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KERMA

SOUDAN

1984-1985-1985-1986

Archaeological Excavations at Kerma (Sudan)

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Preliminary report on the 1984-1985 and 1985-1986 seasons

The last two seasons of excavation by the Mission of the University of Geneva to the Sudan were spent on the sites of Kerma, Ashkan and Kadruka (Northern Province). They followed more than ten years of research at Kerma and once again produce abundant information on the prehistory and history of Nubia[1]. Mr. Nigm Ed Din Mohamed Sherif and Mr. Akasha Mohamed Ali, of the Antiquities Service of the Sudan were of tremendous help especially in organizing the salvage excavations. We would also like to acknowledge the excellent relations we have developed with the French Archaeological Research Unit of the Directorate General of Antiquities and National Museums of the Sudan, especially with Mr. Jacques Reinold, director of the Kadruka excavation. We are equally grateful to Professor J. Leclant, Permanent Secretary of the Académie des Inscriptions et Belles Lettres for his support and are honored by his invitation to present the results of our excavations at Kerma[2] at the Collège de France and to publish them in the review *Orientalia*[3].

Our profoundest thanks go to the Swiss National Fund for Scientific Research, the Museum of Art and History of Geneva and to private contributors, notably the H.-M. Blackmer Foundation, all of whose contributions make our work possible. We would also like to thank the Excavations Committee of the University of Geneva for their advice and interest in our work[4].

Once again our research was concerned with the study of the Kerma cultures, that is, the ancient kingdom of Kush (2400-1450 B.C.). The study of the city seemed to us of primary importance because civil architecture in sun-dried brick all along the Valley of the Nile has not yet been adequately studied. At the same time, the development of this metropolis is particularly interesting especially in relation to the development of the contemporary cemetery.

The sinking of new wells intended to irrigate land hitherto uncultivated prompted us to carry out a brief survey in the Kerma Basin. At the far end of the Ouadi El Kowi, several Neolithic and Kerma period sites were located along a former branch of the Nile, about 5 to 10 km east of the present bed of the river. The alluvial plain there is perfectly suitable to cultivation and already at the beginning of the century an irrigation system had been put in place. Since the archaeological sites are threatened with permanent destruction by the expansion of the agricultural zone, we proposed to the appropriate authorities that a rapid survey be made to the south and north of Kerma to determine the importance of the remains and to define a policy of preservation. Surveys carried out in conjunction with prehistorians from the French Archaeological Research Unit had already given us an idea about the occupation of this territory as early as the 3rd millenium. Further research is foreseen in the coming years.

The excavations took place from December 5, 1984 to January 30, 1985 and from December 7, 1985 to January 30, 1986. The two rais of Tabo, Gad Abdallah and Saleh Melieh, both in their twentieth field season with the Swiss Mission, directed a team of 60 to 75 workmen. The contributions of Mr. Salah Eddin Mohamed Ahmed and Mr. Mahmoud El Tayeb Mahmoud, Inspectors of the Antiquities Service of the Sudan, towards the study of the remains, the organization of the excavation and the restoration of the monuments have been immeasurable.

The competence and experience of the usual collaborators of the Mission was of great help. Ms. B. Privati was responsible for the archaeological material and participated in the cemetery excavations. Mr. T. Kohler worked primarily on the data gathered in the city, while Mr. Salah Eddin Mohamed Ahmed devoted himself to the excavation of the Napatan building. Mr. L. Chaix and Mr. C. Simon continued their systematic study of the skeletal material. Mr. D. Berti, who resumed responsibility for the photographic work while taking part in the excavation also dealt with the problems of team management, aided in this task, during the latter mission, by Mrs. V. Zorzi.

The City

The 1984-1985 season was marked by a discovery which is fundamental to understanding the history of the city. A large round structure was uncovered in one of the sectors close to the center of the agglomeration. Situated at an important crossroads, this construction, distinguished by its plan as well as its size, constitutes a second focal point

in the city, after the Deffufa. It was possibly related to the area of circular huts uncovered earlier in this zone.

The interior space is divided by three rows of enormous wooden supports founded deeply in the ground. A brick partition with traces of an ochre-red wash marks off a room whose corners are cut on a diagonal and which measures approximately 12 meters per side. In the north-west corner were two round rooms in one of which the earth was reddened and ashes from a hearth were found on several levels. Between the partition and the exterior wall was a passage or narrow spaces. This exterior wall, in its final state was reinforced by pilasters as well as low interior walls. Post-holes mark the circumference of the construction and undoubtedly indicate an over-hang or portico.

Six stages of construction were distinguished. Each time the exterior wall was razed and then rebuilt to suit the enlarged proportions of the new phase. Burn levels no doubt explain in part these remodellings. The first foundation was built of an archaic type of large brick, some of them square, set into a bed of fine sand. The fill in some post-holes and the ceramics found indicate that the monument was still in use when the city was abandoned. This long occupation period, which, given the current state of our research, we situate between 2000 and 1500 B.C., attests to the importance of the building whose function was perhaps linked to the exercise of royal power.

The thickness of the exterior wall is relatively slight in relation to the volume of the central part of the structure, leading us to suppose a conical roof. The whole construction might have been in the form of a large hut, much taller than the neighboring houses.

In the beginning the construction was protected by an enclosing wall whose earliest phase we are currently studying. To the north there is a pile of rubble from the fallen sun-dried brick walls which will have to be fully excavated. Currently, the remains of two enclosures are being excavated. We have found the better preserved baked brick foundations on only three sides; to the south post-holes outline a semi-circular palisade which was also rebuilt several times. The enceinte was subsequently abandoned and huts built on the remains. One of these huts, on the west side where several re-cuttings can be seen, measured close to 8 meters in diameter.

There is no comparable contemporary construction, but this kind of mixed wood and brick architecture became subsequently widespread in Central Africa. Ceremonial huts or the audience halls of the sultans of Darfour or the kings of Southern Sudan are recent examples[5] and surely come out of a long tradition which may have begun in the 3rd or 2nd millenium B.C.

Several houses from the Middle Kerma (2050-1750 B.C.) and Classic Kerma (1750-1500 B.C.) periods in this quarter in the center of the city were also studied. The Middle Kerma houses had one *(M 40)* or two rooms, sometimes adjoining *(M 38, 42, 44, 46)*, flanked by huge courtyards generally given over to the kitchens, granaries and shelters for the farm animals. In one of the houses, enclosed by a winding wall[6], two potter's workshops were uncovered. Here, as in many other places in the city, the surface of the floor was marked by a hardened whitish ash. The kilns are made up of rounded shallow pits outlined by small low walls against which has been built a segment of a semi-circular wall. Dark red traces and the accumulation of ashes indicate that the kilns were used for quite a long time. The pits, designed for open firing, produced most of the domestic ceramics. The artisans do not appear to have been bothered by their proximity to the large hut.

During the Classic Kerma period, very spacious houses were built *(M 39-41)* beside more modest dwellings *(M 43-45)*. The plan of the second phase of House 42 is rather unusual: five long adjoining rooms. This kind of plan is well attested, however, in Nubia during the Napatan and Meroitic periods[7].

Behind the Deffufa, the great temple of Kerma, a large area was opened up towards the north in order to study the relation between the earliest levels of the primitive settlement and the northern quarter of the city. The remains of a pile of white earth which had been brought in appeared about a meter beneath the foundations of the solid apse belonging to the "first phase" of the Deffufa. Possibly this might be part of an enclosing wall which undoubtedly marked the limit of the city of Old Kerma on that side. On the surface, hundreds of post-holes belonging to different types of structures were noted. Some are aligned in a round pattern and may belong to huts. One house *(M 48)* from the beginning of the Middle Kerma period has been identified at this level. The kind of masonry used as well as the quality of the construction link it to the long buildings discovered under the western annexes of the Deffufa. The house is composed of three rooms laid out within a quadrilateral; the southernmost room is quite large. Several fragments of plaster still have a layer of blue color on them. In the north-west corner, a small rounded wall no doubt had to do with the kitchens.

In the area right around the house and at the same level two shallow pit kiln which seem to belong to a large workshop, were located. The walls of several later houses, which are being excavated, bear witness to the development of this quarter. Such urbanization did not, however, put an end to the activities of the potters who, once again, in this spot, installed a circular brick kiln with a firing chamber and a hearth supported by a vault.

About 80 meters north of the Deffufa, three, possibly four, phases of occupation are discernible from the foundations. We have uncovered the remains of the Classic Kerma period in the direction of the city center, thus enhancing our understanding of the layout of the quarter. The two large houses *(M 47 and 51)* situated at the northern end have a simple two-room plan including a small vestibule on one of the houses *(M 47)*. The roof of the square main

room is supported by beams resting on stone bases. The walls of Classic Kerma dwellings are larger than in preceding periods and do not have pilasters. The courtyards stretch towards the south. Their closing walls were often rebuilt either because they had suffered from erosion, an effect heightened here by the nearby alleys, or because new structures had been added. In this particular case a large circular silo and a monumental portal intended to define the limits of the property required a modification in the outline of the walls. Some houses *(M 50-53)* are distinguished by their smaller proportions; the dimensions of *House 50*, for example, are exactly half those of *House 47*.

Two imposing buildings separated this quarter from the Deffufa. One has almost entirely disappeared; only a very thick wall is preserved against the apse. The foundations of the other, however, are better preserved and outline a perfectly circular building 11 meters in diameter. The thickness of the exterior wall (0.50 m) indicates that the elevation must have surpassed the roofs of the neighboring dwellings. The foundations rest on a bed of fine sand. In the middle is a rough-quarried sandstone block, also sitting on sand, which no doubt served as a support for the base, worked in white quartzite, found in a later destruction trench not far from its original site. The floor, partially preserved, was made of a course of bricks arranged in a round pattern and covered by a layer of mud.

This circular structure is surely not a silo; these are usually built on stronger foundations consolidated with stones and thick mud. The care taken in erecting this building, the circular quartzite base and the thickness of the walls suggest a cult edifice. It should be noted, however, that this building is located outside the religious quarter.

The material inventoried within the city, although often quite damaged, provides some information about the domestic and artisanal activities of the inhabitants. While there is a great variety of ceramics from all periods, the incised triangle decorations are predominant. Stone objects, either carved or polished, are well represented in the houses and consist mainly of knives, blades and scrapers. A large number of clay figurines and models were found. The mobile head of an anthropomorphic figurine with a very elongated body was still held in place by a twig[8]. Another exceptional find was several fragments of ostrich eggshell which had been incised with giraffes and several human figures. The fragments come from the first occupation level of House 38 and are dated to the end of the Middle Kerma period. Stylistically these drawings are related to the C-Group and to the rock drawings of the Saharan area, evidence of cultural exchanges between the Valley and the neighboring deserts[9].

