m, giving an idea of the task that remains to be accomplished in order to understand the development and the role of this settlement, which has such an importance for the history of Africa.

The ancient town

The organization of the *eastern quarter* is linked to the presence of a major access road, to what is probably one of the principal gateways of the town. It is indeed the most direct route to the necropolis, about 3.5 km away. Quite early on in the Middle Kerma period, the defence system in this sector was equipped with strong and massive walls that were rounded to ensure a good line of fire for the archers. Unfortunately, the very poorly preserved foundations allow only a limited interpretation of their plan. In fact, it was necessary to follow these ramparts "in negative" since it was the ditches that restored the general outline. This study is made much more difficult since all these fortifications were continually altered and their successive extensions are far from showing a coherent plan.

During the Classic Kerma period, the creation of a rectangular frontage formed a significant extension to the south of what we take to be one of the principal entrances into the town. The new wall, opened out over a length of more than 40 m, extends about 20 m beyond the ancient ramparts, whose embankment was consolidated by a network of foundations forming compartmented structures. It was to serve thereafter as a support point for the other defensive systems. The very powerful foundations, between 1.5 and 2 m thick, were constructed from large blocks of ferruginous sandstone, to a depth of more than 2 m. Once again, a ditch ran alongside and then skirted round this rampart, whose superstructure was undoubtedly formed from a thick mass of unfired brick. In the interior, built against the wall, were several structures perhaps serving as "casemates".

In the north east, bakeries were installed in these buildings, covering an area of about 16 m square. They consist of a small central court, surrounded by two or perhaps three porticos and several side rooms; a well dug to a great depth has walls that are completely faced with slabs of hard sandstone, carefully dressed. In front of the north portico were a set of ten rectangular ovens, aligned one beside the next, so that they could all be used at the same time. Long

conical moulds, with flat bottoms, were found around the ovens or thrown beyond the ramparts with the cinders. Ovens were superimposed on one another several times and there were many signs of rebuilding, suggesting a long period of use, probably throughout the Classic Kerma period.

The excavations at the neighbouring site of Tabo (Northern Province) also gave us the opportunity to study similar installations, although of rather later date⁸. At many other sites in the Sudan (Kerma, Kawa, Gebel Barkal), mounds, several metres high, formed by the cleaning out of cinders and broken moulds attest the presence of bakeries close to the cult buildings of the Napatan and Meroitic periods. In Egypt, this kind of mould, which was in use from the First Intermediate Period, is often associated with a religious context⁹. However, royal residences are also equipped with bakeries, for which the accounts have sometimes been found¹⁰. In the case of Kerma, their proximity to the Deffufa, the main temple, and to the religious quarter, leads us to suppose that the bakeries principally served the religious buildings.

In the *centre of the town*, close to the north east angle of the Deffufa, a stratigraphic study was started on the site of the second "addition" excavated by G.-A. Reisner¹¹. Our first priority was the cleaning of the surfaces, in order to gain a general outline of the organization of the settlement. This horizontal picture must now be complemented with stratigraphic testing. The first results are interesting in that they confirm the religious designation of this quarter as early as the Middle Kerma period.

The study was carried out over an area 15 m by 7 m, which had the advantage of having been levelled almost to the foundations of the great monument. It will allow us to study the architectural development up until the abandonment of the Deffufa, since on the edge of the excavation, the stratigraphy preserves the later phases. To date, seven stages have already been cleared; in view of the thickness of the accumulated layers, it will take several months before we reach the levels of the earliest foundation.

A first group of buildings can perhaps be dated to the middle of the Middle Kerma period. It comprises a small square building with internal dimensions of 3 m, opening to the east, and a second rectangular building measuring 3.70 by 1.70-1.80 m internally, and opening to the west. Both have an annexe. In the rectangular building the first setting of unfired bricks had been preceded by a foundation rite. The floor of the room had first of all been entirely excavated, then flooded and finally filled with fine sand. In front of the door, two large, carefully polished stones had been placed on the sand. The provenance of one of them seems to be from a fairly distant region¹². A little distance away, an ostrich egg, perhaps used as a container, had been broken, as had a red bowl with a black border. Cattle and caprovine bones, a fragment of giraffe bone and a gazelle horn were scattered in the upper levels of the sand. The

entire filling was covered by traces of a fire that had reddened the bricks of the base of the foundations. Fragments of charcoal from an earlier fire were also found at the base of the pit, under the sand. The floor of the building was made from hardened alluvium and had been brushed with ochre.

These two buildings and their annexes seemed to be arranged in the interior of a much larger architectural group, belonging to a phase earlier than the urban development to which *house 48* (north of the Deffufa) of the early Middle Kerma period belongs. Foundations discovered at the north west of the trench could also belong to this period.

The building of an enclosure wall to the north of the square building modified the arrangement of this small group of structures. That this wall had a particular importance is suggested by two foundation deposits. One, placed within the thickness of the wall, consisted of a large bowl containing jars, a bronze blade wrapped in a fibre cloth and red ochre. The other, about 60 cm away, was placed at the base of the outside wall. It consisted of a jar in which there was also a bronze blade, identical to the first. Beside it, a flat-based pot, filled with ochre was upturned on the ground. After the construction of this wall, the eastern and southern walls of the square building were slightly displaced. A rectangular oven, similar to those of the bakery, was installed outside, against the enclosure wall. An accumulation of cinders suggests a fairly long occupation.

In the following phases, the south-eastern building was abandoned but the small square building was rebuilt at least three times on the same site. Then the whole sector was once again remodelled. The orientation of the enclosure wall was modified, no doubt in connection with the development of the access road to the north. After a fire which ravaged the centre of the town, the ground was levelled and the first extension to the Deffufa was established at the same time as another, rather spacious and well constructed building. This we had already located at the time of our investigation of and around the Deffufa¹³. It is aligned with the southern chapel set in the body of the first addition. Lastly, in a final phase, the whole of the sector was covered over by the second addition, whose enormous mass is only poorly preserved.

The development of the town in this central area can thus be followed over almost half a millenium. If the constructions studied are fairly modest, they do however confirm the existence of small chapels or secondary religious centres around the principal sanctuary, and allow useful comparisons to be made with the funerary structures of the necropolis.

Several houses were also excavated to the north and to the east of the route which, no doubt, led to the eastern entrance of the town. *Houses 54, 55, 56 and 66* of the Classic Kerma period, had a form that has as yet been little documented. They had two elongated rooms placed either side

of a central courtyard; in some, the interior of the rooms was divided by a partition. Access was from the courtyard, either from the south or from the north and the two wings were entered from the side. The relatively thick walls of these houses were set with large (0.36 by 0.18 m), black bricks.

In contrast, the houses of the early periods were of types already well known. Some could only have had a single room (*M* 57, 60-63, 67, 68). Others had two identical rectangular rooms (*M* 64, 65, "snail" type) or one square room and one rectangular room (*M* 58, 59)¹⁴.

A potter's workshop was identified to the east, in the Middle Kerma fortifications. Close to the kiln were traces of some scanty dwellings. The heating chamber was circular and made of bricks placed vertically. It had no hearth — this must have been placed much higher up, near the level of the sill, which was supported by a central square pillar. There were also several small oval structures, filled with hardened cinders in which were impressed traces of the bottoms of pottery vessels. Such structures have already been encountered at Kerma and we can suppose that they formed part of the workshop, unless they were used for beer or food preparation¹⁵.

