THREE LATE EIGHTH MILLENNIUM PLASTERED FACES FROM 'AIN GHAZAL, JORDAN

P.S. GRIFFIN, C.A. GRISSOM and G.O. ROLLEFSON

Abstract : *Three fragmentary faces originally plastered on skulls are discussed : their excavation history, conservation treatment, and technical analysis. Deposited during the Pre-pottery Neolithic B in a shallow pit at the site of 'Ain Ghazal, Jordan, the modelled faces had apparently been broken off the skulls. Only plaster was found, and the absence of the skulls enabled many aspects of manufacture to be determined during reassembly. Skulls without their mandibles had been prepared by stuffing cavities with grass and coiling rope below the maxillae. Results of plaster analysis using a range of scientific techniques are presented. Stylistic and technical comparisons are made to other Neolithic plastered skulls, as well as to large statues found at the site.*

Résumé : *L'histoire de la découverte de trois «faces» modelées à l'origine en plâtre sur des crânes, les traitements de conservation ainsi que les techniques d'analyse sont présentées ici. Apparemment détachées des crânes ces «faces» avaient été déposées au cours du PPNB dans une fosse peu profonde de l'établissement d'Ain Ghazal (Jordanie). Lors des remontages, l'absence de crânes permit de faire une série d'observations sur leur mode de fabrication. Une fois la mandibule retirée, les cavités des crânes avaient été bourrées d'herbes et un rouleau de cordelette placé sous le maxillaire. Les résultats de l'analyse de l'enduit de plâtre effectuée à l'aide de plusieurs techniques scientifiques sont présentés de même que sont faites des comparaisons stylistiques et techniques avec des crânes surmodelés trouvés sur d'autres sites néolithiques et avec les grandes statues retrouvées à Ain Ghazal.*

Key-words : *Lime plaster, Plastered skull, Neolithic, Levant.*
Mots clefs : *Enduit plâtré, Crâne surmodelé, Néolithique, Levant.*

INTRODUCTION

The Pre-Pottery Neolithic B (PPNB) site of 'Ain Ghazal, Jordan, has yielded rich deposits of ritualistic human burials, floral and faunal remains, utilitarian dwellings, and ceremonial structures, in addition to artifacts such as flints, bowls, and figurines. The finds of perhaps the most impact and interest, however, are anthropomorphic sculptures constructed of lime plaster. These include two large caches containing approximately thirty statues [1] and a third small cache. The latter deposit, initially believed to contain one to four heads similar to those of the statues [2], was blocklifted and taken to a conservation laboratory at the Smithsonian Institution for careful excavation in tandem with examination, analysis, and treatment. Reconstruction enabled the material to be correctly identified as three

1. Work on a large cache excavated in 1983 is ongoing at the University of London's Institute of Archaeology, underwritten by the British Museum. The deposit is believed to contain 26 statues fairly equally divided between full figures and busts (TUBB, 1985 ; TUBB, 1987 ; TUBB and GRISSOM, 1995). Treatment of a second large cache excavated in 1985 was completed at the Smithsonian Institution's Conservation Analytical Laboratory in 1996. Two figures and three two-headed busts have been reassembled ; unassembled fragments including two heads probably belonged to two separate busts (BOULTON, 1988 ; GRISSOM, 1996).

2. ROLLEFSON, 1986 ; ROLLEFSON and SIMMONS, 1986 ; ROLLEFSON and SIMMONS, 1987 ; V. Mathias, unpublished field notes, 1984.

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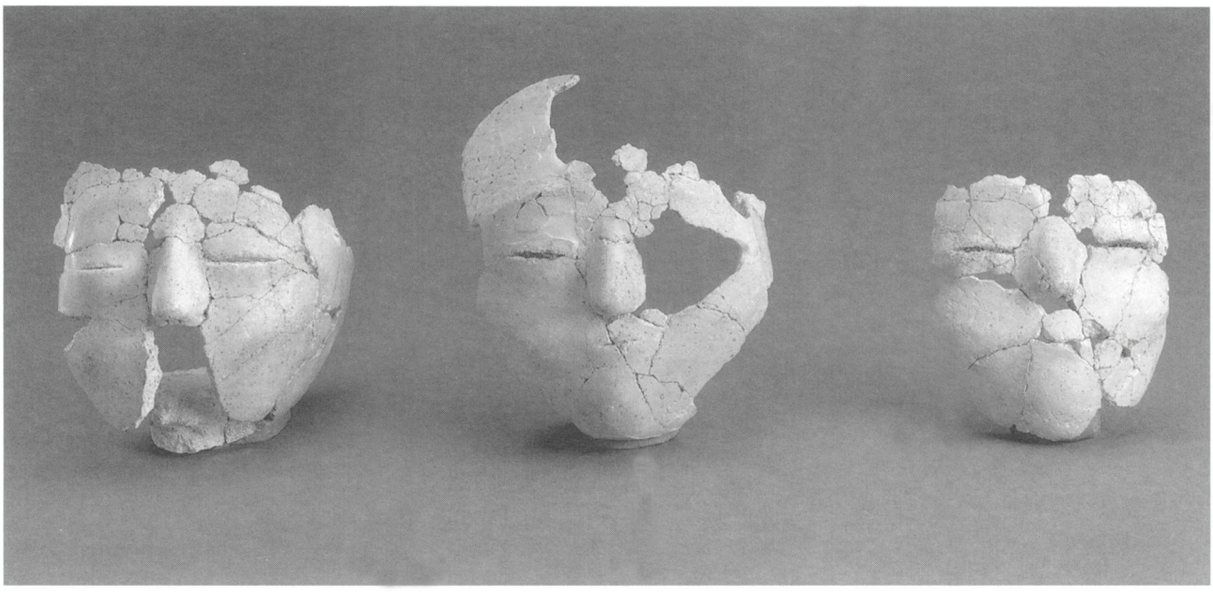

Fig. 1 : *Faces 1, 2, and 3, left to right (J. Tsantes, Smithsonian Institution).*

plaster faces which had originally decorated human skulls (fig. 1). The faces were found in a row lying face down without their skulls and are distinguished by a surface layer of pink-colored plaster and closed eyes inlaid with bitumen.