The Eastern Cemetery

In order to establish the chronology of the earliest phases of development of the eastern cemetery, we resumed our study of sector *CE 1*. In this zone the ^{14}C dates were the oldest although some samples seem not to fit in with the overall results. The results from excavation of a dozen new tombs were unexpected and quite significant. On the one hand, the deposits of ceramics found on the surface around the superstructures turned out to be much richer than those found previously. On the other hand, ^{14}C dating suggests a date of around 2400 B.C. for the beginning of the Old Kerma period. In addition, the presence of a certain number of Early C-Group bowls, a type well studied during the Nubian campaign, confirms this chronology. It is true that this date is a little older than Mr. Bietak's phase Ia[10], but given the current state of research on the question, we do not propose here to settle once and for all the appearance of the Old Kerma phase. The sum of information from the cemetery as well as the city leads us to believe that during the Fifth Dynasty in Egypt, the population settled between the 2nd and 4th cataracts was already partially unified.

Carbon 14 analyses, as well as the historical sources, place the end of the independant kingdom of Kush at around 1450 B.C.; disturbances were still reported in Nubia under Hatshepsut and Tuthmosis III and undoubtedly it was only at this time that the city was finally abandoned. Thus, the Kerma cultures evolved during nigh unto a thousand years. We would like to stress once again the density of contemporary tombs from the First Intermediate Period as well as their richness compared to the early burials[11]. The work currently underway will attempt to determine whether this demographic and economic expansion is directly linked to the political history of Egypt or if other factors played an equally important role[12].

The burials opened in *CE 1* also underlined the limits and difficulties of excavation by trial trench. Often the inventoried material differs from that found in a neighboring sector in spite of similar funerary practices. Two types of almost contemporary superstructures were once again recorded: one characterized by concentric circles of black and white stones stuck into a mud tumulus, and the other distinguished by sandstone stelae arranged in a circle[13]. In both cases the pits were narrow, circular or oval. The coverings and leather garments are identical to all those found in this part of the cemetery. These groups of burials are distinguished especially by their ceramics. The vessels, placed upside down to the east and south of the tumulus make up very diversified series, of the C-Group type but also in the tradition of the handsome Kerma ceramics. We should note that up to now the C-Group type of ceramics seems to be associated mostly with the stelae burials. Vessels are rarely found inside the pits; there were two bowls inside *Tomb 103*, one of which was inside a leather sack with a pair of sandals and the imprint of a seal. A second seal imprint was found in the fill.

Two human skeletons in the same pit *(T. 95)* attest to the practice of human sacrifice during this period. In this

case there were 2 males, 45 and 55 years old. One, the sacrifice, had his head and upper body turned around partway against the ground. This position as well as the arrangement of the two bodies relative to one another – side by side, heads to the east as usual – had been noted before in later burials where the principal subject was accompanied by one, and sometimes two, sacrifices.

In the *CE 10 Sector* the ceramics were clearly evolving in the direction of the Middle Kerma types as defined by B. Gratien[14]. This impression was confirmed with the excavation of six additional tombs which contained numerous jars and crudely made bowls. In addition, 2 intact burials contained a disk-shaped pendant and gold beads. The presence of such jewelry may explain the relatively severe pillaging that this area has suffered. There was also an increase in the number of sheep sacrificed. For example, grave 107 had six, arranged to the south of the pit. The man buried there was accompanied by a female sacrifice, aged 30 to 40 years old.

Sector CE 11, located further to the east, is marked by the presence of Middle Kerma pottery both on the surface and in abundance inside the pits. A jar and three small bowls, each turned upside down in a small depression, were placed to the east of the superstructure over *Tomb 114*, while to the south a calf's skull, also placed in a depression, was found. The burial, an archer between 50 and 60 years old, was lying between 2 leather coverings with a young male sheep. Besides the ceramic vessels grouped on the north side, the archer had an ostrich feather fan. He was wearing a sheepskin loincloth, a linen garment and leather sandals. Four to six arrows, 75 to 80 cm long, ware placed next to the bow. Helical feathering, made from small bird feathers, was still attached to the base of one of the reed arrows. In his right hand, the archer was holding the string of his bow, a practice previously noticed in the tombs from Old Kerma, contemporary with the First Intermediate Period in Egypt. In this regard, it is interesting to note that the hieroglyph for archer was modified at the end of the Old Kingdom; the figure who, until the Fifth Dynasty, was shown in a static posture, began to be shown pulling the string of his bow, ready for combat, like the archers buried at Kerma[15] Traces on the forehead and hair of another archer[16] indicate that he was wearing a band which held a feather, a well attested feature in Egyptian iconography.

Several rows of black sandstone and basalt stones held together by quartz gravel were still preserved in the tumulus of *Tomb 115*. A millstone had been stuck backwards up against the superstructure. One hundred and twenty-nine ox skulls – 98 adults and 31 young calves – were distributed in a crescent to the south of the superstructure. The way they were slaughtered indicates a transition phase since some still have the nasal bones, as was the rule in Old Kerma, while others do not, the frontal having been cut off or conserved as far as the spine[17].

The burial, a man around 30 years old, was lying on a bed whose legs ended in the form of animal paws. Traces of green on the pelvis suggest the presence of a bronze object, possibly a dagger, which was no doubt taken when the tomb was pillaged. A jar and some bowls, which make up most of the gravegoods, were placed beneath the coverings that protected the body and a veritable herd of sheep – 16 in all – were disposed to the south and west. One, at the foot of the bed, had an ostrich feather disk on its skull, quite different from the fan placed near the burial. The animal's horns were pierced, as were those of three of the other sheep. Some beads found nearby possibly belong to hanging pendants which are sometimes part of this decoration. A feather head adornment, identical to those at Kerma, was also found at Kadruka[18], suggesting that the custom of adorning the head of caprovines was fairly widespread.

The neighboring tomb *(T. 116)* was particularly well preserved; the bottom of the pit was scattered with desert plants. Near the burial, a woman aged 30, were a jar, 2 bowls, a plate and a leather churn which still had its small hardwood stopper. The churn is quite similar to present day churns made of sheep- or goat-skin. The four legs are used to hang the skin and the milk is poured through the neck hole. Butter is made by briskly agitating the churn. The burial was dressed in a leather loincloth and cloth garments. Her right wrist had a bracelet made of faïence beads on it and on top of it lay an ostrich feather fan. Besides a sacrificed sheep, several quarters of meat had been put into the pit. It appears that funerary rites became more complex at the beginning of Middle Kerma and that, in particular, gravegoods became more diverse and abundant.

The remains of a *small monument* in sun-dried bricks, measuring 1.40 × 0.90 m was also uncovered in this sector. This building may have been the beginning of the Classic Kerma chapels and temples. Perhaps it was an oratory where offerings made to the memory of the deceased were laid.

A new clean-up of the cult building *K XI*, excavated by G.-A. Reisner, was undertaken. A detailed plan of the apse showed that its proportions are identical to those of the solid apse preserved to the north of the western Deffufa. The remains of the neighboring chapels, *C and D*, were also explored once again. It appeared, in studying the foundations of these two superposed buildings, that they had been built upon a pit which had been completely plundered before the rebuilding of chapel D. In this chapel, several objects were found along one wall and under the reconstructed floor: ornaments for clothing – beads and worked mica plates, as well as elements of the decoration of a bed – a piece of gold sheeting and a bronze inlay representing a palm tree (?). G.-A. Reisner has proposed that these chapels be attributed to tumulus K XV. However, their spatial relationship with the tumulus makes this doubtful, and work on funerary architecture will be continued during future campaigns.

The northern Meroitic cemetery

The extension of the Meroitic cemetery was confirmed by the discovery of completely plundered tombs in the quarter studied to the north of the Deffufa. The situation of a burial vault would seem to indicate that close to a thousand years after the city was abandoned, the walls of some houses were still preserved to a certain height. In fact, the rather large vault was established almost in the middle of the main room in *House 51* in such a way as to not disturb the outline of the older masonry. The narrowness as well as the unusual north-south orientation of the ramp also suggest a desire to preserve these vestiges of Classic Kerma. This arrangement brings to mind some Late Empire burials which are situated inside ancient structures that had fallen into ruin.

In the same zone a communal burial pit, probably from the medieval period, was discovered. It contained eleven individuals – four women, one of whom was several months pregnant, one adolescent and six children – lying on their stomachs, heads usually oriented towards the north. The burials seemed to have occured fairly close together. No gravegoods were found and only a few fragments of leather were preserved.

The Napatan building

Study of the earliest occupation levels of the Napatan building, for which three phases had already been recognized[19], continued. The presence of an older building extending towards the northwest was noted. Unfortunately the proximity of a major transit road will not allow it to be fully excavated. In the deepest levels a pipeline was uncovered. At one end there were several large ceramic vessels suggesting it had to do with the showers or latrines.

Salah Eddin Mohamed Ahmed of the University of Lille is currently studying the inventoried material. A large *terra cotta* piece, made up of a sphere sitting on the trunk of a pyramid, may have been used as a pyramidion. On the surfaces are traces of inscriptions, undoubtedly of a religious nature. This piece can be compared to the stone examples dug up at Meroe by F. Hinkel and those preserved in the National Museum of the Sudan[20].

The Neolithic cemetery of Ashkan

The site of Ashkan is located about 10 km north of Kerma and occupies a rounded mound 50 m in diameter which rises from 80 cm to 2 m above the surrounding plain. Markers were set up all around the archaeological area. An initial trial trench 4 meters square yielded six burials less than 30 cm below the surface. The superimposition of the tombs as well as the ceramic material and stone beads indicate that the cemetery belongs to the Neolithic period. The individuals were lying in either partially or fully contracted positions without any definite orientation. Only a single oval rippled ware bowl was in place. This type of decoration – polishing to create undulations – is attested as much in the A-Group as in other contemporary cultures of the Central Sudan. Fossilized bones indicate an even earlier occupation, either a cemetery or settlement, which was impossible to locate.

The Old Kerma cemetery of Kadruka (KDK 3)[21]

Another rescue excavation was carried out 20 km south of Kerma, a short distance from the ancient site of Tabo. Wind erosion and clearing the land for planting have laid bare the tombs situated on a natural mound 38 × 32 m that dominates the surrounding plain from a height of 1.50 m. Forty tombs were located but the whole of the cemetery must hold sixty. Six of the tombs were excavated. The rounded pits are very narrow and the gravegoods simple. One individual 40 to 50 years old and bound up in leather clothes, was buried with a ram, a she-goat and a kid. In the tomb of a 17 year old youth, a six month old lamb was found wearing an ostrich feather headdress. These Old Kerma tombs are more modest than those in the eastern cemetery at Kerma; there are especially few ceramics. As for objects of adornment, these are limited to either faïence or ostrich eggshell beads and, in one case, a large seashell.

The Classic Kerma settlement of Kadruka (KDK 6)

We intervened a second time at Kadruka on a settlement site dated by its ceramics to Classic Kerma, but which today is surrounded by cultivated fields and partially worked by *sebbakhins*. The foundations of a quadrangular building about 15 m square are being excavated. The structure is made up of several small square rooms disposed around a central courtyard, the center of which is marked by a large quadrangular base. The elevations facing onto the courtyard are not built of sun-dried brick but are built on a framework of wood and vegetable fibers. The entrance flanked by heavy posts is located on the south side, sheltered from the wind.