The eastern necropolis

Sectors *CE* 12, 13, 15 and 16¹⁶ of the Middle Kerma period showed a more hierarchical structure in the population, following an evolution already perceptible in the sectors of the end of the Ancient Kerma period. Subsidiary tombs, sometimes devoid of grave goods, were dug beside large, richly endowed burials, whose superstructures, made up of several circles of black stones, are generally still visible. These characteristics have clearly not escaped the notice of grave robbers, and rare are the important burials that retain all their grave goods. In most cases the bones are displaced, which creates difficulties for the anthropological and archaeozoological studies. The funerary ritual also becomes more complex and chapels appear beside the large *tumuli*.

An increase in the number of human sacrifices can be observed in *CE* 12 and 13. While the presence of several individuals in a single grave is rarer than to the south in *CE* 15 and 16, this does not rule out the possibility that some of the small single graves placed beside the large *tumuli* are those of sacrificial victims. The position of one of the subjects (*t* 138), a woman of 60 to 70 years whose head and chest were twisted to face the ground, could support this hypothesis. The number of whole sheep placed beside the dead was reduced and rarely exceeded one or two (*CE* 15-16). In contrast, the joints of meat placed together to the north could be abundant. In *tomb* 143, for example, there were two lambs of about six months of age which had been dismembered.

As for the grave goods, we found that small wooden boxes, painted red, were a frequent, if not regular component of the funerary equipment. Some, although intact, were empty, while others contained several everyday objects: ornaments, razor, tools, fishing tackle, etc. (*t* 119, 133).

In sector *CE* 12, the most extensive, since it also encompassed remains of the pre-Kerma settlement, only eight graves were excavated. Numerous bowls, upturned on the ground to the east of the superstructures, demonstrated that the custom of the funerary meal was still in force. Some of these vessels were sunk into a cavity in the ground. *Tomb* 119 was particularly well endowed in this respect, with 46 pots on the eastern side and tens of *bucrania* to the south. At the feet of the dead were two sheep with ostrich feather headdresses and pearl ornaments attached to their horns.

The remains of a funerary chapel were uncovered to the west of a large tumulus which has not yet been excavated. As a later grave had partly destroyed the building, it existed only as two walls preserved on a foundation. It is larger than that discovered near *tomb* 115 (*CE* 11)¹⁷, with dimensions double its size (2.88 m long by 1.90 m wide at the exterior). Against the northern wall, a pile of bricks served no doubt to protect the construction from erosion. Unfortunately this irregular mass gives no information as to the elevation of the building.

In this sector, a large tomb, (*t* 128, 7.90-7.40 m in diameter and 1.60 m deep) was chosen for detailed excavation. It was severely plundered, as is almost always the case with this type of inhumation. The only bones in place were those of four feet and one bone from a dog. Examination of the material found in the fill showed that in addition to the corpse, there had originally been present at least three adults, a dog and four sheep.

In sector *CE* 13 seven tombs were opened. A large quantity of pottery was found, as well as many weapons and also ornaments for sheep, including pompoms made from ostrich feathers (*t* 126) fixed to the horns of the animals. However, what characterizes this zone is the large number of human sacrificial victims, of which a high percentage were very young children and adolescents. For example, the principal burial in *tomb* 125, a man of over 60 years of age, was accompanied by an adolescent of 10 to 12 years, three children of 6 to 7 years and one two year old. In *tomb* 131 two women, one of between 60 and 70 years, the other a 40 to 50 year old, were buried beside a child of between one and two years of age.

Sector *CE* 15 is situated close to the "cemetery M" of G.-A. Reisner¹⁸. At the time, only one of the three princely tombs that occupied the centre of the necropolis had been excavated, together with the adjacent graves. Our work concentrated on a relatively restricted area, situated to the west of the second princely tumulus. Ten subsidiary graves were excavated. *Tomb* 133 can be considered as representa-

tive of the Middle Kerma burial tradition. In the circular tomb, about 2.50 m in diameter, the dead man, aged between 20 and 30 years, lays in a flexed position on a bed, orientated east-west, with his head to the east. He was wrapped in a cloth shroud and wore a bracelet made of a string of faience beads on each wrist. All that remained of his dagger, which was placed by his belt, was the ivory hilt and the tip of the bronze blade, which had no doubt been broken by plunderers. There was also a head rest and a little wooden box, in which have probably been put several small objects which were found displaced: a pierced canine from a lion, an ivory harpoon and a bronze blade sheathed in hard wood. The disturbed remains of a second adult and a child were probably those of sacrificial victims. A bone from a large bird was also recovered.

In the northern part of the pit were eight joints of meat, two bowls and three jars, one of which was placed on a small wooden table. A dog, rolled up in a ball, lay under the western end of the bed, while to the south were two sheep. Attached to the horns of one were bead pendants designed with motifs of triangles and lozenges. However, the major discovery in this sector was a *chapel*, whose plan marked an important stage in the evolution of the religious architecture of Kerma. The building had internal dimensions of 4.25-4.28 m, with walls 0.60 m thick. It had a row of three columns ranged longitudinally along a foundation of bricks. One of the column bases, 0.25 m in diameter, was found in place, while a second was discovered nearby in the fill of the badly plundered *tomb 134*. In contrast to the first, which was made of sandstone, this second base had been cut from a white rock. The floor of hardened alluvium, even though poorly preserved, still showed traces of a wash of red ochre on its surface. Some post holes suggested the presence of lightweight structures around and inside the monument.

The situation of this edifice, to the west of the tumulus, confirmed the hypothesis formulated by G.-A. Reisner that *K II* (the eastern Deffufa) and *K XI* (the funerary temple) were associated with the royal *tombs K III* and *K X*. In contrast, the associations of the small chapels ought to be looked at again, as we suspected after the excavation of the two *superimposed chapels, C and D*, to the north-east of *K XI*¹⁹.

We note that in one of the chapels in the town, situated in the north-west part of the religious quarter, the same architectural arrangement, of a central tie supporting a row of columns, was reproduced. The floor of this building was also coated with red ochre. These colour washes, like the foundations of sand, seem to be a characteristic trait of the cult buildings of Kerma²⁰.

Sector *CE 16* is situated at some distance from the "Egyptian cemetery" excavated in 1913-16 and lies close to the Classic Kerma area. However, the four graves that were studied are still of the Middle Kerma culture, as defined by B. Gratién²¹. As a result of repeated pillaging, the surface of

the ground surrounding the graves was strewn with potsherds, including a proportion from jars of Egyptian provenance. The tombs were those of young individuals. The grave goods seem to have been simple, although pottery was abundant, and many of the vessels were of large size. Finally, in the area between *CE 15* and *CE 16*, we established that there was a very low density of tombs and that large areas were completely devoid of burials.

The eastern Deffufa

A new analysis of the eastern Deffufa usefully extended our knowledge of this monument. Its two internal chambers were originally vaulted, which partially explains the thickness of the mass of bricks from which they were constructed. The beginning of the vaulting of the northern room (room A) is still *in situ*. The column bases thus belong to a second stage. This modification was without doubt undertaken after the collapse of the roof; the facing walls and the masonry renewals bear witness to this destruction. On the other hand, in the southern room (room B), an interior passage leading to the monument's terrace was discovered. The access corridor and the stair, placed at right angles, were blocked up following a fire, and replaced by an exterior staircase or a ramp. We partially dismantled the rubble which sealed the passage in order to be able to determine the plan.

