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For nearly a century Egyptian mummy portraits have been discussed in Egyptological literature, and they have been used as indicators of hairstyles, jewelry, social status, etc. Invariably the paintings are described as "haunting", "stunning", or "unsettling".[1)] and the emotional appeal of the portraits is undeniable, in that the viewer comes face to face with an ancient Egyptian at a more personal level than even viewing the actual mummy. As with many scientific assessments of Egyptian mummies, we can turn to forensic techniques to help solve the mystery of these enigmatic portraits. Three-dimensional facial reconstruction has been used for the past 25 years in Britain for forensic identification from skeletal remains, and recently several studies have been carried out using facial reconstruction to assess the accuracy, time of production and artistic techniques of the mummy portraits. It has been estimated that there are more than 1000 mummy portraits,[2)] but fewer than 100 are still bound to their mummies.[3)]

It is possible to reconstruct the face of an individual onto the dry skull, and a technique was pioneered in Manchester, primarily by Richard Neave.[4)] This technique is based on a combination of the Russian[5)] anatomical approach and the North American[6)] tissue depth approach. Gerasimov, a Russian anthropologist, developed the anatomical technique by modeling the facial muscles onto the skull. His method relied upon the skeletal structure of the skull for the recreation of the facial musculature and, therefore, the facial form. Alternatively, the North American method, as developed primarily by Krogman[7)] and Gatliff,[8)] relied upon sets of mean facial tissue depths from anatomical points over the surface of the skull, which related to the sex, age and racial origins of the specimen. The Manchester method uses these tissue depth measurements as guides during the procedure, whilst sculpting the facial muscles one-by-one onto the skull. In the cases of Ancient Egyptians with Negroid

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1) C. Katatsaki, "Fayum: Portraits of the Human Soul", *Hermes* (July-August, 1999), 36-7; J. Berger, "The Fayum Riddle". *Doubletake* (Spring 1999), 141-143.

2) Berger, op. cit. 12.

3) L H. Corcoran, Portrait Mummies from Roman Egypt (Chicago 1995), 3.

4) J. Prag and R.A.H. Neave, Making Faces (London: British Museum Press 1997).

5) M. Gerasimov, Face Finder (New York 1971).

6) B.P. Gatliff and C.C. Snow, "From skull to visage", *Journal of Biocommunication* 6(2) (1979), 27-30.

7) W.M. Krogman and M.Y. Iscan, The Human Skeleton in Forensic Medicine (Illinois: C.C. Thomas Publishers, Illinois 1986).

8) Gatliff, op. cit.

skulls, tissue data from Black North Americans[9] are used. In the cases of Ancient Egyptians with Caucasoid skulls, tissue data from Mixed Race Africans[10] or White Europeans[11] are used. The origins, attachments and strength of each muscle, and the details of the facial features can be determined from the skeletal structure, following the reconstruction rules of Krogman, Gerasimov, Fedosyutkin and Nainys,[12] and Neave.

The Unit of Art in Medicine at the University of Manchester has a 75% success rate with identification following forensic facial reconstruction and has carried out many laboratory studies into the accuracy of the technique. These results suggest that it is possible to recreate the face of an individual that could be recognized by a relative or close friend.[13] Therefore, the accuracy of this forensic facial reconstruction technique is considered sufficient to enable a comparison of the face of an Egyptian mummy with the attached portrait.

A study was carried out by R. I. Macleod and associates[14] of an ancient Egyptian mummy from the collection of the National Museums of Scotland. The mummy was examined by CT scanning and a facial reconstruction was prepared and compared with the painted portrait attached to the wrappings. No mention is made as to whether the portrait was viewed prior to the production of the reconstruction, but the results suggest that the face is a close resemblance to the portrait.

The largest study of mummy portraits with facial reconstruction was carried out by Wilkinson, Neave and Smith[15] using four different Egyptian mummies. One male and one female from the British Museum collection,[16] one male from the Carlsberg Glyptotek collection[17] and one male from the Metropolitan Museum of Art collection[18] were reconstructed in a blind study. The British Museum mummies had been previously unwrapped and the original skulls were available, but the other two specimens were intact and the skulls were reconstructed from the digital data from CT scans.[19] The reconstructions of the British Museum mummies showed strong similarities to the portraits with many consistent features, particularly at the mouths, noses and facial proportions

9) J.S. Rhine and H.R. Campbell, "Thickness of facial tissues in American Blacks", *Journal of Forensic Sciences* 25(4) (1980), 847-858.

10) V.M. Phillips and N.A. Smuts, "Facial reconstruction: utilisation of computerised tomography to measure facial tissue thickness in a mixed population", *Forensic Science International* 83 (1996), 51-59.

11) R. Helmer, Schadelidentifizierung durch elektronische Bildmischung (Heidelberg: Kriminalistik Verlag 1984).

