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FEEDING THE PHARAOHS:
A DISCUSSION AND OBJECT STUDY OF FOWL VICTUAL MUMMIES FROM
ANCIENT EGYPT

by

Paige Emily Brevick

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Arts

Major: Art History

The University of Memphis

May 2019

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Dedicated to goose mummies everywhere.

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Abstract

Food offerings were a critical part of ancient Egyptian funerary ritual, as these offerings sustained the dead in the afterlife. Among food offerings placed in tombs were victual mummies: cuts of meat or fowl mummified and wrapped in linen bandages like their human counterparts. This thesis seeks to define fowl victual mummies as an object class through a discussion of their procurement, processing, and production. It addresses the status of victual mummy categorization. This thesis considers the following prompts: are fowl victual mummies truly “mummy” in their preparation and presentation? Are fowl victual mummies prepared specifically as food items, ready for long-term consumption and storage? Or can fowl victual mummies represent a unique hybridization of these trades? X-ray imaging and pXRF analysis were conducted on fowl victual mummy 1981.1.18 at the Art Museum of the University of Memphis, coinciding with an analysis of published victual mummies, to address these questions.

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Chapter One: Introduction

Nourishing the dead in the afterlife was a significant aspect of Egyptian society, a concept frequently depicted in tomb daily life and offering scenes, models of food and food processing, and evidenced by plant-based and faunal offerings that date back to the Predynastic period.¹ These came to include offerings known to Egyptologists as “victual mummies,” left to sustain the dead’s *ka* through the reification of food objects and seen most prevalently in New Kingdom Theban tombs.² Victual mummies are composed of wrapped bones and cuts of preserved edible meats, with whole preserved fowl being a frequent choice offering.

Victual mummy production is an understudied area of Egyptology, in need of research and studies incorporating scientific analyses.³ Studies on victual mummies not only yield information on ancient animal mummification, edible species, and butchery techniques, but also serve to elucidate efforts taken to equip the deceased in the afterlife. Thorough research into victual mummy production may also provide us with a better understanding of ancient Egyptian food preferences, revealing previously unknown

¹ Veerie Linseele and Wim Van Neer, “Gourmets or Priests? Fauna from the Predynastic Temple,” *Nekhen News* 15, no. 15 (2003): 6-7; Salima Ikram, “Food and Funerals: Sustaining the Dead for Eternity,” *Polish Archaeology in the Mediterranean* 20 (2011): 361; Salima Ikram, “Re-Analysis of Part of Prince Amenemhat Q’s Eternal Menu,” *Journal of the American Research Center in Egypt* 48 (2012): 119. Rozenn Bailleul-LeSuer, *The Exploitation of Live Avian Resources in Pharaonic Egypt : A Socio Economic Study* (Chicago: University of Chicago: 2016), 46.

² Salima Ikram, “The Loved Ones: Egyptian Animal Mummies as Cultural and Environmental Indicators,” in *Archaeozoology of the Near East*, ed. H. Buitenhuis, A.M. Choyke, L. Martin, L. Bartosiewicz, and M. Mashkour (Groningen: ARC, 2005), 243.

³ Katherine A. Clark, Salima Ikram, and Richard P. Evershed, “Organic Chemistry of Balms in the Preparation of Pharaonic Meat Mummies,” *Proceedings of the National Academy of Sciences of the United States of America* 110 No. 51, 20392; Ikram, “Food and Funerals.” 362; Ikram, “Amenemhat Q’s Eternal Menu.” 119.

distinctions in material availability, use of food resources,⁴ and food culture. Victual mummies are embodiments of abiding sustenance, whose thoughtful production and placement within the tomb signify their status as valued funerary objects.

This thesis seeks to better understand fowl victual mummies as an object class through a discussion of their processes of manufacture and known examples, based on archaeological evidence, artistic representations, and scientific analysis of surviving examples. Through this study, this thesis will address the status of victual mummy categorization – articulating the details of victual mummy construction and classification as mummified fowl, food offering, or a blend of both. I specifically consider the following questions: are fowl victual mummies truly “mummy” in their preparation and presentation or were they prepared specifically as food items, ready for long-term storage and consumption? Or do fowl victual mummies represent a unique blending of these technologies given their status as both a food offering and a mummified object?

Animal mummification began in the Predynastic period and persisted in Egypt until the Roman period,⁵ when traditional religious cult activity dwindled following the advent of Christianity. Four kinds of animal mummies have been generally attested from ancient Egypt: pet mummies, sacred animal mummies, votive mummies, and victual mummies.⁶ The rarest form of animal mummification is the occurrence of pet burials,

⁴ Alexandra Touzeau, Romain Amiot, Janne Blichert-Toft, Jeah-Pierre Flandrois, Francois Fourel, Vincent Grossi, Francois Martineau, Pascale Richardin, and Christophe Lecuyer, “Diet of Ancient Egyptians Inferred from Stable Isotope Systematics,” *Journal of Archaeological Science* 46 (2014), 114.

⁵ Salima Ikram, “An Eternal Aviary: Bird Mummies from Ancient Egypt,” in *Between Heaven and Earth: Birds in Ancient Egypt*, ed. Rozenn Bailleul-LeSuer (Chicago: Oriental Institute Museum Publication, 2012), 41.

⁶ Salima, *Divine Creatures: Animal Mummies in Ancient Egypt* (New York: The American University in Cairo Press, 2005), 1-15.

when members of the Egyptian elite had their pets mummified and interred alongside them. None of the known pet mummies are identified as birds.⁷ Sacred animal mummies are uniquely identifiable animals, sometimes with special markings that distinguish them as manifestations of a deity.⁸ The Apis bulls are the most notable example of this type of mummy.⁹ The most widely appearing animal mummy, numbering in the millions, is the votive offering, such as the ibis mummies at Saqqara and Tuna el-Gebel.¹⁰ Votive mummies were animals raised, and sacrificed, in the cult temples, with ibises and raptors noted as the most frequently occurring dedicated bird offerings, because of their association with Thoth and Horus respectively.¹¹ Besides ibises and raptors, the most common votive mummies include cats, canines, crocodiles, shrews, snakes, and sometimes fish.¹²

Victual mummies are a relatively rare type of animal mummy that functioned specifically as food offerings, destined for consumption by the dead in the afterlife. Most of the victual mummies discussed in this thesis are from New Kingdom Theban tombs, though victual mummies, both real and models, date back to at least the Old Kingdom.¹³

⁷ Ikram, “An Eternal Aviary,” 41.

⁸ Ikram, *Divine Creatures*, 5.

⁹ Ibid., 74.

¹⁰ Angela von den Driesch, Dierter Kessler, Frank Steinmann, Veronique Berteaux, and Joris Peters, “Mummified, Deified, and Buried at Hermopolis Magna: The Sacred Birds from Tuna el-Gebel, Middle Egypt,” *Agypten und Levante* Vol. 15 (2005), 214.

¹¹ Foy Salf, “The Role of Birds Within the Religious Landscape of Ancient Egypt,” in Rozenn Bailleul-LeSuer’s (ed.), *Between Heaven and Earth: Birds in Ancient Egypt* (Chicago: Oriental Institute Museum Publications, 2012), 37.

¹² Edward Bleiberg, Yekaterina Barbash and Lisa Bruno, *Soulful Creatures: Animal Mummies in Ancient Egypt* (Brooklyn: GILES, 2013), 80.

¹³ Ikram, *Divine Creatures*, 4; Sue D’Auria, Peter Lacovara and Catharine H. Roehrig, *Mummies & Magic: The Funerary Arts of Ancient Egypt* (Boston: MFA Boston, 1989), 93-94.

They are composed of joints of meat and bones, or whole parts of food animals, including beef, fowl, and sometimes fish.¹⁴ While pork was readily consumed by the ancient Egyptians, no victual mummies of this animal have yet been identified.¹⁵ This may be attributed to the low status or ritual prohibition of the pig or its meat,¹⁶ making it an unworthy or undesirable food offering in the afterlife. This thesis will focus exclusively on the production and placement of fowl victual mummies.

Fowl victual mummies were typically prepared much like fowl for the dinner table, being first plucked of feathers and usually decapitated, with their wing tips and feet removed. Next, they were eviscerated, sometimes with organs like the heart, lungs, and liver placed back in the body cavity.¹⁷ The fowl victual mummies were preserved with various oils, resins, and spices, and underwent desiccation to dehydrate the remaining flesh, thus allowing it to last. The fowl were wrapped in linen bandages that typically follow the form of the bird, with folded limbs often wrapped separately.

Most fowl victual mummies were placed in individual cases, though these are not always found intact or with matching lids and bases. Made of wood or limestone, these cases are often modeled to resemble the birds within them,¹⁸ sometimes even including carved outlines of wings and feet. Though most have been found open or partially sealed, some of the cases from Amenemhat Q's food offering assemblage were found

¹⁴ Ikram, "Food and Funerals," 362.

¹⁵ Ikram, "Food and Funerals," 367; see also Ikram, *Divine Creatures*, 4.

¹⁶ Ikram, *Divine Creatures*, 4.

¹⁷ Baillel-LeSuer, Rozenn, "Catalog No. 40," in *Between Heaven and Earth: Birds in Ancient Egypt* (Chicago: Oriental Institute Museum Publications, 2012), 213.

¹⁸ Ikram, *Divine Creatures*, 4.

securely wrapped in linen strips, binding them shut.¹⁹ Still other vidual mummies were placed in baskets,²⁰ or grouped together in wooden chests.²¹ While these cases are worthy of further analysis themselves, they will not be a focus of this thesis.²²

This thesis begins with a survey of published literature, followed by a discussion of the sources and uses of fowl in ancient Egypt, and moves on to a study of the manufacture and known examples of fowl vidual mummies, including a corpus of fowl vidual mummies compiled from previous published sources (Table). This study is based on archaeological evidence, artistic representations, and scientific analyses of surviving examples, in addition to new material based on my own examination of an unpublished fowl vidual mummy in the collection of the Institute of Egyptian Art and Archaeology at the University of Memphis (acc. no. 1981.1.18a,b).²³

Chapter Two presents my review of the relevant literature, discussing both field reports that include fowl vidual mummy assemblages and investigations of vidual mummy construction. Scholarship on animal mummies, especially vidual mummies, is limited but this thesis will attempt to compile the most applicable studies. In Chapter Three, I will provide background information on the exploitation of fowl in ancient Egypt, covering the basic methods of their procurement, domestication, captive husbandry, and butchery, as well as processing techniques used to make fowl vidual

¹⁹ Ikram, "Amenemhat Q's Eternal Menu," 120.

²⁰ Ikram, "The Loved Ones," 240.

²¹ See Carter's original excavation notes: <http://www.griffith.ox.ac.uk/gri/carter/062-c062-01.html>. Griffith Institute, accessed February 1st, 2019.

²² For further discussion on vidual mummy cases see Ikram, "Meat Boxes," In *Choice Cuts: Meat Production in Ancient Egypt* (Leuven: Peeters Press, 2005), 231-236. See also Ikram, "Amenemhat Q's Eternal Menu," 120-121.

²³ I would like to thank Dr. Lorelei Corcoran, Director of the Institute of Egyptian Art and Archaeology, for permission to study and publish this mummy and other pieces discussed in Chapter Five.

mummies based on scientific analyses and experimental archaeology. Chapter Three will also discuss distinctions between the preparation of foods for short-term and long-term consumption, discussing how this may impact the construction of fowl victual mummies.

In Chapter Four, I will summarize information based on the fowl victual mummy corpus (Table). This chapter will also include a detailed visual analysis of the University of Memphis Dynasty 18 victual mummy and its case (Figure 1), including photographs presented here for the first time. Chapter Five will address previous scientific studies undertaken on fowl victual mummies, in an attempt to better understand their construction and to possibly identify the resins and other substances used on the fowl and its case. I will also present new data based on radiographic and pXRF²⁴ analyses undertaken on the fowl victual mummy at Memphis. pXRF analysis of comparative materials was also undertaken. These studies yield insights into the construction methods of this and potentially other fowl victual mummies.

Finally, in Chapter Six, I will present my conclusions based on the previous chapters' discussions of victual mummies drawn from archaeological evidence, artistic representations, and scientific analyses of surviving examples. Most importantly, I will present my conclusions based on the findings of the radiographic imaging and pXRF analyses on the goose mummy and case. This discussion will demonstrate that goose mummy 1981.1.8a was most likely a bird that died in its prime. A broken humerus on the bird suggests that it may have struggled against restraints while being carried, or it may be a remnant of an injury during capture; this coincides with artistic depictions of

²⁴ Portable x-ray fluorescence is a technique of elemental analysis conducted on an object's surface using a handheld instrument. X-rays beams are directed into the object and the object's atoms send back their own beams, "fluorescing," and this is then analyzed by the instrument. This is discussed in detail in Chapter Five.

fowl being transported and captured. Finally, the pXRF analysis indicates that the bird may have been mummified with preservatives that included natron and bitumen.

Chapter Two: Literature Review

In this chapter I will discuss the major works that provide our current understanding of fowl vidual mummies and illuminate where further research is needed. Scholarship on animal mummies in ancient Egypt has been relatively minimal, having garnered increased study and become more common in the last couple decades.¹ According to Lidjia McKnight, literature on animal mummies has traditionally fallen into one of two categories: animal mummies are mentioned in excavation reports, or they are discussed in terms of a mummy autopsy.² Research on vidual mummies remains even more limited due to the small number of specimens available. Several authors have contributed both directly and indirectly to the expanding corpus of vidual animal mummy studies. The most important of these will be discussed below.

The first catalogue produced on the non-human mummies at the Egyptian Museum was by C. Gaillard and G. Daressy in 1905, which described the collection and condition of animal mummies at the museum.³ Since that publication, many of the catalogue's animal mummies have been deaccessioned to smaller, local museums or have been seriously damaged from unwrapping.⁴ The *Catalogue General*, therefore, is a significant source of information on the original state of these now-lost or damaged mummies.

¹ Lidija McKnight, *Imaging Applied to Animal Mummies* (Oxford, England: Archeopress, 2010), xiii, 11.

² McKnight, *Imaging Applied*, 11.

³ C. Gaillard and G. Daressy, *Catalogue General: La Faune Momifiée de l'Antique Egypte* (Cairo: Institut Francais d'Archeologie Oriental, 1905).