The discovery of a staircase at *K II* makes even more evident its relationship with the funerary temple *K XI*, even if in the latter the stair opens into the second room²². This thus suggests the possibility that, in its original form the eastern Deffufa also had a solid apse like that of *K XI*. Since the northern side has been completely eroded, this section could have disappeared over time. We should note that in the western Deffufa (*K I*) the stair leading to the upper terrace was also placed to the east of the small room which seems to have been a sanctuary.

The late cemetery on the site of the ancient town

As a result of the excavations near *house 65*, to the north-east of the Deffufa, a tomb without grave goods was discovered. We also noticed others to the north, about 500 meters away in the direction of "Kom des Bodegas". As they were shallow, with the disturbed bones very close to the surface of the ground, they had almost all been destroyed as a result of modifications made to the level of the cultivated land. Some pottery from two tombs was however recovered and suggested a date in the Meroitic period for the cemetery.

An extension in this direction of the cemetery excavated by G.-A. Reisner is quite unexpected²³. The density of

tombs is however very low and we did not find any other burials as a result of our investigations of this zone.

The modern town

In the modern town, surveillance of construction sites within the archaeological area located new remains of the Napatan period, as a result of which, several rescue excavations were organized. Thus, in a courtyard situated to the south of the building investigated between 1982 and 1985²⁴, some foundations were uncovered which gave us the dimensions of the annexes belonging to the first phase of building. Eighty meters away we located the remains of a *second residential house*. Investigation of the north-west corner showed that the structure was restored at least three times. Despite the poor state of preservation of the building, the accumulation of archaeological deposits, rich in material, confirmed the importance of the town between the 7th and 4th centuries BC.

Around the northern mosque of the town of Kerma, a large Christian cemetery was discovered, but we were only able to make a rapid inspection of the site. The 17 tombs

counted had, for the most part, a superstructure consisting of a vault of mud brick, a wall to the east and a small wall closing off the burial vault. The potsherds were too eroded to allow the dating of this cemetery, but the form of the tombs suggested that they were of the medieval period. At Tabo, similar tombs were found around a church placed in the courtyard of a large temple of the twenty-fifth Dynasty.

Conclusions

The results of these two latest campaigns show that the archaeological resources of the site of Kerma are far from exhausted, as is witnessed, for example, by the discovery of the interior staircase in the eastern Deffufa, which had escaped the notice of G.-A. Reisner. New information such as this allowed us to deepen our understanding of the religious architecture, which recently has been the subject of several interesting discussions²⁵. In addition, the investigations underway in the pre-Kerma settlement will give us details of the origins of the kingdom of Kush and perhaps contribute to the clarification of the transition between Group A and Group C.

¹ For works in progress, see:

Ch. BONNET, *Les fouilles archéologiques de Kerma (Soudan), Rapport préliminaire sur les campagnes 1977-78; 1978-79 et 1979-80; 1980-81 et 1981-82; 1982-83 et 1983-84; 1984-85 et 1985-86*, in: *Genava*, n.s., vol. XXVI, 1978, pp. 107-127; vol. XXVIII, 1980, pp. 31-62; vol. XXX, 1982, pp. 29-53, vol. XXXII, 1984, pp. 5-20; vol. XXXIV, 1986, pp. 5-20; *Kerma, territoire et métropole*. Quatre leçons au Collège de France, IFAO, Bibliothèque Générale, vol. IX, 1986; *Travaux de la Mission de l'Université de Genève sur le site de Kerma (Soudan, Province du Nord)*, in: BSFE, no. 109, June 1987, pp. 8-23; *Kerma, royaume africain de Haute Nubie*, in: HÄGG T. (ed.), *Nubian Culture Past and Present*, Sweden, 1987. Ch. BONNET and D. VALBELLE, *Un objet inscrit retrouvé à Kerma (Soudan)*, in: CRIPEL, no. 9, 1987, pp. 25-29; J. LECIANT, *Fouilles et travaux en Egypte et au Soudan*, in: *Orientalia*, vol. 56, fasc. 3, 1987, pp. 364-5.

² The members of the Commission, whose president is M.M. Valloggia, are MM. Y. Christe, J. Dörig and A. Giovannini.

³ W. Y. ADAMS, *Nubia, Corridor to Africa*, London, 1977; B. G. TRIGGER, *History and settlement in Lower Nubia*, New Haven, 1965, pp. 70-79; *Nubia under the Pharaohs*, London, 1976. H.-A. NORDSTRÖM, *Neolithic and A-Group sites*, SJE, vol. 3, Uppsala-Lund, 1972.

⁴ P. PIOTROVSKY, *The early dynasty settlement of KHOR-DAUD and WADI-ALLAKI, The ancient route of the "gold"*, in: SAE - *Fouilles en Nubie (1961-1963)*, Cairo, 1967, pp. 97-118. B.B. LAL, *Indian archaeological Expedition to Nubia, 1962. A preliminary report*, in: *ibid.*, pp. 104-109. H. SMITH, *Preliminary reports of the Egypt Exploration Society's Nubian Survey*, Antiquities Department of Egypt, Cairo, 1962.

⁵ L. CHAIX, *Cinquième note sur la faune de Kerma (Soudan), Campagnes 1987 et 1988*, in: *Genava*, vol. XXXVI, 1988, pp. XI-XIII.

⁶ Ch. BONNET, *Les fouilles archéologiques...*, 1982, pp. 30-32.

⁷ C14 Determinations made by the Institute of Limnology of Thonon-les-Bains (France).

⁸ Ch. MAYSTRE et al., *Tabo I*, Geneva, 1986, p. 13.

⁹ H. JACQUET-GORDON, *A tentative Typology of Egyptian bread moulds*, in: *Studien zur altägyptischen Keramik*, Mainz, 1981, pp. 11-24.

¹⁰ A. SPALINGER, *Baking during the reign of Seti I*, in: BIFAO, vol. 86, pp. 308-352.

¹¹ G.-A. REISNER, *Excavations at Kerma*, part II, in: HAS, vol. V, Cambridge, 1923, pp. 25-29.

¹² M. P. de Paepe, personal communication.

¹³ One of these walls is shown on our earlier plans, cf. Ch. BONNET, *Les fouilles archéologiques...*, 1982, p. 35.

¹⁴ Ch. BONNET, *Aperçu sur l'architecture civile de Kerma*, in: CRIPEL, no. 7, 1985, pp. 11-21.

¹⁵ Ch. BONNET, *Les fouilles archéologiques...*, 1984, pp. 8-10.

¹⁶ The designation CE 14 has been retained for the area dug during the 1979-1981 seasons in order to integrate this with the series of excavations carried out near sectors CE 12, 13 and 15. For CE 14, see Ch. BONNET, *Les fouilles archéologiques...*, 1980, pp. 50-58.

¹⁷ Ch. BONNET, *Les fouilles archéologiques...*, 1986, pp. 14-15.

¹⁸ D. DUNHAM, *Excavations at Kerma*, part VI, Boston, 1982.

¹⁹ Ch. BONNET, *Les fouilles archéologiques...*, 1986, p. 15.

²⁰ Ch. BONNET, *Les fouilles archéologiques...*, 1982, pp. 31-38.

²¹ B. GRATIEN, *Les cultures Kerma, Essai de classification*, Lille, 1978.

²² Ch. BONNET, *Les fouilles archéologiques...*, 1986, pp. 15-17.

²³ G.-A. REISNER, *op. cit.*, part II, pp. 41-57.

²⁴ Ch. BONNET et Salah Eddin Mohamed AHMED, *Un bâtiment résidentiel d'époque napatéenne*, in: *Genava*, n.s., vol. XXXII, 1984, pp. 35-42.

