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Author(s): Renée Stein, Katherine Singley, Mimi Leveque, Alexandra Klingelhofer, and Ronald Harvey

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RESTORATION REVISITED: ANCIENT AND MODERN REPAIRS ENCOUNTERED IN THE CONSERVATION OF AN ANCIENT EGYPTIAN COLLECTION

Renée Stein, Katherine Singley, Mimi Leveque, Alexandra Klingelhofer, and Ronald Harvey

The acquisition of the Niagara Falls Museum collection of Ancient Egyptian objects launched a two-year conservation project which has involved the cooperative efforts of numerous museum staff, scholars, scientists, curators, and conservators. This paper is a reflection of that on-going collaboration.

Conservation of the mummies and coffins in preparation for their installation in the renovated galleries has provided an opportunity to consider the variety of repairs and restorations seen among the collection. Some of these restorations are clearly modern, probably dating to the nineteenth or early 20th centuries. Other modifications, however, appear to be ancient, indicating damage that was repaired, materials that were re-used, or constructions that were recycled for continued use in antiquity. Technology of construction, ancient alterations, modern repairs, and subsequent damage all had to be interpreted and reconciled with current treatment and aesthetic goals. The primary objective has been the stabilization and long-term preservation of the coffins and mummies. Visual compensation and integration are intended to aid the interpretation of these objects as part of a major permanent gallery installation.

A brief survey of these complex objects reveals a wide range of conditions and preservation issues. Many of the coffins were separated along joints in the pieced wood constructions, and one coffin was broken into numerous pieces. All of the wood and paint surfaces had layers of dust and grime. Several of the coffins appeared to have been near a fire, as evidenced by surface coatings that were embrittled from extreme heat and heavy soot that concealed the painted images. Direct contact with water, perhaps again in association with a fire, caused paint discoloration and staining from the migration of dirt and residues from the bodies. Water damage also caused lifting and distortion of painted linen and plaster layers, compromised the structural integrity of the wood, and promoted the efflorescence of salts. Extensive paint loss revealed the underlying wood and preparation layers, detracting from the legibility of both images and hieroglyphs. Abrasions, damages, flaking paint, and deteriorated surface coatings disfigured the carefully carved and painted faces (Fig. 1).

Many of the coffins were previously repaired, during their almost 150 years as part of the Niagara Falls Museum collection. Rusting iron nails and screws were added to repair or reinforce failing joints. New boards, held in place with nails, plaster and a densely woven cloth, were attached to the undersides of severely weakened coffins. Structural and surface losses were often filled with a hard grey or white compound that tested positive for lead. A similar lead-containing putty, resembling window caulking, was applied to the rims of several coffin bases to secure contoured glass, making the coffins into vitrines for the mummies inside. Modern dowels were added, mimicking the ancient joining technique and often attempting to disguise the new additions with a layer of simulated “mud”. New pieces of wood were often inserted to plug losses or reinforce the ancient constructions. These small, oddly shaped additions are usually

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roughly contoured to the loss and only sometimes toned to match surrounding surfaces, thus leaving them readily visible.

These modern repairs sometimes accompanied extensive restorations. A set of inner and outer coffins were a nested pair built and decorated around 700 BCE for the female mummy of Iawttayesheret, who had been a servant to the Divine Adoratrice or Highest Priestess of Amun at Thebes during Nubian domination. The nesting coffins were constructed from numerous planks of an unidentified hardwood joined with wood pegs. The tenons that join the lid to the base are still in good condition and have been drilled to receive a dowel securing the two halves together. The wood of the outer coffin is left partly exposed, while the inner coffin is completely painted on both interior and exterior. In damaged areas along structural joints of the inner coffin, it is possible to see a dark-resinous pitch-like material directly on the wood substrate. Coarse fibers are often interspersed in the dark resin. This resin appears to have been used as an adhesive along joints and as a preliminary coating. The decorative paint lies on a white preparation that is layered with linen, visible through shallow losses and in cross-section samples viewed under magnification.