The presence of several hearths, milling and grinding stones, as well as a common everyday type of ceramic suggests that the settlement was a farm, which will provide us with further information about rural architecture. Other structures around this building remain to be fully excavated.

Conclusion

The thirteen excavation campaigns already carried out by the Mission of the University of Geneva have demonstrated the importance of the Kerma site. Up to the present, our research has focused primarily on the development of the city in relation to the eastern cemetery and it is clear that many more years will be needed to complete and to successfully interpret all the information gathered. On the other hand, we are still very poorly informed about the formative phases and the unification of Kerma cultures. Several rescue operations carried out outside the capital turned up remains of rural settlements that constituted the back country of the kingdom of Kush. It appears desirable at this point to further develop survey and excavation in the regions located between the 3rd cataract and the island of Meroe in order to define the territorial limits of the kingdom and to study its relations with Egypt as well as other peoples on the African continent.

[1] 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*, in *Genava*, n.s., t. XXVI, 1978, pp. 107-127; t. XXVIII, 1980, pp. 31-62; t. XXX, 1982, pp. 29-53; t. XXXII, 1984, pp. 5-20. *Excavations by the Archaeological Mission of the University of Geneva to the Sudan: 1983-1984 Season; 1984-85 Season*, in *Nyame Akuma, a Newsletter of African Archaeology*, n° 24/25, 1984, pp. 18-19. *Aperçu sur l'architecture civile de Kerma*, in *Cahiers de recherches de l'Institut de papyrologie et d'égyptologie de Lille*, n° 7, Lille, 1985, pp. 11-21. *Discovering Kerma: Swiss Archaeology in the Sudan*, in *Swissair Gazette*, 9/1984, pp. 14-21.

[2] Ch. BONNET, *Kerma, Territoire et métropole, IFAO, Bibliothèque Générale*, t. IX, 1986 (forthcoming).

[3] J. LECLANT, *Fouilles et travaux en Egypte et au Soudan, 1981-82; 1982-83; 1983-84*, in *Orientalia*, vol. 52, fasc. 4, 1983, pp. 522-524; vol. 53, fasc. 3, 1984, pp. 397-398; vol. 54, fasc. 3, 1985, pp. 396-397.

[4] The Commission headed by Mr. M. Valloggia, is made up of Professors Y. Christe, J. Dörig and A. Giovannini.

[5] G. SCHWEINFURTH, *Au cœur de l'Afrique, Voyages et découvertes: 1868-1874*, Paris, 1875. C.G. SELIGMAN, *Pagan Tribes of the Nilotic Sudan*, Londres, 1932; S. DENYER, *African Traditional Architecture*, Africana Publishing Company, New York, 1978; E. GUIDONI, *Architecture primitive*, Collection Histoire mondiale de l'Architecture, Paris, 1980; B. PIERRE, *Le roman du Nil*, Paris, 1980, p. 21; B. STRECK, *Sudan, Steinerne Gräber und lebendige Kulturen am Nil*, DuMont Buchverlag, Cologne, 1982.

[6] For the Middle Kingdom see, for example, J. VERCOUTTER, *Excavations at Mirgissa – I (October - December 1962)* in *Kush*, Vol. XI, 1963, pp. 116-120.

[7] Notably the Napatan residential building of Tabo. See also, Ch. BONNET, *Un bâtiment résidentiel d'époque napatéenne à Kerma, premières interprétations*, in *Actes du Congrès international d'études méroïtiques*, Rome, July 1984 (forthcoming).

[8] N. FERRERO, *Figurines et modèles en terre mis au jour dans la ville de Kerma*, in *Genava*, n.s., 1984, pp. 21-22.

[9] P. HUARD, *Influences culturelles transmises au Sahara tchadien par le Groupe C de Nubie*, in *Kush*, vol. XV, 1967-68, pp. 108-113; L. ALLARD-HUARD et P. HUARD, *Les gravures rupestres du Sahara et du Nil*, II, *L'ère pastorale*, in *Etudes scientifiques*, Cairo, 1983, p. 41 FF.

[10] M. BIETAK, *Studien zur Chronologie des Nubischen C-Gruppe, Ein Beitrag zur Frügeschichte Unternubiens zwischen 2200 und 1550 vor Chr.*, in *Österreichische Akademie der Wissenschaften, Phil.-Hist. Klasse Denkschriften*, Bd. 97, Vienna, 1968, p. 141 FF.

[11] See the table p. 20.

[12] B.G. TRIGGER, *The reasons for the construction of the Second Cataract Forts*, in *SSEA Journal*, XII/1, 1982, pp. 1-5.

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[15] M. VALLOGGIA, *La stèle d'un chef d'expédition de la première période intermédiaire*, in *BIFAO*, t. 85, 1985, pp. 265-266.

[16] Ch. BONNET, *Les fouilles archéologiques...*, 1982, pp. 43-47.

[17] L. CHAIX, *Seconde note sur la faune de Kerma (Soudan). Campagne 1981-1982*, in *Genava*, n.s., t. XXX, 1982, pp. 67-68.

[18] Ch. BONNET, *op. cit.*, 1984, pp. 15-17.

[19] Ch. BONNET et Salah Eddin Mohamed AHMED, *Un bâtiment résidentiel d'époque napatéenne*, in *Genava*, n.s., t. XXXII, 1984, pp. 35-42.

[20] For the catalog of these objects: Salah Eddin Mohamed AHMED, *Un bâtiment résidentiel d'époque napatéenne à Kerma (Soudan)*, Mémoire de maîtrise, UER d'histoire, d'histoire de l'art et d'archéologie, Université de Lille III, 1984-1985.

[21] The abbreviation KDK was adopted by the Archaeological Research Unit of the Directorate General of Antiquities and National Museums of the Sudan. The numbers correspond to the different sites of the Kadruka region.

Table 1: Radiocarbon dates of Kerma

Sector of the cemetery	Tomb number	Uncorrected ^{14}C age (B.P.) (1)	Corrected age (B.P.) (2)	Calibrated age (3)		
CE 1	t 43	3567 ± 67	3820 ± 70	2530/2125 BC		
CE 1	t 44	3524 ± 67	3640 ± 70	2295/1865 BC		
CE 1	t 47	3378 ± 68	3620 ± 70	2185/1780 BC		
CE 1	t 95	3512 ± 67	3610 ± 70	2180/1770 BC		
CE 1	t 96	3335 ± 62	3575 ± 60	2160/1740 BC	3683	2500–1900 BC
CE 1	t 97	3519 ± 66	3740 ± 70	2500/1965 BC		
CE 1	t 99	3374 ± 70	3650 ± 70	2300/1870 BC		
CE 1	t 100	3644 ± 75	3875 ± 75	2650/2120 BC		
CE 1	t 103	3429 ± 70	3695 ± 70	2320/1895 BC		
CE 1	t 104	3481 ± 128	3605 ± 130	2395/1675 BC		
CE 2	t 53	3630 ± 75	3890 ± 75	2755/2140 BC		
CE 2	t 53-54	3630 ± 70			3900	2635–2215 BC
CE 3	t 72	3680 ± 70	3920 ± 70	2640/2195 BC		
CE 4	t 57	3460 ± 60	3660 ± 60	2305/1875 BC		
CE 5	t 67	3480 ± 60	3700 ± 60	2320/1905 BC		
CE 5	t 70	3580 ± 55	3720 ± 55	2390/1945 BC	3675	2500–1900 BC
CE 7	t 77	3416 ± 70	3665 ± 70	2305/1875 BC		
CE 8	t 80	3394 ± 69	3655 ± 70	2300/1870 BC		
CE 8	t 81	3356 ± 61	3650 ± 60	2300/1870 BC		
CE 9	t 89	3019 ± 63	3295 ± 60	1750/1425 BC		
CE 10	t 112	3365 ± 58	3380 ± 60	1885/1565 BC		
CE 11	t 114	2686 ± 65	2955 ± 65	1380/905 BC	3215	1885–1340 BC
CE 11	t 115	3055 ± 59	3280 ± 60	1740/1420 BC		
CE 11	t 116	2938 ± 65	3165 ± 65	1665/1340 BC		

Bronze workshop within the town	3680 ± 70 3860 ± 70
Burn levels under the Deffufa Abandon deffufa entrance post	3450 ± 80 3330 ± 80
Burn levels under the annexes of the deffufa	3270 ± 63
Round structure abandon and destruction	3330 ± 90 3210 ± 80

Leather samples (cattle skin) from the cemetery and charcoal samples from the town.

1. Uncorrected ^{14}C age: $t = 8033 \ln \frac{100}{A^{14}C_{mes}}$ according to Libby (T = 5568 years) for an initial activity of 100%.

2. Corrected age: as before, substituting

$$A^{14}C_{mes} \text{ par } A^{14}C_{corr} = A^{14}C_{mes} \cdot \left[1 - \frac{2\,(25 + \delta^{13}\,C)}{1000}\right]$$

3. Age calibrated from J. KLEIN, J.C. LERMAN, P.E. DAMON, E.K. RALPH, 1982, *Calibration of radiocarbon dates, Radiocarbon*, vol. 24, n° 2, 103-150.

Datations made by the Institute of Limnology of Thonon-les-Bains (France) and by Ms T. Riesen of the Institute of Physics of the University of Bern (Switzerland).

The Fadl Bashir Mosque in Kerma El Beled

By Daniel BERTI, Thomas KOHLER and Esam E. OSMAN
Translated by Kitch Carter Young

The Fadl Bashir Mosque, which has been closed for some time, is located on the western edge of the village and rises among the small sun-dried brick houses that stretch out on a hill along the Nile. The architecture of the houses, as well as their placement and the narrowness of the streets indicate that this quarter was formerly the center of modern Kerma.

A project to tear down the mosque prompted us to undertake an analysis of the masonry. When this study drew the attention of the community to the quality of the building's architecture and its history, the local authorities decided to put off the proposed work. Today, the Mosque consists of two buildings separated by a courtyard. The original construction, a room for prayer 5.80 × 3.80 m in size and including an annex to the east, is preserved in the smaller building to the north-west. An overhang held up by a row of columns shades the entrance.

On the other side of the courtyard, the principal and more recent building serves also as a room for prayer flanked by a minaret on the east side. The roof, which rests on sun-dried brick pillars, is made of palm tree trunks laid transversally and covered with palm leaf mats. Small windows as well as a space between the walls and the roof provide light. A pulpit, or *minbar*, stands against the east wall into which is cut a niche, the *mihrab*, which indicates the direction of Mecca. In the north facade are two doors; the one on the west side is the entrance for the faithful, and the other, on the east side, was reserved for the *imam* whom a wall at right angles screened from view. Sun-dried bricks adorn the interior of the whitewashed building.