⁴ Salima Ikram and Nasry Iskander, *Catalogue General of Egyptian Antiquities in the Cairo Museum. Nos. 24048-24056, 29504-29903 (selected), 51084-51101, 61089. Non-Human Mummies* (Cairo: The Supreme Council of Antiquities Press, 2002), i.

In 1919, Ambrose Lansing of the Metropolitan Museum of Art reported finding funerary meats⁵ in and around the burial shaft and chamber of an unidentified Dynasty 18 Theban tomb (MMA 1021).⁶ Lansing reported that pigeons, quail, geese, and ducks were identified.⁷ The process of continued clearing in the area revealed a steatite shawabti with the inscription, “The Chief Steward, and Scribe, Seniu”⁸ leading Lansing to attribute the funerary meats to Seniu, though Ikram attributes them to Amenemhat Q because of his reburied coffin found in the fill.⁹ These fowl mummies are discussed in greater detail in subsequent chapters.

Currently, one of the foremost scholars of animal mummies is Salima Ikram, whose research has encompassed a wide variety of related animal mummy topics from ancient Egypt. Though most of Ikram’s work has been on votive mummies and the animal cults associated with them, she has several publications, including *Choice Cuts: Meat Production in Ancient Egypt*, on various elements that arise in the discussion of the victual mummy economy and process of manufacture. In *Choice Cuts* she discusses ancient Egyptian common edible food animals, butchery techniques, and food processing for both long-term and short-term storage or consumption. It also includes a corpus of over 400 known victual mummies. Ikram visited over a dozen museums and her visual

⁵ Ikram, *Choice Cuts*, 269-277.

⁶ Ambrose Lansing, “The Egyptian Expedition 1918-1920: I. Excavations at Thebes 1918-19,” *The Metropolitan Museum of Art Bulletin*, Vol. 15, No. 12, Part 2: The Egyptian Expedition 1918-1920 (Dec., 1920) 7.

⁷ Lansing, “Excavation at Thebes,” 7.

⁸ Lansing, “Excavation at Thebes,” 8. Dows Dunham, “Exchange of Egyptian Antiquities with the Metropolitan Museum,” *Bulletin of the Museum of Fine Arts*, Vol. 35, No. 211 (Oct. 1937): 74.

⁹ Ikram, “Amenemhat Q’s Eternal Menu,” 119. See images of other victual mummies from this tomb at Metropolitan Museum of Art, <https://www.metmuseum.org/art/collection/search/555905>, accessed April 1st, 2019.

descriptions of victual mummies and animal remains are based on first-hand observation. Despite their brevity, these descriptions are invaluable to anyone undertaking victual mummy research because they comprise the first and largest corpus of victual mummies, most of which were previously only published in excavation reports. Ikram's corpus also serves as the reference corpus cited in Rozenn Bailleul-LeSuer's 2016 dissertation, discussed below. This thesis seeks to expand Ikram's victual mummy corpus by adding an analysis of the University of Memphis's victual fowl mummy.

The Animal Mummy Project was founded in 1998 by Ikram and Nasry Iskander. The Animal Mummy Project systematically described, radiographed, and conserved each mummy in the collection of the Egyptian Museum in Cairo, subsequently moving the collection into the newly renovated museum gallery.¹⁰ A new *Catalogue General* volume, *Non-Human Mummies*, was also produced. It details the condition of each mummy and includes the corresponding entry in Gaillard and Daressy's catalogue when present. Victual mummies in the Egyptian Museum are noted as strictly Theban,¹¹ and throughout the catalogue the authors comment on possible mummification techniques based on their visual observations of the remains. It also includes radiographic studies.

Ikram also conducted several experimental investigations at the Egyptian Museum from 1999-2002, using rabbits, fish, and duck, exploring possible variations in the animal mummification process.¹² While Ikram's work has been critical in advancing our understanding of animal mummies and experimental archaeology, it is not without its

¹⁰ Salima Ikram, *Beloved Beasts: Animal Mummies from Ancient Egypt* (Cairo: The Supreme Council of Antiquities Press: 2004), 12.

¹¹ Ikram and Iskander, *Non-Human Mummies*, ii.

¹² Ikram, *Divine Creatures*, 29-43.

limitations. Much of her interpretation relies on ethnographic comparison and representations depicted in tomb scenes, with less emphasis on scientific evidence. Nevertheless, there is no doubt that Ikram and Iskander's work brought animal mummies to the attention of scholars and *Choice Cuts* comprises the first thorough inventory of published victual mummies.

The most advanced imaging studies conducted on animal mummies have been conducted at The Ancient Egyptian Animal Bio Bank of the University of Manchester since 2010.¹³ Here, McKnight, a specialist working with the KNH Centre for Biomedical Egyptology of the University of Manchester, used advanced clinical imaging techniques on the animal mummy collection at the Manchester Museum and other UK institutions. McKnight's work focuses on the comprehensive, yet non-invasive, study of animal mummy construction using digital radiography and computerized tomography (CT) imaging techniques. Besides determining the presence or absence of an actual mummy within the bundles, imaging studies aid in determining species and can sometimes be helpful in describing the mummification process. She continues to work on animal mummies worldwide.¹⁴

In order to properly understand the nuances of fowl victual mummy production and meaning, some background on the exploitation of avifauna is required. Rozenn Bailleul-LeSuer conducts research on the use of birds in ancient Egypt. Her dissertation *The Exploitation of Live Avian Resources in Pharaonic Egypt: A Socio Economic Study*,

¹³ University of Manchester, <https://www.mummies.manchester.ac.uk/>, accessed October 21st, 2018.

¹⁴ Lidjia McKnight and Stephanie Atherton-Woolham, *Gifts for the Gods: Ancient Egyptian Animal Mummies and the British* (Liverpool: Liverpool University Press, 2016).

describes the ancient Egyptian avifauna industry, from capture and captivity, to processing, and consumption, illuminating topics that were previously not a main focus of study. Bailleul-LeSuer uses archaeological, art historical, literary, ethnographic, and scientific evidence to offer detailed descriptions of each step of the avifauna industry, focusing primarily on their utilitarian role – making her research critical in the discussion of fowl victual mummies. She incorporates work by Linda Evans, who describes bird behaviors depicted in Egyptian art as highly naturalistic.¹⁵ While Bailleul-LeSuer’s publication describes in detail the process of capturing and raising Egyptian avifauna, she rarely describes its link to the production of fowl victual mummies, nor does she discuss the significance underlying the purpose of the victual fowl mummy. This thesis will use the background information provided by Bailleul-LeSuer and others to discuss the distinctions between avifauna used for food instead of offerings, and the overlap between these two categories.

Steven Goodman, conservation biologist at the Field Museum of Natural History, Chicago, has published extensively on the fauna of Egypt, particularly birds. His work in Egypt has provided survey studies on both avifauna species and migration,¹⁶ as well as detailed studies on bird species that have sometimes been depicted in ancient Egyptian

¹⁵ Rozenn Bailleul-LeSuer, *The Exploitation of Live Avian Resources in Pharaonic Egypt: A Socio Economic Study* (Chicago: University of Chicago: 2016), 17. Linda Evans, *Animal Behavior in Egyptian Art: Representations of the Natural World in Memphite Tomb Scenes* (Oxford: Australian Centre for Egyptology, 2010).

¹⁶ S.M. Goodman and P.L. Ames, “Contribution to the ornithology of the Siwa Oasis and Qattara Depression, Egypt,” *Sandgrouse* 5 (1983): 82-96.

hunting scenes, such as ostriches¹⁷ and doves.¹⁸ Goodman's 1989, *The Birds of Ancient Egypt*, was the first exhaustive ornithological reference published on Egyptian avifauna, incorporating not only a comprehensive list of species and migratory patterns, but also relevant environmental shifts, ethnographic information on hunting and processing, and local terminology used to describe select species.

In 1987, while at the American Museum of Natural History, Goodman unwrapped and published nineteen fowl vidual mummies obtained from the Metropolitan Museum of Art.¹⁹ His findings detail the physical status of each mummy, including when possible identification of the species, as well as commentary on the presence of resins and oils on the surface of each mummy.²⁰ Though Goodman's investigation does not include any chemical analyses, it is a helpful report that combines visual observation of surface substances alongside his summary of what was contained in each unwrapped mummy.

Studies that discuss the presence of residues on animal mummies are limited, with vidual mummy studies even more so. Any chemical analysis studies are valuable, however, because they provide insight into the embalming process. Chemical analyses of votive mummies were conducted by Stephen Buckley, Katherine Clark, and Richard Evershed; their work has included gas chromatography-mass spectrometry studies of

¹⁷ S.M. Goodman, P.F. Houlihan, I. Helmy, "Recent records of the Ostrich *Struthio camelus* in Egypt," *Bulletin of Britain Ornithological Club* 104 (1984): 39-44.

¹⁸ S.M. Goodman and P.F. Houlihan, "The Collared Turtle Dove *Streptopelia decaocto* in Egypt," *Bulletin of Britain Ornithological Club* 101 (1981): 334-336.

¹⁹ The vidual fowl mummies are from an unknown and severely robbed Theban tomb (MMA 1021) nearby the burial of Prince Amenemhet. Goodman notes that this association needs reevaluation but given the proximity of the burials, the vidual fowl mummies have been cautiously dated to the 17th or 18th Dynasty. Goodman, S.M. "Vidual Egyptian Bird Mummies from a Presumed Late 17th or Early 18th Dynasty Tomb," *Journal of the Society for the Study of Egyptian Antiquities* 17, no. 3 (1987): 67.

²⁰ Goodman, "Vidual Egyptian Bird Mummies," 71-72.

votive mummies. Their biomarker research indicates that the balms²¹ used in votive mummy production were highly varied mixtures, likened to those used on human mummies.²² A similar study was conducted in 2013 by Clark, Ikram, and Evershed on a selection of vidual mummies from the Theban tombs of Yuya and Thuya, Isitekmkeb, and Henutmehyt,²³ using lipid biomarkers and stable carbon-isotope investigations. Their results presented a mix of potential mummification materials, concluding that highly complex and exotic balms, such as *Pistacia* resin were present. Similar studies have been conducted at the KNH Centre for Biomedical Egyptology, University of Manchester,²⁴ which analyzed twenty-four samples from votive mummies using gas chromatography-mass spectrometry to identify the residues present. These studies, which focus on votive mummy residue identification, are helpful as comparative standards in the discussion of vidual mummies, since their descriptions often include observation of resins or oils on the mummies and the case interiors. A chemical analysis of vidual fowl mummies is beyond the scope of this thesis or the expertise of the author, however, understanding the basics of vidual mummy residues and embalming aids is important in the discussion of their categorization: are they viduals prepared as preserved foods or are they mummified?

²¹ The term “balm” was used in this study to generically describe the residues sampled. This term is sometimes used interchangeably with “resin,” which is the semi-solid aromatic oil produced by trees, used in mummification for their preservative properties.

²² S.A. Buckley, Clark, K.A., Evershed, R. P., “Complex Organic Chemical Balms of Pharaonic Animal Mummies,” *Nature* 431 (2004): 298.

²³ Clark, Ikram, and Evershed, “Organic Chemistry,” 20383.

²⁴ Rhea Brettel, William Martin, Stephanie Atherton-Woolham, Ben Stern and Lidija McKnight. “Organic Residue Analysis of Egyptian Votive Mummies and Their Research Potential,” *Studies in Conservation*, 62 no. 2, (2017): 68-82.

Since its acquisition by the University of Memphis, the fowl victual mummy and case (1981.1.18a,b) have appeared in two publications. It was included as part of a collection study, in Carol Crown's 1983 University of Memphis publication with Rita Freed.²⁵ And a photograph of it in its case was also included in Rita Freed's *Ramesses the Great, His Life and World* exhibition catalog.²⁶

The next chapter will present the system of avifauna exploitation and the subsequent processing of fowl for long-term storage, cooking, or consumption used by the ancient Egyptians. In addition, methods used to procure wildfowl, poultry-yards used sustain captive bred and wild-caught fowl, and fowl butchery techniques will be discussed.

²⁵ Carol Crown and Rita Freed, *Ancient Egypt: A Guide Book*, (Memphis, TN: University of Memphis, 1983): 31.

²⁶ Rita Freed, *Ramesses the Great, His Life and World: An Exhibition in the City of Memphis* (Memphis, TN: University of Memphis, 1987): 90.

Chapter Three: Fowl Procurement, Husbandry, and Processing

To date, no recorded ancient Egyptian guide to fowl husbandry, slaughter, or butchery is known. Instead, Egyptologists must rely on artistic depictions, zooarchaeological evidence, and the occasional ethnographic comparison to understand the methods by which fowl were captured, raised, housed, and prepared for consumption, both in this life and the after-life. This chapter will investigate the history of fowl in Egypt, fowl hunting, fowl husbandry, slaughter, and butchery techniques, using the appropriate technical terminology. For this study I will draw on two major studies and a number of articles. Ikram's *Choice Cuts: Meat Production in Ancient Egypt*, combines traditional image analysis with her own first-hand ethnographic observations in Cairo and experimental archaeology conducted in Egypt and Bailleul-LeSuer's visual analysis in *The Exploitation of Live Avian Resources in Pharaonic Egypt: A Socio-Economic Study*.

As noted previously, this thesis focuses mainly on ducks, geese, and quail, as these are the avifauna most frequently identified as fowl victual mummies, and would have made up an ample portion of the edible avifauna in ancient Egypt. Ikram prefers the term "poultry," and defines this more broadly, encompassing all species of birds consumed or used for other reasons in Egypt. She includes herons, cranes, storks, ibis, chicken,¹ partridges and quail, swans and geese, ducks, pigeons and doves, grouse, ostrich, and other wading and aquatic birds.² Most of this chapter will discuss ducks, geese, and quail, but where relevant will include other avifauna.

¹ There is a well-known ostrakon from the New Kingdom that depicts a Red jungle fowl (*Gallus gallus*) - the ancestor of the common chicken. However, there is little archaeological or artistic evidence to suggest chickens were in Egypt any time before the Ptolemaic Period. See Salima Ikram, *Choice Cuts*, 26.

² Ikram, *Choice Cuts*, 25-29.