When the inner and outer coffins arrived at the Carlos Museum, both faces had disturbing, oversized yellow eyes made from plaster. These eyes were certainly not ancient and were probably added to the coffins in the 19th or early 20th century. In antiquity, the faces would have been inset with eyes formed from bronze, stone, shell, or glass. Inlaid eyes were easily removed from the coffins for reuse of materials or for separate sale. The large plaster eyes, surrounding fabric, and overpaint on the nested coffins were removed during recent conservation to reveal carefully carved cavities which would have received the inlaid eyes. A black line that served to outline the shapes for carving is preserved on the wood of the eye cavities (Fig. 2). During treatment, exposed wood was covered with layers of Japanese tissue, and the final layers were toned to match the surrounding painted surfaces. New eyes and eyebrows modeled after ancient examples of bronze and stone inlays were then fabricated from Milliput epoxy putty. The epoxy was molded into the carved cavity over a barrier layer. Once cured, the epoxy putty was painted to simulate bronze. Toned paper was used to re-create the stone eyeballs and pupils. The replacement eyes were then adhered in place with Acryloid B-72.

Not all repairs and restorations seen on the coffins are, however, modern additions. The small wedges and rectangles of wood seen among the long planks of the 25th dynasty outer coffin were installed in antiquity (see Figure 3). The notches and plugs serve no structural or joinery purpose in the construction of the coffin. These boards were probably originally cut for some other ancient object, perhaps an article of furniture or a boat. Good timber was valuable, relatively scarce and often imported into Ancient Egypt. Previously cut boards were recycled to build this coffin, and the voids were filled with small pieces of wood held in place with wooden pegs and mud. The damage seen on the foot board of a 21st dynasty coffin may provide evidence of another example of ancient re-use. The square board at the end of the coffin is pierced near its center with numerous holes, approximately 0.5cm in diameter. Damage from wood-boring insects or worms is evident in only one other board in the coffin construction, and the body

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within the coffin showed little sign of insect activity. It, therefore, seems that this localized damage may have occurred to the board prior to the coffin's construction.

Sometimes entire coffins seem to have been re-used in antiquity, presumably discarding the original occupant and perhaps modifying the coffin for burial of another deceased. Evidence from two coffins in the Carlos Museum collection suggests their probable re-use in antiquity. Careful examination of a 21st dynasty coffin lid reveals that the painted areas around the hands have been modified. The open hands indicative of a female, or closed hands representing a male, on 21st dynasty coffin lids are carved separately and peg-joined to the coffin before decoration. If a coffin were to be reused for a deceased of a different gender, the hands could be removed and replaced with relative ease. The painted areas surrounding the hands on one coffin lid are unvarnished and lack the glossy finish of the surrounding surfaces. The painted pattern of the broad collar has been replicated, but the shapes are clumsy and the strokes are much less refined. Filling and repainting of isolated damage using materials apparently similar to the original is not typical of the modern repairs seen throughout the collection. After discussing this repair with curators at the Carlos Museum and with visiting researcher John Taylor, it was concluded that this repair to the hands is likely to be ancient. Of course, raised additions to the coffins are also likely sites for damage, but there would be little opportunity to notice and repair such damage in antiquity unless the coffin were removed from its tomb, probably to be re-used for another burial.

The ancient re-use of a second coffin became apparent during the conservation treatment of another 21st dynasty example. The coffin is typical of the construction and decorative style common around Thebes (modern Luxor) during the period dating approximately 1075 to 945 B.C.E. The boards are cut from local hardwood, probably sycamore fig, which was cultivated in Ancient Egypt for its fruit and timber. Long contoured side-boards are secured with wooden dowels to the base board. A curved board is attached at the head and a single square board at the foot. A recessed channel is carved in the rim to receive the lid. Deep sockets held tenons that secured the lid to the base. The wood surfaces are covered with a mud layer of varying thickness, sometimes followed by a white preparation layer. The mud layer covered joints in the wood construction and provided a uniform surface in preparation for painting. A thin layer of yellow paint served as the background for the decorative painting. Scenes and text panels were outlined in red or black paint, and the details were painted in progression - red, blue, green, and then black (Fig. 4). Whether this ordered application was to allow paint to dry or if each color represents the work of an individual artisan is unclear. Many coffins were then coated or "varnished".