The earliest mosque was built about 150 years ago by the *sheikh* Fadl Bashir Zumrawi. Subsequently an annex and porch were added. Eventually, when the community outgrew the building, it was transformed into a Koranic school. And finally, the school was replaced by a much larger prayer hall which today occupies two-thirds of the present building. The northern wall came up to the northern row of pillars and the roof was lower – one can still see traces where the roof supports were raised. The southern part of the eastern wall bulges out somewhat, undoubtedly corresponding to the earliest *mirhab*. When this building, the prayer hall, became too small in its turn, the north wall was torn down and rebuilt further to the north. At the same time the roof was raised, a new *mirhab* put in and a row of pillars added. The wall of the courtyard was moved further east, probably in order to make room for a minaret.

Certain kinds of sun-dried brick architecture from Ancient Nubia tend to disappear with time. The Fadl Bashir Mosque, consequently, is a particularly valuable example of a building tradition for which we have few remains.

Some remarks concerning the potter's workshops of Kerma and C-Group ceramics

By Béatrice PRIVATI
Translated by Kitch Carter Young

The ceramics studies carried out during the latest excavation seasons at Kerma have allowed us to better identify the categories of production present on different sites. What we are able to learn from the material found in *the city*, however, remains fairly generalized because the material collected is often virtually limited to surface finds. In effect, the habitat site is very eroded and there are few places where it is possible to demonstrate by means of the ceramics the different occupation levels which are clearly perceptible otherwise when one considers the topochronology and the architectural evolution. The pottery from the city is less sophisticated and more repetitive than that found in the cemetery, and we hesitate on the basis of this material to modify our earlier typological classifications. The settlement contemporary with the origins of the cemetery has not yet been excavated because it is beneath the religious quarter. Sherds relating to the last phases of the Old Kerma period were found to the south of the Deffufa inside houses partially covered by the temple foundations. The inventoried material from the quarters which extend to the west and the north of the religious edifice belongs essentially to the Middle Kerma and Classic Kerma levels.

Several potter's workshops were located. On the surface these areas were marked by concentrations of a white ashy substance, hardened by wind and wear. During Middle Kerma, artisans seem to have worked in the center of the city as well as on its periphery[1]. For example, in the courtyard of *houses 39 and 41*, next to the large circular structure to the south-west of the Deffufa, are two rounded pits, 2.70-3.50 m in diameter and around 0.30 m deep. In addition, each pit is surrounded by a small wall, 2 or 3 brick courses high, shored up on the north side by a small buttress. The inside surface of each wall is markedly reddened from contact with fire. On the south side, a segment of a semi-circular wall is built up against them; its surface has also been burned. A pile of hardened ash, deposited in layers, takes up about one-third of the space in each of these rounded structures which undoubtedly were used to fire ceramics. A few kilns like this, although simpler models, are still used today in the province. Such kilns have been well attested in the Sudan[2] as well as in other African countries. We know, therefore, that a high-quality ceramic can be made in this type of kiln which can be fired to relatively high temperatures[3]. At Kerma, the open-fire pits were probably used to fire the common wares but the black-topped redware could also be made in them. The latter had to be placed upside down, perhaps in the ashes, at some point during the firing[4]. It is difficult to suppose, in fact, that the production of black-topped redware could have been realized in the other kilns discovered in the city[5]. They are more elaborate and have a hearth with several heat ducts. The exterior rim and interior of black-topped redware is achieved by using a reduction firing process, but it is difficult to see how that could have been done without closing these heat ducts, which would make the firing impossible all together.

Some time ago experimental pit-firing was done in Geneva, particularly with ceramics made out of earth from Kerma. We encountered problems in choosing an appropriate fuel and the best moment to uncover the pots at the end of firing in order for a reoxydation of the exterior surface to occur. On the other hand, the characteristic burnish as well as the black rim and interior were easily obtained by placing the bowls downwards on top of the fuel and polishing[6].

One of the potter's workshops in the city is located to the south-west and is earlier than most of the houses in this zone. It must have been located at the edge of the habitat during the Middle Kerma period. Several concentrations of ash were excavated near the kiln which had a firing chamber and a hearth. In the course of the excavation it became clear that some of them marked the location of elongated oval pits, surrounded by small narrow brick walls which were intended to contain a fill of hardened ash. On the surface of the ash were depressions resembling the form of the bases of ceramic vessels. If we consider the way the Nuba made hemispherical holes in the ground in which to shape the bottom of a pot, we might suppose the same thing was done here. And using ashes as a support is a practice still current among other peoples.

There are many zones distinguished by an identical white matter which have not yet been studied. The large number of workshops is not really surprising considering the great quantity of ceramics produced all during the history of Kerma. What is more surprising are the potter's kilns found during the earliest excavation seasons along the edge of the eastern cemetery, to the south-west near the Classic Kerma burial ground[7]. Unfortunately this work was done before we began excavating the cemetery. Since

that time the land under cultivation has spread to the very edges of the site and the kilns have disappeared. Possibly they produced a part of the ceramics placed in the tombs. In fact, if a lot of the pottery, some of it worn or repaired, comes from the habitat, there are indications that some vessels were made only for use in the tombs. Such would be the case, for instance, with the crude bowl found in the tomb of a young girl; it was so little baked that it must never have been intended for any other use[8].

One peculiarity of various pots from the Akasha cemetery[9] at least in part confirm this theory. Several examples of black-topped redware leave one's hands black as though from a carbon deposit like that on the inside of pots that have been fired rim downwards in an open pit and not washed afterwards. It seems thus unlikely that they had ever been actually used in daily life. Although no ceramics like this have yet been found in any Kerma tombs, we can imagine that a funerary ceramics production existed, at least during some periods.

The continuation of the cemetery excavations, particularly in the latest sectors to be studied, has allowed us to follow the evolution of those categories of ceramics which are close to the Middle Kerma types. This pottery, however, is not completely representative of the abundant ceramics from this period found in the city where there is less variety.

In the oldest part of the cemetery, to the north, we resumed work and enlarged sector CE 1. Five years previously ten tombs had been excavated. They were distinguished principally by two types of superstructures; one group was signalled by stelae placed around the burial pits, and the other by concentric stone circles. We seemed to have a relative chronology because a tomb with stelae had disturbed one of the circle superstructures. Nevertheless, there was no noticeable difference between either the material or the funerary practices which appeared identical for both groups[10]. A small amount of ceramics had been found, essentially black-topped redware (85%) which was fairly homogeneous in terms of the quality of the fabric and the incised decoration on the rims. Two vessels were found still in place, upside down to the east of the superstructure. Several sherds reminiscent of ancient C-Group ceramics had also been inventoried (15%).

Excavation of eleven new tombs provided additional information which leads us to modify our interpretation of this sector. In fact the ceramic material proves to be much richer than the earlier excavations suggested. This pottery is related to the series of bowls to which should be added several restricted vessels or small jars. Most of this material is Kerma ware but several bowls similar to what one sees in C-Group or related groups were also found in these deposits.

The vessels found in situ are principally Kerma types (18 bowls, or 81%) but also belong to C-Group (4 bowls, or 18%). Among the large quantities of mixed sherds found in the fill of the tombs, Kerma ceramics are by far the most numerous (78%) but C-Group is quite well represented as well (21%). The remaining 1% are imports or imitation Egyptian ceramics.

The Kerma ceramics differ little from those collected in 1981[11]. The make-up of the fabric is analogous to later periods; the fabric of the black-topped redware bowls is fine and hard. It is interesting to note the use of vegetal tempering, which does not appear, at first glance, to drive only from fodder detritus. The forms often are deep but not as pointed as those found in sector CE2 and the carenation less marked. The rims are either simple or slightly rounded. All pieces are polished and there are nearly equal numbers with (51%) and without (49%) decoration. The decorations are usually located on the rim, within the black zone. They are geometric, more or less finely incised or combed and often highlighted in red. Some examples have decoration that covers a larger surface (fig. 3, *t. 104, 1*), or covers the pot completely like the two vessels from tomb 103 (fig. 2, *t. 103, 3*), decorated with impressions achieved by using a comb. Some jars also have decorative motifs covering the whole surface.

Those bowls which we believe to belong to C-Group are not, nonetheless, totally homogeneous in character. The hemispherical forms are more or less deep and the bases are always rounded. The make-up of the fabric is not very different from the Kerma ceramics[13], but varies as to hardness and color, ranging from the deepest black to a brown on the exterior surface (fig. 3, *t. 105, 3*). Normally the exterior is polished but several bowls of very high quality are not (fig. 1, *t. 101, 4*). The bowls are covered with either incised or, more rarely, impressed[14] geometric decoration which is generally filled with a fine white paste. Some of the motifs used are found in the repertoire of motifs for C-Group, but several seem to be rarer (fig. 3, *t. 104, 2*). The interior of these vessels is either smoothed with the brush marks clearly visible, or occasionally polished (fig. 2, *t. 103, 10-11*).

There are a number of ceramics which appear to be links between the Kerma bowls and those which we are attributing to the C-Group. In particular these ceramics have borrowed the decorative scheme which normally characterizes the black vessels. For example, we find impressed on the rim of black-topped redware opposing triangles (fig. 2, *t. 103, 4*); elsewhere these accompany motifs particular to Kerma (fig. 2, *t. 103, 5*). Finally, there are ceramics wich recall those of C-Group but which differ in their manufacture either in the color or the more crumbly quality of the fabric, or in the decorative scheme chosen or its execution. Bowl 6 from tomb 103 (fig. 2), for example, is black and is decorated on the rim with opposing triangles but on the body with designs perhaps achieved by the application of some vegetable fibers then filled in with white paste. Two other vessels from the same tomb (fig. 2, *t. 103, 10-11*) seem to be fairly distant from the usual treatment. Whereas normally a line separates the exterior decoration from the rim,

in these two cases the surface is continuous with the rim. B. Gratien made similar observations in her analysis of the pottery from Old Kerma of Saï and she divided one category which is close to C-Group into three classes[15].

It is thus possible to distinguish different hand at work on these ceramics. While the production of some vessels is quite close to that of various Aniba ceramics, we may suppose nonetheless that part of the vessels found were made at Kerma. Examination of Kerma pottery found in different places near the site suggests that it was made by local artisans, an hypothesis corroborated by the morphological characteristics of the Akasha material.

In the cemetery zone of Kerma from which these ceramics come, we find at the same time two distinct series of superstructures and two separate families of ceramics. Although the style of burial and the objects found inside the tombs do not precisely define two chronological or cultural groups, the C-Group bowls found in place are associated with the tombs that are marked by stelae. In addition, the greatest number of sherds of this type were found in the fill of pillaged tombs of this kind. Nevertheless, some of these graves also contained Kerma ware ceramics. Unfortunately the material from the fill of the pits is not very helpful because when there are lots of sherds it indicates that at least attempted pillaging must have occured and that the vessel fragments may derive from several tombs. In any case the tombs with stelae contained more C-Group ceramics than the other tombs.