Ritual use of human skulls was widespread in the early Neolithic throughout the ancient Near East, with evidence of the practice found at sites in the modern countries of Israel, Jordan, Syria, and Turkey. Skulls with sculpted plaster faces are less common, but have been found at Jericho, Tell Ramad, Beisamoun, and most recently Kfar Hahoresh. However, this find at 'Ain Ghazal is the only known instance in which plastered faces have been discovered in a ritualistic grouping without their skulls.

RITUAL BURIAL PRACTICES

Ritualistic PPNB skeletal burials excavated at 'Ain Ghazal suggest that ancestor veneration was common at the site. The majority of adult burials were found in pits beneath the floors of dwellings, the skeletons lying on their sides, flexed, and decapitated. More than 80 Middle PPNB human burials have been excavated to date, but very few skulls have been found[3]. Removal of the skull occurred some time after initial internment. Graves were reopened above the head, and the upper portion of the skull was removed, leaving the mandible with the body.

The ceremonial redeposition of damaged plastered skulls has been noted for three other plastered skulls excavated at 'Ain Ghazal. Two were found grouped with two other skulls that lacked evidence of plastering, all four propped upright using small stones and chunks of plaster[4]. The third plastered skull, although much better preserved, was from a disturbed context, but it was clear that it had been placed in a pit beneath the floor of a house[5]. Both of these skull caches are in accordance with common group skull burial practice in the ancient Near East, although there are conflicting accounts about burial contexts at some sites[6], and for others, records are scanty.

The three plaster faces found at 'Ain Ghazal in 1985 are unusual because the plaster fragments had been detached from their skulls and ritually buried in a fragmentary state. This has been concluded because the burial was undisturbed prior to discovery, no bone was found, and an estimated 40% of the original plaster was missing from the burial. Because of undercuts, the plaster had to be broken in order to be removed from the skulls, and the faces were not intact artifacts after removal. Nevertheless, care was taken in their burial, evidence

3. ROLSTON in ROLLEFSON *et al.*, 1985; ROLLEFSON and SIMMONS, 1988.

4. ROLLEFSON, 1983; BUTLER, 1989.
5. SIMMONS *et al.*, 1990.
6. Notably at Jericho, BIENERT, 1991.

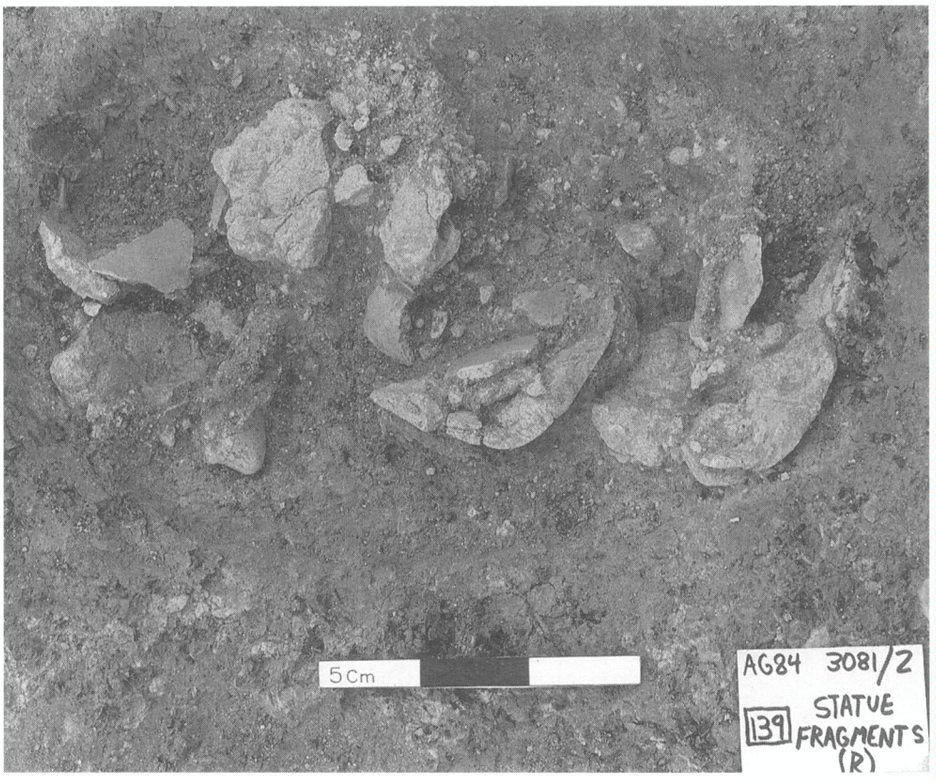

Fig. 2 : *Faces 1, 2, and 3, left to right, in situ in 1984. They are face downwards, chins in the foreground (G. Rollefson).*

that damaged plaster was accorded attention equivalent to that for human remains even when it was no longer physically associated with human remains. Similarly the large plaster statues excavated at 'Ain Ghazal, apparently damaged prior to burial, were carefully buried in pits.