Examination of the exterior of the coffin revealed curious areas where the hieroglyphs were over-painted in yellow, and in one area additional hieroglyphs were painted over the yellow (Fig. 5). Assisted by visiting Egyptologist Joyce Haynes, curators at the Carlos were able to decipher the hieroglyphs. They discovered that the original occupant of the coffin was a woman named "Tanakhtanettahat", and that she had served as a chantress in the Temple of Amun at Thebes. When the coffin was re-used in antiquity, the name of Tanakhtanettahat was obscured

with yellow over-paint and the name “Ta’aset”, was added to identify the second occupant of this coffin. Similar overpaint conceals the name of the original occupant where it appeared on the lid of the coffin. The interior of this 21st dynasty coffin is also painted, and many of the images on the interior side-walls are overpainted with a matte red paint. In some instances the re-paint carefully outlines existing images, leaving them visible in the field of red. Other figures were completely over-painted and can be seen only as shadows under the red paint. On the bottom of the coffin, linen from the first mummy was overpainted in the second campaign and linen from a second mummified occupant is adhered to the topmost paint layers. A large crack and surrounding paint loss extended across the ankle region of the re-used coffin lid. Inspection of the painted surface at the ankles and lower legs revealed a confusion of layers (Fig. 6). Portions of the decorative surface appear to have been repainted. Similar to the repaired hands on a coffin lid discussed earlier, isolated areas are unvarnished, the designs are more crudely rendered, and the colors are limited to red and blue on yellow. In contrast, the surrounding surfaces are delicately painted with green and black as well as red and blue, followed by a thick coat of varnish. Looking at the underside of the lid helped to clarify the confusion of the painted surface. Ancient damage had left the central board of the lid pierced with multiple complex fractures. The cause of this damage is unclear, but it appears that a heavy object probably struck the lid from above. This disfiguring damage would have necessitated localized repair and repainting of the exterior prior to re-use of the coffin for its second occupant. The damaged area was patched with mud to create a more uniform surface for repainting. The mud was layered with a white preparation and painted yellow. The registers of designs and images seen in the first decorative campaign were continued and repeated in the new painting, although with less refinement and a more limited palette. The layering, the pigments and the decorative motifs of the ancient repair are, therefore, similar to the original painting technique. During the recent conservation, the flaking layers of mud and repaint were stabilized. In some areas, the mud and repaint were reduced to reveal the more delicately painted images below and to minimize the visual confusion of the surface. Through conservation treatment, this ancient repair has been documented and preserved. The richly painted decorative surface with its ordered registers of designs and images has also been made more legible. The upper and lower halves of the coffin lid are now better integrated, allowing the high quality of the painting to be appreciated.

Ancient re-use of this coffin helps to explain the presence of a poorly mummified body in such a finely painted coffin. X-radiography, CT-imaging, and endoscopy have provided evidence of the body’s incomplete mummification, revealing that most of the internal organs were left within the body, counter to normal mummification in which only the heart would remain. The shrunken brain is clearly visible in a CT image of the skull (Fig. 7). The flesh is poorly preserved and brittle. Incomplete mummification could promote deterioration due to insect infestation. Examination of another mummy in the collection revealed pupal cases of the blow fly that probably infested the body soon after death. The blow flies, along with dermestid beetles, managed to survive and multiply for some time within the wrappings. Apart from these unusual cases, the poor state of preservation of most of the mummies was generally due to their having been partially or completely unwrapped either in antiquity or in the 19th century. The

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unwrapping of mummies by tomb robbers looking for jewelry or amulets began in antiquity and continued into modern times. Once brought to the West, mummies were not immune from indignities: the Victorians were known to unwrap mummies as a morbid parlor game. It is evident that some of the Niagara mummies had been opened in antiquity, since both wrappings and bodies had been equally exposed to incursions of mud and soil. In some cases, however, it is clear that the unwrapping was more recent and done purely for voyeuristic purposes. Subsequent damage to the unwrapped mummies has been largely due to their long-term exposure to dust, light, heat - including a fire in some cases - and excessive moisture, probably in the attempt to put out the fire. The result to both bodies and textiles has been extreme soiling, discoloration, embrittlement, and the development of mold.