These findings lead us to suggest that the series of tombs with stelae be attributed to a population which, while very close to Kerma traditions, was related to the C-Group. For the moment, the chronology established for the site suggests a date of around 2400 B.C. for the earliest tombs, a date confirmed by various ^{14}C analyses and somewhat earlier than that put forth by Mr. Bietak for the beginning of the C-Group. There is more work and analysis needed, however, before we can date definitively the beginning of Old Kerma. The black bowls highlighted with white which were found in the cemetery may belong partly to level Ia but especially to level Ib. As we have seen, one of the tombs with stelae cuts into the superstructure of a tomb covered with concentric circles. It is possible, therefore, to imagine that some of the tombs with stelae may be slightly later although this discrepancy does not show up in the ^{14}C analyses nor in the funerary practices which were, in any case, slowly changing during this earlier period.

[1] The potter's workshops were uncovered during the last season in the north quarter of the city, behind the deffufa. For a chronology of the kilns, see: Ch. BONNET, *Les fouilles archéologiques de Kerma (Soudan), Rapport préliminaire sur les campagnes de 1982-1983 et de 1983-1984; 1984-1985 et 1985-1986*, in *Genava*, n.s., t. XXXII, 1984, pp. 8-10; t. XXXIV, 1986, pp. 5-20.

[2] See especially: J. W. CROWFOOT, *Nuba pots in the Gordon College*, in *Sudan notes and records*, t. VII, 1924, pp. 18-28; *Further notes on pottery*, t. VIII, 1925, pp. 125-136; N. TOBERT, *Ethno-archaeology of pottery firing in Darfur, Sudan: Implications for ceramic technology studies*, in *Oxford Journal of archaeology*, 3, 1984, pp. 141-156.

[3] D. RHODES, *La poterie, Les fours*, Paris, 1976, p. 13-17.

[4] H. HODGES, *Black-Topped Pottery, an Empirical Study*, in *Bulletin de liaison du Groupe international d'étude de la céramique égyptienne*, VII, 1982, pp. 45-51.

[5] See *supra*, note 1.

[6] These experiments were carried out under the direction of Mrs. Claude Presset, ceramist, Professor at the School of the Decorative Arts of Geneva and we thank for her kind collaboration.

[7] Ch. BONNET, *Kerma, territoire et métropole, Quatre leçons au Collège de France*, in *Institut français d'archéologie orientale du Caire, Bibliothèque générale*, Cairo, t. IX, 1986, p. 40.

[8] Ch. BONNET, *Les fouilles archéologiques de Kerma (Soudan), Rapport préliminaire des campagnes de 1980 et de 1981-1982*, in *Genava*, t. XXX, 1982, p. 21 et fig. 20.

[9] C. MAYSTRE, *Akasha I*, Geneva, 1980.

We would like to thank M[lle] Y. Mottier, Conservator of the Archaeology Department of the Museum of Art and History of Geneva for making the Akasha collections accessible to us.

[10] See *supra*, note 8, pp. 12-13.

[11] B. PRIVATI, *Nouveaux éléments pour une classification de la céramique du Kerma Ancien*, in *Genava*, n.s., t. XXX, 1982, pp. 27-28 et pl. I.

[12] P. DE PAEPE, *Analyse microscopique et chimique de la céramique de Kerma (Soudan)*, in *Genava*, n.s., t. XXXIV, pp. 41-45.

[13] *Idem*, pp. 41-45.

[14] B. PRIVATI, *Op. cit.*, pl. 1, tombe 49, 9.

[15] B. GRATIEN, *Les cultures Kerma, Essai de classification*, Lille, 1978, pp. 155-156 et fig. 44.

Preliminary Anthropological Study of the Material from Kerma (Sudan) The 1984-1986 Campaign

Par Ch. SIMON
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During these two field seasons, numerous tombs from different periods were explored and some seventy skeletons excavated.

1. The eastern cemetery

In this cemetery 23 tombs were excavated. The division by sex is as follows:

	Non-adults	*Adults*		*Total*
		Men	*Women*	
1984-1986 campaigns	4	10	8	22

The anthropological material taken from the older zones is in a perfect state of preservation, contrary to the more recent skeletons (C10, C11). The latter tombs have been pillaged and what little material remains is rather poorly preserved. In nearly all these tombs part of the skeleton, often the skull unfortunately, was missing.

We do not intend to discuss here the morphology of the individuals buried in these graves since for the older tombs that has been done adequately in the last report and for the more recent tombs the number of skeletons is still too limited to permit fruitful comparisons to be made.

One tomb from the Old Kerma period *(tomb 95)*, however, is particularly noteworthy. Two adult males were found in this tomb and the archaeological context (Ch. BONNET, 1986) indicates that one of them was a sacrifice, buried at the same time as the other person. A sacrifice of this type is not unusual, several others from the same period having been found.

It was noted that the principal subject was missing the two central incisors from the upper maxilla. The alveoli have completely disappeared and only a neat scar remains. These two teeth were undoubtedly pulled during adolescence because the lower incisors show little signs of wear (fig. 1). During earlier seasons we had already noted that two subjects were missing the lower right lateral incisor *(tombs 44 and 53)*. At the time we did not attribute any particular significance to the fact since we could not be sure that it was a question of a voluntary extraction. Now, however, in light of this new find, we must reconsider the problem. A more detailed analysis based on X-ray and macroscopic examination led us to consider whether this might not be a pathological phenomenon. Finally, the results of these analyses suggest an intentional extraction of the teeth in question.

The custom of extracting the upper incisors is still practiced today by many African peoples (MONTANDON, 1934). Among these groups, the mutilation which takes place between the ages of 10 and 12, results most often in an atrophied jaw. The geographic distribution of this practice is as follows:

– on both sides of the tropical forest, in the savannahs, mutilation by removal of the lower incisors. Many population groups from the Upper Nile to Lake Victoria practice this form of mutilation (Dinkas, Chillouks).

– in the west, that is in the equatorial forest, habitual extraction of the upper incisors.

Prehistoric peoples also had a tradition of dental mutilation. This practice is well attested for the Mesolithic and Neolithic periods in North Africa (VERGER-PRATOUCY, 1968) and numerous cases of teeth removed from either the maxilla or mandible have been observed. South of the Sahara there are fewer documents, but what we have indicates a geographical distribution similar to what one finds today – in the region of the savannahs (Khartoum, Jebel Moya) and in the Central Sudan or Kohaito in Ethiopia (fig. 2). A few cases have been noted on the southern fringe of the Sahara (Lake Chad, Mali). Finally some indications of this custom have been found further to the North (Hoggar, Wadi-Shaw, Kerma). Among these peoples teeth are pulled out of the maxilla and the mandible, but most frequently from the mandible. From the necropoles at Kerma, Jebel Moya and Kohaito, we found that 6% (3 cases), 11% and 24% of the adult population respectively had had teeth pulled in this way. The number of cases increases as one moves south and seems especially linked to Negro ethnic populations; few cases appear in Saharan regions. The distribution of this particular cultural trait points out the correlation between the Nubian groups and their neighbors to the south and indicates a certain influence on the people of Kerma from the black populations.

In 1984 a similar observation was made concerning the human sacrifices found. It was suggested by the archaeologists involved that these sacrifices may have been "slaves" and that they originally came from regions further to the

south. Because the number of sacrifices available to us are so few, we have re-examined the anthropological findings from Classic Kerma (COLLETT, 1933) royal tumuli which yielded numerous sacrifices. Based on the archaeological findings of G.-A. Reisner, we have attempted to determine two groups of buried subjects, the principal subjects and the sacrifices.

Initial results from two groupings of twenty male subjects show a slight morphological difference between the two groups. The sacrificed subjects tend to have an elongated skull (dolichocranium) while the principal subjects largely have moderately elongated skulls (mesocranium) (fig. 3). The facial dimensions are similar but the sacrifices have larger nasal fossae. What does this difference mean? Does it indicate a difference in socio-economic status between the two groups or is it an indication of a foreign intrusion into the population group to which the sacrifices belong? Further research will hopefull answer these questions.

2. The collective tomb

Quite an unusual tomb was discovered in the course of cleaning off the surface of one of the quarters in the old city of Kerma, to the north of the Deffufa. This large tomb (2 × 4 m) is trapezoidal in shape and oriented east-west. Although no archaeological material was found we may suppose it to be medieval. Inside the tomb, 12 bodies, both adults and non-adults, had been placed lying on their stomachs in a north-south position, the heads towards the north. There were two notable exceptions: skeleton 11 which was placed on the feet of the other individuals with his head to the east and skeleton 12 which was oriented north-south like the others but was placed lying on his back. The positioning of the bodies is clearly deliberate. The adults are lying side by side on the east side of the tomb while the non-adults are lying one on top of the other on the west side of the tomb. The arrangement of the bodies indicates that the adults were put in place before the children. All the skeletons were probably buried at the same time however, as there is no sign of disturbance in either the position of the bones or in the sediments found between the bones. The determination of the ages and sex of the subjects gives rather curious results:

Ages

0	*1-4*	*5-9*	*10-14*	*15-19*	*Adults*	*Total*
1	0	4	1	2	4 (female)	12

Except of one male in the 15-19 age group, all the subjects are female. One young woman aged 20-22 years old (No. 2) was found with a fœtus in the birth position, the head already engaged in the birth canal. The other women are older – 20-30, 30-40 and 60-70 years old.

What is the significance of this tomb? Neither the position of the bodies nor the predominance of females is usual. Why were the 12 subjects buried together? One possible answer is that there was an epidemic or some kind of infections disease in a single family. But in that case it is hard to understand the relatively high number of subjects aged 5-9 because normally they would be less likely to succumb than younger children and infants. No pathological illness was observed but it is true that infectious diseases rarely leave traces on skeletons. Another possibility is that this tomb reflects a particular religious practice but given our present state of knowledge it is impossible to say for sure.

3. Rescue excavations

A. Old Kerma tombs at Kadruka, near Tabo

Because these tombs are visible on the surface of the ground, they have been severely pillaged. We excavated five tombs; in two cases the skeletons were complete *(tombs 1 and 2)* and in the others the skulls were missing. There were two men, including an adolescent of 18-19, 2 women and 1 child aged 14-15 of indeterminate sex. The two complete skeletons have a rather elongated skull (dolichocranium), a rather high cranial dome, an average *(tomb 2)* or long *(tomb 2)* face and an average nose. They are tall with sturdy bones. In comparison with the female population of Old Kerma these female subjects appear to belong to the same population group.

B. The Late Neolithic tomb at Ashkan

The only tomb excavated contained the remains of four individuals. Because the cemetery is located where the Nile floods, the bones found are often fragmented into small bits a few centimeters in size. For the first subject we have only the pelvis and legs. It is an adult, probably female, 158-160 cm tall but not very sturdy. For the second skeleton we have the head, a few cervical vertebrae and the pectoral girdle. This is a woman 20-30 years old also rather slender. The third subject is complete although extremely fragmented and is once again a woman, 50-60 years old. Finally there is one man, also complete but fragmented, aged 55 to 65, sturdy and around 160 cm tall. The skulls were in such a poor state of preservation that we could only reconstruct the top of the skulls. Consequently we are unable to make valid comparisons but can only mention a few general observations. The skulls were very elongated (dolicho- to hyperdolichocranium), possessing a slender bone structure and were of an average to large size.