EXCAVATION

Excavation began at the site of 'Ain Ghazal in 1982, and by the summer of 1996 ten seasons had been conducted. The plaster faces were found at the end of the 1984 season in a depression measuring ca. 40 × 30 × 20 cm (Square 3081, Locus 139), a discrete intrusion into otherwise culturally sterile soil (fig. 2). Carbon-14 analysis of charcoal in a stone-lined pit from a later stratum dates the faces to earlier than 7100 + 80 BC (8041 ± 65, calibrated)[7]. Lying face down, the plaster faces were covered with a layer of fine clay containing fragments of chalk, rock, and floor plaster. Because bone generally survives at the site and none was found, it is believed not to have been present when the faces were buried. Since it was late in the season, the area was backfilled after loose plaster fragments were removed.

In 1985 a special season was called for blocklifting the contents of the pit as well as of the second large pit containing plaster statues, based on the successful process used for the large statuary cache removed in 1983. In preparation for lifting the contents of the small pit, fragments at the surface were exposed, drawn, and photographed. Unfortunately, during the night prior to blocklifting, the contents were disturbed by visitors to the site, resulting in breakage and scattering of fragments. However, all fragments shown in photographs taken before the disturbance can be accounted for, and it has been concluded that no material was lost because of vandalism. Loose fragments were then individually lifted and packed while the remaining deposit was pedestaled, crated, and lifted as had been originally planned.

The contents of both pits were transported to the Smithsonian Institution's Conservation Analytical Laboratory (CAL) in

7. GrN-12965.

1986. Intensive campaigns of examination, research, and treatment of both caches culminated in an exhibition of the reconstructed sculptures at the Smithsonian's Arthur M. Sackler Gallery[8], followed by exhibition in Paris at the Institut du Monde Arabe[9] prior to return of the sculptures to the Hashemite Kingdom of Jordan.

CONDITION AND CONSERVATION TREATMENT

In the conservation laboratory at the Smithsonian, fragments were assigned numbers correlated with locations on photographs taken as they were excavated. This detailed documentation proved critical for reconstruction of the precise orientation of the faces in the pit.

Treatment was relatively straightforward and began with cleaning followed by light consolidation of the plaster to strengthen it for reassembly. The degree of consolidation was less than that required for reconstruction of plaster statues from 'Ain Ghazal because the face plaster had greater inherent strength and density, retaining sharp break edges; moreover, the ensembles are not heavy.

Nearly all fragments could be joined, including both blocklifted fragments and those lifted separately beforehand[10]. Although the faces remain fragmentary, missing a considerable amount of plaster, the strength of the plaster permitted minimal use of auxiliary materials so that most impressions on interior plaster surfaces remain visible for study. Presentation of the faces in a fragmentary state was also thought appropriate because the faces had been buried as fragments. Thus, only a few gaps were filled where adjoining surfaces between fragments matched poorly, and overall support was added only to the reverse of three areas on "Face 2" where original plaster was particularly thin.

The faces can be readily distinguished from one another because of differential damage. Although the mouth and forehead are missing, "Face 1" is the most intact, the only one with substantial portions of the underside and side of the head extant. A thin rounded edge above the proper left ear appears to be part of the original perimeter of the plaster (fig. 3, d). "Face 2" is more fragmentary but has most of the lower face, a partial ear, and the only complete portion of the forehead. Finished upper edges on the forehead appear to correspond to the coronal suture and temporal line. "Face 3" is the most fragmentary, lacking both sides and the underside of the head, as well as the forehead. However, the facial region is nearly complete, and both eyes retain bitumen inlay.

DESCRIPTION

Impressions on the interiors of the reconstructed faces provide evidence that plaster was modeled on human skulls without mandibles (fig. 3). The most diagnostic features are impressions of the zygomatic arch and hard palate, but impressions of eye orbits, the nasal cavity and bones, the maxilla, coronal suture, temporal line, and a few teeth can also be identified[11]. Apparently because of the missing lower jaws, the faces are horizontally broadened and vertically shortened, and the features were modeled without regard to bone structure (fig. 3, h).

The faces are similarly rendered in a schematic fashion and were probably made by the same hand, but they are not identical. They are modeled with skill using smooth subtle curves. The mouths and eyes are represented by horizontal incisions at the center of gently sloping mounds, the closed eyes originally inlaid with bitumen. Prominent wedge-shaped noses are made of solid plaster, their nostrils delineated by pairs of vertical incised lines. The ears are smooth, slightly elongated protrusions which were placed higher and farther back than is anatomically correct. The surface plaster layer, measuring about 0.25 mm in thickness, is light pink in color (5YR 8/4), while underlying plaster is white (10YR 8/2)[12].

Plaster covered the facial regions and the undersides of the skulls (minus the mandibles) but apparently not the crania. The perimeter of original plaster is indicated by the finished edges noted on the side of "Face 1" and forehead of "Face 2." The crania may have been decorated with paint, as they were for some skulls with plastered faces at other Near Eastern sites[13]. Two painted crania were found at 'Ain Ghazal in separate deposits, but it is unclear whether they had been part of skulls with plastered faces because the facial areas of the skulls were missing[14].

8. GUNTER, 1996.
9. KAFAFI and ROLLEFSON, 1997; GRISSOM, 1997.
10. Based upon their positions in the pit, a few large fragments can be associated with specific heads but could not be attached. Two which bear rope impressions probably belong with "Face 1" and "Face 3," and two may be associated with the proper left eye of "Face 2." Three ear fragments cannot be associated with specific heads. Other unattached fragments are small, and most of these lack the pink surface layer.
11. Unfortunately plaster losses preclude derivation of skeletal measurements.
12. MUNSELL, 1975.
13. For example, skull D114 (Reg. 530) found at Jericho, now in the Archaeological Museum, Amman. KENYON, 1981 : 437, Pl. 56.
14. ROLLEFSON, 1985; 1986.