The examination and treatment of these mummies has been governed by respect for them as individuals and for the culture that produced them. While treatment of human remains is not acceptable in some cultures, for the ancient Egyptians, assurance of an afterlife was conditional upon remembering the person, repeating their name, and preserving the body. The separation of mummies and coffins is known to have occurred prior to sale in 19th-century Egypt, and bodies were shuffled among coffins at the Niagara Falls Museum. Recent work with the mummies has re-associated some bodies with their appropriate coffins, enabling their names to be read and then used in all written and verbal references to the body.

Using minimally invasive techniques of examination and stabilization we have had the opportunity to learn about these individuals and about mummification practices. The linens were gently dusted, layer by layer, into a HEPA filter vacuum and re-configured. After cleaning, the linens were rearranged, occasionally with added stitches. Some of the most damaged mummies required encapsulation in Stabiltex, a sheer polyester fabric that secures the delicate textiles while permitting details of the wrappings to remain visible. Figure 8 shows the mummy of a male priest prior to conservation, and Figure 9 illustrates the same mummy on the right after stabilization and encapsulation. After conservation, the mummies were placed on contoured boards to provide support and facilitate handling. These boards were cut from birch or MDO plywood, wrapped with Marvelseal, padded with polyethylene batting, and covered with pre-washed linen. Small feet cut from Ethafoam and hot glued to the bottom allow the mummy to be safely lifted without tilting. Once conserved, the mummies will be returned to their coffins.

Conservation of the mummies offered an opportunity to examine and document the variety of textiles used as wrappings, recording weave patterns and the use of colored threads. The wrapping technique of each layer was noted, including any interesting features such as delicate fringe or an unusual braid used to add height in compensation for damage to the feet. Ancient stitching and seams, as well as evidence of ancient wear and repair attest to the fact that these textiles had served other uses prior to becoming part of the mummy wrappings. One wadded textile found among the wrappings of a male mummy proved to be part of a shirt. Another tangled length may have once been a shawl or belt. A textile removed from near the head of another mummy bears an inscription that may offer further clues to the identity of the body.

Conservation of the coffins has provided the opportunity to document construction as well as the materials used in decoration. Samples of wood, preparation layers, pigments, and coatings were routinely removed for analysis. When pertinent to the treatment, samples were sent out for immediate identification. Further analysis and interpretation will continue in the future. One research area of particular interest is the variety of surface coatings seen among the collection. These coatings are often unevenly applied, varying in color, thickness, and coverage. These surface coatings generally fluoresce under ultraviolet light. Samples of coatings have been analyzed via FTIR and GC-MS. The coatings often contain a conifer resin, such as pine. The conifer resin may also be mixed with a *Pistacea* resin, the species from which mastic is produced. Conifer and *Pistacea* resins are known to have been used in ancient Egypt. Non-drying fat, head-bodied drying oil, and beeswax were also identified in samples of coating layers. In some examples it remains unclear whether the additional fat, oil, or wax components are mixed into the natural resin layer or if they comprise a separate, discreet layer. Some cross-sections reveal multiple coatings, while other samples appear to contain only a single layer. It is certain that many of the coffins have been restored and repaired in the past. The fat, oil, or wax could have been applied in a previous effort to re-saturate or consolidate the painted surfaces. These components could, however, be ancient. The surface of one 22nd-dynasty coffin is covered with an undecorated black layer of unquestioned antiquity. This layer was identified as animal fat. The surface of another coffin is varnished with natural-resin, but also shows isolated drips and patches of a darkened coating that was found to contain a heat-bodied drying oil, possibly linseed oil. It has been suggested that this oil might have been applied in antiquity as a libation. The ancient Egyptians associated magical properties with wax and used it as an adhesive as well as to form ritual objects. The composition and antiquity of the various surface coatings certainly warrant continued investigation. Future research projects involving the Carlos Collection will hope to further investigate the coatings, construction methods, and intended appearances of the coffins.