Egypt's fertile delta and Nile Valley sustained a wide variety of waterfowl, particularly during the migratory seasons, as many international species made the long migration to overwinter or pass through Egypt's warm Nile valley, and back again in the spring.³ The ancient Egyptians would have known which species of waterfowl to expect during seasonal migrations.⁴ Though there is no exhaustive ancient list of bird species that inhabited ancient Egypt, identifications of some of the most common or highly desired birds have been confirmed through their depictions in art and through contemporary work of ornithologists such as Steven Goodman and Peter Meininger.⁵ Wild waterfowl are seen in numerous reliefs ambling through marshes and seeking shelter in papyrus thickets (Figure 2). Some scenes depict only the simple image of a standardized waterfowl, without clear species identification, while others depict species easily recognizable through plumage, facial markings, and relative size (Figure 3).

Birds make up sixty-six distinct hieroglyphic signs in Gardiner's sign list, including signs representing an egg (H8) and a fowl carcass (G54), indicating that they were a significant part of the Egyptian language.⁶ While they are often referred to simply as *ꜥꜥꜥ*, a generic term for fowl or bird, many species had distinct identifications in Egyptian. Text alongside offering scenes sometimes designated birds by species, such as *z.t* (pintail duck), *rꜥ* or *sr* (greylag goose), *ꜥꜥꜥ* (white-fronted goose), *smn* (Egyptian

³ Bailleul-LeSuer, *Live Avian Resources*, 60-61.

⁴ J. Donald Hughes, "Sustainable Agriculture in Ancient Egypt," *Agricultural History* 66, no. 2 (1992): 13.

⁵ Steven Goodman and Peter Meininger, *The Birds of Egypt* (Oxford: Oxford University Press, 1989).

⁶ Alan Gardiner, *Egyptian Grammar: Being An Introduction to the Study of Hieroglyph* (Oxford: Griffith Institute, 1982): 545.

goose), *šnty* (heron), *mn.t* (swallow), *s* (Eurasian teal) or *mnw.t* (dove).⁷ Species identification aids in understanding how the Egyptians viewed and managed their natural resources. It may also contribute to understanding the possible symbolic association of fowl vidual mummies, as wild-caught birds may have different connotations for the tomb owner than farm-raised fowl.

Zooarchaeological evidence of fowl in ancient Egypt is common but its utility to Egyptology remains limited because of the challenge in small and fragmentary bone identification.⁸ Remains from the Paleolithic through Neolithic periods suggest that some of the frequently identified remains belong to small- and mid-sized wading ducks, geese and swans, and Family *Rallidae*, including common birds like coots, crakes, and rails.⁹ Other birds less-frequented documented include ostrich, cormorant, spoonbill, and a variety of cranes, egrets, and herons, among others.¹⁰ Aside from the ostrich, most of these species prefer shallow-water ecosystems, making them predictable and easy hunting targets during winter migrations.¹¹

Birds have featured prominently in petroglyphic imagery and tomb scenes across Egypt and Nubia since Predynastic times.¹² Though ostrich is the most frequently-depicted bird in these early representations, waterfowl such as wading birds are possibly

⁷ Bailleul-LeSuer, *Live Avian Resources*, 12, 38, 45, 52-53.

⁸ Ibid., 77.

⁹ For a summary on the known faunal remains of birds in Paleolithic-Neolithic Egypt, please see the discussion and associated tables in Bailleul-LeSuer, *Live Avian Resources*, 77-88 and for discussion and associated tables on the Dynastic Period see 108-110.

¹⁰ Ibid., 83-85.

¹¹ Ibid., 103.

¹² Ibid., 89-91.

identifiable in Naqada II C-D period ceramics (Figure 4).¹³ Birds such as ostriches were often depicted with imagery that may depict a desert background, indicated by triangular hills, while other wading species like flamingoes are depicted near wavy lines possibly signifying the Nile River.¹⁴

Birds were caught by teams of hunters called *fowlers*, a term which denotes their specialized knowledge of the marshland and bird trapping techniques.¹⁵ An image depicting the obvious hunting and capture of waterfowl first appears in Dynasty 1 on a small disc, where King Den is shown trapping cranes with a clap-net, indicating that clap-net technology had been developed at least by Early Dynastic times.¹⁶ While fowlers certainly employed small nets and snares to catch birds as well,¹⁷ the clap-net is the most commonly rendered method of fowl capture in elite tomb scenes from the Old Kingdom until a little after Dynasty 18, at which point daily life scenes become less frequent.¹⁸ Fowling with the clap-net, an elongated hexagonal-shaped net braced by stakes driven into the ground, was probably a commonly utilized trapping method because of its effectiveness in capturing large numbers of birds. Clap-nets could be constructed to suit the size requirements of the intended bounty, but of course, larger clap-nets required

¹³ Ibid., 98.

¹⁴ Ibid., 98.

¹⁵ For a detailed discussion on titles and terminology associated with Egyptian fowlers, please see Bailleul-LeSuer, *Live Avian Resources*, 214-223.

¹⁶ Frank E. de Roder, Peter L. Meininger and Uffe Gjøl Sørensen, "Some Notes on Market Sales of Birds and Bird Hunting in Egypt, 1989-90," in *Ornithological Studies in Egyptian Wetlands (1989/90) Stichting Werkgroep Internationaal Wad- en Watervogelonderzoek WIWO Report* Vol. 40, 274. Bailleul-LeSuer, *Live Avian Resources*, 104.

¹⁷ Nora Scott, "An Egyptian Bird Trap," *The Metropolitan Museum of Art Bulletin* 35, No. 8 (1940): 164.

¹⁸ Bailleul-LeSuer, *Live Avian Resources*, 159-160.

more man-power to operate. A scene from the Old Kingdom tomb of Ptahhotep shows teams of thirteen fowlers handling two large nets, each ensnaring dozens of fowl, some of which are shown flying wildly as they escape.¹⁹ Another wall scene from the Middle Kingdom tomb of Khnumhotep II depicts two clap-nets filled with fowl of many species, including a pintail duck escaping in the background, while a fowler removes the captured birds from the net (Figure 5). The clap-net method has gone relatively unchanged for millennia and is still used in Egypt and across the world today.²⁰

Ground traps of several varieties were also employed. Smaller traps for ground fowl, like quail, are less commonly depicted in art. One such net is seen in the Dynasty 6 tomb of Mereruka at Saqqara, where four fowlers manage the corners of a ground net, capturing ten quail (Figure 6). Several distinct varieties of traps are represented in the Dynasty 11 tomb of Khety and Baqt, possibly for catching other birds, such as orioles (Figure 7). Part of an Egyptian ground trap has been preserved at the Metropolitan Museum of Art (Figure 8), and another more complete ground trap exists at the Cairo Museum. These traps were spring-operated and could be easily handled by a single fowler.²¹ The handle on Egyptian Bird Trap 30.8.221 is carved into the shape of a spoonbill's head (Figure 9).²² Historic accounts note that birds had their flight feathers

¹⁹ William J. Darby and Paul Ghalioungui, and Louis Grivetti, *Food: The Gift of Osiris* (London: Academic Press, 1977), 267.

²⁰ Irini Papageorgiou, "The Practice of Bird Hunting in the Aegean of the Second Millennium BS: An Investigation," *The Annual of the British School at Athens* 109 (2014): 120. Bailleul-LeSuer, *Live Avian Resources*, 162.

²¹ Scott, "An Egyptian Bird Trap," 164.

²² *Ibid.*, 164.

torn out as soon as they were removed from the nets, to prevent an accidental escape,²³ and it is possible that this was common-practice in ancient Egypt as well.

Fowlers also hunted birds by means of thrown weapons (Figure 10), though these methods were primarily used to kill the fowl on impact, or disable the animal by breaking its bones. A well-recognized Egyptian recreational activity is hunting birds in the marshes with a throwstick (Figure 11). These images were common in elite tomb scenes from the Old Kingdom through the New Kingdom.²⁴ Overall, fowling by throwstick probably had little economic impact and was practiced primarily as sport, since the time and precision skill needed to take down a single bird was great compared to other methods of acquisition, such as netting. It is possible that fowling by throwstick may have been practiced opportunistically, with fowlers keeping their throwsticks on them to hunt should the chance arise.²⁵

Birds were also hunted by bow and arrow, such as desert hunts of ostrich,²⁶ and smaller waterfowl in the marshes.²⁷ A gilded shrine (JE 61481) from the tomb of Tutankhamun depicts the young king hunting fowl in the marshes with bow and arrow, his wife at his side.²⁸ Slings were another projectile weapon possibly used to hunt birds, and three slings were discovered in Tutankhamun's tomb. Together, these opportunistic

²³ R.E. Moreau, "Quail," *Bulletin of the Zoological Society of Egypt* 1, (1927-1928): 11.

²⁴ Bailleul-LeSuer, *Live Avian Resources*, 182; Gay Robins, *The Art of Ancient Egypt* (Cambridge: Harvard University Press, 2008): 68.

²⁵ Bailleul-LeSuer, *Live Avian Resources*, 182-183.

²⁶ *Ibid.*, 186.

²⁷ *Ibid.*, 187.

²⁸ *Ibid.*, 186.

methods seem most likely utilized by individuals or farmers who may have easily carried such items with them while performing regular agricultural duties.

Set traps and nets, however, were the most reliable and effective ways to ensure capturing live fowl. Once caught in nets or traps, struggling and panicked birds had to be handled with care by fowlers to prevent broken bones en route to poultry-yards, if they were intended to be housed for a period before consumption. Images depict fowlers carrying birds in small cages, often carried on a yoke with pairs of birds in cages on either side. Though some birds were likely slaughtered, butchered, and consumed immediately after capture, others might have been maintained for some time in poultry-yards, to ensure fresh meat for a later date. Poultry-yards appear in tomb scenes with varying amounts of fowl present, sometimes with birds packed so densely that it is difficult to make out the exact number. Poultry-yards may have even been furnished with shallow ponds for fowl to wade in, such as the pond depicted in the Dynasty 5 mastaba of Ti (Figure 12). It is also possible that poultry-yard attendants took advantage of natural ponds and waterscapes, building enclosures around them where possible.²⁹

Aviculture, the practice of the husbandry, breeding, and rearing of captive wild birds, occurred across ancient Egypt by at least Predynastic times, and was depicted in the Old Kingdom.³⁰ Birds making up the Egyptian aviculture industry include utilitarian fowl destined for the dinner table, such as ducks and geese, as well as birds belonging to the large-scale votive mummy economy later in Egyptian history, such as hawks³¹ and

²⁹ Ibid., 246.

³⁰ Ibid., 242-244.

³¹ A kestrel found to have perished from force-feeding of a mouse lodged in its esophagus, confirms that birds of prey were being kept, and likely bred, in captivity. See more in Salima Ikram, Ruhan

ibises. It is possible that birds of all species were captured using the above-described methods, with a small percentage of the wild-caught birds sustained in captivity to produce subsequent captive-bred generations.³² These fowl were cared for by aviculturists, who had at least a basic understanding of veterinary medicine, as birds are mentioned in the Kahun Veterinary Papyrus.³³

In the Late period, there is evidence of such care based on examples of healed fractures found on a Sacred ibis from Abydos.³⁴ Though this ibis was raised for votive use, there is no reason to assume that basic husbandry requirements were withheld from fowl raised for consumption. A scene from the tomb of Mereruka depicts fowl moving freely, exhibiting natural behaviors such as preening, feeding, and hopping (Figure 13), despite the birds in the foreground that are force-fed by attendants.

Force-feeding of captive animals is a common motif in agricultural and daily life images. Tomb scenes depict cows, cranes, and even hyenas being force fed. In the tomb of Mereruka, unidentified fowl are force-fed to hyenas (Figure 14). Geese are also known to have been force fed, as weight gained from over-feeding and low mobility in an enclosed space produces excess fat in the meat.³⁵ Images from the tomb of Mereruka and

Slabbert, Izak Cornelius, Anton du Plessis, Liani Colette Swanepoel, and Henry Weber, "Fatal Force-feeding or Gluttonous Gaggling? The death of Kestrel," *Journal of Archaeological Science* 63 (2015): 76.

³² During the Saite period there is a shift from relying on wild-caught or captive-bred species. Instead geese like *Anser anser*, which by then were domesticated, were utilized. Later, the domestic chicken, *Gallus gallus*, was also introduced to Egyptian cuisine. See Baillel-LeSuer, *Live Avian Resources*, 410 – 419.

³³ William H. Peck, *The Material World of Ancient Egypt* (Cambridge, UK: Cambridge University Press, 2013): 118.

³⁴ Stephanie Atherton, Don Brothwell, Rosalie David, and Lidija McKnight, "A Healed Femoral Fracture of *Threskiornis aethiopicus* (Sacred Ibis) from the Animal Cemetery at Abydos, Egypt," *International Journal of Paleopathology* 2, (2012): 47.

³⁵ Ikram, *Choice Cuts*, 176.

the tomb of Djhutihotep show workers force-feeding handfuls of grain to geese.³⁶ Geese are also naturally fatty animals, with the common Egyptian Greylag goose (*Anser anser*) having about 5mm of fat thickness depending on sex and maturity.³⁷ It is possible that fowl were sometimes preserved in jars of their own fat, such as the jars at Amarna labeled as goose fat,³⁸ which could last a little under a year in Egypt.³⁹ Besides its preservative properties, goose fat was valued for its taste and use in medicine.⁴⁰

Once a bird reached its desired weight and age for consumption, fowl were slaughtered by butchers. Fowl were dispatched by having their necks wrung rather than slit,⁴¹ the latter being common with mammalian livestock. If the fowl was wild caught, they may have perished from wounds inflicted by spears or arrows, but it is also possible that some captured fowl had their necks wrung in the marshes, allowing their carcasses to be transported back with ease. Ducks and geese raised in avian stockyards were slaughtered in the same way. To wring⁴² a bird's neck means that the neck vertebrae and

³⁶ Force-feeding of geese is still practiced in some parts of the world today in order to produce *foie-gras*, a dish of fatty goose liver. It is possible that the Egyptians had similar culinary preferences, but this cannot be known for sure.

³⁷ J.J. Negro, J. Figuerola J. Garrido A. J. Green, "Fat stores in birds: an overlooked sink for carotenoid pigments?" *Functional Ecology* 15, no. 3 (2001): 300.

³⁸ Ikram, *Choice Cuts*, 179.

³⁹ *Ibid.*, 169.

⁴⁰ *Ibid.*, 175.

⁴¹ Today in Egypt it is common practice to slit the throat of any fowl to ensure the blood is drained swiftly from the body in accordance with halal dietary law. See J.M. Regenstein, M.M. Chaudry and C.E. Regenstein, "The Kosher and Halal Food Laws," *Comprehensive Reviews in Food Science and Food Safety* 2 (2003): 121-122.