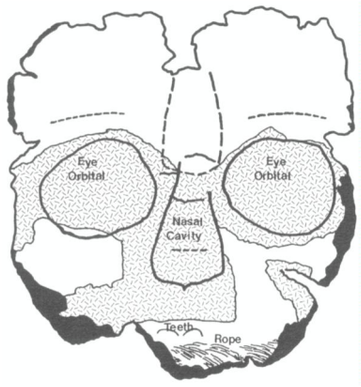

Fig. 3, a : *Drawing of reverse of Face 3, showing fiber-impressed areas (hatched), bone-impressed areas (unhatched), skeletal features, and impressions of rope and teeth. Features modelled on the exterior are indicated with dashed lines (C. Grissom).*

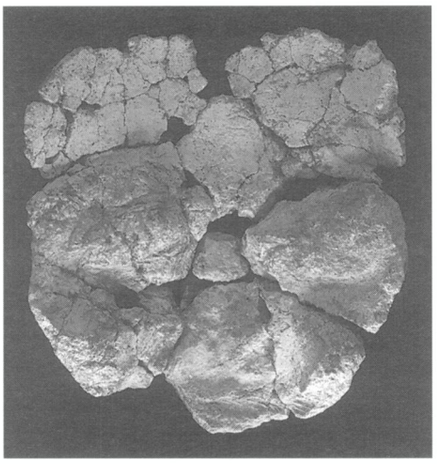

Fig. 3, b : *Reverse of Face 3 (C. Grissom).*

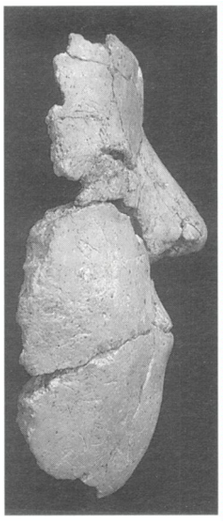

Fig. 3, c : *Right profile of Face 3 (C. Grissom).*

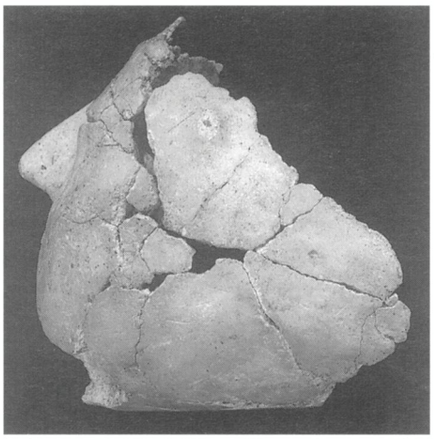

Fig. 3, d : *Left profile of Face 1 (C. Grissom).*

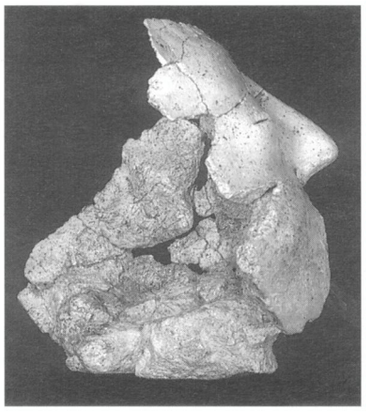

Fig. 3, e : *Right profile of Face 1 (C. Grissom).*

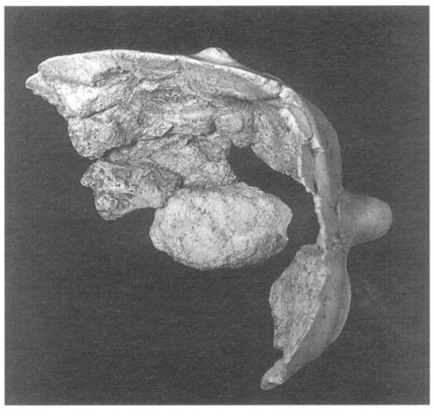

Fig. 3, f : *Face 1 from above (C. Grissom).*

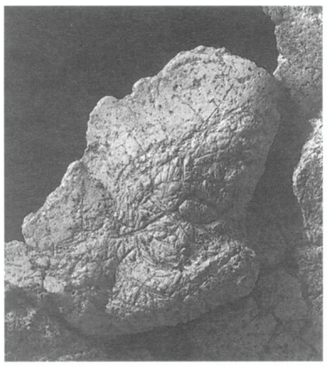

Fig. 3, g : *Detail of fig. 3, e; impression of left zygomatic arch (C. Grissom).*

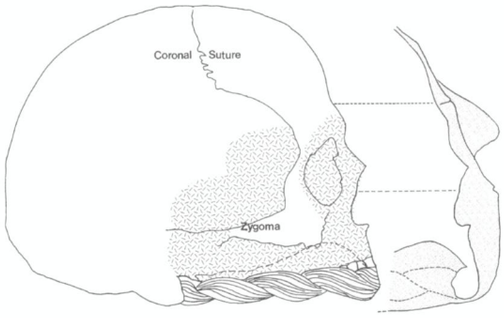

Fig. 3, h : *Drawing of skull showing rope prop and padded areas (hatched), on the left; plaster cross-section through the center of the face, on the right. The plaster eyes and mouth are linked by dashed lines to their positions on the skull (C. Grissom after H. Beaubien).*