Acknowledgements

Numerous individuals contributed their interest and expertise to the on-going project of examining, documenting, and conserving the mummies and coffins in the Carlos Museum collection. This work was undertaken at the Parsons Conservation Laboratory of the Michael C. Carlos Museum, under the stewardship of Head Conservator Therese O’Gorman. Egyptologists Peter Lacovara, Curator of Ancient Egyptian & Ancient Near Eastern Art, and Betsy Teasley Trope, Assistant Curator for Permanent Collections, shared their knowledge and expertise. This project was further complemented by the collegueship of Bob Brier of Long Island University, John Taylor of the British Museum, and Joyce Haynes of the Museum of Fine Arts in Boston. X-rays and CT-images were interpreted with Heidi Hoffman of the Emory University Hospital. Cross section samples were prepared and examined by Philip Klausmeyer of Klausmeyer Conservation Studios and Susan Buck of Historic Paint and Architectural Services. Richard Newman and Michele Derrick performed FTIR and GC-MS analyses at the Museum of Fine Arts in Boston. Wood samples were identified by Regis Miller of the Center for Wood Anatomy

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Research and Kent Schneider of the U.S. Department of Agriculture. Visiting conservators, volunteers, and students assisted in the conservation treatments.

Materials

Acryloid B-72

Conservation Resources International, L.L.C., 8000-H Forbes Place, Springfield, VA, 22151, (800) 634-6932

Klucel G

Talas, 568 Broadway, New York, NY 10012, (212) 219-0770

Marvelseal

Bell Fibre Products, Bell Packaging Corp., P.O. Box 1158, Columbus, GA 31993, (706) 323-7316

Milliput

Conservation Support Systems, P.O. Box 91746, Santa Barbara, CA 93190-1746, (800) 482-6299

Stabiltex

Talas, 568 Broadway, New York, NY 10012, (212) 219-0770

Authors' Addresses

Renée Stein, Michael C. Carlos Museum, Emory University, 571 South Kilgo St., Atlanta, GA 30322

Katherine Singley, Conservation Anthropologica, 1083 Oakdale Rd, NE, Atlanta, GA 30307

Mimi Leveque, ArchaeaTechnica Conservation, 83 Galen St., Waltham, MA 02451

Alexandra Klingelhofer, P.O. Box 2673, Macon, GA 31203

Ronald Harvey, Tuckerbrook Conservation, RD 2, Box 589D, Lincolnville, ME 04849



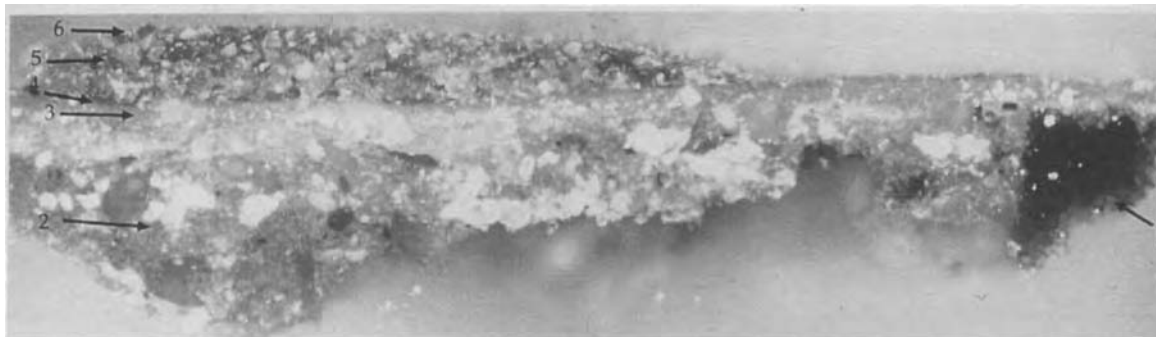
Figure 1. Detail of 21st Dynasty coffin showing typical conditions found among the recently acquired collection. Note separation along structural joints, old fills, flaking paint, and losses. Coffin of Tanakhtanettahat, 1075-945 B.C.E., 181cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.17A.