²⁵ D. O'CONNOR, *Kerma and Egypt: the significance of the Monumental Buildings Kerma I, II and XI*, in: JARCE, vol. XXI, 1984. B.G. TRIGGER et al., *Ancient Egypt, A social History*, Cambridge University Press, 1983, pp. 160-173. P. LACORAVA, *The Funerary Chapels at Kerma*, in: CRIPEL, no. 8, 1986, pp. 49-58.

The pottery of the pre-Kerma settlement

By Béatrice PRIVATI

Translated by Annie Grant

The inventory of the potsherds recovered from approximately one hundred excavated pits of the pre-Kerma settlement, situated at the centre of the second millennium necropolis, allows an attempt at a first approach to this material, which was previously unknown south of the third cataract.

This pottery is clearly distinguishable from that found in the tombs or in the levels of the ancient town. However, particularly in the presence of black-topped red wares, a technique is recognized that emerges more clearly during the first phases of the Kerma period. In this category are some sherds from small half-spherical bowls which, in their form and colour, resemble rather disconcertingly examples discovered in the most ancient sectors of the cemetery. However, the burnishing has often left clear traces of the tool used, something that is rarely observed in the Ancient Kerma period. Also, the red colour of the exterior is, in numerous cases, due to the application of a fairly dark slip covering a lighter fabric, in buff or pink, while in the Ancient Kerman pottery the surface and slip are generally very close in colour. The contrast between the light colour and the red slip seems to have been used to obtain a decorative effect on some vessels, where the slip, applied with a brush, allows the colour of the fabric to show through. This is illustrated by a bowl, found in *pit* 42 (fig. 2/6), whose everted and almost straight walls recall forms that one still finds in the Ancient Kerma period¹. Other pre-Kerman black-topped red bowls, with flared walls, have a clear line between the well marked black rim and the red slip, a reminder of the original colour of the vessel.

The majority of the pre-Kerman pottery, whether fine or coarse ware, seems to have been fired in open-fire pits, where they were placed upsidedown. This technique was used later at Kerma for the black-topped red pottery². However, the pre-Kerman pottery is apparently less well-fired than that of later periods and is often fragile. This is undoubtedly due to the composition of the clay used, and perhaps also to a lower firing temperature than that used later for the Kerman pottery³.

The pre-Kerman production is essentially characterized, like that of Ancient Kerma, by bowls, basins, and some jars without necks; to date, not a single sherd of imported Egyptian pottery has been found.

Before approaching the more detailed description of this material, we would like again to raise the important ques-

tion of the connections that can be established in Nubia between Group A and the beginning of Ancient Kerma and the "Early C Group". The settlements or cemeteries studied in Lower Nubia indicate that this region has been abandoned for several centuries. Only the Egyptian post of Buhen seems to show continuous occupation. It seems accepted that the territory of Lower Nubia was thus entirely controlled by Egypt and that its population was considerably reduced at the end of the pre-Dynastic period or at the beginning of the Old Kingdom⁴. Moreover, Horizon A shows an Egyptian influence, since the pottery assemblages have a large proportion and a great variety of imported vessels⁵.

In the region that we are studying, the site of the pre-Kerma settlement could give evidence for a continuity of occupation in a territory which did not suffer the same population displacements; in fact the Ancient Kerman cemetery was sited in the immediate vicinity of the late third millennium settlement.

The pre-Kerma pottery recovered during the course of the excavation of the settlement is without doubt partly contemporary with that of Group A, for a number of the sherds show links with the production of that culture in Lower Nubia, even though differences can be seen. In fact, there was a large quantity of rippled ware sherds and of sherds of beige clay, undecorated or decorated with geometric motifs painted in red, recalling egg shell or variegated haematitic wares⁶.

The vessels with a rippled decoration are essentially black-topped red wares. The outside surface was burnished and either beige or brown if it has not been coated with slip, or light to dark red, occasionally with a beige band remaining below the black edge. It is this border, of variable width, which is in the majority of cases decorated (fig. 1/3, 4 and fig. 2/11). This contrasts with what we find in the Group A pottery which is characterized by motifs covering the whole body⁷. We have only encountered one example of a pot with an outside surface which is entirely black with a rippled band under the rim and on part of the body (fig. 2/3), and only a few dark red body sherds decorated with the same motif. A red bowl was coated on the outside with a darker slip which stopped sharply below the rim. This was decorated with a rippled motif and a light slip (fig. 2/9).

The painted pottery is less well fired than the examples that we have looked at, and sometimes quite friable; its

surface is light brown or beige and well burnished especially when decorated, outside or inside, with horizontal red bands (fig. 1/7). A single sherd, already mentioned in the category of simple black-topped red ware (fig. 2/6), had a black burnished interior and a beige exterior coated with red slip, unevenly painted on. Several body sherds, of the same quality but undecorated, had either both surfaces beige, or a beige or light brown exterior and a black interior. In the latter case, demonstrated particularly by a bowl with a pinkish beige body covered with a white burnished slip (fig. 2/2), the fabric is clearly stronger.

The coarse wares are, in contrast, of fairly mediocre workmanship, with some exceptions. Two large brown jars, squat and without necks, were found at the bottom of a pit; they were sealed by sherds which protected their contents. One of them only had a hatched decoration incised on the rim, like that of another fragmentary pot (fig. 1/2). The large vessels, basins, pots and jars, have a crudely burnished brown or reddish exterior surface, a black

rim incised with hatchures and a black smoothed interior. A large bowl had impressed motifs that perhaps formed triangles (fig. 1/6). Some black-topped red bowls had a finer combed decoration (fig. 2/5 and 10). The pottery with red surfaces without slip (fig. 2/7 and 8) is burnished or smoothed.

The comparison that we have been able to make with the pottery of Group A, ascertains that close relations existed between Lower and Middle Nubia. However, the material discovered in the pits of the pre-Kerma settlement is sufficiently different for it to be attributed, at least while it is still being studied, to a southern Horizon A. Even although the sherds collected at Kerma form a fairly diversified sample, it is still hazardous, with an unstratified archaeological assemblage, to put forward a chronology. The first analysis suggests that part of the material could belong to a rather late context, only just preceding the Ancient Kerman culture.

¹ B. PRIVATI, *Remarques sur les ateliers de potiers de Kerma et la céramique du Groupe C*, in: *Genava*, n.s., t. XXIV, 1986, pp. 23-28, *tomb 103*, fig. 2/3. This vessel illustrates a rather archaic form.

² *Idem*, pp. 23-24.

³ P. DE PAEPE, *Analyse microscopique et chimique de la céramique et inventaire de l'outillage lithique du site de Kerma (Soudan)*, in: *Genava*, n.s.,

vol. XXVI, 1988, p. XV-XVII.

⁴ W. Y. ADAMS, *Nubia, Corridor to Africa*, London, 1977, pp. 163-175.

⁵ *Idem*; H.-Å. NORDSTRÖM, *Neolithic and A-Group sites*, Uppsala, 1972, vol. 3:1, pp. 21-22.

⁶ H.-Å. NORDSTRÖM, *op. cit.*, H4.01, pp. 63-64.

⁷ *Idem*, AX, pp. 89-90.

Anthropological report on the human remains from Kerma (Sudan): 1986-1988 seasons

By Christian SIMON
Translated by Annie Grant

Twenty-nine tombs, in four chronological zones of unequal area were excavated.