12) B.A. Fedosyutkin and J.V. Nainys, "The relationship of skull morphology to facial features", Chapter 15 of Forensic Analysis of the Skull, eds. M.Y. Iscan and R.P. Helmer (New York 1993).

13) C.M. Wilkinson and R.A.H. Neave, "Skull re-assembly and the implications for forensic facial reconstruction", *Science & Justice* 41 (3) (2001), 233-234; C.M. Wilkinson and D.K. Whittaker, "Juvenile forensic facial reconstruction – a detailed accuracy study". Proceedings of the 10th Meeting of the International Association of Craniofacial Identification (Italy 2002), 98-110.

14) R.I. Macleod, A.R. Wright, J. MacDonald, and K. Eremin, "Historical Review – Mummy 1911-210-1", *J.R.Coll.Surg. Edinb.* 45 (April 2000), 85-92.

15) K. Douglas, "Image is everything", *New Scientist* 2320 (8 Dec 2001), 39-41.

16) The author would like to thank the British Museum and Dr. Paul Roberts and his team for providing these specimens.

17) The author would like to thank the Carlsberg Glyptotek and Dr. Niels Lynnerup and his team for providing the specimen.

18) The author would like to thank Dr. Bob Briers, Dr. David Mininberg and his team, and the Metropolitan Museum of Art for making their CT scan data available.

19) H. Hjalgrim, N. Lynnerup, M. Liversage and A. Rosenklint, "Stereolithography; Potential applications in anthropological studies", *American Journal of Physical Anthropology 97* (1995), 329-333.

(*Figs. 1A,1B*). The comparison of the reconstruction and the portrait for the Glyptotek mummy suggested some inconsistencies. The portrait and the reconstruction were very different in facial features and proportions and appeared to show individuals of different ages and racial origins (*Fig. 1C*). The reconstruction of the Metropolitan Museum mummy also appeared to show inconsistencies to the portrait, but these differences were subtler. The facial proportions and many facial features matched closely, but the portrait revealed the face of a somewhat younger man with a narrower nose (*Fig. 1D*). These four mummies yielded somewhat different results, but each gave some insight into the accuracy of the portraits. However, the numbers included in the study were very small, too small to draw any general conclusions, and it was the hope of the researchers that further studies could be carried out on other mummies to shed additional light on these enigmatic portraits.

An opportunity to carry out further research came about through Professor Daszewski, head of the Archaeological Mission of the Polish Centre of Archaeology in Cairo (Warsaw University) at the Marina el-Alamein site in Northern Egypt.[20)]

Fig. 1. Mummy portraits and their facial reconstruction: A and B – male and female from the British Museum collection; C – male from the Carlsberg Glyptotek collection; D – male from the Metropolitan Museum of Art collection (Reconstruction photos C. Wilkinson, Unit of Art in Medicine, University of Manchester; portraits S. Walker, Ancient Faces, Routledge, New York 2000)

20) W.A. Daszewski, "Excavations at Marina el-Alamein 1987-1988", *MDAIK 46* (1990), 15-51; id., *PAM II, Reports 1990* (1991), 30ff.; id., *PAM III, Reports 1991* (1992), 33-34; id., *PAM IV, Reports 1992* (1993), 28; id., *PAM VIII, Reports 1996* (1997), 73-75; id., *PAM X, Reports 1998* (1999), 43-46; id., *PAM XI, Reports 2000* (2001), 54-56.

A Hellenistic-Roman town was excavated there, its necropolis yielding evidence of many mummified bodies. The mummy in question comes from the early 2nd century AD and was buried not in the main funerary chamber of a large underground tomb (T 6), but in the western of two additional burial chambers cut in the rock on either side of a rockut staircase that led down to the main chamber of the tomb. There were three other mummies, all males of different age, in this small carefully concealed chamber. All four mummies were provided with portraits painted on wooden panels, but only one was preserved in anything like fair condition (it is now in the storeroom of the Graeco-Roman Museum in Alexandria). A facial reconstruction of this mummy, a young man with a gold leaf between his teeth, was suggested as a further blind study. The skull of the mummy was copied on site,[21] using a dental alginate mould, and the plaster skull was transported to the University of Manchester where the facial reconstruction was produced.

The young Egyptian was known to be 29 to 30 years of age and the skull was in good condition. All the maxillary teeth were present except the 1st and 2nd left premolars, 2nd right premolar, 1st left molar and 2nd right molar. All the mandibular teeth were present except the 1st and 2nd right incisors and the 1st and 2nd right premolars. The skull was small and gracile with a high level of symmetry. The skull suggested an oval face shape with a high forehead and gonial angles greater than 125 degrees. It exhibited moderate brow ridges, supraorbital notches and a deep nasion. The skull had an elongated sagittal contour, frontal bossing (which was more marked on the right than the left), a domed cranium, large developed mastoid processes, mild prognathism, a marked occipital bulge and gonial flaring (*Fig. 2*).