⁴² Salima Ikram uses the term "strangulation" (Ikram, *Choice Cuts*, 57) to describe the same action, but this term denotes a different mechanism of death, as strangulation results in death from oxygen deprivation. Though it is technically possible that fowl were sometimes strangled, strangulation is a longer, less humane, and potentially hazardous method of slaughter as compared to wringing the neck. For the

spine have been separated through neck dislocation, usually achieved by placing both hands around the bird's neck and twisting in opposite directions. The resulting blood flow loss to the brain causes unconsciousness, and the severed spinal cord results in breathing cessation.⁴³ This method of slaughter incapacitates fowl but it does not consistently guarantee immediate unconsciousness and is therefore not used in large-scale poultry production today.⁴⁴

Though most fowl perished through neck wringing, it is possible that victual fowl intended for food offerings may have been slaughtered by having their throats cut. Blood pooling in the chest cavities of victual fowl mummies has been suggested to indicate blood-letting trauma to the throat,⁴⁵ possibly as a result of the required rituals needed to offer the meat,⁴⁶ although this could also have happened after decapitation. Though there are artistic depictions of the ritual slaughter of cattle,⁴⁷ such as reliefs in the tomb of Ptahhotep at Saqqara or Horemheb in Memphis, there are no known scenes showing ritual blood-letting of fowl. There is, however, an Amarna Period relief fragment featuring the ritualistic offering of a duck by Akhenaten to the Aten (Figure 15). Here, Akhenaten grasps the duck's wings behind its body in one hand, and its neck with the other, immobilizing the frantic bird, as he raises it above his head towards the

purposes of this thesis, I will exclusively use the term "wring" and its appropriate implication of neck dislocation.

⁴³ Humane Slaughter Association, *Practical Slaughter of Poultry* (UK: Humane Slaughter Association, 2013), 42.

⁴⁴ Ibid., 42-43.

⁴⁵ Goodman, "Victual Egyptian Bird," 71.

⁴⁶ Ikram, *Choice Cuts*, 60.

⁴⁷ For discussion on the ritual slaughter of cattle and other large mammalian livestock, please see Ikram, *Choice Cuts*, 43-48.

outstretched hands of the Aten. This sunk relief scene may symbolize Akhenaten's dominion over the natural environment of Egypt, representing his control of the chaotic natural world, in addition to his perpetual offering.

Scenes of fowl and fish processing from the tomb of Rekhmire (TT100) show butchers seated on low stools, wringing the necks of Greylag geese, which can be identifiable by their distinctive grey facial markings. In this image, dead geese are shown being carried by a butcher on a yoke, tied by their legs in groups of six and five for equal weight distribution. While wringing fowls' necks was relatively simple and likely done routinely in an ancient Egyptian home, it does still require practice and confidence to do correctly. The seemingly mundane method of slaughtering fowl may explain the lack of its artistic representation in tomb scenes.

Once a bird has been killed, the next step in processing is to dress and eviscerate the carcass. Dressing the carcass for immediate consumption or preservation entailed the removal of feathers, and cutting off wing tips (metacarpus and phalanges) and feet. It is possible that the ancient Egyptians submerged fowl in boiling water, which softened the skin where feathers are attached and aided in the de-feathering process, but this is not depicted in tomb scenes.⁴⁸ It is also possible that feather down from fowl victual mummies was singed away by holding a dressed fowl over a flame.⁴⁹ A plucked bird can be obvious in representations, however, as the carcass may show the feather follicles on the skin as dotted or dashed lines (Figure 16). Feathers were a by-product of fowl slaughter, likely used much as they are today for stuffing in cushions and pillows. A

⁴⁸ Ibid., 61.

⁴⁹ Goodman, "Victual Egyptian Bird Mummies," 71.

footstool from the tomb of Yuya and Thuya was packed with feathers, though the species is unknown.⁵⁰ It is impossible to know if it was typical to dress the carcass before evisceration, or if viscera were removed immediately upon death.

Most fowl carcasses were eviscerated,⁵¹ rather than left whole, by cutting a ventral slit lengthwise down the bird, and removing the intestines and internal organs. Removing the viscera is critical to processing and preservation, as bacteria build up quickly in the bird's interior if there is excess liquid. The act of removing the organs from a carcass is not depicted in any known tomb scenes. Evidence of evisceration is depicted by slits on processed fowl, shown as either a solid ventral line (Figure 17) or a narrow ventral opening (Figure 16 & 18). Experimental archaeology conducted by Ikram suggests that if fowl carcasses have been eviscerated, they can last up to six hours without any further processing before bacterial levels become hazardous.⁵² Vidual fowl mummies have been found to have internal organs placed back into the body cavity after being cleaned.⁵³ This may suggest that the fowl were prepared with special considerations as "whole objects," since they were mummified. Or it may indicate that the nutritious organs were consumed as part of a meal, and would therefore be required with the fowl.

Soon after death it is necessary to prepare the fowl for immediate consumption, or preserve it for short-term, or long-term storage and later consumption. It is impossible to

⁵⁰ Paul T. Nicholson and Ian Shaw, *Ancient Egyptian Materials and Technology* (Cambridge: Cambridge University Press, 2000), 291.

⁵¹ Ikram, *Choice Cuts*, 60.

⁵² *Ibid.*, 60.

⁵³ Goodman, "Vidual Egyptian Bird," 67-77.

know for certain how much time typically elapsed between slaughter and consumption in ancient Egypt, but this would surely have relied on the species of bird, and the desired “end-result” of processing, as fowl size makes a difference in terms of the taste and final product. The heat of an Egyptian summer would limit the amount of time that fresh meat could be left unattended, as bacteria quickly multiplies in the undried, interior parts of meat.⁵⁴ Ethnographic observations in present-day Egypt suggest that ducks and geese may be killed up to three hours before cooking or consumption.⁵⁵

While beef and fish were sometimes preserved through sun-drying,⁵⁶ a method that entails hanging strips of meat on a drying line and leaving them in the sun to dehydrate, fowl was not typically preserved in this way. Instead, the few artistic representations of dressed birds suspended from lines in tomb scenes likely indicate a meat softening technique, where fowl is hung whole without being eviscerated, allowing instead for the meat to “settle,” similar to European treatment of game birds.⁵⁷ Scenes from the tomb of Djhutihotep (TT36) show fowl suspended by their wrung necks. Their legs, wingtips, and feathers have been removed, but they lack ventral evisceration lines and may have even been consumed raw, as Herodotus notes that quail were sometimes consumed this way during the Greco-Roman Period.⁵⁸ However, most fowl likely underwent some degree of processing before it was consumed or stored, in order to

⁵⁴ Ikram, *Choice Cuts*, 147.

⁵⁵ Ibid., 145.

⁵⁶ Ibid., 147 – 151.

⁵⁷ Ibid., 59.

⁵⁸ Herodotus (Loeb Classical Library), Translated by A.D. Godley, *Herodotus, The Persian Wars, Vol I: Book II*, 77 (London: W. Heinemann, 1920), 365.

protect against contamination. A study of meat samples from modern-day poultry (chicken, turkey, ostrich, quail, partridge) analyzed from slaughterhouses in Iran,⁵⁹ Pakistan,⁶⁰ and Serbia,⁶¹ suggests that poultry, especially quail, has the highest rate of *Listeria* contamination, among other pathogens. Bacterial contaminants on meat are controlled and destroyed through proper food-processing and cooking techniques, such as drying, smoking, boiling, roasting, and other heating, or salting.

There is very little ancient evidence to suggest that fowl were processed by sun-drying. The tomb of Ipuy (TT217) has the only known representation of fowl meat pieces possibly “drying” (Figure 16). Here, seated butchers are shown eviscerating deceased fowl. The ducks have had their necks wrung and have been dressed by having their legs and wingtips removed, and are fully plucked. Above one of the butchers are two lines, where rectangular-shaped slices of meat have been hung to dry. Though fowl are being processed in the scene, it is unclear if the drying meat is actually that of the fowl.⁶²

Smoking is another present-day method of preservation, though its use as a preservation method for fowl in ancient Egypt is not depicted clearly in any tomb scenes. Though tomb scenes sometimes show cuts of meat hanging on a line near a fire, Ikram asserts that these are unlikely to be depicting the actual smoking of meat, especially of

⁵⁹ Ebrahim Rahimi, Farzad Yazdi, and Hussein Farzinezhadizadeh, “Prevalence and Antimicrobial Resistance of *Listeria* Species Isolated from Different Types of Raw Meat in Iran,” *Journal of Food Protection* 75, no. 12 (2012): 2226.

⁶⁰ M.S. Mahmood, A.N. Ahmed and I. Hussain, “Prevalence of *Listeria monocytogenes* in Poultry Meat, Poultry Meat Products and Other Related Inanimates at Faisalabad,” *Pakistan Journal of Nutrition* 2, no. 6 (2003): 348.

⁶¹ Dimić, R. Gordana, Sunčica D. Kocić-Tanackov, Olivera O. Jovanov, Dragoljub D. Cvetković, Siniša L. Markov, Aleksandra S. Velićanski, “Presence of *Listeria* Species in Fresh Meats from Retail Markets in Serbia,” *Apteiff* 41 (2010): 3-6.

⁶² Ikram, *Choice Cuts*, 151-152.

fowl.⁶³ In a meat-processing scene at the tomb of Thutnefer (TT104) the top register suggests long thin strips of meat may be “smoking” near a fire. This is improbable, however, given the distance from the fire, the time it takes to thoroughly smoke meat, and the fact that the fire here is covered by a pot.⁶⁴

Fowl was most likely preserved by salting and brining, as these methods work effectively for long-term storage, lasting up to several years and thoroughly protect meat from bacteria.⁶⁵ Both methods use salt (NaCl) or natron as the agent of preservation, given that both salt and natron was readily available⁶⁶ and valued for their anti-microbial properties.⁶⁷ Packing cuts of meat in salt or natron is considered “dry-salting,” while brining means that the meat has been sealed in a mixture of salt,⁶⁸ water, and an optional sweetener, like sugar or honey, otherwise known as “wet-salting.”⁶⁹ Dry-salting and brining are mentioned in antiquity by Herodotus, where whole pickled birds were stored in amphora,⁷⁰ likely prevalent throughout Egyptian history given the availability of both salt and natron and the long shelf-life of brined or salted birds. The Dynasty 18 Tomb of

⁶³ Ibid., 155.

⁶⁴ Ibid., 155.

⁶⁵ Ibid., 156.

⁶⁶ Ibid., 165; J.R. Harris, *Lexicographical Studies in Ancient Egyptian Minerals* (Berlin: Akademie Verlag, 1961), 189-198.

⁶⁷ William Albarracin, Ivan Sanchez, Raul Grau and Jose M. Barat, “Salt in food processing; usage and reduction: a review.” *International Journal of Food Science & Technology* 46 (2011): 1330.

⁶⁸ Salt (NaCl) is composed of sodium chloride, while natron is a naturally occurring salt mixture, containing sodium bicarbonate and sodium bicarbonate decahydrate, among other trace minerals. “Table salt” and natron both preserve meat through dehydration. See also, Ikram, *Choice Cuts*, 156-157 and Ikram, “Meat Processing,” Chapter in *Ancient Egyptian Materials and Technology* edited by, Paul T. Nicholson and Ian Shaw (Cambridge: Cambridge University Press, 2009), 665, 667.

⁶⁹ Ikram, *Choice Cuts*, 156.

⁷⁰ Herodotus, *The Persian Wars*, 365.

Kha (TT 8) contained one such large amphora filled with brined fowl, who had been beheaded, eviscerated, and plucked, though Ikram notes that many still had their wing tips and feet.⁷¹

The brined fowl were possibly preserved by first lining the bottom of an amphora with the mixture of salt and sweetener, then alternating between layers of meat and brine mixture to the top of the vessel.⁷² Storage containers for brined fowl were large amphora with short necks, sometimes with handles for easy transport.⁷³ Brining liquid would have been poured into the amphora while still hot, and as it cooled a vacuum seal was created. The resulting anaerobic interior prolonged the preservation of its contents.⁷⁴ Processing scenes from the tomb of Rekhmire (TT100) show workers placing small fowl into large amphora, possibly to layer and prepare for brining preservation (Figure 19).

Though salting was the preservation method of choice, one possible alternative to salt is honey. Honey is naturally bactericidal and anti-fungal,⁷⁵ and its high viscosity allows it to thoroughly permeate meat tissue. These qualities may have served dual purposes, ensuring long-term preservation of meat while also acting as a flavor enhancer,⁷⁶ possibly even representing the dining preferences of the deceased.

⁷¹ Ikram, *Choice Cuts*, 157.

⁷² Brigitte Maas-van, Berkel Brigiet van den Boogaard, and Corlien Heijnen, *Preservation of Fish and Meat* (Netherlands: Agromisa Foundation, 2004), 29-30.

⁷³ Ikram, *Choice Cuts*, 185.

⁷⁴ William Albarracin, *et al.*, “Salt in food,” 1334.

⁷⁵ A. Zumla and A. Lutat, “Honey – Remedy Rediscovered,” *Journal of the Royal Society of Medicine* 82 (1989): 384.

⁷⁶ D’Auria, Lacovara and Roehrig, *Mummies & Magic*, 142.

While little is known about ancient cooking practices or the recipes that made up an Egyptian menu,⁷⁷ it is at least certain that Egyptians enjoyed fowl cooked by boiling or roasting. Cooked fowl was likely covered in spices for flavoring, possibly even honey, as possibly suggested by chemical analysis conducted on vidual mummies.⁷⁸

Presumably, fowl of all kinds were a desired meal, for both living and deceased, as evidenced by the vast variety of waterfowl named on tomb offering lists and represented on offerings tables.⁷⁹ Including this provision for the deceased dates to Dynasty 0 and spanned all of Egyptian history.⁸⁰ The most frequently represented birds on offering scenes were the Greylag goose (*Anser anser*), White-front goose (*Anser albifrons*), Pintail duck (*Anas acuta*), Eurasian teal (*Anas crecca*), and the Turtle Dove (*Streptopelia turtur*).⁸¹ Geese depicted in these scenes were almost certainly part of captive flocks, and both ducks and doves would have been easily obtained from the wild. As such, their frequency on offering scenes may be associated with the ease of their availability.