A. Demography

We counted forty-two individuals, including 12 males 12 females and 16 non-adults, a rather large number since it represents 38 per cent of the population.

Sector	Men	Women	Indeterminate	
			Adult	Non-adult
CE 12	3	6	1	2
CE 13	4	3	0	6
CE 15	4	2	4	2
CE 16	1	1	0	3
Total	12	12	5	13

Distribution by sex

Age classes

Sector	0-4	5-9	10-14	15-19	Adults	Total
CE 12	0	0	2	0	10	12
CE 12	2	3	1	0	7	13
CE 15	2	0	0	1	9	12
CE 16	2	0	1	2	0	5
Total	6	3	4	3	26	42

Distribution by age at death of the non-adults

The distribution by age class is very variable and demonstrates an increased number of young children.

This distribution of age at death of the non-adults shows an interesting aspect to the demography of the population, and even given the reduced sample size, seems to show a selection of children in favour of certain age groups.

The previous report (SIMON 1986) discussed human sacrifice, a ritual that was common in the civilization of Kerma. This practice, already apparent in the Ancient Kerma period, developed during Middle Kerma, reaching a peak in Classic Kerma, with hundreds of sacrificial victims.

Amongst the 29 tombs excavated, six contained several individuals and we may suppose that some of these had been sacrificed.

In two tombs there were four individuals; two males and a female in one, and a man and three children in the other.

In two other tombs there were three dead; two females and a child in one, and in the other two adults, of which one was male, and a child.

The last group of tombs contained two individuals, one with two females and another with two children.

We should note that in this small sample, human sacrifices do not just involve adults but also a significant number of children.

We wished to compare the age of the sacrificed children with the age of those from individual inhumations. This showed that the sacrificial victims were young children, between one and five years of age, while those buried individually were older (ten years and above).

We have also studied the age of the adults in the tombs containing several people. The sacrificed individual is usually older than the principal burial, and often female.

We are beginning to get a better grasp of this ritual of human sacrifice where the subjects are either elderly or young children. Of course, these few observations must be confirmed by a larger sample of the population.

This practice must have had undesirable demographic effects on the population. In those populations where life expectancy is low, infant mortality is very important and, if young children are sacrificed, the demographic equilibrium could be appreciably altered.

B. Morphology

It is not possible to give much indication of the morphology of the Middle Kerman population as many of the tombs had been severely pillaged and the skeletons badly disturbed. In many cases, part of the skeleton, usually the skull, had disappeared, and the skull is fundamental to the determination of population morphology.

The few Middle Kerman skeletons for which we have the skull (6 males and 7 females) do not seem to show any change in morphology from the Ancient Kerma period. From the post-cranial skeleton, which was better preserved, we were able to calculate the stature (Dupertuis-Hadden method) of the two population.

Old Kerma				Middle Kerma			
	N	Mean	S	N	Mean	S	t-test
White	M. 19	1785.73	61.70	13	1764.21	47.04	8.00
	F. 17	1615.41	76.29	12	1626.95	55.20	3.72
Black	M. 19	1755.47	73.89	13	1727.19	57.94	9.55
	F. 17	1662.47	53.97	12	1652.69	54.68	3.52

Determination of stature using the DUPERTUIS-HADDEN method (1951), data in mm.

One can thus see a variation in stature between the Ancient Kerman and Middle Kerman populations. The difference is statistically significant (Student's t-test, probability level 0.01). However, this difference is not the same for both sexes. While there is a diminution in stature from the Ancient Kerman to the Middle Kerman males, for the females the inverse is the case.

It is possible that these differences in stature have a biological significance, but, given the heterogeneity and the small size of the Middle Kerman population, it is premature to attempt an explanation of this phenomenon.

C. The Christian tombs

In the modern town of Kerma, six Christian tombs were excavated (two males, three females and an adolescent of 13-14 years).

The cranial morphology of these individuals shows an elongated to moderately elongated head (dolicho- to mesocephalic), an average face and a large nose. The post-cranial skeletons are of average to large stature with a proportion characterized by long legs and long forearms. There is a significant robustness of the bones which is particularly pronounced in the male skeletons.

Some morphological traits show Nubian characteristics. Given the small sample, it is not yet possible to attempt a comparative analysis.

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Fifth note on the fauna of Kerma (Sudan): the 1987 and 1988 seasons

By Louis CHAIX

Translated by Annie Grant

As in previous years, our research was focussed on three archaeological assemblages:

- the ancient town of Kerma
- the eastern necropolis
- the Napatan buildings.

In this short report we have restricted ourselves to noting, for each of these, the facts that are outstanding or new in relation to the results previously obtained (CHAIX, 1980, 1982, 1984, 1986).

The ancient town

The foundations of a Middle Kerma chapel, situated at the north-east angle of the Deffufa, yielded several interesting pieces, whose presence there could not have been merely a result of chance. There was a fragment of the shaft of the metatarsal of a giraffe (*Giraffa camelopardis* (L.)). The distal part had been worked to a point or bevel. In the same area, the horn core of a male gazelle, very probably *Gazella dorcas* (L.) was discovered, and also the remains of an ostrich egg. The presence of giraffe is interesting as it confirms the existence of some of the large African animals at Kerma around 2000 BC. The presence of this animal was known to us already in the decoration of an ostrich egg with two giraffes and human figures (Bonnet, 1986).

Still in the town, a ditch to the east of the Deffufa yielded the mandible of a hippopotamus (*Hippopotamus amphibius* (L.)). There were no teeth in the jaw and one might suggest that they had been deliberately removed. We know that these elements were used for the manufacture of objects, from the neolithic period onwards (Chaix, in preparation). The dimensions of the alveolus of the canine indicated an animal of good size, probably a male.

In the area south-east of the Deffufa, in house 2, we found a fragment of the foot of a monkey. The morphology and dimensions of the metatarsal indicated that it probably was that of a cercopithecine such as a vervet (*Cercopithecus aethiops* (L.)). This species was discovered at the Egyptian site of the Ptolemaic period at Tuna-el-Gebel I, where its role seemed to be that of a pet (BOESSNECK and von den DRIESCH, 1987). LORTET and GAILLARD (1907,

p. 32) have also noted mummies of cercopithecines from the region of Thebes.

A very interesting bone was found in a well in the centre of the town, dated to the Middle Kerma period. It was a fragment of the proximal end of a donkey radius. Its size was well within the range of variation of domestic donkey, but we cannot be sure that this bone was from such an animal. For the time being we attribute it to *Equus* c.f. *asinus* (L.).

The bone is burnt and on its antero-internal face has fine disarticulation marks, no doubt resulting from the cutting of the terminal tendon of the biceps. These marks may result from the preparation of a shoulder joint.

Evidence for the consumption of donkey in this area had not previously been found. However, there were several bones from this species among the food debris in a funerary context at the site of Elephantine, dated to the Old Kingdom (BOESSNECK and von den DRIESCH, 1982). The taboo against the eating of donkey meat thus seems to be more recent.

The eastern necropolis

In this area, a settlement was discovered of earlier date than that of the necropolis itself, very probably corresponding to a settlement of the "Group A" culture. In the absence of certain comparisons, it has been called "pre-Kerma".

The many pits of this habitation yielded only a very small amount of bone material of which we note here only the most important. A fragment of a half mandible of an equid was found in pit 78. All the cheek teeth were present. Certain characteristics, such as the rounded metastylid of the premolars suggest that it was an asinine rather than a zebra. The double fold is of stenonian type. The dimensions of the teeth seem to confirm its identification as an asinine (Eisenmann, 1981). Further study may permit its attribution to wild donkey or to its domestic descendant.