Figure 2. Detail of the cavity carved into the wood of a 25th Dynasty coffin to receive the inlaid eye and eyebrow. Note the linen layer beneath the paint, especially visible above the eyebrow. Inner coffin lid of Iawttayesheret, 760-656 B.C.E., 171cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.8D.



Figure 3. Detail of a 25th Dynasty outer coffin lid, showing small wedges and plugs of wood inserted to fill voids in recycled boards. Outer coffin lid of Iawttayesheret, 760-656 B.C.E., 191cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.8B.



Photomicrograph of cross-section sample from painted surface of Egyptian Coffin Base, c. 950 BC, 10X objective used, Michael C. Carlos Museum, acc. no. 1999.1.134

- 1) fragment of wood substrate
- 2) mud surface preparation layer consisting of coarse particles and occasional plant fiber
- 3) yellow pigmented paint layer
- 4) very thinly applied wash of red pigmented paint
- 5) paint layer consisting of coarsely ground Egyptian blue pigment particles
- 6) thinly applied upper paint layer consisting of greenish brown pigment particles

Figure 4. Cross section of preparation and paint layers on a 21st Dynasty coffin. Prepared and examined by Philip Klausmeyer. Coffin of a Priestly Official, 1075-945 B.C.E., 187cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.13A.



Figure 6. Detail of the hieroglyphs on the re-used 21st Dynasty coffin. The written name of the original occupant is overpainted with yellow paint in the right column. Coffin of Tanakhtanettahat, 1075-945 B.C.E., 181cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.17A.

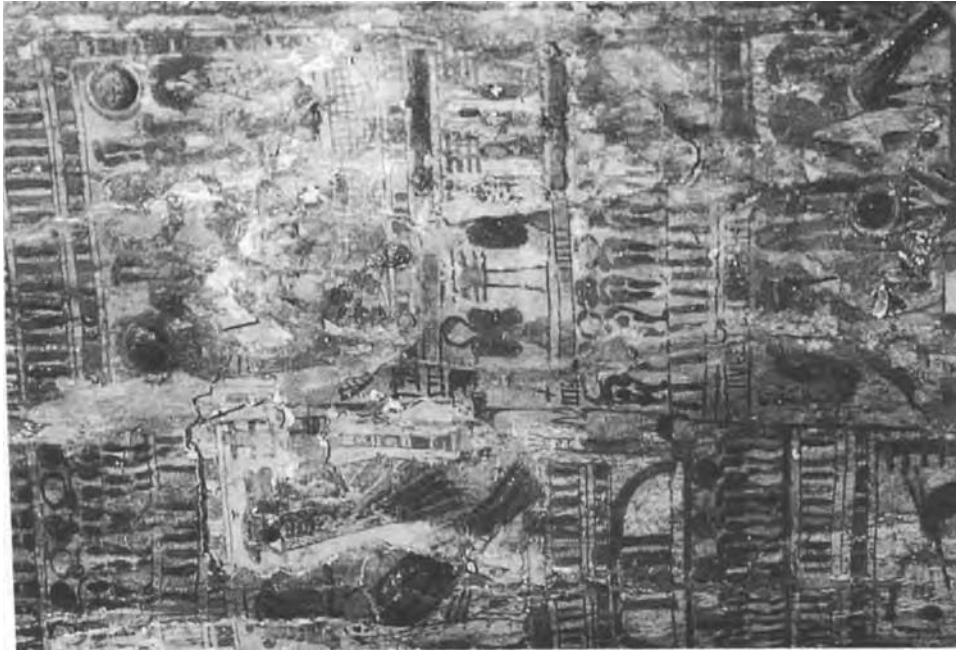


Figure 5. Detail of 21st Dynasty coffin showing ancient overpaint applied to repair and resurface the coffin prior to its reuse in antiquity. The winged eye toward the upper left of center is an element of the original painted decoration, visible within losses in the ancient overpaint. Coffin Lid of Tanakhtanettahat, 1075-945 B.C.E., 181cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.17C.