Fig. 3, i : *Detail fig. 3, f showing rope impressions (C. Grissom).*

Construction

Examination of interior surfaces of the faces shows that plaster was applied to three materials : directly onto skull bone, to grassy material which filled or covered parts of the skull, and to a coil of rope on which the skull rested (fig. 3). Areas modeled directly on bone, especially in the forehead area, exhibit smooth interior surfaces, and the plaster is often thin in section (0.5-2 mm). Impressions of amassed thread-like fibers are found where there were hollows and cavities in the skull, such as the eye orbitals or areas adjacent to them. These fibers were probably a plant material such as flax[15]. Because of the fineness of impressions and lack of plant structural features, the material seems to have been processed[16]. Plaster from fiber-impressed areas tends to be thicker than that modeled directly on bone, perhaps necessitated by the flexibility of the grassy material. Impressions of plaited rope about 1cm in width surround each palate, where teeth would be located on the upper jaw. Uncertainty about its function remains, but the rope probably stabilized the skull during modeling.

Unpigmented plaster appears to have been added in a single application to padded and unpadded bone as well as the rope. Globs of plaster were probably pressed against these surfaces, although evidence of globular application could not be discerned by radiography, a technique which has been used to posit horizontal strip application of plaster on a statue head from Jericho[17]. The plaster would then have been modeled to create facial features. After the base plaster had stiffened and could be smoothed, pink-pigmented plaster was applied in a thin, even layer. However, good cohesion between layers indicates that the unpigmented plaster was still damp when the pink layer was applied, and this was confirmed by cross-sections which show mixing of the two layers. The pink plaster has an almost burnished surface, and compaction of the surface layer, apparently from smoothing, is visible at break edges with low magnification. The scanning electron microscope (SEM) also showed denser packing and more fragmentation of particles in the surface region.

Subsequent damage reflects construction. Most forehead plaster is missing, probably because it remained well-adhered to the skulls or was fragmented because of its thinness during removal by the ancient inhabitants of 'Ain Ghazal. Plaster modelled on grassy material has survived to a larger extent, probably because it was thick and could be easily detached since it was not adhered directly to the skull. Two palates survive, probably because they were thick (c. 3 cm) and rope at their perimeters resulted in thin plaster there, enabling the palates to be easily broken off the skulls. Plaster was often broken at the same places on the three faces, related to the skulls : at edges of skeletal features such as the eye orbits or nasal cavities ; around undercut areas produced by the skeleton, such as the zygomatic arch ; and at the juncture of grassy stuffing and direct application to bone. Breakage can also be related to facial features which were modeled with thicker plaster, such as the cheeks or the nose, but it does not seem related to the application of plaster in globs or horizontal strips.

Plaster Technology

X-ray diffraction analysis (XRD) using a powder camera identified calcite as the major component of both white and pink layers ; SEM energy dispersive spectroscopy (EDS) confirmed elemental constituents. Calcite is the principal mineral in marl found at the site, apparently the raw material for the plaster. With an SEM, the calcite appears mostly as rhombohedral particles (0.5-2 μm), but also in the form of coccoliths (5 μm), the calcareous remains of the cellular structures of green algae[18], and as sub-micron rounded particles (< 0.5 μm). The clay mineral montmorillonite, identified by XRD as the major component of the acid-insoluble fraction of the plaster (4-9 wt%), is also the second major constituent of the marl. Lesser constituents in both plaster and marl include quartz and feldspar. Translucent particles of finely divided quartz (less than 1% of the plaster) were visible on break edges, confirmed by XRD. A small amount of feldspar was observed during microscopic examination, differentiated from quartz by albite twinning. The pink plaster, otherwise identical in composition to the base plaster, was probably pigmented with a small amount of iron oxide. EDS analysis detected a trace amount of iron in the pink layer, and optical microscopy suggested that the pigment is a natural ochre with a mix of particles. However, the pigment could not be identified using XRD because of the poor quality of the pattern obtained, in itself consistent with an iron oxide pigment[19]. A fine grass-like temper was incorporated in the plaster, indicated by plant impressions visible along fresh break edges and plant-shaped voids on Xero-radiographs. Opaque black inclusions were visible at low magnification in both plaster layers at break edges and identified as carbon by XRD.

15. Woven or twined textile fragments composed of processed flax have been preserved at the PPNB site of Nahal Hemar. SCHICK, 1988.
16. McCORRISTON, pers. comm.
17. KINGERY *et al.*, 1992.
18. BLACK, 1973.
19. The pattern was dark with few legible lines, apparently because of the small particle size of the pigment which renders it somewhat amorphous and secondary fluorescence of iron by copper k-alpha radiation.

Analytical work indicated that the plaster was made by mixing a large amount of powdered marl, a smaller amount of slaked lime made from calcined marl[20] and plant temper. The presence of coccoliths in the plaster indicates that it contained powdered marl which had not been calcined because coccoliths disappear at calcination temperatures. Evidence of the slaked lime component is indirect, since the calcium carbonate which it forms by carbonation is chemically identical to the limestone from which it was made. Water resistance of the face plaster indicates that slaked lime was used because plaster made from marl alone disintegrates in water. The presence of carbon is indicative of lime burning, and sub-micron rounded particles of calcium carbonate are indicative of recarbonated lime[21]. Identification of calcium hydroxide or calcium silicates may also indicate the presence of lime, but the first was not present and the second was not conclusively found[22]. Differential thermal analysis, which has been used to differentiate lime plaster from limestone on the basis of decomposition of smaller recarbonated lime particles at lower temperatures[23], proved unreliable because the calcium carbonate decomposition temperatures varied for different marls from the site. Thin-section petrographic analysis (TSPA) also proved unsuccessful[24].