Rare finds of bones were made in other pits (nos. 11, 12, 30, 42, 47, 53 and 55). Most of these were either from small ruminants (7), amongst which we identified domestic caprovines (sheep or goat), or from cattle (4). In addition there were fragments of ostrich shell (nos. 54 and 64) and

shells of aquatic molluscs (*Pila* sp. and *Unio* sp.) in pits 30 and 57. Surface cleaning of this area and of that of sector CE 13 also revealed post-cranial elements from cattle, donkeys and caprovines. It is very likely that this material is of pre-Kerma date since the Middle Kerma graves never contain such bones.

The excavation of the Kerma graves continued with the opening of new sectors, further to the south. The extraordinary conservation of organic material seen in the northern part of the necropolis was not so perfect here. Quite frequently, hair and skin were absent and some components such as the stomach contents and coprolites had disappeared. Many graves had been plundered, resulting in disturbance of the animal deposits.

We are restricting ourselves here to reporting on some important aspects that came to light during the last two seasons.

– Lambs bearing discs between their horns or horn pendants, similar to those discovered in the more northern sectors of the necropolis (BONNET, 1984, 1986; CHAIX, 1984, 1986) were found. Tomb 119 contained seven sheep, of which two wore discs. Two other less well preserved graves (121 and 133) each also contained an ornamented lamb.

– In tomb 133 there was a lion's (*Panthera leo* (L.)) upper left canine, with a pierced root. This must have been worn as a pendant, as was shown by the wear on the upper edge of the perforation.

– The examination of the many collections of *bucrania* showed that the cattle from which they originated had been killed at a wide range of ages, from a few months to several years old. As we have said elsewhere (CHAIX, 1987) the representation of the sexes was also comparable to that of a living herd.

It seems that these facts suggest that they were all slaughtered at the same time, or over a very short period.

– Two new dogs were found, bringing up to six the total number of these animals found in the excavated material. In tomb 133, an adult male dog was rolled up in a ball at the foot of the bed. Strange marks, that are difficult to interpret, were observed on the right dorsal surface of the atlas. They seemed to correspond to the cutting of a part of the atlanto-occipital membrane. It is difficult to see how a dog could have been killed in this manner! In the stomach contents of this animal were several fish vertebrae and some bone fragments from a large mammal.

– Further joints of meat were found in many tombs, always placed in the north of the grave. Most often they were from lambs, cut into 16 pieces. Thus one finds the spine cut into three, the sternum and the costal cartilage, two rib joints, two shoulders (scapula + humerus), two radiuses and ulnas with the first row of carpal bones, two

half pelvises, two femurs with their patellas and two tibias still attached to the os malleolus, calcaneum and astragalus. Only the metapodials were missing, and these had probably been retained for making into points.

In tomb 143, two lambs had been butchered in this manner, one of less than five months and the other between eight and nine months of age.

– Specialist studies carried out on the material from the cemetery allowed the following observations:

a. Detailed analysis of preserved sheep hair demonstrated in some cases the development of a fleece. It seems that these are the earliest finds of such a phenomenon. In addition, the structure of the coat suggests that the sheep were mainly killed in the winter (RYDER 1984, 1987; RYDER and SABRA-SANDERS 1987).

b. The rare finds of preserved pollen in the coprolites suggests, in the Middle Kerma period, a vegetation that was very similar to that of today, with stunted bushes and grasses (Urticaceae and Graminae) (TAYLOR, unpublished report; CHAIX and GRANT, 1987).

c. Several charcoal and wood fragments from the area of the necropolis were analysed (SCHOCH, unpublished report). The trees identified were mainly acacias (*Acacia nilotica* (L.) and *Acacia* sp.). There were also finds of jujube (*Ziziphus* sp.), myrtle (*Myrtus* cf. *nivellei*), date palm (*Phoenix dactylifera* (L.)) and fig (*Ficus* sp.). It is highly probable that the fruit of some plants was used as food (jujube, fig and date) while others could have been used as seasonings (myrtle) (OZENDA, 1983).

The Napatan Buildings

Several excavations of the Napatan building (BN II) yielded interesting material.

The fauna was dominated by cattle, and included many remains of young calves. The caprovines were next, and included both sheep and goat. Amongst the caprovine remains there was the distal extremity of a tibia with parallel circular cuts, similar to those we have described on another bone from the same site (CHAIX, 1984, p. 33). Some fish vertebrae were also found.

Several remains from equids must also be added to this assemblage. They were mainly upper cheek teeth belonging to two adult animals. The morphology of these teeth, (caballin fold and protoconid) show clearly asinine characteristics. In the absence of a more precise identification, we attribute them to *Equus* cf. *asinus*. In addition there was a

right patella with traces of the cutting of the lateral patellar ligament on the anterior surface. Thus a lower leg had been removed, very probably during butchery. In this, together

with the find in the Middle Kerman well, we have proof of the consumption of donkey during the second and first millennia at Kerma.

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Microscopic and chemical analysis of pottery and inventory of stone artifacts from Kerma (Sudan)¹

By Paul DE PAEPE

The 1986-1987 and 1987-1988 excavation campaigns of the Mission of the University of Geneva to the Sudan have made it possible to continue the laboratory work² on the pottery, started in 1984, as well as to carry out a geological survey of the site of Kerma and the adjacent area.

The pottery selected for this work belongs to very different occupation periods. An important part of the finds were recovered from graves which were located in the *sectors CE 7 to CE 13* of the eastern cemetery. According to the C14 dates³, the production of this pottery belongs to the second half of the Ancient Kerma period (KA) (*CE 7 to CE 10*) and to the Middle Kerma period (KM) (*CE 11 to CE 13*). Pots found in pits or "silos" from a pre-Kerma settlement – uncovered in the centre of the above-mentioned cemetery – have also been analyzed. These ceramics have probably the same age as the A-Group pottery of Lower Nubia and could date from the fourth and the early third millenium BC. Other samples include a bread mould found in a KC bakery located in the eastern zone of the ancient city of Kerma, as well as four vessels discovered in a settlement of the Classic Kerma period (KC) at Kadruka⁴.

The fieldwork³ focussed on the study of both the regional geology of the Kerma Basin and the stones used by the inhabitants of the ancient city of Kerma for building, sculptures and tool production purposes. In an attempt to establish the sources of the raw materials of the stone artifacts, several quarries and natural outcrops of hard rock situated along the right bank of the Nile between the third cataract (Tumbus) and Tabo, as well as in the nearby desert, were visited. While traveling within the Kerma Basin, we took the opportunity to examine several dozen wells. When sufficiently deep and without brick revetment, these wells offer magnificent geological section through the Quaternary deposits and occasionally through the underlying, so-called Nubian Sandstone Formation⁶. Thus, they constitute excellent observation points for the investigation of the Nile alluvia and the eolian sediments associated with them.

As the present report was drafted soon after our return from Nubia, the laboratory work regarding the stone artifacts is still in progress. Therefore, the following data are preliminary ones and concern only some aspects of our research.

The pottery of the eastern cemetery

As far as the nature of the main temper constituents and the bulk chemical composition of the fabrics are concerned, there are no significant differences between the ceramics from *sectors CE 7 to CE 13* and those from *sectors CE 1 to CE 6*. A full account of the latter was given previously⁷. The average chemical composition of 78 pots from all above-mentioned sectors, listed in the first column of table 1, can thus be considered representative for the whole of the KA and KM pottery from the Kerma cemetery. As to the concentrations of the major elements, this pottery shows a distinct resemblance to that uncovered in several cemeteries of the Kerma necropolis in the island of Saï⁸.