The finer details of the skeletal structure of the skull suggested slight upturned eye fissures (laterally), eyes of normal protrusion and arched eyebrows following the supraorbital margin. The nasal bones indicated a horizontal columella, a narrow nasal width, a high nasal root, rounded tip and high oval alae with the left alar margin being higher than the right. The nasal profile was hooked. The teeth exhibited an overbite with the maxillary teeth projecting further than the mandibular teeth. The mandibular canines were prominent suggesting a square lower lip shape, and the height of the teeth indicated thick lips, with the lower lip being

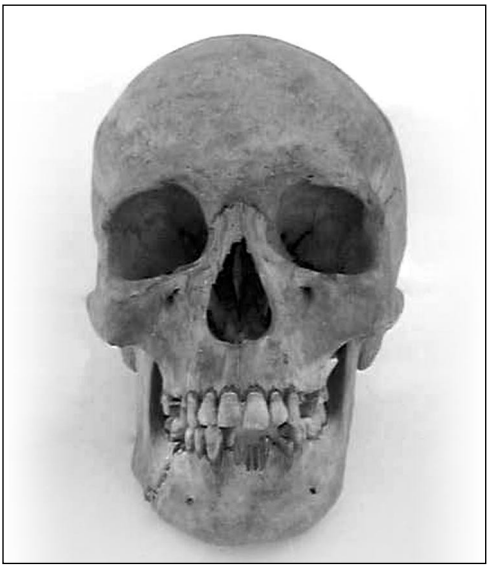

Fig. 2. The skull of the Marina Mummy (Photo C. Wilkinson, Unit of Art in Medicine, University of Manchester)

21) The author was invited by Prof. W.A. Daszewski to join the team and make a cast of the skull during the March 2002 field season at the site.

thinner than the upper lip. The enamel line of the upper teeth suggested a Cupid's bow shape to the upper lip, and the levator muscle attachments indicated upturned mouth corners. The zygomatic bones were moderately prominent and the chin appeared retrusive and square with no mental crease. The canine fossae were shallow suggesting an absence of nasolabial creases. The mastoid processes indicated moderately sized adherent ears.

The skull cast was mounted on a pole in the Frankfurt plane. Mixed Race African male adult data was used.[22] Holes were drilled into the cast of the skull at ninety degrees to the bone surface at the appropriate 21 anatomical points using a 3 mm drill bit. Wooden pegs were cut to the lengths governed by the tissue depth data and inserted into the holes in the cast. In this way a set of guides for tissue depth across the face was attached to the surface. Plaster eyeballs were set into the eye sockets, at normal protrusion, using clay. Normal protrusion was taken as the cornea being approximately 3.5 mm anterior to the tangent drawn from superior to inferior margins of the orbit. The muscles of the head and neck were modeled onto the skull in clay, one by one. Adherent ears were modeled and attached to the sides of the head using the external auditory meatus to determine position. Skin strips were rolled, shaped, and placed over the muscle structure to create the finished face. This layer mirrored the shape of the muscles