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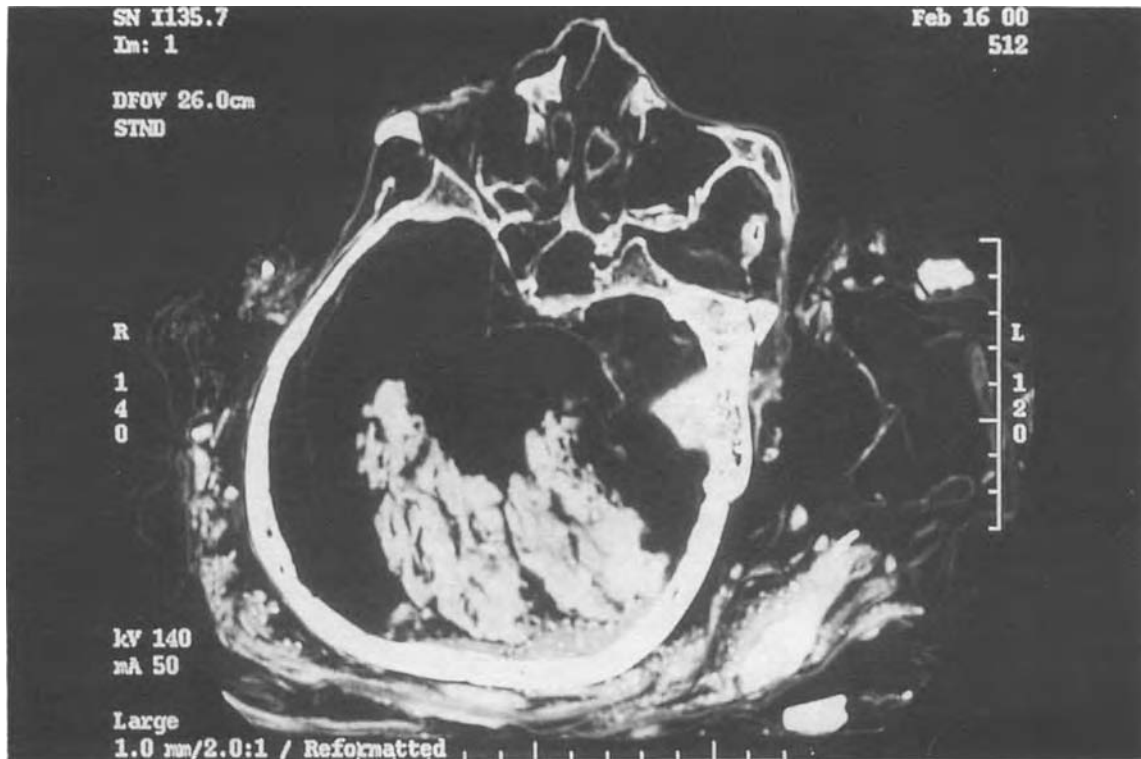


Figure 7. CT image of the skull in cross-section of a poorly mummified mummy, showing the shrunken brain in situ. Mummy of Ta'aset, date unsure, 145cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.18.