Six sherds of a total of 33 available for this study, however, have petrographical and chemical characters which are distinctly different from those of other samples from the eastern necropolis. They come from tombs located in *sectors CE 10, CE 12 and CE 13*. Archaeologists identify this ware as imports or imitations of Egyptian pottery and it constitutes at the most 1% of the KA and KM pottery from the cemetery⁹. The sherds studied show orange, brown red, or – less frequently – yellowish tinges; they are rather dense, well-fired and covered with a white or buff slip.

This rather uncommon pottery contains very few remains of organic matter. The fabric, on the other hand, carries a great quantity of microcrystalline carbonate minerals (mainly calcite). The non-plastic inclusions present in the pottery are always very small and consist essentially of angular quartz grains and minute flakes of mica (muscovite and biotite). Less frequently, one finds plagioclase, microcline, oxidized green hornblende, opaque iron ore, colourless or purplish brown augite and epidote. A few specimens also include skeletons of micro-organisms (foraminifera). There are but few rock inclusions. They usually derive from very fine-grained or glassy basic lava flows and from rocks of granito-gneissic composition. The fabric of some vessels underwent incipient fusion during firing. As a result of this, the calcite grains have been partially or even completely destroyed.

A particular aspect of the calcareous ware from Kerma is of course its high calcium content (table 1, column b). Compared to other KA and KM ceramics from the eastern necropolis, it is moderately enriched in chromium,

lithium, strontium and zinc, whereas the iron, manganese, titanium, sodium, copper and cobalt levels are distinctly lower. The average chemical composition of this pottery is quite close to that of a sherd with "a very fine calcareous, orange tinged fabric", discovered in a KC tomb on the island of Sai¹⁰.

The pottery of the ancient city

For the purposes of the present report, only one piece of pottery from the ancient city could be investigated. As far as thin-sectioning data are concerned, it is identical to the funerary wares produced in Kerma during the first periods of the Kerma civilisation. The distribution of major and trace elements (table 1, column c) confirms this picture.

The pottery of a pre-Kerma settlement

The sample studied consists of a total of 21 sherds, recovered from 16 pits or "silos" scattered over the whole area of the pre-Kerma settlement, as it was known at the end of the 1987-1988 excavation campaign.

Under the polarizing microscope, the pre-Kerma ceramics are superficially similar to the KA and KM pottery from the eastern necropolis and from the ancient city of Kerma. The former, however, are far more heavily tempered with sand-sized quartz grains. Additionally, they are characterized by the presence of very well-preserved carbonized plant remains (figures 1 and 2) and by a relatively low calcite nodule content.

These microscopic particularities explain at least part of the chemical differences existing between the Kerma and the pre-Kerma wares (table 1, columns a and d). The high frequency of large quartz inclusions in most of the pre-Kerma sherds is the principal cause of two distinct features: first, the high silica content of the pottery, and second, the fairly low abundances of all chemical components which are not a major constituent of quartz. The impact of the amount of calcite nodules on the chemistry of the pottery is equally considerable. When re-fired at a temperature of 1000 °C, the pre-Kerma pottery undergoes a loss of weight which is more important than that in the case of the Kerma pottery. This particular phenomenon most certainly reflects other firing conditions as well.

A few pre-Kerma sherds show a marked affinity to the Kerma ware of the area and their influence on the computed average chemical composition, given in column d of table 1, is substantial. The more representative samples of the pre-Kerma ceramics thus have chemical properties which are more explicit than a quick look at this table would suggest.

The pottery from Kadruka

The range of common inclusions and the chemical composition of the Kerma pottery from Kadruka (table 1, column e) match those of other Kerma wares in the area (Kerma, Akasha). As the pottery from Kadruka often includes sand-sized quartz grains, it is logical that its average silica content is slightly higher than that noted in the case, for instance, of the pottery from the eastern necropolis at Kerma.

The petrological analysis further reveals that many pores occurring in a sherd from this locality are filled with gypsum. One may admit that this mineral precipitated from aqueous solutions, which percolated through the pottery while it was in the ground.

The stone artifacts

Archaeological evidence pointing to the systematic use of stone in Kerma construction practise is extremely rare. One of the very few known examples is a *large circular structure* discovered, some fifteen years ago, in the southern part of the modern town of Kerma¹¹.

The flat stones used for the steps in the stairway leading to the foot of the circular wall of this monumental building consist mainly of ferruginous sandstone. Less commonly, quartzose sandstone (quartzite) and biotite granite have been used. The stones used for the wall construction are of a more varied nature. They comprise ferruginous, quartzose and pebbly sandstone (with abundant quartz pebbles), as well as silicified wood (fossil wood), granite (of at least two main types), gneiss and amphibolite. Nevertheless, sandstone and granitic rocks predominate largely. Granite often occurs as boulders.

It is fairly easy to attribute all these stones to well-defined geological horizons. The different varieties of sandstone, for instance, recall the rocks of the Nubian Sandstone Formation. These Cretaceous sediments are well-known at Kerma. There are no outcrops along the banks of the Nile as the formation is capped here with a thick cover of fluvio-lacustrine and eolian deposits. The formation is, however, directly accessible in the hills ("jebels") which delimit the Kerma Basin to the east. The igneous and metamorphic rocks, on the other hand, come from Precambrian layers. The Precambrian basement outcrops north of Kerma (third cataract). The typical rocks from this area are biotite granite with well-developed jointing and gneiss. Amphibolite and marble are also found in this region, as well as west of Kerma¹². Both are of very localized occurrence.

The few wall foundations, wall revetments and stone wells which have been discovered in the *ancient city of*

Kerma, are made with unworked blocks of ferruginous and quartzose sandstone. The roof of some public and domestic buildings, located in the centre of the city, were supported by wooden pillars, which rested on stone column-bases (fig. 3). The latter are circular and often flattened. A beautiful 75 cm high column-base, measuring about 100 cm across, is located in a room of the western deffufa¹³. Thin-sectioning of a fragment of a column-base, found on a waste heap south of the deffufa, shows that the raw material of those architectural components is dolomitic marble¹⁴. It is a rather coarse-grained white rock, which contains locally a great quantity of magnesian silicates (tremolite, antigorite). Column-bases carved from quartzose sandstone have also been observed, but they are really unusual.

The study of a limited number of stone implements (palettes, querns, mortars, axes, mace-heads, etc.) bears witness to the petrographic diversity of the objects examined. First, there is an important percentage of tools fashioned from sandstone and biotite granite. Next, among the other rock varieties which could be recognized, one notes flint, silicified wood, argillite (claystone), schist, quartz and chalcedony pebbles (carnelian and agate are two widespread varieties of chalcedony), alabaster, red porphyritic granite, aplite, diorite, gabbro, gneiss, amphibolite, greenstone¹⁵ of variable grain size and mineralogy, and micaschist. There is hardly any doubt as to the local provenance of most of these rocks. The source localities of the greenstones have not yet been identified, but it is likely that they are located either in southern Egypt or in the north-eastern part of the Sudan.

Finally, it is to be noted that the stones recovered from both the superstructure and the interior of the graves in the eastern necropolis are less varied than those recorded in the ancient city. Among the more common rocks, one finds many sandstone varieties, quartz pebbles and a dark fine-grained rock, the microscopic examination of which is still in progress. Even in this particular zone of the Kerma site, metamorphic and igneous rocks occur regularly, though they represent only a limited percentage of the finds.