SEM images of face plaster compare well with those for standards made from marl and containing 25 wt% and 50 wt% carbonated lime. This range in amount of lime accords with traditional mortar formulation, for which 2-3 parts aggregate are added to one part lime in order to economize on lime and minimize shrinkage.

The face plaster has physical characteristics that distinguish it from plaster used for the statues excavated in 1985. It is harder, denser, finer in texture, and generally of higher quality. The constituents in the two plasters are essentially identical although the face plaster contains more calcium carbonate and less clay than the figure plaster, probably because of slightly different sources at the site[25]. These slight percentage differences do not seem to account for the higher quality of the face plaster. Rather its higher quality is attributed to a higher percentage of lime[26]. Using SEM and TSPA the face plaster appears finer, with fewer coccoliths and more submicron particles indicative of recarbonated lime.

Of particular interest was whether the face plaster was the product of a deliberate mixture of more lime and less marl than the figure plaster or the product of incompletely calcined marl heated longer or at a higher temperature, mixed only with water. In order to answer this question, many experiments were performed using marl from the site, accompanied by instrumental analyses[27].

Water-resistant plaster was produced from marl heated as low as 500 °C for four hours, although SEM showed its appearance to be no different than plaster made from unheated marl. Chunks of marl heated at temperatures between 500 °C and 700 °C for two hours showed distinct zones of powdery material on their surfaces which were easily sloughed off. The powdery material was apparently calcined, confirmed by alteration of coccoliths in powder examined with SEM, and it is noteworthy that this occurred at temperatures considerably lower than those usually stated for lime production[28]. At higher temperatures, the entire rock became cracked and powdery, and its complete calcination was confirmed by SEM, which showed an absence of coccoliths throughout. In either case, calcined material could have been easily identified and harvested.

One of the most interesting byproducts of our experimentation was the discovery that when surface powder had been removed, remaining chunks were extremely difficult to grind, possibly because clay in the marl had been fired. This phenomenon was especially pronounced when compared to the ease of grinding unheated marl, and it has led us to believe that partially calcined rocks could not have been used to make

20. Calcination is the process which produces lime (calcium oxide) by thermal decomposition of calcium carbonate. The dissociation temperature for calcite is 898 °C at 1°atm for a 100% CO_2 atmosphere but dissociation can occur at much lower temperatures when other minerals are present. BOYNTON, 1980 : 159-162.

21. Cf. GOURDIN and KINGERY, 1975; KINGERY *et al.*, 1988; KINGERY *et al.*, 1992.

22. Calcium hydroxide is usually found in "young" lime plaster because the lime has not fully recarbonated, but was not found in the face plaster, apparently because of its extreme age. Calcium silicates are likely to be produced by heating calcium carbonate in the presence of clay at temperatures somewhat higher than those required for calcination. Their presence was strongly suggested during experiments with replica plaster, by partial hydraulic set of slaked marl samples which had been heated between 700 and 1000 °C. Nevertheless, calcium silicates could not be conclusively identified by XRD in either carbonated lime plaster made from marl or original plaster. However, they can be difficult to identify because they are somewhat amorphous, and they might have been present in a small percentage below the detection limit.

23. GOURDIN and KINGERY, 1975.

24. In contrast with the work of other analysts, powdered marl could not be distinguished from carbonated lime in face plaster, figure plaster, or plaster standards made from lime and crushed marl, apparently because of equally fine particle size. The technique proved more useful in examining floor plaster samples from the site. GOREN and GOLDBERG, 1991; GOREN and SEGAL, 1995; GOURDIN and KINGERY, 1975.

25. Acetic acid-digestion showed an average 12 wt% acid-insoluble fraction for the figure plaster. Three different marls from 'Ain Ghazal had 5 wt%, 14 wt%, and 17 wt% acid-insoluble fractions.

26. SEM showed that the figure plaster matched plaster containing 10 wt% carbonated lime made from the marl, as well as samples of pure marl. However, only the former was water-resistant like the figure plaster.

27. A full account of experimental work will be published separately.

28. KINGERY *et al.*, 1988.

the plaster, as previously suggested[29]. Rather, the mixture of slaked lime and ground marl must have been deliberate and thus could be controlled. This scenario is supported by examination of samples of floor plaster from the site which exhibit clearly differentiated mixtures between fine surface layers and coarser layers below. Other authors have noted differences in the types and quality of plasters used within a single artifact as well as between different types of artifacts and between similar artifacts from different sites[30].

The superior quality of the face plaster relative to the figure plaster may have occurred for one of any number of reasons. It might have been that experienced craftsmen found that more slaked lime provided better adhesion of plaster to bone. Economics and scale may have played a role : use of a higher percentage of slaked lime would have been an insignificant use of resources given the small amount of plaster required for the faces, in contrast to the large amount required for a similar percentage of lime to be used in making the large statues. Perhaps there was a hierarchy of artifacts in which the plastered skulls were more valued and made with higher quality plaster containing more slaked lime. Finally, practice may have been inconsistent over time, not improbable since face plaster was made some centuries before the figure plaster, or differences may simply have occurred by chance.