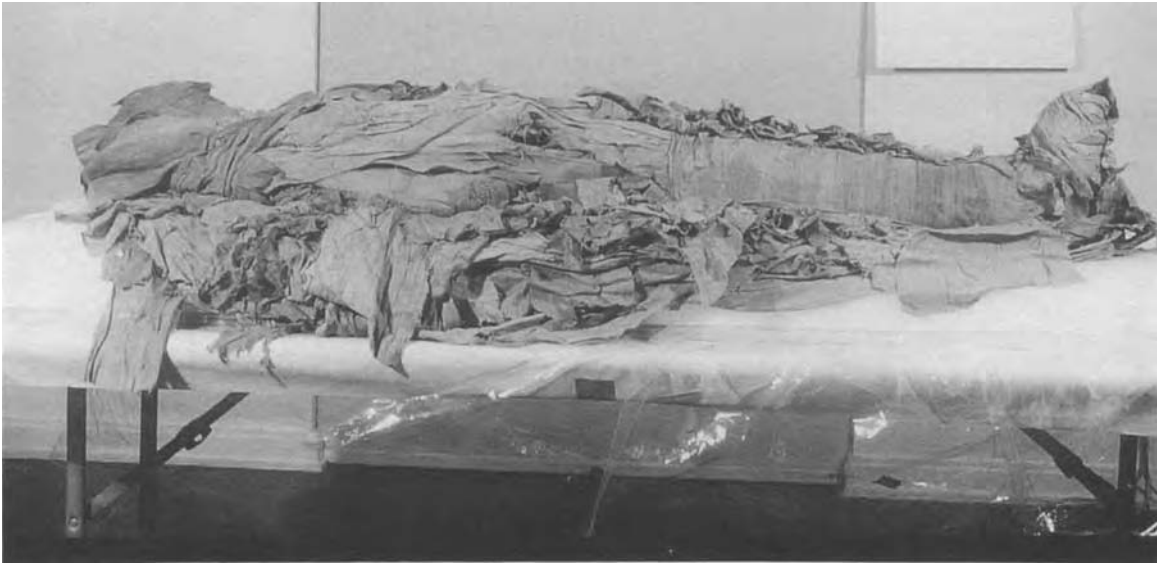


Figure 8. Mummy before treatment showing partially unwrapped layers of linen. Mummy of a Priestly Official, 1075-945 B.C.E., 146cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.14.

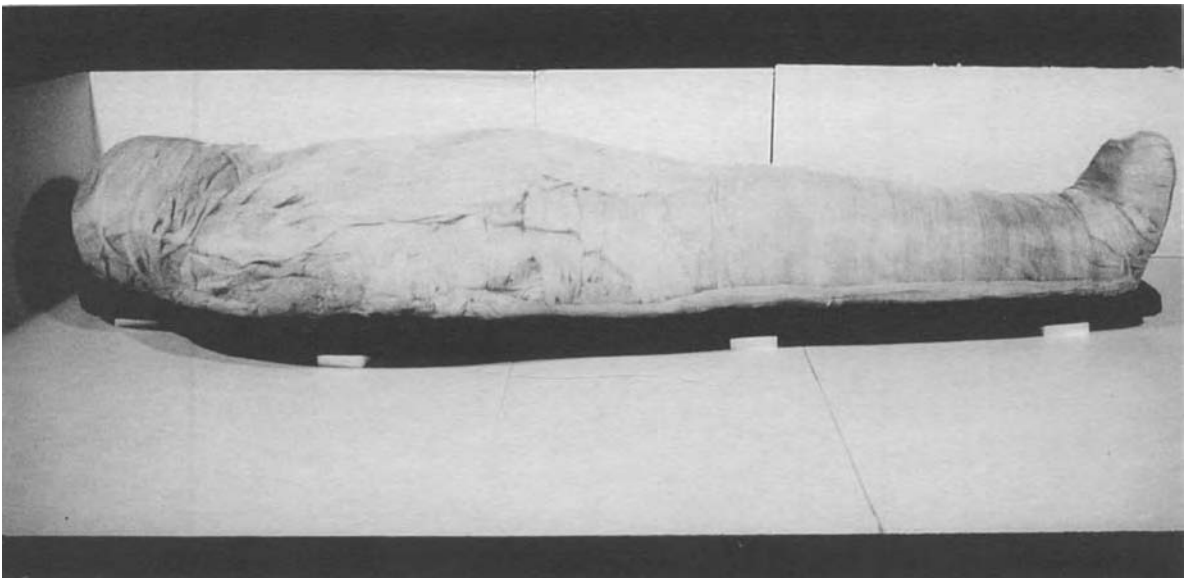


Figure 9. Mummy after treatment, enclosed in Stabiltex, and on padded support board. Mummy of a Priestly Official, 1075-945 B.C.E., 146cm, Charlotte Lichirie Collection of Egyptian Art, Michael C. Carlos Museum, 1999.1.14.