Conclusions

The microscopic and chemical analysis of 21 sherds from a pre-Kerma settlement, of 110 sherds of Kerma ware from the Kerma site¹⁶ and of 4 sherds from Kadruka suggests the existence of three main fabric types. Statistical classification methods using fifteen elemental components of the fabric allow us to present the grouping in a graphical form (fig. 4).

A first type of fabric includes six calcareous sherds from the eastern necropolis. Their typology recalls some of the

Table 1: Chemical composition of pre-Kerma and Kerma pottery from Kerma and of some Nile sediments from the Kerma area(*)

	a	b	c	d	e	f
SiO ₂	60,58	55,05	60,99	69,73	63,62	58,42
Al ₂ O ₃	15,58	16,79	15,02	14,16	14,68	15,92
Fe ₂ O ₃ (+)	10,34	6,97	9,01	7,33	9,21	11,44
TiO ₂	1,72	1,06	1,74	1,40	1,76	1,83
MnO	0,17	0,10	0,17	0,09	0,15	0,18
CaO	4,46	14,48	5,21	2,73	4,45	5,23
MgO	3,38	2,75	2,93	1,58	2,60	3,45
Na ₂ O	2,39	1,42	1,95	2,01	1,70	2,16
K ₂ O	1,41	1,38	2,98	0,97	1,84	1,36
Co	37	25	36	23	35	41
Cr	172	221	173	144	169	163
Cu	62	37	59	49	51	82
Li	14	32	16	15	14	17
Ni	88	67	62	51	75	71
Rb	40	52	61	41	56	45
Sr	348	552	380	270	327	364
Zn	109	134	115	96	101	121

a. Pottery from the sectors CE 1 to CE 13 of the eastern cemetery at Kerma (mean value calculated on 78 sherds).

b. Calcareous pottery from the eastern cemetery at Kerma (mean value calculated on 6 sherds).

c. Bread mould from a bakery in the ancient city of Kerma.

d. Pre-Kerma pottery from Kerma (mean value calculated on 21 sherds).

e. Kerma pottery from Kadruka (mean value calculated on 4 sherds).

f. Nile alluvia coming from the vicinity of Kerma (mean value calculated on 7 samples).

(*) The data refer to anhydrous samples (Anal. J. Van Hende). The major and minor elements are given in % of weight. The trace-element abundances are in ppm.

(+) All the iron is calculated as Fe₂O₃.

Egyptian wares. The fieldwork in the Kerma region did not reveal the source locality of the raw materials used in the manufacture of this pottery. The Qena pottery¹⁷ – known for its high carbonate content – shows calcium levels which are quite close to the mean value given in table 1 (column b). Therefore, one may suggest that the calcareous ware found at Kerma was traded from Upper Egypt. The laboratory study of several pieces of Qena ware is presently in progress with the aim of checking this hypothesis.

The wares of a second type of fabric – equally represented in small quantities – all except one come from the pre-Kerma settlement. The remainder of the pre-Kerma material – a total of 8 sherds – belongs to a third and last type of fabric, the chemical composition of which is characteristic for the KA, KM and KC wares from Kerma and Kadruka, as well as for recent Nile muds from the area (table 1, column f). The latter have been studied thoroughly in an earlier paper¹⁸.

The laboratory data are consistent with the use of Nile silts to manufacture the ceramics of both last-mentioned

fabric types. Compositional differences reflect either divergent granulometric and mineralogical properties of the raw materials or the application of different techniques to prepare the paste. The ceramics of both groups may originate from local workshops.

Finally, the preliminary study of the stone artifacts shows that the inherent properties of each type of rock have determined their use. Because of their hardness and

coarseness, the local rocks, abundantly available and readily accessible, were preferably used for the manufacture of querns and mortars, or for building purposes. The stones used for palettes, axes, mace-heads and various kinds of ornaments, however, often come from distant areas, thus testifying as to the existence in the northern part of the Sudan of major commercial trade systems during the whole course of the Kerma civilisation.

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² The National Fund for Scientific Research (Brussels) and the Research Council of the State University of Ghent provided the laboratory equipment used for the chemical analyses.

³ Ch. BONNET, *Les fouilles archéologiques de Kerma (Soudan), Rapport préliminaire sur les campagnes de 1984-1985 et de 1985-1986*, in: *Genava*, n.s., t. XXXIV, 1986, p. 20.

⁴ Ch. BONNET, *op. cit.*, 1986, pp. 18-19.

⁵ The geological survey in the Kerma area was carried out from December 19, 1987 to January 31, 1988. During this period, we could profit from the hospitality of the Mission of the University of Geneva to the Sudan, directed by Ch. Bonnet. We are most grateful for the kind help provided during our journey by the Swiss team and by the members of the French Archaeological Research Unit of the Directorate General of Antiquities and National Museums of the Sudan, conducted by J. Reinold.

⁶ M.K. OMER, *The geology of the Nubian Sandstone Formation in Sudan*, Geological and Mineral Resources Department of the Ministry of Energy and Mining (Sudan), 1983, p. 227.

⁷ P. DE PAEPE and Y. BRYSE, *Analyse microscopique et chimique de la céramique de Kerma (Soudan)*, in: *Genava*, n.s., t. XXXIV, 1986, pp. 41-45. The oxide percentages of the analyses published by these authors have not been recalculated to 100% anhydrous.

⁸ D. DUFOURNIER, *Analyse de la céramique, premiers résultats*, in: *B. Gratiën*, Saï I. La nécropole Kerma, 1986, pp. 444-446.

⁹ B. PRIVATI, *Remarques sur les ateliers de potiers de Kerma et sur les céramiques du Groupe C*, in: *Genava*, n.s., t. XXXIV, 1986, pp. 23-28.

¹⁰ D. DUFOURNIER, *op. cit.*, 1986, p. 445.

¹¹ Ch. BONNET, *Nouveaux travaux archéologiques à Kerma (1973-1975)*, in: *Etudes nubiennes - Colloque de Chantilly, 2 au 6 Juillet 1975*, 1978, pp. 25-34.

¹² See for instance: A.J. WHITEMAN, *The geology of the Sudan Republic*, Clarendon Press - Oxford, 1971, 290 p., and A. HUTH, G. FRANZ & H. SCHANDELMEIER, *Magmatic and metamorphic rocks of NW Sudan*, in: *Berliner geowissenschaftliche Abhandlungen*, t. 50, 1984, pp. 7-21.

¹³ Ch. BONNET, *Les fouilles archéologiques de Kerma (Soudan), Rapport préliminaire des campagnes 1978-1979 et 1979-1980*, in: *Genava*, n.s., t. XXVIII, 1980, p. 47.

¹⁴ In the past, this particular stone has often been wrongly identified as quartzite.

¹⁵ Dark-green metamorphic basic and ultrabasic igneous rocks (e.g. greenschist, epidiorite, amphibolite and serpentinite).

¹⁶ This number includes all the Kerma sherds analyzed presently at the Rijksuniversiteit Gent.

¹⁷ R.G.V. HANCOCK, N.B. MILLET & A.J. MILLS, *A rapid INAA method to characterize Egyptian ceramics*, in: *Journal of Archaeological Science*, vol. 13, 1986, pp. 107-117.

¹⁸ P. DE PAEPE & Y. BRYSE, *op. cit.*, 1986.