3. The Meroitic cemetery

In one part of the present day city of Kerma, an area of the Meroitic cemetery is threatened by the installation of a pump. In consequence of this danger we excavated 17 tombs and took out 24 individuals including 11 men – one of whom is an adolescent, 8 women and 5 non-adults of indeterminate sex. In some cases some of the tombs had been re-used (*tomb 72* - 4 subjects, *tombs 78 and 87* - 2 subjects each). The bones are in a very poor state of preservation because the tombs are located near an irrigation canal and are subsequently periodically damp. All observations were made and measurements taken *in situ* because the bones fall apart once they dry out.

These tombs are part of a large cemetery which we had already excavated in 1979 and 1980. In comparison with the skeletal material from those campaigns, there are some interesting differences in this most recent group.

	Men	*Women*	*Indet. Adults*
1979-1980 campaign	4	14	6
1984-1985 campaign	10	8	1

Age:	*0*	*1-4*	*5-9*	*10-14*	*15-19*	*Adults*	*Total*
1979-80 campaign	–	1	–	2	5	24	32
1984-85 campaign	–	3	2	0	1	19	25
Total	–	4	2	2	6	43	57

This year there is a fairly good spread among the sexes represented whereas in 1979 and 1980 we had found mostly female subjects. The distribution of ages is also different; in 1979 and 1980 there were more adolescents while in the last campaign there were more children. About 25% of all subjects found are children but there are no infants and few children under 5 years of age. With a sampling which is so non-homogeneous and material which is so fragmented it is difficult either to calculate the life expectancy at birth or to estimate the mortality rate among adults. In order to evaluate the morphology we brought together the skeletons from the two excavations and depended solely on the more numerous female skeletons. In terms of cranial size, there is little difference between these skeletons and the women of Old Kerma. The Meroitic women, however, are smaller and more slender.

The morphology of the populations in the Kerma region remains amazingly stable over time and it is difficult to see how historical events affected the evolution of these groups.

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Fourth Note on the Fauna of Kerma (Sudan) Seasons 1985 and 1986

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Translated by Kitch Carter Young

The results obtained during the 1985 and 1986 seasons at Kerma and in another nearby zone demonstrate not only the complexity of the situation and our almost total ignorance of how the civilization of Kerma was formed, but also the difficulty of interpreting certain aspects of funerary ritual, the "disk-wearing sheep" for instance.

The principal interest of these most recent excavations is the opening up of nearby sites which have cemeteries similar to those of the capital but whose social context appears to be different. Here we will discuss the trial trenches put down at Kadruka, approximately 25 kilometers south of Kerma. At the same time, the trial trenches opened up by the Mission on the site at Ashkan, to the north, and by the French Section of Archaeological Research on the Neolithic site of Kadruka 1, should help us to understand better how Kerma relates to earlier cultures of the region about which very little is known. Concentrating primarily on animal remains, we will discuss the various aspects of our research on the vast site of Kerma itself (town and cemetery) as well as the trial excavations at Kadruka and Ashkan.

1. Kerma. The city.

The 1985 and 1986 seasons confirmed the results previously obtained (CHAIX, 1980, 1982 and 1984). The new osteological material found in the city attests to the almost total dominance of domestic species. Wild animals must have been rare, for only a very few remains turned up. For example, a lower right incisor, a left proximal portion of ulna and a pyramidal of hippopotamus (*Hippopotamus amphibius* L.) were found. The size of these bones suggest a large animal. Some remains of Nilotic animals were also discovered: mainly fragments of carapace of the great Nile tortoise (*Trionyx triunguis* Forskal), but also crocodile dermal plates (*Crocodylus niloticus* Laurenti). Few remains of fish were found despite systematic sifting in certain sectors. Some vertebrae did turn up, however, and these will allow us to identify the species and to make a reliable estimate of the fishing season (DESSE, 1983).

As noted above, domestic fauna predominate, accounting for more than 90% according to initial estimates. Among the most well represented species are cattle (*Bos taurus* L.) and caprovines *(Ovis/Capra)* with sheep predominating. Dogs (*Canis familiaris* L.) are in third place and a few rare donkey (*Equus asinus* L.) bones fill out the picture.

In several places there were concentrations of bones. For instance, we found the remains of several very large cattle around the large circular structure in the southwest quarter of the city. The selection of skeletal parts represented and the way the bones had been cut suggest that the site was used for slaughtering. House 48, just north of the Deffufa, also provided a large number of cattle bones. Likewise, in the northwest quarter (*houses 15, 17 and 18*) concentrations of animal bones were found; in some cases caprovine remains, in others bovine. Bird bones occur very rarely and specific identifications have not yet been made.

Most of the bone-made objects found are awls. Some of them come from metapodia of cattle and we have found several diaphyses split lengthwise. Most of these tools, however, are made from metacarpals and metatarses of goats and sheep. This year, in the zone west of the Deffufa and south of *houses 36 and 37*, we found an unfinished awl cut from the juvenile metacarpus of a goat. After taking a lengthwise section of the diaphysis, the working surface of the tool had been sharpened, like a pencil, working from the distum towards the proximum (fig. 1), as indicated by numerous traces of scraping.

2. Kerma. The eastern cemetery.

Several tombs from the northeastern sector of the necropolis, contained abundant material, including quite a lot of animal remains. While *tomb 115* is laid out in the Classic Kerma funerary style, it is nevertheless distinguished by an impressive series of ox skulls found to the south of the edge of the pit. There are no fewer than 129 skulls forming a huge crescent, itself reminiscent of ox horns. The problems of the significance of ox skulls and of their arrangement in a deposit here have been discussed elsewhere (CHAIX, 1985) but an analysis of the skulls bordering the south of *tomb 115* is particularly interesting for several reasons. Firstly, ox skulls at Kerma have been cut in two different fashions: one, conserving the nasal bones, belongs to an older phase; the other, eliminating the nasals, is more recent. Both are here present together, suggesting a phase of transition. The two methods of cutting occur with adult

as well as with very young subjects (fig. 2). Secondly, a metric study of 56 pieces, based primarily on the horncores (BOESSNECK, 1971) and the diameter of the frontal bone indicate that there are 9 bulls for 47 cows. In addition, 24 skulls belong to very young calves between the ages of 2 and 12 months, based on Grigson's criteria (1982). Inside the pit, to the south and west of the burial were found the remains of 16 male sheep, most of which were complete, all of them between the ages of around 10 and 20 months, an estimate based on the data of Habermehl (1975). These values are only approximate for the moment and await the results of more detailed studies currently underway (CHAIX and GRANT, forthcoming). The ram located to the northwest of the burial *(115/1)* has the same kind of ostrich feather disk between his horns as that found in tomb 81 (BONNET, 1984; CHAIX, 1984). The horn-sheaths are also pierced but no pendant with stitched beads has been found. Three other sheep *(115/3, 115/8 and 115/10)* also have perforations at the ends of their horn-sheaths.

In view of these various observations we may propose that these animals wore not only horn pendants but perhaps disks as well. We have noted elsewhere that this ornament is widely represented in the rock-drawings of the Sahara (CHAIX, 1984) but it is too early to attempt to explain its significance. It was also found on a lamb in a tomb of the Kerma type excavated during a rescue operation at Kadruka, 30 or so km. south of Kerma (see below).

Finally, again in *tomb 115*, the excavation revealed a pile of caprovine skins, some bicolor, located north of the bed on which the body lay. Their specific identification is not yet precisely known.

One pathological detail worth pointing out is the presence of a larva of the fly *Oestrus ovis* in the nasal cavity of sheep *115/9*, thus proving the existence of *Oestrus ovis* in this region at a very early date. We have frequently noticed the fly on sheep presently found in the area (fig. 3). *Tomb 116*, a woman around 30 years old, is also worthy of comment. A male lamb, aged 6 to 7 months, was found to the south of the deceased. Grains of polystic barley (*Hordeum vulgare* L.) had been scattered on the animal, a practice noticed at Kerma (CHAIX, 1984) and at Saï further to the north (JOURDAN, 1981).

To the north of the body several animal offerings, all from a male lamb of the same age, had been placed. A morphological resemblance between the two animals leads us to think they were twins.

The lambs had been cut up as follows:

– the anterior part of the backbone, from the atlas to the 12th thoracic vertebra. We dit not notice any indication that their throat had been cut;

– the posterior part of the same backbone, from the 13th thoracic vertebra to the caudal vertebrae. There are 10 caudal vertebrae indicating a short tail which distinguishes this animal from its fellow creatures presently living in the north of the Sudan and who have 20 to 25 such vertebrae. We will explore this anatomical peculiarity further in a future work (CHAIX and GRANT, forthcoming);

– 2 sections of rib cage, one with 10 ribs, the other with 12. The latter had been chopped off at the neck leaving the articular heads joined to the backbone;

– an intact sternum;

– a right shoulder including the scapula and humerus;

– a left shoulder, also including the scapula and humerus;

– a left haunch with the femur, patella, tibia and tarsus. There is a slight butchering mark on the inside face of the large cuneiform;

– and finally, an *os coxae* was found apart. It belongs, however, to a right leg found in connection some distance away.

These finds suggest the same cuts of meat which are still prepared today in the region. Most often the first rib is left attached to the anterior part of the backbone, as is the case for the segment found in *tomb 116*. The haunch of lamb found in this tomb is the first to be discovered at Kerma. Apparently none have ever been found at Saï (JOURDAN, 1981).

Buried in *tomb 117* was a young women between 18 and 20 years old. At her feet lay 2 male lambs. Nearby, in a small leather sack, two very fine awls, made from a goat (*Capra hircus* L.) metatarsal, were found as well as a flat tool, no doubt for polishing, made out of an ox rib. This tool shows many friction marks perpendicular to its main axis as well as a beveled edge at one end (fig. 4). These tools probably have to do with leather-working.

Numerous samples were taken from the various tombs excavated. Examination of coprolites and of stomach contents ought to provide information about the ecological environment in the absence of pollen conserved in sediments (LEROI-GOURHAN, 1984, in *litt.*). Samples of fur, for example, from buried animals provide an exceptional opportunity to study slaughtering seasons and the evolution of the breed. With the analyses of a greater number of samples we should be able to verify the results of Ryder's preliminary study of our material (1984).

3. *Kadruka.*

As noted at the beginning of this article, the Mission also undertook a rescue excavation of a small Kerma necropolis located approximately 20 km. south of Kerma and 17 km. east of the Nile, not far from the underground course of the Wadi el Khowi which is marked by sevetal wells. Two tombs contained animal remains.