Faunal remains intended as food offerings occur in a variety of contexts, including palace and building foundation deposits, but they are primarily found in private and royal tombs.⁸² Tomb scenes depict offering bearers presenting all manner of materials to the deceased, including bread, beer, cattle, and numerous species of birds and waterfowl.

⁷⁷ Ikram, *Choice Cuts*, 1; Hilary Wilson, *Egyptian Food and Drink*, Shire Egyptology no. 9 (Aylesbury, UK: Shire Publications, Inc, 1988), 7.

⁷⁸ Ikram, “A Re-Analysis of Part of Prince Amenemhat Q’s Eternal Menu,” 132-133.

⁷⁹ For a table of waterfowl species represented in Dynastic offering lists, see Bailleul-LeSuer, *Live Avian Resources*, 52.

⁸⁰ Bailleul-LeSuer, *Live Avian Resources*, 120-121.

⁸¹ Bailleul-LeSuer, *Live Avian Resources*, 50 – 52.

⁸² For a discussion of the use of fowl offerings in building structural foundations, see Bailleul-LeSuer. *Live Avian Resources*, 125-127.

Birds are transported by hand, in cages and flocks are guided by multiple attendants in offering processions, such as on the masataba of Ti from Dynasty 5. Almost all of the birds depicted in offering processions are still alive, though smaller ducks sometimes appear carried by their wrung necks. In the Dynasty 11 tomb of Meru, multiple species of waterfowl are present (Figure 20).

In a scene from the tomb of Ptahhotep (Figure 21), an offering bearer is depicted in the act of wringing a fowl's neck – and other birds may have recently been butchered in the same manner. This action is similar to the motion of Akhenaten described above (Figure 15) and to a scene in the Dynasty 12 tomb of Ukkhotep II, a nomarch, where the front offering bearer is depicted in the act of killing a fowl. Here, the frantic bird is held with both wings back, while its feet and neck are seen in multiples, representing rapid movement as the fowl dispatched. A deceased duck, with its neck wrung, is seen already laying at the feet of the offering bearer.⁸³

Waterfowl also appear on offering tables before the deceased, at a variety of stages of preparation. In the same scene from the tomb of Ptahhotep (Figure 21) fowl at all stages of processing are shown. A dispatched and plucked waterfowl, with head and neck still attached, lays amidst a heap of offerings in the top left register, while a fully dressed carcass tops a plate of figs, or perhaps persea fruit, in the center left. Three other birds across the center and top of the scene are shown with their wings outstretched, seemingly in motion. These fowl may depict living offerings, intended to replenish the flocks of the deceased, thereby providing an endless supply of food. Or they may represent recently dispatched ducks, displayed across offering heaps.

⁸³ Darby, Ghalioungui, and Grivetti, *Food: The Gift of Osiris*, 292.

Tomb scenes readily include both living and deceased fowl, and occasionally depict the act of wringing a bird's neck. They do not, however, seem to depict offerings left behind as literal victuals, such as a prepared meal on a plate or a wrapped victual mummy. There are no fowl carcass shapes depicted with linen bandages, or the shapes of victual mummy cases, perhaps suggesting that these were viewed merely as items of packaging – and the only symbol worth depicting was the contents inside. Though unidentified oblong shapes sometimes appear in these scenes (Figure 22), there is nothing to suggest that these shapes are in fact fowl victual mummies or their cases, rather they may represent bread loaves.

In archaeological contexts, intact faunal remains are uncommon and their presence in early excavation reports is usually limited to a mention of bones, usually left in a bowl or dish.⁸⁴ Some offerings seem to have been fully or partially cooked, suggesting that they had been prepared as a complete meal for the deceased, such as a flattened and grilled fowl from Deir el Medina,⁸⁵ while others were presented in large jars of brine, as pickled fowl.⁸⁶ Birds have been found preserved in brine-filled amphora in the tomb of Kha and the tomb at Balat.⁸⁷

Fully wrapped fowl victual mummies did not become prevalent until at least the Middle Kingdom, though rare Old Kingdom examples are known. It can be difficult to differentiate between species in fowl victual mummies, especially since they are often recovered quite damaged. Those that have been identified, however, are typically

⁸⁴ Bailleul-LeSuer, *Live Avian Resources*, 123.

⁸⁵ Wilson, *Egyptian Food and Drink*, 41.

⁸⁶ Ikram, *Choice Cuts*, 157; Bailleul-LeSuer, *Live Avian Resources*, 29 no. 110, 381.

⁸⁷ *Ibid.*, 157.

Greylag geese, White-front geese, Pintail ducks, Eurasian teals, and Turtle Doves.⁸⁸ Due to their frequency in offering scenes and as victual mummies, it is possible that these species had a ritual significance.⁸⁹ It is important to note, however, that fowl depicted in tomb scenes and found in faunal assemblages, are not always of the same species. For example, though cranes were sometimes depicted among offering processions to the tomb owner, their presence in faunal remains is very uncommon.⁹⁰

Overall, identifying and distinguishing between species of waterfowl in tomb scenes and faunal assemblages may help us understand ancient aviculture practices. Species identification in fowl victual mummies may also clarify food preferences. There does not seem to be any examples of victual mummies depicted in Egyptian art. Though the act of leaving wrapped and encased food offerings for the deceased may have bridged an important ritual gap between representations of food offerings in tombs scenes and a real, fully cooked meal. Investigating ancient fowl hunting, husbandry, and butchery, provides valuable insight into the production process of fowl victual mummies. In the next chapter, I will discuss the published corpus of fowl victual mummies and share insights gained from a detailed visual analysis of goose mummy 1981.1.18a.

⁸⁸ Bailleul-LeSuer, *Live Avian Resources*, 154.

⁸⁹ *Ibid.*, 154.

⁹⁰ *Ibid.*, 154.

Chapter Four: Corpus of Fowl Victual Mummies and Visual Analysis of *Trussed*

Goose and Case 1981.1.18

As part of the preparation for this thesis, the author created a corpus of known fowl victual mummies based on Ikram's appendix of "meat mummies"¹ and Bailleul-LeSuer's faunal assemblage additions (Table).² This chapter will summarize the corpus of fowl victual mummies, and discuss the history of the University of Memphis' *Trussed Goose and Case 1981.1.18*, from its excavation to current location. Next, I will provide a detailed visual description of that victual mummy and its case. Coinciding with this visual analysis was a detailed photographic study, with many of the photographs included in the Appendix. Visual examination of the interior of the mummy based upon x-ray images will be presented in Chapter Five. To date, no such studies have been conducted on mummy 1981.1.18a.

Fowl Victual Mummy Corpus

As previously mentioned, the corpus of published fowl victual mummies all originate from New Kingdom Theban tombs (Table). These fowl were prepared specifically as meals for their deceased tomb owners and were placed in the tomb to sustain the dead in the afterlife. All of the victual mummy wrappings listed in the Table contain complete or partially complete wrapped fowl remains, and the cases contain wrapped faunal remains. Some tombs, however, had additional empty cases of varying types – these are discussed in more detail by Ikram.³

¹ Ikram, *Choice Cuts*, 237.

² Bailleul-LeSuer, *Live Avian Resources*, 570-581.

³ Ikram, *Choice Cuts*, 231 – 236.

Fowl victual mummies are defined in this thesis as whole body, wrapped fowl, possibly enclosed in a case, box, or other storage container. The wrapped mummy is composed of osteological and dried soft tissue remains, including bone, flesh, and potentially feathers, as well as any agents of preservation, linen wrappings, and any possible decorative material or pigment. The preservative agents identified on victual mummies vary, but include resin, possibly from a coniferous or non-coniferous tree or shrub source.⁴ Resins were both sourced locally and imported into Egypt. It is possible that fowl victual mummies also contained salt (sodium chloride), natron, bitumen, beeswax, honey, or other plant-gum additives to aid in the desiccation process and bind linen wrappings together.

The majority of these fowl victual mummies come from royal or elite tombs. Their placement inside the tomb varies, though their precise locations may not have been reported in the excavation reports, or their original placement inside the tomb was disturbed by tomb robbers. This chapter highlights and summarizes the diversity represented by food offerings found in the elite and royal tombs of both men and women, and includes fowl victuals uncovered both with and without their original cases.

In Tutankhamun's tomb (KV 62) forty-eight food offering boxes, made of sycamore wood, were stacked under the Hathor couch (Figure 23). The meats inside these boxes were found partially decayed,⁵ suggesting that they had not been adequately preserved before their wrappings were applied, though their exteriors were covered in

⁴ Margaret Serpico. "Resins, Amber and Bitumen," In Paul T. Nicholson and Ian Shaw, eds., *Ancient Egyptian Materials and Technology* (Cambridge: Cambridge University Press, 2000), 432.

⁵ Noted in Carter's original excavation notes, Griffith Institute, <http://www.griffith.ox.ac.uk/gri/carter/062-c062-01.html>; Ikram, *Choice Cuts*, 250.

black resin. Hieratic inscriptions mark twenty-eight of the boxes, though many of these were incorrectly labeled and do not match the contents of the box.⁶ In investigating these victual boxes, Ikram noted that eight boxes contained remains of fowl victual mummies. Some boxes contained wrapped pigeons (JE 61439 and JE 61441), three to a box, while one contained only the wrapped organ, possibly a liver, of a goose (JE 61390).⁷

Another royal funerary assemblage with unique features is that of Tuthmosis IV (KV 43), whose Dynasty 18 tomb contained six fowl victual mummies. These mummies were identified by Ikram as Greater White-Fronted geese (*Anser albifrons*), a large species not native to Egypt.⁸ Their presence may suggest that the tomb owner passed away during the winter, when the migratory bird is found in Egypt, and producing such victual mummies would be plausible.⁹ Though it is possible that victual mummies were made far in advance, their limited presence in tombs makes it more likely that these food offerings were constructed at or near the time of burial.¹⁰

The Dynasty 18 tombs of Amenhotep II (KV 35) and Thutmose III (KV 34) yielded more than two hundred food offerings, more than any other tomb known. These tombs are discussed together, as they were discovered, excavated, and published together by Victor Loret,¹¹ who grouped the offerings without distinguishing their original

⁶ For a detailed discussion of these hieratic labels, see Ikram, *Choice Cuts*, 142 – 144.

⁷ See Table.

⁸ Ikram, *Choice Cuts*, 256.

⁹ *Ibid.*, 256.

¹⁰ *Ibid.*, 256-257.

¹¹ Victor Loret, “Le Tombeau du Thoutmosis III et Le Tombeau d’Amenophis II,” *Bulletin de l’Institut d’Egypte* 9 (1898): 91-112.

locations.¹² The majority of these offerings were beef, with only two Greater White-Fronted geese (*Anser albifrons*) recorded. There were also four fowl-shaped cases found in these tombs, one made of stone and three wooden, resembling processed fowl without heads, wingtips, or feet; none of the fowl victual cases were explicitly mentioned by Loret.¹³

A few tombs of royal women also contained fowl victual mummies. Twenty-five victual mummies, including two fowl victual mummies, were recovered from the Dynasty 18 tomb of Meryetamun (TT 358). The Dynasty 19 tomb of Isit contained only four wrapped victual mummies, all fowl mummies, that were placed in unique teardrop-shaped cases.¹⁴ The Dynasty 21 tomb of Isitemkheb D, wife of Pinudjem II, contained twenty-one wrapped food offerings, only four of which were fowl victual mummies (Table). These were small fowl that appear to lack resin, and three of them were without cases.¹⁵ It is possible that by Dynasty 21 the practice of leaving food offerings in the tomb was not as widely practiced as in previous dynasties.

A non-royal example is the group of fowl offerings recovered from the tomb of the fan-bearer Maherpri (KV 36). Of the twelve meat offerings taken from the tomb, including one wrapped bundle of ten individual veal cuts,¹⁶ five were identified as fowl and each was in its own case. Ikram notes that the wrappings of these fowl did not

¹² Ikram, *Choice Cuts*, 239.

¹³ Ikram, *Choice Cuts*, 241-242. Daressy, G. *Fouilles de la Vallée des Rois* (Le Caire: Imprimerie de l'Institut français d'archéologie orientale, 1902), 177.

¹⁴ Ikram, *Choice Cuts*, 283.

¹⁵ *Ibid.*, 262.

¹⁶ Daressy, *Fouilles de la Vallée des Rois*, 58.

appear to have been fully saturated by resin.¹⁷ This may represent fowl that were wrapped in thicker layers of linen bandages, so they would not appear resin impregnated. Or, since this was a non-royal tomb, perhaps there was a limited amount of resin available for economic reasons. The Dynasty 18 tomb of vizier Imhotep (QV 46) represents another non-royal example containing food offerings. Imhotep's tomb contained six fowl victual mummies, each encased in a wooden bird-shaped box. These boxes exhibit the typical presentation of a processed fowl, with head, wing-tips, and feet removed.¹⁸

Food offerings from the Dynasty 18 tomb of Yuya and Thuya (KV 46) yielded six wrapped fowl victual mummies, each in its individual case (Figure 24). These fowl victuals are unique compared to other funerary assemblages, because both the interior and exterior of some cases were coated with resin.¹⁹ Another anomaly of this funerary assemblage is the possible inclusion of an antelope scapula.²⁰

Victual Fowl Mummy 1981.1.18a – History

A primary focus of this thesis is fowl victual mummy 1981.1.18 now in Memphis, Tennessee and originally excavated from a tomb in a small bay above Deir el-Bahari by the Metropolitan Museum of Art in 1918 by A. Lansing.²¹ It was during his excavations at Thebes that Lansing discovered a collection of mummified meats scattered in and around tomb number MMA 1021. A variety of victuals were recovered, including fowl

¹⁷ Ikram, *Choice Cuts*, 257.

¹⁸ Ibid., 265.

¹⁹ Ibid., 260.

²⁰ Ibid., 262.