COMPARATIVE EXAMPLES

Stylistic comparison of the 'Ain Ghazal faces to plastered skulls from other sites shows both similarities and differences based primarily on photographs and written accounts[31]. The majority of skulls were plastered without mandibles. Like the 'Ain Ghazal faces, the plastered face of a skull from Kfar Hahoresh was made smaller than in real life in the absence of the mandible, and the facial features were modeled higher than corresponding skeletal features[32]. Its proportions are broadened, similar to but slightly more exaggerated than those of the 'Ain Ghazal faces. All but one plastered skull found at Jericho lack mandibles, and some have similarly rounded faces and small chins[33]. However, two are described as having more normal facial proportions because the chins were built up with plaster, the locations of their facial features matching skeletal features[34]. The single skull from Jericho[35] and skulls from Tell Ramad and Beisamoun[36] which retained mandibles, have proportions which appear more elongated.

The extent of plastering appears similar for nearly all plastered skulls, ending at the top of the forehead and extending diagonally across the sides. Thus, plaster is absent where hair would be, suggesting that cranial decoration might have imitated head coverings or hair or that actual head coverings or hair were used but have not survived. However, aside from pigment on crania noted earlier, the only other decoration which has been reported are unusual collagen "nets" on crania from the Nahal Hemar Cave, although those skulls bear no evidence of plaster faces[37]. Plastered skulls are almost invariably plastered on their bottom surfaces, whether or not the mandible was present, creating more or less smooth surfaces on which they rested. Exceptions are skulls found at Tell Ramad which have substantial plaster necks below the skulls, thought to have allowed them to be displayed on headless plastered statues found nearby[38].

Treatment of the eyes is one of the most distinctive features of the plastered skulls. Like the 'Ain Ghazal faces, the eyes of the Kfar Hahoresh plastered skull are depicted closed, adding to their similarity in appearance. The eyes of the skull found at Beisamoun also appear to be closed, and one skull from Jericho has inlaid cowrie shell eyes, apparently to represent closed eyes[39]. All other plastered skulls from Jericho have eyes made of bivalve shells, representing the eyes open. The best preserved of the other plastered skulls found at 'Ain Ghazal is depicted with eyes open, and in general it seems more closely related to the faces on the statues excavated in 1985 to which it is closer in date : eye perimeters are defined by incised lines as if to be inlaid with bitumen, although no bitumen was found[40]. A second plastered skull from 'Ain Ghazal probably also had open eyes delineated with bitumen, but it retains plaster only in one eye socket with an unidentified black substance on the surface[41]. The best preserved eye on a Tell

29. BOULTON, 1988.

30. KINGERY *et al.*, 1988 ; GOREN and GOLDBERG, 1991 ; GOREN and SEGAL, 1995 ; HERSHKOVITZ *et al.*, 1995a ; HERSHKOVITZ *et al.*, 1995b.

31. See especially BIENERT, 1991 ; 1995.

32. HERSHKOVITZ *et al.*, 1995a ; HERSHKOVITZ *et al.*, 1995b ; GORING-MORRIS *et al.*, 1995.

33. For example, D 115 (Reg. 533), now at the Royal Ontario Museum. KENYON, 1981 : Pl. 55. There are discrepancies in published numbers for the total number of skulls from Jericho, the highest being twelve. BIENERT, 1991 : 11.

34. GOREN and SEGAL, 1995. D111 (Reg. 534), now at the Ashmolean Museum, Oxford (Reg. 195-565), and E22 (Reg. 3657), now at the Rockefeller Museum, Jerusalem (JPE 121.32). KENYON, 1981 : Pl. 57.

35. Skull D112 (Reg. 532)], now in the Archaeological Museum, Amman. KENYON, 1981 : Pls. 54, 58.

36. FEREMBACH and LECHEVALLIER, 1973.

37. ARENSBURG and HERSHKOVITZ, 1988 ; YAKAR and HERSHKOVITZ, 1988 ; NISSENBAUM, 1997.

38. More than 20 plastered skulls have been found at the site, but only 2 have been published. CONTENSON, 1971 ; FEREMBACH, 1970.

39. GOREN and SEGAL, 1995.

40. SIMMONS *et al.*, 1990.

41. ROLLEFSON and SIMMONS, 1988 ; BUTLER, 1989.

Ramad plastered skull appears to have whiter outlines and pupil/iris areas, as if bitumen had fallen off, representing the eyes open[42].

Comparison of other features is potentially illuminating, but information is more limited. The ears of the plastered skulls from Beisamoun are single protrusions like the 'Ain Ghazal ears, as are those of at least one plastered skull from Jericho[43]. The ears of another example from Jericho are more ring-shaped[44], while the Kfar Hahoresh skull is missing ears altogether[45]. The mouth of the Kfar Hahoresh skull is depicted in a manner similar to the 'Ain Ghazal face, a horizontal slit between protruding lips, and one Jericho head has a similar mouth[46]. The nostrils of one Jericho head[47] appear to be depicted by elongated indentations similar to those of 'Ain Ghazal plastered skulls and statues, while those of a plastered skull from Beisamoun exhibit rounded apertures.