Tomb 1 yielded a woman about 50 years old accompanied by 3 caprovines. To the southwest of her was a he-goat about a year old, a small animal without horns. Its height at the withers, following the Schramm method (1967), was about 67 cm. To the north of this animal was found a female goat between the ages of 20 and 30 months,

although this is a very approximate estimate based on the criteria of *Habermehl* (1975). The problem of using tables based on European material for exotic breeds still needs to be resolved. The exceptional finds made in this region of the Sudan should allow us to shed at least a little light on this problem. The she-goat is also distinguished by the absence of horns and is relatively small, 60 cm. at the withers, when compared to the size of the animal in *tomb 89* at Kerma (CHAIX, 1984). It is interesting to find hornless goats in this region in the third millenium. Representations of such animals, as well as some skulls, which are unfortunately misdated (EPSTEIN, 1971; PIA, 1942), are known in Egypt, at Lisht, dated to around 2450 B.C. (BÖKÖNYI, 1974). Finally, to the north of the buried woman, a very young male caprovine approximately 3 months old was found. He had very small cores and we may assume that as an adult he would have been horned.

As for *tomb 5*, it contained the body of a young man around 18 years old. Behind him was found a male lamb about 7-8 months old, who wore the same kind of ostrich feather disk between his horns as that found at Kerma (BONNET, 1984; CHAIX, 1984). The animal's rather poor state of preservation, however, prevents us from determining whether the horn-sheaths had been pierced, and no bead-work pendant was found. Nonetheless, it is most interesting to discover this type of ornament in another cemetery. The problem of its meaning is thus reasserted but the finds are still too few in number to let us go very far. All we know for the present is that rams wearing disks may be of very different ages. The lamb in *tomb 81* was three months old while the animal in *tomb 115* was 20 months old. In this latter tomb three other animals had pierced horn-sheaths wich suggests that they had worn disks at one time. Furthermore, their relationship between the age and social position of the deceased remains unclear.

In any event it is unlikely that these decorated animals were leaders of a herd since the leaders are usually adult males. In this regard we might mention the tufts of wool which decorate the head and back of the lead ram in herds in the south of France during seasonal migrations (FINBERT, 1956).

4. Ashkan.

Finally we will consider the results of a rescue excavation carried out in 1985 at a small *kôm* located north of Kerma, 4 km. east the 3rd cataract. We began by collecting the bone fragments around the edges of the tombs and those spread about in a small area to the south of the tumulus. It is important to remember that surface finds like these give an inaccurate picture of the range of fauna in the area and that proper excavation would be necessary to provide the basis of a more accurate assessment. The bones collected are highly mineralized and display the grey-black patina characteristic of exposure to air in a desert environment. Unfortunately they lack collagen so it was not possible to carbon-date them.

Most of the bones belong to domestic cattle (*Bos taurus* L.) and the measurements taken suggest rather large animals. While they are not as large as Sudanese and Egyptian aurochs (GAUTHIER, 1968), they are larger than the Neolithic cattle of western Europe (BECKER and JOHANSSON, 1981). We noticed butchering marks on the interior surface of a talus and on the dorsal surface of a first phalange, the latter of which might indicate leather working.

Artiodactyla bones were also found, primarily antelope and gazelle. While the species have not yet been identified, we can probably assume the presence of the antelope, *Alcelaphus buselaphus* (Pallas). Two teeth and some carpal bones indicate the presence of hippopotamus.

Numerous fish vertebrae, several of which are quite large, as well as some dermal plates from crocodiles finish off our list of vertebrates.

Several fragments of mollusk shells were found. Besides examples of classic fauna from the Nile or adjacent basins (*Pila* cf. *ovata, Lanistes* cf. *carinatus, Unio* sp. and *Mutela sp.*), one fragment of Neritidid shell was found, an interesting find since it must have been brought here by man. Probably these shells were used as jewelry as we have seen at Kerma. In the tomb of a young girl *(t. 70)* was found a necklace made of moon-shells (Naticids), *Pollinices tumides* Sw. (CHAIX, 1982). We might also mention here that the Neolithic site Esh-Shaheinab, in Central Sudan, also had *Nerita forskali* (ARKELL, 1953) shells. This sampling of fauna, which contains a relatively high number of wild species, suggests a date earlier than Kerma, probably Neolithic, but we currently lack more precise chronological data. The presence of numerous osteological remains, some of which show butchering marks, is also an indication of a nearby settlement.

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Microscopical and chemical analysis of the ceramics from Kerma (Sudan)[1]

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(Translated by F. Verhaeghe)

The value of the physical analysis methods for the characterization, classification and identification of the geographic origin of the prehistoric pottery from the Eastern Sahara and from the Sudan has already been repeatedly demonstrated[2]. Following the promising results of our first campaigns carried out in Central Sudan[3] and in the southeasternmost area of Libya[4], we started a mineralogical and chemical study of the ceramics from Kerma and from the Kerma area. The present paper offers a survey of the results obtained thus far.

Of the pottery finds available for this study, 71 come from the Kerma site, where they were discovered by the Mission of the University of Geneva to the Sudan, directed by Ch. Bonnet. This material was found in some thirty tombs located in the northern part of the eastern necropolis (a total of 55 sherds) and in a few trial trenches in the centre of the ancient city (16 sherds). It belongs to different phases of the development of the Kerma civilisation and to C-Group. The majority of the sherds are identified as Ancient Kerma and the C-Group pottery is represented only by a few sherds. The available reference material consisted of 7 alluvial Nile sediments, collected near the site, and of a few vessels – among them a waster – discovered in pottery kilns of the Middle Kerma (2050-1750 B.C.), located in the ancient city[5]. The classification of the Ancient Kerma pottery was the subject of a recent publication[6].

In order to orient our future work, 7 sherds from a Kerma graveyard, located in Akasha, as well as 5 samples from the sites of Kadruka and Ashkan, have also been analysed. The Akasha material dates from Ancient and Middle Kerma; it is part of the collections in the Art and History Museum of the city of Geneva. The pottery from the other sites dates from the Neolithic period and was provided by the Mission. The results of our work on the Akasha, Kadruka and Ashkan finds are of course tentative because of the limited number of samples available for analysis.

The techniques used for the present work include a study by means of a polarizing microscope and atomic absorption spectrophotometry. The former allows us to identify the transparent tempering elements[7] with a diameter of more than 0.03 mm. The latter defines the pottery in terms of the absolute concentrations of major, minor and trace chemical elements. As the samples were subjected to bulk chemical analysis, these concentrations depend both on the nature of the tempering material and on the composition of the basic components of the paste. The procedures preparatory to the microscopic and chemical investigation, as well as the laboratory methods used, have been discussed in a previous paper[3].

The present contribution demonstrates the primordial part played by the Nile alluvia in pottery production during the period of the Kerma civilization. As the chemical composition and the mineralogy of the coarse detrital inclusions of these sediments remain identical over large distances, the results of the present study do not provide any clues as to the precise localisation of the ancient pottery workshops. During a routine check by means of a scanning electron microscope (SEM), we were struck by the abundance, the diversity and the state of preservation of the vegetal inclusions occurring in most of the analysed sherds. The indications do not consist of impressions but of actual vegetal remains, the cellular structure of which often is very well preserved. A detailed study of the species present should allow the specialists to draw up a first inventory of the vegetation – possibly also of the cultivated plants – in this region at the time of the Kerma civilisation. This evidently would increase our still limited knowledge of the palaeoecology of this particular part of the Sudan. Indeed, the Kerma excavations so far have yielded only a very few identifiable macroscopic plant remains.

It may be noted that a larger number of data concerning the mineralogy and the chemical composition of the ceramics and of the alluvia will be published at a later date[8], as well as a complete list of the samples investigated.

The tempering material.

The microscopical analysis of the Kerma pottery found at Kerma – including the sherds found in the kilns – and at Akasha has shown the occurrence of several types of tempering material: organic inclusions, loose minerals, rock fragments and carbonate rich nodules.

The organic components, all of them of a vegetal nature, are particularly numerous (figs. 1 to 4). Their size normally is larger than 1 mm and therefore they can easily be recognized with the naked eye. The identification of the different species seen by SEM of course was not part of our

research, but a preliminary analysis[9] has been carried out. It would seen that the inclusions mainly consist of papyrus, rushes and gramineae. Specialist work will, however, have to confirm the validity of these first observations.

The loose minerals equally are very numerous. Most of them belong to the coarser loam fraction[10] and – less commonly – to the sand fraction. The finest grains generally have an angular shape, while those belonging to the sand fraction are rather rounded. The types of minerals vary but little from one sample to another. In decreasing order of abundance, the type series includes the following minerals: quartz, plagioclase, microcline, opaque minerals, brown biotite, green hornblende, augite, muscovite, orthoclase, calcite, epidote minerals (mainly pistacite), calcedony, opal, zircon and brownish green tourmaline. Quartz by far is the most common mineral.

Rock fragments are fairly uncommon; the diameter of the grains generally is smaller than 0.1 mm. One recognizes: basaltic rock fragments with a microlitic or vitreous texture and plutonic or metamorphic inclusions. In some of the Akasha sherds the plutonic and metamorphic inclusions occur more frequently and are coarser than those of volcanic origin. The carbonate rich inclusions are microcristalline and consist of calcite, various detrital minerals and organic matter. They are scattered throughout the fabric in a very irregular pattern. Occasionally, the diameter goes up to 3 mm. The nodules generally are not very common and quite a number of sherds do not have them. The megascopic identification of the nodules is easy, mainly because of the size of some of them. The effervescence caused by the application of a drop of hydrochloric acid equally is diagnostic.

A few of the vessels characterized by the applied pellets on the body and probably of a southern origin[11] occur amongst the studied finds from the eastern necropolis of Kerma. It is very difficult to differentiate them from the other pottery from Kerma and from Akasha, at least if one only considers the nature, the granulometric characteristics and the relative abundance of the tempering materials.

The four sherds of C-Group from Kerma – all of them found in sector CE1 of the eastern necropolis – show the same inclusions as the Kerma pottery. They contain, however, slighty more nodules and lava fragments. Unfortunately, the number of samples is too limited to ascertain that all the C-Group pottery from Kerma shows the same features.

Microscopic examination of the Kerma and Akasha finds indicates that the vegetal tempering material was added by the potter at the time of the fabrication of the pots. The loose minerals, the rock fragments and the nodules, on the other hand, appear to have been natural components of the raw material.

Taking into account the mineralogical composition and the quantity of the non-plastic inclusions, the two Neolithic sherds from Kadruka are dissimilar. In one of them, the loose minerals, such as feldspars, quartz, green hornblende and brown biotite, are very frequent (figs. 5 and 6) and sometimes of a fairly large size. Opaque minerals, muscovite, garnet, pistacite, sphene, chlorite and zircon are far less common. All these minerals originate from the disintegration of granitic rocks, fragments of which can also be detected in the paste. With the other sherd, the tempering material mainly consists of quartz grains and of far less frequent feldspars. Zircon, pistacite and hornblende occur only occasionally while rock fragments are absent. The two Kadruka samples contain but very little organic material and the average grain size of the non-plastic inclusions is evaluated at 0.1 to 0.2 mm. Their maximum size is of the order of 1.5 mm.