²¹ Lansing, "The Egyptian Expedition," 7-8.

such as geese, duck, and quail, as well as cuts of beef and even individual beef organs like the liver and heart.²² The number of fowl vidual mummies was not mentioned in Lansing's report, but Ikram later noted that twenty geese, thirteen ducks, and nine pigeons or doves were accounted for at the Metropolitan Museum of Art.²³ Each fowl vidual mummy was individually prepared with resin, bound with linen wrappings, and placed into a wooden bird-shaped case. The tomb had been subject to plundering and when discovered, the mummies were strewn about the chamber, shaft, and entrance and no longer in their original cases. Fill from the shaft or possibly cliff debris above the tomb had shifted down, leaving large deposits of limestone chips in the tomb.²⁴

Lansing notes that the fowl mummies remaining in their cases had "bitumen" used as the sealant within, with white "stucco" remnants on the outside of the cases.²⁵ This "bitumen" on the case interiors has been variously described as resin,²⁶ and black pitch,²⁷ though its correct identification is unknown. The identity of the tomb owner was unclear, but subsequent excavations at the bay revealed a steatite shawabti with the inscription, "The Chief Steward and Scribe, Seniu" and the coffin burial of a prince Amenemhat of the early Dynasty 18 that had been reburied in a reused Dynasty 22 coffin.²⁸ Tomb MMA 1021 and its associated vidual mummies were originally attributed

²² Ibid., 7.

²³ Ikram, *Choice Cuts*, 277.

²⁴ Ibid., 7.

²⁵ Ibid., 8.

²⁶ D'Auria, Lacovara, and Roehrig, *Mummies & Magic*, 142.

²⁷ MFA Boston, "Offering Case 37.554a-b Accession Card," Boston, 1930s.

²⁸ Lansing, "The Egyptian Expedition," 8-11. William C. Hayes, *The Scepter of Egypt. Part II: The Hyksos Period and the New Kingdom (1675 – 1080 BC)* (New York: The Metropolitan Museum of Art,

the burial of Seniu. Subsequently, the material has been associated with the reburial of prince Amenemhat.²⁹

One of the fowl mummies collected as part of this victual funerary assemblage was at the Metropolitan Museum of Art until 1937,³⁰ when it was acquired by the Museum of Fine Arts Boston in an exchange which also contained a few other of the victual mummies from MMA tomb 1021.³¹ It was at the MFA Boston until 1975 when it was acquired by the Art Department of the University of Memphis³² through the generosity of Edward H. Little of Memphis, in memory of his wife Suzanne Trezevant Little.³³ The piece is currently on display in the Egyptian Gallery of the Art Museum of the University of Memphis. The mummy (1981.1.18 a) is in generally good condition, and rests in one half of a wooden case (1981.1.18 b) that replicates the shape of the trussed goose. Though a complete victual mummy offering in antiquity would have included a sealed pair of upper and lower cases, the University of Memphis is in possession of only one portion of a case and the location of its “lid” is unknown.

This fowl victual mummy was initially identified as a duck on the Boston

1959), 58-59.

²⁹ Lansing, A, “The Egyptian Expedition,” 6-7; D’Auria, Lacovara, and Roehrig, *Mummies & Magic*, 141; Ikram, “Amenemhat Q’s Eternal Menu,” 119.

³⁰ MMA acc. no. 19:3:282 (case), 19:3:221 (goose).

³¹ MFA acc. no. 37.554a-b. Dows Dunham, “Exchange of Egyptian Antiquities with the Metropolitan Museum,” *Bulletin of the Museum of Fine Arts*, Vol. 35, No. 211 (Oct. 1937): 74.

³² Then Memphis State University.

³³ Carol Crown, “The Memphis State University Egyptian Collection,” *Interpretations. A Journal of Idea, Analysis, and Criticism*, vol. 13, no. 2, Department of English, Memphis State University (Spring 1982), 1.

Museum of Fine Arts accession card, a distinct species identification was not suggested.³⁴

In 2003 while this object was on display at the University of Memphis, Salima Ikram suggested that it was more likely to be a goose.³⁵ A victual mummy identified by its MMA accession number (19.3.221) appeared in print identified as a Greater White fronted goose (*Anser albifrons*).³⁶ Dr. Aimee Berliner of the Memphis Zoo later confirmed that fowl victual mummy 1981.1.18a is most likely a goose based on radiographs, though it is difficult to comment on the species with any certainty.³⁷ In *Choice Cuts*, MMA 19.3.282 was identified as a goose (*Anser anser?*), however, a victual case in Memphis also bares in red ink the MMA number 19.3.282.³⁸

On March 29th 2018, a detailed macroscopic and low magnification (10X hand lens) visual inspection and photographic study was conducted on victual mummy and case 1981.1.18a,b (Figure 25). This study was carried out over the course of five hours, using Canon EOS 20D digital and iPhone 6 HDR cameras. More than 900 photos were taken of the ventral and dorsal sides of the mummy and the interior and exterior of the case. Measurements were taken of the mummy and case. A summary of these measurements is seen in the tables below.

Victual Fowl Mummy 1981.1.a Description

The fowl has been prepared, at least in its visual presentation, as if for the dinner table with its head and most of the neck removed. In addition, the wing tips, including

³⁴ MFA Boston, "Offering Case 37.554a-b Accession Card," Boston, 1930s.

³⁵ See IEAA accession record for 1981.1.18a,b notes that S. Ikram suggested an identification of goose in March, 2003.

³⁶ Ikram, *Choice Cuts*, 270; Bailleul-LeSuer, *Live Avian Resources*, 577.

³⁷ Personal communication with Dr. Aimee Berliner, February 25th, 2019.

³⁸ Ikram, *Choice Cuts*, 273.

radius, ulna and metacarpals, and feet, comprising the tarsometatarsus and toes, have been removed.

The entire body is wound tightly in cloth, with only small portions of bone exposed at the ends of the neck, humeri, tibiae and pygostyle. Wrapping encompasses the bird in a simple spiral pattern, except for the lower portions of the limbs, which have been wrapped separately. The lower legs appear to be wrapped in a crisscross pattern. The proper left wing- is folded beside the body. Though the mummy is delicate, the wrappings are well impregnated with resin and dirt, with no areas of fraying or unraveling visible, except for small portions at the ends of the legs and knee hole. There are, however, at least seven small patches of wrapping where the structure of the fabric is identifiable because the weave is loose. The material of the wrappings, most likely linen, appears to be a relatively fine, loosely woven, unbalanced plain weave with S-twist. A patch of loose wrapping over the proper right leg joint revealed 28-30 threads per centimeter as the weft, and 12 threads per centimeter as the warp, and another section near the keel approximately 30 x 20 threads per centimeter.³⁹ The wrappings on the dorsal side of the mummy do seem to be more resin and dirt impregnated than the ventral side, and the overall shape of the dorsal side is, not unexpectedly, slightly flatter than the keel.

One notable feature of the wrapping is the tuck that occurs proper right across the clavicle and keel, likely indicating the final fold during the mummy's production (Figure 26). Most of the mummy's wrappings remain intact, though there are small areas of wear on the distal ends of the tibiae and humeri. The proper right knee joint also has a small (1.8 x 1.3 cm) bean-shaped hole through the cloth and into the bone, and a sharp flat

³⁹ Based on a count by Dr. Patricia Podzorski, March 29th, 2018.

piece of debris is wedged into the end of the joint. This debris could be a very thin piece of flint, or even a fragment of a leaf or plaster from the outer case. At the distal end of the proper right humerus, the wrappings are clipped off in a straight edge, and it is unclear if the bone is actually exposed, as the end is clogged with dirt and difficult to distinguish. The ventral surface remains relatively free of dirt, the dorsal side revealed a significant deposit of debris clinging to the wrappings of the mummy (Figure 27).

While the mummy was at one point probably saturated with a resin for preservation, traces of this resin are not clearly visible, as the surface of the mummy, especially the bottom, is encrusted with dirt and plaster fragments, and the mummy has only a very faint odor from lingering balms. There are no areas of saturation or stains indicating resin on the surface of the wrappings. The mummy is thoroughly dried out, likely hastened by the separation of the case from its lid, and the subsequent exposure to air and environment.

Turning mummy 1981.1.18a over exposed the dorsal surface covered with dozens of possible flakes of gesso or plaster from the exterior of the case, small pieces of stone, and fragments of faunal and floral remains. This debris is not visible when the mummy is resting in its usual keel-up orientation. Overall, there are at least a couple hundred flakes of light tan stone chips scattered across the mummy's dorsal side, embedded in a thick layer of dried resin and dirt. Additionally, there are approximately twenty small deposits of black pitch / resinous material lodged among the debris. The most notable features on the dorsal side of mummy 1981.1.18 a are two tiny faunal bone fragments and one tooth, possibly from a small rodent, caught between layers of dirt.

Victual Fowl Mummy 1981.1.18a – Measurements

Overall ventral length (neck to tail)	27.1 cm
Overall maximum length	28.3 cm
Length of neck	1.8 cm
Length of proper right humerus	14.1 cm
Length of proper left humerus	15.5 cm
Length of proper left tibia	11.4 cm
Length of proper right tibia	12.9 cm
Length of pygostyle (base to tip)	3.3 cm
Length of keel (visible portion only)	13.5 cm
Width of carcass at proximal humerus ends	c. 11.0 cm
Width of carcass across mid-body	c.12.0 cm
Width of carcass at distal ulna ends	12.7 cm
Maximum (D-V) distance	8.7 cm

Most of the debris is composed of what appear to be thin flakes of gesso or plaster with small fragments of pigment. They vary in size, with the majority being small, around 2 x 1.5 mm, dispersed densely over the mummy form, with no area on the dorsal side uncovered. The largest flake, an elongated rectangle, 12 x 7 mm, was partly embedded in the proper left wing. These flakes could be the reverse side of pigment used to line the interior of the case or the now missing lid.

On the proper left dorsal side above the pygostyle, a possible rodent scapula is embedded between the wrapping (Figure 28). The scapula appears to have the coracoid process facing upwards, with most of the preserved bone hidden under the strip of wrapping. Further down the proper left side is a tooth, possibly belonging to the same unidentified animal (Figure 29). Directly below the scapula is what appears to be the bud of an unknown plant, with tiny bud scales or petals still distinguishable (Figure 30). Fragments of similar buds surround the pelvic girdle region of the mummy. These flora remains are dark tan. Other flora fragments appear across the clavicle region and both tibiae of the mummy, but these are more embedded within the resin and dirt compound (Figure 31). Additionally, small fragments of insect casings can be seen throughout the pelvic region. These materials likely adhered to the victual mummy in its post-depositional state, after the mummy and case were unsealed in the fill.

Victual Fowl Mummy Case 1981.1.18b Description

The case half in Memphis (1981.1.18 b) appears to have been carved from a single piece of wood (Figure 32). The wood varies from a medium brown color where it has weathered, to a lighter shade of brown on more recently exposed surfaces. The interior retains remnants of both a base layer (ca. 0.5-1.0 mm in thickness), light tan in color, overlain by a layer of mottled brown and black “pitch” of varying thickness. Both layers are severely chipped (Figure 33). In some areas along the rim, it appears as though the tan pigment has reacted with the black material, as it has rust discolorations, perhaps a result of oxidization after becoming exposed to the air. The remaining “pitch” is thickest at the bottom of the case, where its pattern reveals its method of application (Figure 34). Here, the dried “pitch” shows parallel ridges and a swirl in the center,

indicating it was applied with a brush. The brown layer also has traces of brush application and at a few points appears to underlay the black layer; it is unclear if the brown is distinct from the black layer, or if they are the same material. Perhaps the brown being less oxidized than the black upper layer. Due to the losses in the “pitch” layer, it is difficult to be certain, but the brush may have been as much as 2 cm wide.

Victual Fowl Mummy 1981.1.18b – Measurements of Case and Case Description

Length of case, max (exterior, measured hollow side up)	40.2 cm
Width of case, max (exterior, hollow side up)	19.5 cm
Depth of case, max (exterior)	6.9 cm
Width of case neck (interior)	4.8 cm
Width of case end of neck (exterior)	6.5 cm
Width of neck peg hole (interior)	0.7 cm
Width of tail peg hole (interior)	0.5 cm
Depth of neck peg hole	1.7 cm
Interior depth of case (max)	5.5 cm
Wall thickness (measured at edge of case)	0.5 – 2.0 cm

The rim of the case is worn, with chisel marks evident on the left leg of the case. Two holes are present at opposite ends of the case, where the neck and tail of the mummy rest. The tail hole still contains a broken piece of a round wooden peg of similar color, which would have secured the lid to the other half of the case. The hole in the neck is not

visible on the exterior and it may have been only partially drilled, with the peg inserted before the case was closed, serving as a pivot.⁴⁰ The hole in the tail portion goes completely through the wood and is visible on the exterior surface. This end of the hole is larger, ca. 1 cm across, and of irregular shape, perhaps indicating damage caused when the case was opened. It appears that “pitch” was used to seal the base and lid together, with thick layers of black “pitch” still visible on the rim edge, especially in the areas of the neck, legs and tail. This “pitch” was then likely applied around the exterior of the rim as a final preservation step, judging from small deposits of this substance on the outside of the rim.

The exterior of the case is coated in the same shade of sandy-colored material over which is a denser, possibly pigmented layer of similar color, with many areas suffering damage where these layers have flaked away. There are two notable features across the keel region of the exterior case. First, traces of a dark brown discoloration varying between 2.5 and 4 cm in width cross the width of the lid at approximately the center of the keel (see Figure 35). Sections are most strongly colored on the proper right “wing” and keel. Perhaps this mark is the imprint of coarsely woven bands, possibly impregnated with “resin”, once used to tie the two halves of the case together.⁴¹ Second, forward of this band (towards the neck), four very thin black strokes may represent small markings, perhaps drawn on with a fine brush (Figure 36).

The mummy is displayed in the case lying supine with ventral side up, evident from the prominent keel (Figure 37) and direction of visible pelvic girdle bones. Given

⁴⁰ It should be noted that the area where the hole would be visible on the exterior is mostly covered by the surface coating and pigment layers, possibly obscuring the hole.

⁴¹ Lansing, “The Egyptian Expedition,” 8, mentions such bands in his report. As does D’Auria, Lacavara, and Roehrig, *Mummies & Magic*, 142.

the rounded angles and scooped shape of the interior of the case, it seems that a fowl mummy was originally intended to be placed in the other direction, with the keel facing into the hollow. It is likely that this part of the case may have originally been a case lid, but has become mismatched with mummy 1981.1.18. The original bottom portion of the case would have allowed for a better fit with between the mummy and case.

