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Fatal force-feeding or Gluttonous Gagging? The death of Kestrel SACHM 2575

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ABSTRACT

The use of digital CT imaging on a bird mummy from Iziko Museums of South Africa in Cape Town has allowed us to carry out a virtual autopsy on the animal. We have been able to establish its species, cause and probable time of death, as well as, for the first time, to find evidence for the maintenance of a captive raptor population in ancient Egypt. This may represent early evidence of keeping raptors in captivity anywhere in the world.

1. Introduction

Iziko Museums of South Africa in Cape Town's Social History collection includes a votive bird mummy, SACHM 2575, which arrived there at the beginning of the 20th century. Macroscopic study and digital imaging have allowed us to discover the unusual circumstances surrounding this bird's death (Fig. 1).

Animal mummies were an important feature of ancient Egyptian religious life, particularly from c. 600 BC to c. AD 250 (Kessler, 1986; Ray, 2001; Ikram, 2015). During this time, following invasion and unrest, there was a strong movement to bolster national identity and confidence through archaizing. In religion, this manifested itself in the form of a rekindling of animal cults, such as that of the Apis bull, which were established early in Pharaonic history, c. 2950 BC (Simpson, 1957). The Egyptians believed that each deity had an animal avatar that shared certain characteristics with that god. Thus, for example, virile bulls were associated with creator gods such as Ptah or the sun god Re, the latter also being represented by raptors who commanded the sky and whose coloring and eyes evoked the sun. Certain animals, recognizable to the priests by their markings, were thought to act as hosts for the divine spark of a particular deity. During its lifetime, such an animal would be worshiped and catered to as the living god; upon its death it would be buried with great pomp, amidst national mourning. The god's spirit would then migrate to the body of another distinctly marked animal, and the cycle would continue, as is the case with Buddhist Tibetan lamas. As part of the cult celebrating these living animal deities, votive offerings in the form of animal mummies were given, a custom that became particularly popular from c. 600 BC until the

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Fig. 1. Photograph of SACHM 2575 showing the mummy of a bird (©Iziko Museums + Photograph Carina Beyer).

Roman era, stopping in c. AD 250. These animal mummies were of the same species associated with the deity in question, but were not sacred themselves. Millions of such votive mummies of cats, dogs, ibises, and raptors have been discovered in catacombs throughout Egypt (Kessler, 1986; Ray, 2001; Ikram, 2015) and are found in museums all over the world today. Unlike sacred animals, which lived out their natural lives to the full extent, votive animals were sometimes put to death by strangulation, through a blow to the head, and in the case of juveniles, untimely removal from parent (Armitage and Clutton-Brock, 1980, 1981; Ikram, 2015; Zivie and Lichtenberg, 2015; Hartley et al., 2011; Ikram et al., 2013). Many others, however, died of natural causes.

Both sacred and votive mummies were prepared in various ways, depending on whether they had fur, feathers or fins. Economic constraints and available technology were other relevant factors. Most creatures were eviscerated to prevent bacteria and gas build up. They were then washed and desiccated using natron (a mixture of sodium decahydrate, sodium bicarbonate, and small quantities of sodium chloride and sodium sulfate), a substance that occurs naturally in Egypt and has defatting and desiccating properties (Lucas, 1911, 1914). After desiccation, which took varying amounts of time depending on the size of the animal, the creature was anointed with a mixture of oils, resins and wax (Buckley et al., 2004; Clark et al., 2013), and finally wrapped in linen bandages (Ikram, 2015). Birds, such as SACHM 2575, were frequently eviscerated, desiccated, and then dipped into molten resin or a mixture of heated resin and oil before wrapping, although sometimes evisceration was omitted from this sequence (Ikram, 2015; Nicholson, 2015).

2. Materials and methods

In addition to a macroscopic study, computed tomography (CT) scanning was used to assess bird mummy SACHM 2575 (Cornelius et al., 2012). This provides a non-destructive analysis of a museum specimen and imaging is increasingly used in mummy studies (Ikram, 2015). The CT scanner unit is part of the Central Analytical Facilities (CAF) at Stellenbosch University and the instrument is a microfocus X-ray CT scanner model General Electric Phoenix V|Tome|X L240 with an NF180 tube. This machine uses x-ray projection images at a rate of up to 3000 angles around the object to reconstruct a complete 3D image that can be used to accurately measure, analyze and view the external and internal structure of an object as well as to provide more advanced analyses of materials in a non-destructive way.

The settings used for scanning the whole bird mummy sample were 160 kV, 200 μA for x-ray generation, 500 ms acquisition time per projection image with no averaging or skipping of images, 3000 images recorded during one full rotation, making the total scan time approximately 35 min at a scan resolution of 112 μm. A background detector calibration was made using a dark background, as well as 2 current settings (2-point calibration). A shift option was activated to shift the detector between projection images to minimize the rotation axis artifact sometimes visible in CT scans. A background region of interest was recorded for each image, to normalize the background intensity during the scan. A subsequent higher-resolution "region of interest" or sub-volume scan was made of the stomach region at 36.2 μm resolution. This involves over-filling the detector and scanning only the central volume exposed to the detector in all acquisitions during the rotation. These projection images were then reconstructed using the

Table 1
Measurements of the bones of SACHM 2575.

Anatomical element	Measurement (mm)
Left Carpometacarpus	30.89
Left Femur	41.30
Left Fibula	37.11
First Phalanx	8.27
Claw	6.12
Left Humerus	48.60
Left Radius	56.05
Left Tarsometatarsus	38.35
Left Tibiotarsus	56.15