The Ashkan finds are equally poor as to organic inclusions. Two sherds have a tempering which essentially consists of quartz grains of the fine sand fraction. Feldspar is less common and among the additional minerals, one notes green hornblende, muscovite, biotite, opaque grains, zircon, pistacite, calcedony and kyanite. The tempering material of the third specimen mainly belongs to the coarse loam fraction and includes loose minerals, a few rock fragments and nodules. Among the minerals, one notes quartz, plagioclase, microline, orthoclase, green hornblende, brown biotite, opaque minerals, muscovite, titaniferous augite, pistacite, sphene, calcedony and opal. The rock fragments are of a volcanic origin and they are identical to those found in the Kerma pottery. A few nodules have a diameter in excess of 1 mm.

The chemical composition.

All of the Kerma and Akasha samples have been examined chemically. For this purpose, only the sherds without a slip have been analysed. The precision of the analytical data has been checked by means of the FCG standard[12], a fired clay prepared and distributed by the Institute of Nuclear Sciences of the Ghent University. The results of the individual analyses have been used to calculate the average chemical compositions shown in Table 1 (columns a to e).

The similarities between the Kerma pottery recovered at Kerma and that found at Akasha, noted in the case of the mineral and lithic inclusions reappear in that of the chemical analyses. The composition of the fabric of the material from both these sites thus is fairly similar and suggests that the pottery from Kerma and from Akasha has been made with the same type of raw material.

Granted, notable differences characterize the concentration of some of the elements. The microscopic analysis shows, however, that these differences often only reflect fluctuations as to the relative frequency and the composition of some inclusions (quartz, feldspars, carbonates).

These fluctuations result from local, chronological or simply accidental variations. In some cases, the fact that too few samples were studied explains the situation. The same remarks can also be made as to the C-Group pottery from Kerma, the chemical composition of which is close to that of the Kerma pottery from the Kerma and Akasha sites.

When studying more closely the distributions frequency of the trace elements in the finds from the eastern necropolis and from the ancient city of Kerma – so far the only site from which a sufficiently large number of sherds could be analysed – the relatively limited dispersion of the concentrations and the symmetrical aspect of the histograms are striking. These phenomena in turn suggest that throughout the period of the Kerma civilisation the same type of raw material was used for the production of pottery.

The Nile alluvia.

The Mission's researchers sampled the alluvia at three different places: a well, located southwest of the town of Kerma, a pit south of the deffufa and a terrace of the Nile close to the resthouse. According to the granulometric data, these alluvia may be classified as clayey loam, sandy loam or gravelly loam. They are calcariferous and sometimes slightly consolidated.

Among the detrital grains identifiable by means of microscopy, one finds numerous quartz grains and – less frequently – plagioclase, alkali feldspar (mainly microcline), opaque minerals, green hornblende, brown biotite, epidote minerals (predominantly pistacite), titaniferous augite and muscovite. Colourless garnet, sphene, tourmaline, chlorite, tremolite, calcedony and opal occur only occasionally. Rock fragments are relatively rare. Those of a volcanic origin are basaltic in composition and their texture is either microlitic or vitreous. A few loams include minute granitic fragments.

The detrital minerals of the alluvia are locally cemented by secondary precipitations of calcite and of amorphous iron. The carbonates often crystallised in oblong or more or less rounded patches, the diameter of which may sometimes amount to a few mm. These patches occur in a very irregular pattern within the loam and they may contain amorphous substances, which are rich in iron.

The alluvia have a low organic content. The organic material is always of a vegetal nature and the remains generally are of a small size.

The average chemical composition is shown in Table 1 (column f). When taking into account the higher water content of the unfired loam and scaling the values to the same total as those for the ceramics, this composition is quite similar to that of the pottery from Kerma and from Akasha.

Conclusions.

The Kerma pottery found at Kerma and at Akasha appears to be the result of the firing of a man-made mixture of alluvial Nile sediments and organic materials of a vegetal nature. Considering the geographic location of these two sites, a local origin of these sherds is plausible, but given present state of knowledge, it cannot be proven in a definite way. The discovery of kilns on the site of Kerma constitutes an additional indication in favour of this hypothesis.

A first analysis of the plant remains incorporated in sherds of different periods testifies to the abundance and the diversity of the species encountered. Thanks to favourable carbonisation conditions, the plant remains often are very well preserved and they will allow the specialists to reconstruct to some extent the vegetation of the area in the period of the Kerma civilization. The presence of papyrus, rushes and gramineae has been noted, but these identifications have to be considered as provisional, at least until a more detailed study has been completed.

The mineralogical and chemical differences between the Kerma pottery from the eastern necropolis in Kerma and the nearby ancient city are of limited importance. As the pottery from these two areas belongs to several phases of the Kerma civilization, it has been established that neither the temper analysis, nor the chemical analysis of the sherds make it possible to distinguish the Ancient Kerma material from this site from that belonging to later periods. Complementary research will be needed to see if this applies equally to all of the pottery found in Kerma.

The petrographical study by means of the polarizing microscope has revealed the existence of some minor differences between the Kerma pottery from Kerma and that excavated in Akasha. They exclusively concern the relative abundance of some of the tempering materials.

The C-Group pottery and the pottery with a body decorated with small, applied pellets have a tempering material and a bulk chemical composition which are not different from those of the associated Kerma sherds. The quantity of organic remains of a vegetal origin included in these sherds equally is fairly large. The kilns which produced both these types of pottery indubitably lay in the Nile valley, but their precise location cannot as yet be determined.

The Neolithic sherds from Kadruka and Ashkan have a fairly coarse and varied tempering material. Organic substances are few and their presence appears to be accidental rather than anything else. Because of the lack of chemical analyses on the material from these sites, the part played by the Nile muds in the production of these vessel could not be established. The presence of a vessel strongly tempered with granitic mineral and rock fragments is notable: indeed, it suggests the existence of a production centre in a geological environment which is rather different from that where the pottery from the Kerma and Akasha sites was made.

[1] We thank the National Fund for Scientific Research in Brussels and the Research Council of Ghent University, who provided us with the equipment necessary to carry out the chemical analyses.

[2] See for instance:
M. OKRUSCH, G. STRUNK-LICHTENBERG & B. GABRIEL, *Vorgeschichtliche Keramik aus dem Tibesti (Sahara), I: Das Rohmaterial, Berichte der Deutschen Keramischen Gesellschaft*, t. 50, 1973, pp. 261-267; G. STRUNK-LICHTENBERG, B. GABRIEL & M. OKRUSCH, *Vorgeschichtliche Keramik aus dem Tibesti (Sahara), II: Technologischer Entwicklungstand, Berichte der Deutschen Keramischen Gesellschaft*, t. 50, 1973, pp. 294-299; T. HAYS & F. HASSAN, *Mineralogical analysis of Sudanese Neolithic ceramics*, in: *Archaeometry*, t. 16, 1974, pp. 71-79; K. BANKS, *Ceramics of the Western Desert*, in: *F. Wendorf & R. Schild* (eds.), *Prehistory of the Eastern Desert*, 1980, pp. 299-315; V. FRANCAVIGLIA & A. PALMIERI, *Petrochemical analysis of the "Early Khartoum" pottery: a preliminary report*, in: *Origini*, t. XII, 1983, pp. 191-205.

[3] P. DE PAEPE, *Etude minéralogique et chimique de la céramique néolithique d'el Kadada et ses implications archéologiques, Archéologie du Nil Moyen*, t. 1, 1986, pp. 113-140.

[4] P. DE PAEPE, *La provenance de la céramique néolithique du Gebel Uweinat (Libye): Evidence minéralogique et chimique, Archéologie du Nil Moyen*, t. 1, 1986, pp. 149-159.

[5] Ch. BONNET, *Rapport préliminaire sur les campagnes de 1982-1983 et de 1983-1984*, in: *Genava*, n.s., t. XXXII, 1984, pp. 8-10.

[6] B. PRIVATI, *Nouveaux éléments pour une classification de la céramique du Kerma Ancien*, in: *Genava*, n.s., t. XXX, 1982, pp. 27-36.

[7] By this we mean all the nonplastic inclusions, occurring in the fabric, some of which have possibly been added by the potter.

[8] P. DE PAEPE & Y. BRYSSE, *Scholae Archaeologicae* (in preparation).

[9] Provisional identifications have been carried out by Prof. W. VAN COTTHEM of Ghent University and by Prof. W. VAN ZEIST of Groningen University. The former indicated that macroscopic remains of papyrus and of gramineae could be present. The latter drew our attention to the possible presence of rushes and of gramineae, but he could not confirm that papyrus occurred. We wish to extend our thanks to both specialists for their help with this matter.

[10] Grains belonging to the coarser loam fraction have a diameter ranging from 20 to 50 μ; in a sand the size of detrital grains goes from 50 μ to 2 mm.

[11] Ch. BONNET, *Rapport préliminaire des campagnes de 1980-1981 et de 1981-1982*, in: *Genava*, n.s., t. XXX, 1982, pp. 29-53.

[12] F. DE CORTE, A. DEMETER, Lin XILEI, L. MOENS, A. SIMONITS, A. DE WISPELAERE & J. HOSTE, *Evaluation of the k_0-method by its applications to (n,γ) RNAA of geological, environmental and clay reference materials, Isotopenpraxis*, t. 20, 1984, pp. 223-226.

Table 1: Chemical composition of the Kerma pottery, of the C-Group pottery and of some Nile alluvia in the Kerma region(*)

	a	b	c	d	e	f
SiO_2	55.55%	55.90%	55.78%	57.41%	60.87%	51.03%
TiO_2	1.49	1.46	1.35	1.97	1.35	1.60
Al_2O_3	14.22	14.51	14.48	14.48	14.94	13.91
Fe_2O_3(+)	9.63	9.31	9.23	9.86	9.29	9.99
MnO	0.16	0.14	0.15	0.17	0.14	0.16
MgO	3.20	2.40	2.98	3.28	2.50	3.01
CaO	4.08	3.15	4.59	4.01	3.37	4.57
Na_2O	2.26	1.75	3.09	2.06	1.58	1.89
K_2O	1.28	1.57	1.29	1.76	1.35	1.19
Co	32 ppm	32 ppm	34 ppm	38 ppm	33 ppm	36 ppm
Cr	148	139	141	147	131	142
Cu	57	52	57	53	49	72
Li	13	13	14	14	17	15
Ni	88	70	72	77	68	62
Rb	31	31	43	42	47	39
Sr	322	331	316	300	274	318
Zn	102	111	99	114	107	106

a. Kerma pottery from the Eastern necropolis in Kerma (mean values calculated on 51 sherds).
b. Kerma pottery from the ancient city of Kerma (mean values calculated on 16 sherds).
c. C-Group pottery from the eastern necropolis in Kerma (mean values calculated on 4 sherds).
d. Pottery from ancient kilns in Kerma (mean values calculated on 6 sherds).
e. Pottery from Kerma cemetery in Akasha (mean values calculated on 7 sherds).
f. Nile alluvia sampled in the vicinity of Kerma (mean values calculated on 7 samples).

(*) Analysts: J. De Jaeger and J. Van Hende (Ghent).
(+) All the iron is calculated as Fe_2O_3.