In summary, the visual analysis of victual mummy 1981.1.18a and its case yielded insight into its current condition and manufacture. The external wrappings of the fowl victual mummy do not have any dark resin patches visible on the surface, but the bottom is heavily encrusted with a dark substance, and its case retains portions of dark “pitch,” possibly some of the same substance as on the mummy. Though a detailed chemical analysis is beyond the scope of this thesis or the expertise of the author, some basic non-destructive analytical techniques may provide further insight into the materials used in the manufacture of the mummy. In the following chapter I will discuss previous chemical analyses conducted on victual mummies, in order to provide basic context for the scientific study of mummy 1981.1.18a. I will also present a radiographic imaging study and pXRF analysis that I conducted on the University of Memphis fowl victual mummy.

Chapter Five: Scientific Analyses on Fowl Victual Mummy Corpus, Radiographic Study and pXRF Analysis of Goose Mummy 1981.1.18a

This chapter will discuss previous scientific analyses on fowl victual mummies, in order to better understand their manufacture. It will also include a descriptive analysis of radiographs and pXRF testing conducted on goose mummy 1981.1.18a. Radiographic studies of victual mummies may confirm the contents of wrappings, aid in species identification, identify the selected butchery techniques, and reveal anomalies in the wrappings. Chemical analysis of substances left on an animal mummy, its wrapping, and the interior of its case can reveal specific residual components, such as resins, binding agents, natron and salt. These components may indicate how expensive the mummy was to produce, if its resins are similar to human embalming materials, and the complexity of the production methods. Additionally, study of an animal mummy's remains and wrappings may reveal the specific types or quality of fabric selected. Though the basic methods of victual mummification are understood,¹ evidence of unguents selected, and methods of wrapping remain understudied.²

Significant studies conducted by Goodman and Ikram on the victual mummies³ from MMA tomb 1021 will be discussed in this chapter. Additionally, this chapter draws on radiographic analysis of avifauna votive mummies and experimental archaeology for comparative data. The second portion of this chapter will discuss the data gathered from a radiographic imaging study and pXRF analysis conducted by the author on Goose

¹ Goodman, "Victual Egyptian Bird Mummies," 74; Ikram, "A Re-Analysis of Part of Prince Amenemhat Q's Eternal Menu," 119.

² Clark, Ikram, and Evershed, "Organic chemistry," 20392.

³ Ikram, "A Re-Analysis," 122.

Mummy 1981.1.18a.

Nineteen fowl victual mummies recovered from Lansing's excavations at Deir el-Bahari were analyzed in detail by Steven Goodman at the American Museum of Natural History (AMNH) in 1987.⁴ These fowl victual mummies had been acquired by the AMNH from The Metropolitan Museum of Art in July 1965. Goodman unwrapped each mummy, noted any features that might suggest species or mummification methods, and took measurements of the *Anser* specimens. Next, the birds' ventriculi (gizzards) were removed from the abdominal cavities and soaked in water for 24 hours prior to dissection. Overall, species identification was limited because this is ideally done through the form of the bill, but like most victual mummies, these birds had their heads removed. Based on the general size of the bones, Goodman estimates that most of the victual mummies are geese, either *Anser anser* (Grelag goose) or *Anser fabalis* (Bean goose).⁵

Goodman's unwrapping and dissection of the nineteen mummies revealed patterns in their method of production. Of the mummies, seventeen contained “small” balls of cloth in the abdominal cavities, while three of the them containing two to three cloth balls.⁶ In some cases, these cloth balls were soaked with blood, suggesting that the birds were wrapped soon after slaughter and before any blood dried. Additionally, some mummies contained large blood clots near the neck and sternum. This may indicate that

⁴ Metropolitan Museum of Art catalogue numbers: MMA 6139 – MMA 6141, MMA 6143 – MMA 6150, MMA 6152, MMA 6153, MMA 6155, MMA 6157, MMA 6159, MMA 6161 – MMA 6163.

⁵ Goodman, “Victual Egyptian Bird Mummies,” 68-71.

⁶ Ibid., 68-71.

the birds necks were wrung or throats slit.⁷ Though Goodman did not conduct a chemical analysis, he observed that there was minimal resinous substance on the victual mummies, with only one containing remnants of the case sealant.⁸ Of the ventriculi dissected, one contained a few pebbles, while the rest were found empty.⁹ Three birds had two ventriculi replaced in their abdominal cavities. Goodman suggests that this indicates the birds were processed and mummified as a group. Each victual mummy was de-feathered before mummification, standard preparation for any poultry intended for consumption, with no down remaining.

The osteological remains of the nineteen AMNH victual mummies dissected remain at the museum in storage.¹⁰ Given that mummies are typically no longer unwrapped in academic studies, Goodman's 1987 research provides a valuable visual assessment that compliments later radiographic and chemical studies conducted on fowl from the same corpus.

In 2006, Ikram reanalyzed the four remaining victual mummies at the MMA from Lansing's excavations,¹¹ with support from MMA conservator Ann Heywood.¹² These victual mummies consisted of a beef shoulder and three fowl mummies still sealed in cases; two empty fowl cases were also studied. A detailed visual examination was

⁷ Ibid., 71.

⁸ Ibid., 71.

⁹ Ibid., 71-72.

¹⁰ There is no mention of remaining flesh from the mummies or if any dried flesh was stored along with osteological remains. Goodman does note that the unwrapped textile portion of the mummies were in the care of Ms. Amy Rosenberg of the Kelsey Museum of Archaeology. Goodman, "Victual Egyptian Bird Mummies," 68.

¹¹ Conducted through a Metropolitan Museum of Art Fellowship.

¹² Ikram, "A Re-Analysis," 123.

undertaken by Ikram, including a new study of existing MMA x-ray images, which coincided with new analytical tests conducted by the MMA Department of Scientific Research.¹³ These studies were undertaken in hopes of identifying the chemicals used in the preservation of the surviving MMA victual mummies. Though the data was not discussed in great detail, Ikram notes that the tests included: Fourier transform infrared micro-spectroscopy, gas-chromatography/mass spectrometry, and pyrolysis/gas chromatography mass spectrometry.¹⁴ Additionally, an enzyme-linked immunosorbent assay (ELISA) test was conducted in an attempt to isolate individual chemical enzymes present within the mummy balms, though these results are not discussed in Ikram's publication.¹⁵

Electron microscopy of *Scapula of Cattle 19.3.247* revealed that the victual mummy had not been cooked as a meal before it was offered to the deceased,¹⁶ contradictory to previous speculation, because large amounts of natron indicated that the meat had only been dry cured.¹⁷ Electron microscopy suggested that the black material coating the victual case was a mixture of beeswax¹⁸ and *Pistacia palaestina* resin, rather than bitumen.¹⁹ Ikram notes that no residual substances were found directly on the victual mummy, but a dark brown color on the wrappings was suspected to be a possible

¹³ Ibid., 123, Ikram notes that the majority of these new analyses were conducted by Research Assistants Adriana Rizzo and Mark Wypyski.

¹⁴ Ibid., 123.

¹⁵ Ibid., 123.

¹⁶ Ibid., 124.

¹⁷ Ibid., 124.

¹⁸ Ibid., 129, Or possibly honey.

¹⁹ Ibid., 124.

vegetable oil.²⁰ Ikram suggests that the MMA poultry victual mummies and their cases were prepared in a similar way.

Two of the three remaining fowl victual mummies are still sealed in their cases. These mummies were studied using x-ray imaging and by conducting micro-sampling of the residues at the case edges. *Victual mummy 19.3.275* was sealed in its bird-shaped case, with linen bindings wrapped crisscross over the length of the case to further secure it. Ikram notes that this particular mummy case bares a “drooping neck,” similar to the wrung necks of dead fowl brought as offerings.²¹ This is a unique feature among the victual mummy cases in the study, as on most, the neck is only a small stub, where the head of the bird was removed.²² The residue on the edge between the cases was a *Pistacia* resin and beeswax mixture, and the exterior of the case was covered in a layer of plaster, and possibly whitewash.²³ *Bird shaped case 19.3.276* was also sealed shut, with electron microscopy revealing the same black *Pistacia* resin and beeswax mixture at the edges.²⁴ This case is distinct because it suggests variety in the species of fowl left as offerings. It was shaped to represent a pigeon or quail, based on its small size, proportions, and pronounced sternum.²⁵ Ikram suggests that species variety in offerings may reflect the personal preferences of the deceased.²⁶ Details on the cases may reflect

²⁰ Ibid., 124.

²¹ Ibid., 125 - 126.

²² Ibid., 126.

²³ Ibid., 126.

²⁴ Ibid., 128.

²⁵ Ibid., 126-128.

²⁶ Ikram, “Food and funerals.” 364.

accurately the species within, but it is also possible that the species portrayed by the cases represent the desired victual mummy, while the remains inside were simply what was available. The resin mixture on this mummy case protrudes from the case to such a degree, that the edges do not align, suggesting a possible miscalculation in pairing the bird with an appropriately fitting case.²⁷ *Bird-shaped Case 19.3.281a,b* and *Poultry Case 19.3.289a,b* were treated with the same black resin mixture, though the two parts of these empty cases are no longer joined by pegs or wrapped linen. Case *19.3.381a,b* has the shape of a prepared goose, and case *19.3.289a,b* is again likely representing a smaller bird, such as a pigeon or quail, and has the same pronounced sternum as *19.3.276*.

Case Containing a Poultry Victual Mummy 19.3.280 was the only open victual mummy included in Ikram's study that still included a physical bird. Like the Memphis specimen, the presumed lid is unaccounted for, and this victual mummy rests in only half of a case.²⁸ The exterior of the case had the same layer of plaster as the other victual mummy cases, while the interior was lined with the same black substance identified as a mixture of *Pistacia* resin and beeswax, applied with a "thick" brush. Ikram notes that chemical markers possibly indicating spices were identified, though only aniseed was identifiable.²⁹ Electron microscopy/energy dispersive x-ray spectroscopy identified high levels of natron on the mummy's dark-brown wrappings, similar to the cattle scapula, suggested that this mummy may have been desiccated by dry-curing.³⁰ The radiographs

²⁷ Ikram, "A Re-Analysis," 128.

²⁸ Ikram notes that this missing lid was probably left unrecovered during the Lansing excavation. Ikram, "A Re-Analysis," 129.

²⁹ Ibid., 129.

³⁰ Ibid., 129.

of the bird revealed a sloppily removed head, as the vertebrae in the neck indicate only a partial removal, with part of the damaged skull visible. Radiographs confirm that the wingtips were removed, and the proper right tibia is broken above the distal joint.³¹

Ikram asserts that the electron microscopy conducted on the victual mummies confirms that the birds were not cooked before undergoing mummification, because the presence of natron suggests that they were simply dry-cured.³² The radiographs confirm that the victual mummies were dressed as if for a meal, even having their livers and giblets replaced inside their body cavities after preparation for consumption in the afterlife.³³ The tests suggest that after their mummification, it was possible that victual mummies were coated in vegetable oil, or sprinkled with spices, though the only suspected spice identified on these mummies was *Pimpinella anisum* L. or aniseed.³⁴ Ikram theorizes that some spices, such as aniseed and fenugreek, may have been utilized both for their flavor during the preparation of meats, as well as possible antibacterial properties, which would have aided in long-term preservation.³⁵ The black substance coating the interiors and edges of victual mummy cases is presumed to have served as a sealant, lining the cases and securing the offering within. There is, however, a chance that the beeswax markers are instead indicators of honey, a natural preservative.³⁶ Like the spices, the inclusion of honey on victual mummies may have been for its taste, or for

³¹ Ibid., 129.

³² Ibid., 132.

³³ Ibid., 132.

³⁴ Ibid., 133.

³⁵ Ibid., 133.

³⁶ Ibid., 134.

use as an effective and aromatic preservative.

The chemical makeup of resins was a central part of Clark and Evershed's 2013 analysis of four victual mummies. These victual mummies included tissues and meat samples of beef ribs from the tomb of Yuya and Thuya (CG5109), a possible goat from the tomb of Theban priestess Henutmehyt (EA51812), a calf victual mummy from the tomb of Istemkheb D (CG29852), and a duck from the tomb of Henutmehyt (EA51812), sent to them from the Egyptian Museum in Cairo and the British Museum.³⁷

Ultrasonication was used to extract microscopic samples; a variety of tests measured biomarkers of tissue, balms, and petroleum. The wrappings were determined to contain fatty acids, diacids, and dihydroxyacids. The dihydroxyacids only form as a result of oxidization of unsaturated fatty acids, indicating that their presence on only the exterior wrappings means they were applied externally to *Goat Leg EA51812*.³⁸ The duck tissue sample from the same offering box, however, presented no detectable lipids.³⁹ *Pistacia* resin was detected on the beef ribs from the tomb of Yuya and Thuya, though it is possible that these resins were actually contamination from the case. The presence of *Pistacia* resin on victual mummies in particular is possible, since *Pistacia* resin is known to provide unique flavoring to foods in the Mediterranean today.⁴⁰ While the resin certainly acts as a preservative, perhaps its primary function was as a flavoring or dressing for the meat.

As part of my research on *Goose Mummy 1981.1.18a*, two new studies on the

³⁷ Clark, Ikram, and Evershed, "Organic chemistry," 20392-20393.

³⁸ Ibid., 20393.

³⁹ Ibid., 20393.

⁴⁰ Ibid., 20394.

piece were conducted, in addition to the observational analysis reported in the previous chapter. Both radiographic and x-ray fluorescence analyses, the latter using a handheld device, were conducted in order to provide greater insight into the production of the mummy.

On February 25th 2019, a series of x-rays were taken of IEAA *Goose Mummy 1981.1.18a* at the Memphis Zoo, under the guidance of veterinarian Dr. Aimee Berliner, DVM. The mummy was x-rayed without its case (Figure 38 and Figure 39). Six images were taken in the ventrodorsal (Figure 40) and dorsoventral orientations (Figure 41), and one image in the lateral right orientation (Figure 42), using an Eklin EDR5-Mark V digital x-ray. Radiographic exposure for the ventrodorsal and dorsoventral images was set to 70 kVp (peak kilovolts) and 300 mAs (milliamperage) for 0.008/ 1/120 radiographic seconds. Exposure for the lateral right image was increased to 86 kVp in order to compensate for the longer path length of the x-rays due to the increased thickness of the material imaged in this orientation (Figure 43). In radiography, x-ray photons passing through the studied material are absorbed in various degrees depending on material density. Higher density materials, such as bone or metal, appear white in radiographs because x-ray photons do not reach the x-ray detector, while lower density materials, such as tissue, organs, or fabric, appear in varying degrees of grey and black.⁴¹ Although the dorsal surface of the victual mummy is heavily encrusted with what appear to be small (generally < 0.5cm), thin chips of light colored stone (limestone?), tan stone (flint?), sand, and possibly flakes of plaster, only a few of these elements are clearly visible in the x-rays. The most obvious of these is the small chip of white stone, oriented

⁴¹ McKnight and Atherton-Woolham, *Gifts for the Gods*, 68.

parallel to the thickness of the mummy, which appears as a radiopaque crescent on the edge of the wrappings between the tail and distal tibia on the mummy's proper left side (Figure 44).