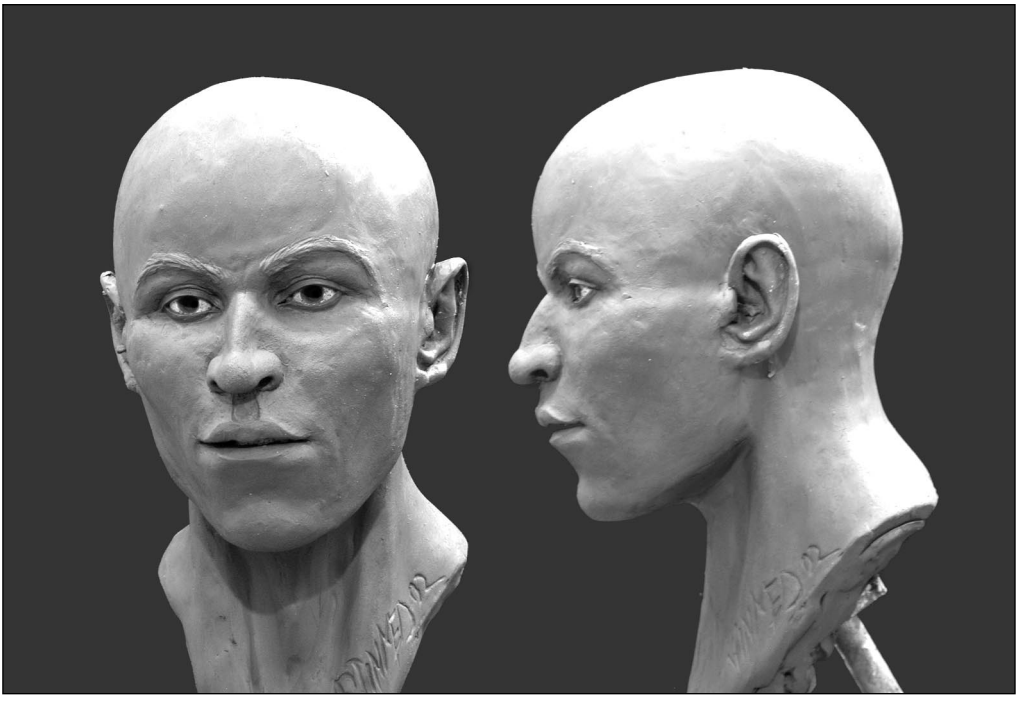

Fig. 3. Model of the head and face of the Marina Mummy (Photo C. Wilkinson, Unit of Art in Medicine, University of Manchester)

22) See note 10 above.

below. During this process the tissue depth pegs were used as guides. The details of the facial features (nasal shape, lip form and eyebrow pattern) were modeled with respect to the assessment of the skull. The surface of the face was smoothed and a final sculptural finish achieved (*Fig. 3*).

At this stage the portrait was viewed and compared with the facial reconstruction. The portrait was not in good condition and some of the facial detail was not visible. However, from the visible detail it appeared to show a face with many features consistent to the facial reconstruction. The eyebrow pattern, eye shape, nasal shape, lip shape, chin shape and facial proportions were similar (*Fig. 4*). The jawline appeared rounder and the face fuller in the portrait than on the facial reconstruction. The eye size also appeared larger in the portrait, but this is a common feature of such portraits and the eyes are often depicted larger than would be likely in life.

Following the unveiling of the portrait, the hair was modeled in the short-cropped curly style seen in the painting, and a similar beard was added to the facial reconstruction (*cf. Fig. 4*). Otherwise the facial reconstruction was not altered in any way.

In conclusion, this study suggested that the portrait was a reliable indicator of the appearance of this individual in life, and proved to be another interesting addition to the portrait-facial reconstruction research series.

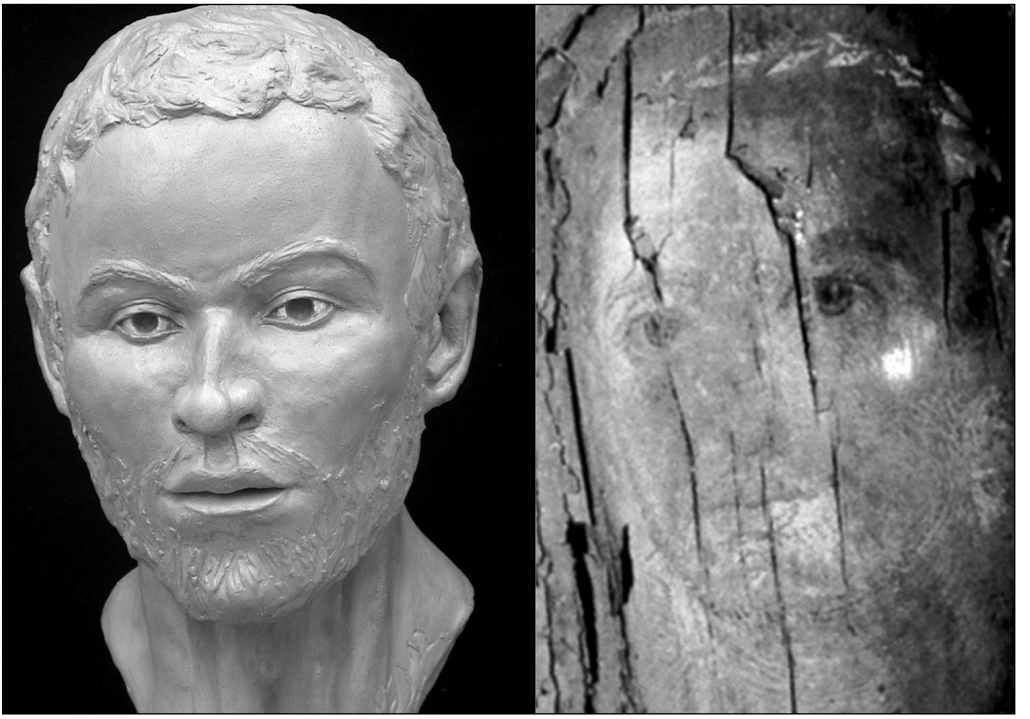

Fig. 4. The Marina Mummy: life portrait on left, portrait painted on wood from the burial on right (Photo C. Wilkinson, Unit of Art in Medicine, University of Manchester (left); W.A. Daszewski)