Comparison of technology and materials is limited to results provided by a few papers[48], but they seem to vary according to site. Plastering a skull which rested on rope appears to be unique, although it would be visible only in the case of damage or by techniques such as computer tomography[49]. The filling of skeletal cavities with grassy stuffing prior to plastering has not been noted in the literature previously, but the presence of skulls and restoration materials would prevent observation of grassy impressions under most circumstances. The closest parallel is the obstruction of the Kfar Hahoresh orbitals with a soft organic material. In contrast to plaster of nearly identical composition used throughout the 'Ain Ghazal faces, plaster at both Jericho and Kfar Hahoresh was built up in multiple layers of different composition, starting with coarse plaster and finishing with finer material. Although marl is believed to be a source material for two Jericho heads, as it is for the 'Ain Ghazal faces, the plaster is regarded as being of poor quality : little or no lime and significant amounts of silica have been found in even the finest layers. By contrast, plaster at Kfar Hahoresh has survived in excellent condition, attributed to use of lime. Silica, believed to have been derived from ash, was mixed with the lime and produced particularly hard plaster in one layer, attributed to a pozzolanic reaction[50]. Mixing plant fibers into the plaster has been noted only for artifacts from 'Ain Ghazal and plaster statue fragments from Nahal Hemar[51], but it seems likely that its use has simply been omitted from other publications. Many plastered skulls from Jericho and the plastered skull from Kfar Hahoresh have pigment traces on top of plaster, but only one skull from Jericho is said to have decorated with pigmented plaster, also pink in color[52]. Bitumen eye inlay, although not an unusual material in the Neolithic Near East, has been reported only on the plastered skulls from 'Ain Ghazal.

Many distinctive stylistic and technical details of the plastered skulls found at 'Ain Ghazal are also found on statues from the site, just as many similarities can be found between plastered skulls and statues from Jericho. Sculpting of features on statues found at 'Ain Ghazal is similar to that on faces, including modeling, incising, and use of bitumen inlays to accent the eyes. This is most striking between the well-preserved plastered skull with open eyes and the statue cache excavated in 1985. Moreover, the plaster used for both faces and statues excavated in 1985 is remarkably similar when compared to plaster at other sites, despite differences noted above. The well-known statue head from Jericho[53] displays bivalve shell fragments inlaid in the eyes like the plastered skulls from Jericho, and there are many similarities in plaster used for both types of artifacts at Jericho[54]. Burial contexts are also similar for plastered skulls and statues at both sites. In contrast, architectural plasters typically reflect construction and composition markedly different from plastered skulls and statues at the two sites. For instance, floor plaster from 'Ain Ghazal shows a layered structure with coarse mineral and marl inclusions in the lowest layer. Similarities between plastered skulls and statues raise the question as to whether they may have served similar functions. The association of headless statues with plastered skulls at Tell Ramad reinforces this possibility.

42. This is most visible in a photograph published by Bienert, BIENERT, 1991 : 14. Ferembach describes the eye of this skull (66-3) as "souligné par sa coloration plus blanchâtre." FEREMBACH, 1970 : 251. The whiter areas resemble those where bitumen had fallen off statues excavated at 'Ain Ghazal in 1985. Such areas were invariably whiter in color, apparently because they were cleaner.

43. Skull E22.

44. Skull D112.

45. GORING-MORRIS, 1995.

46. Skull D 110 (Reg. 531), now in the Archaeological Museum, Amman. KENYON, 1981 : Pl. 54.

47. Skull E22.

48. KINGERY *et al.*, 1988; HERSHKOVITZ *et al.*, 1995a; HERSHKOVITZ *et al.*, 1995b; GOREN and SEGAL, 1995.

49. However, use of twine was integral to fabrication of armatures for plaster statues from 'Ain Ghazal, as well as for making plaster beads at Nahal Hemar. KINGERY, 1988.

50. HERSHKOVITZ *et al.*, 1995a; HERSHKOVITZ *et al.*, 1995b; GOREN and SEGAL, 1995.

51. BAR-YOSEF and ALON, 1988.

52. Skull D 115.

53. Israel Department of Antiquities and Museums No. 35.3289, Rockefeller Museum, Jerusalem.

54. GOREN and SEGAL, 1995.

CONCLUSION

Excavations at the site of 'Ain Ghazal have increased our insight into the cultural and technological advances of its inhabitants during the PPNB, and, because of the wealth of information, of the ancient Near East as a whole. The three plaster faces excavated in 1985 are noteworthy in several respects. Carbon-14 dating makes them the earliest plaster sculptures found at the site and one of the earliest dated groups of human sculpture from the Near East. The fact that the faces were buried in a damaged and fragmentary state without their skulls enables aspects of the technology and construction to be documented which were previously inaccessible. Finally, their careful burial not only sheds new light on the ritual practices of the skull cults but raises tantalizing questions. Were the plaster faces buried when the plastered skulls became damaged or outmoded? Were the skulls given a separate burial or were they replastered so that their cult use would continue?

These three plaster faces exhibit a high level of craftsmanship and control of technology. Their condition is astounding considering their age, superior to the statues excavated in 1985 which are later in date. That the pink surface layer is eroded but otherwise well preserved and remains well adhered to underlying plaster reflects significant technological skill.

Finally, we would like to emphasize that it was through the intervention of trained conservation staff on the site and in the laboratory that new technological information has been provided and complete recovery of material has been possible. In particular, laboratory experimentation has shown that plaster making was controlled and energy efficient, possibly occurring at temperatures lower than previously supposed. The blocklifting process permitted both careful reconstruction of the artifacts (actually a necessary step in correctly identifying that these were the faces of plastered skulls) and use of a minimal conservation treatment which does not inhibit their future study.

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Conservation treatment of the faces was performed principally by Patricia Griffin, then an archaeological conservation intern at the Smithsonian Institution's Conservation Analytical Laboratory under the supervision of Carol Grissom. However, many other individuals at the laboratory were essential for completion of the project. Holly Lundberg assisted with reassembly, while Harriet Beaubien participated in discussions and provided advice at various stages of the project. Melanie Feather, Camie Thompson, and Charles Tumosa provided technical support for SEM examination, EDS analysis, and Xero-radiography. Pamela Vandiver shared observations on floor plaster and limestone rocks from the site. Finally, Anne Liégey proved a valued colleague during conservation.

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