The radiographs confirmed the presence of a fowl skeleton within the wrappings, but also revealed several remarkable features previously unknown and not visible from the mummy's wrapped exterior. Most notable was a large midline break of the proper left humerus, showing a spiral fracture.⁴² Spiral fracturing, or torsion fracturing, is a bone break that occurs under rotational force. This indicates that the bone was broken perimortem, rather than inadvertently during the mummification process.⁴³ A simple fracture is visible across the proper right tibia. This clean break may be postmortem. As is typical in dressed fowl, the lower portion of the wings (radius, ulna, carpometacarpus, phalanges and alula) and the feet (tarsometatarsus and phalanges) were removed. The remaining portions of the legs (femur and tibiotarsus) have been folded against the body at the knee joint, with the tibiae oriented parallel to the length of the body.

The head of the bird has been removed and is not present within the wrappings. The neck was wrapped as a solid stump, with the end of one vertebra slightly exposed through the wrappings (Figure 45). The lateral radiograph revealed at least 5 cervical vertebrae, and that the remaining portion of the neck had been curled back dorsally. The atlas and axis vertebrae, the latter being about half the size of a cervical vertebrae, were not present, and a small gap between two of the remaining cervical vertebrae was visible on the dorsoventral radiographs. This gap may represent a place of separation where the

⁴² All radiographic assessment was conducted by Dr. Aimee Berliner, February 25, 2019.

⁴³ Based on commentary from Dr. Aimee Berliner, February 25th, 2019.

bird's neck was wrung as it was slaughtered, but it is more likely to have separated as the neck was pulled back when constructing the mummy.⁴⁴

No feathers were visible on the radiograph, and feather follicles were difficult to identify with certainty due to the layering of the bones and external wrappings. A few soft tissue structures were observed. Tracheal rings are prominently visible on the proper right on the ventrodorsal radiograph, as is the crop. A mass which may be the heart can be seen in the lateral view. The ventriculus appears to be present in the fowl's midline near the tail as a circular mass. Organs are difficult to identify and it is likely that most of them were removed during evisceration. Removing organs is uncommon in most votive animal mummies,⁴⁵ as these mummies were produced en masse in large quantities. Fowl victual mummies, however, are known to have had their viscera and organs removed,⁴⁶ and sometimes replaced in the body cavity.⁴⁷ It is possible that the inside of this fowl's body cavity was stuffed with additional material to help it keep its shape, but this is unclear in the x-rays.⁴⁸

Dr. Berliner advised that given the overall bone density, this fowl is not an older animal and was likely dispatched at an age prime for butchering. However, given the arrangement of bones, possible stuffing material, and linen wrappings, it is impossible to identify the sex and species of fowl with any certainty, although Dr. Berliner indicated

⁴⁴ Based on commentary from Dr. Aimee Berliner, February 25th, 2019.

⁴⁵ McKnight and Atherton-Woolham, *Gifts for the Gods*, 77-78.

⁴⁶ Goodman, "Victual Egyptian Bird Mummies," 71.

⁴⁷ Ibid., 72. Goodman notes that in his dissection of fowl victual mummies three of the nine mummies had two gizzards instead of one mistakenly placed back inside the body cavity.

⁴⁸ Based on commentary from Dr. Aimee Berliner, February 25th, 2019.

that a species of goose is represented. The suspected plaster, stone, and other materials fixed to the dorsal side of the mummy do not appear with much definition on any of the images, but are probably contributing to the overall grey appearance of the abdomen. Granular inclusions such as stone or sand are common in votive animal mummies and are suspected to be accidentally included during the embalming process.⁴⁹ Though some may have been picked up as the mummy lay outside of its cover after the tomb was pillaged.

X-ray fluorescence spectrometry (XRF) analysis was undertaken on *Goose Mummy 1981.1.18a* and other sample materials on March 1, 2019 under the guidance of Dr. Ryan Parish, University of Memphis Department of Earth Sciences and with the assistance of IEAA Curator Dr. Patricia Podzorski.⁵⁰ This analysis was conducted using a portable handheld Bruker Tracer 5i analyzer (pXRF) with a custom-built stand.⁵¹ Readings were taken from the goose mummy in three locations: two on its proper right side – directly under the keel (Figure 46) and on the lateral tibia (Figure 47) – and the last on the exposed distal epiphysis of the proper left tibia (Figure 48). Of these, only the readings from the tibia and distal epiphysis are included in the analysis. Readings from under the keel were excluded due to poor representative data, likely attributable to difficulty getting flush contact between the mummy and the Tracer 5i at such a curved angle on the side of the goose's body. Comparative readings were taken on two ancient

⁴⁹ McKnight and Atherton-Woolham, *Gifts for the Gods*, 78.

⁵⁰ Thank you also to Renee Stein, Emory University, for sharing insight into the application of XRF on vidual mummies, and to Dr. Sarah Schellinger, for sharing her own experience working with animal mummies at the San Antonio Museum of Art.

⁵¹ For more information visit: <https://www.bruker.com/products/x-ray-diffraction-and-elemental-analysis/handheld-xrf/tracer-5-series/technical-details.html>.

Egyptian linen samples,⁵² an ancient resin sample,⁵³ and three contemporary resin samples prepared by the author. A votive hawk mummy with dark, possibly resin-impregnated wrappings⁵⁴ and votive fish mummy with apparently unsaturated wrappings⁵⁵ were also included in this study for comparative purposes. All readings were taken using identical “light⁵⁶ element” settings on the Bruker Tracer 5i: 15 kV (kilovolts) and 45 uA (microamps) for a duration of 120 seconds, with a 3mm changeable collimator.⁵⁷ Depth of analytic recording is 2mm.

In archaeology, XRF is typically utilized for inorganic elemental analysis on ceramic, stone, and metal objects, or for distinguishing individual elements in ancient pigments.⁵⁸ In pXRF analysis, a handheld XRF instrument is used to emit high-energy photons (x-rays) directly into an object. The x-rays cause atoms in the object to fluoresce, and as a result some of this energy bounces back to the detector in the pXRF analyzer – these unique fluorescent signatures identify specific elemental compositions

⁵² The first ancient linen sample consisted of two tightly woven overlapping pieces, dark brown in color, possibly resin-saturated (1994.4.85a,b). And the second was lighter in color with no apparent residue and an open weave (1994.4.85c). Both were analyzed without being removed from polyethylene bags, due to fragility of the specimens. As controls, pXRF readings were taken of the bags in areas where no linen was present.

⁵³ Resin sample from western Thebes at the Wadi el Habl, acc. no. 1987.5.7.

⁵⁴ Hawk Mummy, 1994.4.242. Art Museum of the University of Memphis, Institute of Egyptian Art and Archaeology.

⁵⁵ Fish Mummy, 1994.4.27. Art Museum of the University of Memphis, Institute of Egyptian Art and Archaeology.

⁵⁶ For detecting the lighter, as opposed to heavier, elements.

⁵⁷ These settings were determined based on the expertise of Dr. Ryan Parish in order to best isolate elements that may be present in organic materials.

⁵⁸ Robert Tykot, “Using Nondestructive Portable X-ray Fluorescence Spectrometers on Stone, Ceramics, Metals, and Other Materials in Museums: Advantages and Limitations,” *Applied Spectroscopy* 70 no. 1 (2016): 53.

within the object. These fluorescent signatures are known as secondary x-rays and are measured in the Tracer 5i against known transition energies of elements, allowing their levels and identities to be analyzed.⁵⁹ Though pXRF lacks resolution for defining an organic spectral “signature” compared to destructive sampling modalities,⁶⁰ its utility in this study was to assess the presence or absence of salt or natron on the mummy, as well as to determine if contemporary resin samples contained any inorganic elements capable of comparison. This is because the ability of pXRF to distinguish between spectra is restricted to heavier elements, which are not the predominant elements present in vegetable-fiber linen, plant resin or organic tissue. Furthermore, pXRF analysis on objects in the AMUM collection was chosen because it is a rapid and entirely non-destructive analytical technique, and the equipment was readily available.

Some basic conclusions based on the pXRF can be determined from the data gathered despite these limitations. Because this method of analysis produces element identifications (e.g. rather than chemical compounds) the number of questions that can be answered with relatively strong confidence is limited, but includes: are elements consistent with the presence of salt or natron present? Were there other components added, inadvertently or deliberately, during mummy construction? Additionally, are there significant differences in the elemental composition of votive versus victual

⁵⁹ Tykot, “Using Nondestructive,” 43.

⁶⁰ Such as Fourier-transformed Infrared spectrometry (FTIR), nuclear magnetic resonance (NMR), high-performance liquid chromatography, or gas chromatography coupled tandem mass spectrometry (HPLC- or GC-MS/MS). HPLC- or GC-coupled mass spectrometry can be used to identify the plant or geochemical origins of the resin or protein characterization of the mummy itself, perhaps aiding in clarifying if this was a duck, goose, or other fowl. Use of these techniques was beyond the scope of this thesis.

mummies? This last question can only be answered in a preliminary context given the very small sample size of mummies in this study and limitations of pXRF.

To begin with, the author determined whether sodium (Na), chlorine (Cl), and sulfur (S) were present in any of the selected objects. These analytes were chosen in order to deduce the presence of brining, as natron (Na_2CO_3)⁶¹ or simple salt NaCl could have been used as part of the brining process,⁶² and possibly sodium sulfate (Na_2SO_4), which is a trace element in natron.⁶³ As a positive control, a mineral NaCl salt block was analyzed and chlorine (Cl) was readily detectable but not sodium (Na), indicating that this latter analytic species was not appropriate for this methodology. Therefore, this analysis will employ the presence or absence of chlorine (Cl) and sulfur (S) as potential preliminary indicators of the presence of natron which could indicate use of brining, either by wet brining or with dry salts.

No chlorine was detected in the modern resin (Figure 49). All other samples show a presence of chlorine (Figure 50 through Figure 54). Chlorine and sulfur, two possible indicators of natron, occur only on *Goose Mummy 1981.1.18a* (Figure 52) and in low levels on the fish votive mummy (Figure 54). This is consistent with two preliminary conclusions: brining or salting occurred in *Goose Mummy 1981.1.18a*, and brining (salting) was present in both victual and votive mummy production to varying degrees.

⁶¹ A naturally compound of sodium carbonate and sodium bicarbonate, sodium sesquicarbonate ($\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$). See Lorna Lee and Stephen Quirke, "Painting materials," in Nicholson and Shaw, eds., *Ancient Egyptian Materials and Technology*, 105.

⁶² Ikram, *Choice Cuts*, 156.

⁶³ Alfred Lucas and J.R. Harris, *Ancient Egyptian Materials and Industries* (Dover Publications, 1999), 267.

Analysis of the elements in ancient resin versus contemporary resins was also informative. As mentioned above, an ancient resin sample from Wadi el Habl was analyzed. Additionally, the author collected resin samples from tree species that were similar to known or imported ancient Egyptian species and utilized for their resin, such as *Pinus ponderosa*, *Pinus nigra*, and *Pistacia lentiscus*. Of these, only *Pinus nigra* and *Pistacia lentiscus* were used in ancient Egypt. *Pinus nigra*, or black pine, was well-known in ancient Syria and was a luxury good in ancient Egypt.⁶⁴ *P. lentiscus* was prevalent across the ancient Mediterranean and Palestine, and is noted as being the most likely resin used in fragrant incense.⁶⁵ The author obtained *P. lentiscus* tears, known as mastic, from a commercial grower on the Turkish island of Chios, where the majority of modern *P. lentiscus* comes from. *Pinus ponderosa*, or bull pine, is native to Western North America and this sample was taken from a tree in Oregon.⁶⁶ No significant elemental differences are detectable between these three contemporary resins using pXRF and the only heavy elements detected in notable quantities were iron and calcium (Figure 49).

The ancient resin sample includes significantly more iron and calcium than the three contemporary resin samples, which consist of primarily organic carbon-based material, with less calcium or iron. This may be suggestive of a deliberate or inadvertent inclusion of iron and calcium in the ancient resin. Peaks of iron and calcium were also detected on the goose (very high), hawk (moderate), and fish mummy (moderate,

⁶⁴ Serpico. "Resins, Amber and Bitumen," 432-433.

⁶⁵ Ibid., 434.

⁶⁶ Though *P. ponderosa* is not native to Egypt, it was available and used as a comparative sample to see if there was any significant elemental difference between the *Pinus* resins.

possibly due to weak sampling contact), as well as both ancient linen samples (also moderate), suggesting that the resin, or – more likely – unknown additives, possibly Egyptian clay or soil particulates,⁶⁷ are the source of these iron and calcium rich signatures and not the linen itself.

Calcium and iron are known soil contaminants, so their presence likely indicates a layer of particulates not visible on the surface, but detectable by the Tracer 5i.⁶⁸ Given the victual mummy 1981.1.18a's discovery in the tomb fill, it is probable that the inclusion of calcium and iron occurred in a post-depositional context, after the tomb was opened and fowl victual mummies were separated from their cases, when limestone chips and dirt may have adhered to mummies and cases. Alternatively, this may be a result of variances in early museum storage after the mummy and case were excavated. Early packing methods used to transport the victual mummy from Egypt to the Metropolitan Museum of Art are unknown, but may have included exposure to soil particulates. Furthermore, early techniques in storage, possible pest control, potential conservation methods undertaken, and even modern particulates on the mummy and its case may account for the presence of calcium and iron.

Tree resins used in mummy production are sometimes known to contain bitumen, or asphalt. Bitumen has a trace metal signature including nickel (Ni), vanadium (V), and

⁶⁷ Hans-Ake Nordstrom and Janine Bourriau, "General Properties of Clays and Ceramic Materials," in *An Introduction to Ancient Egyptian Pottery*, Dorthea Arnold and Janine Bourriau, eds (Mainz am Rhein: Von Zabern, 1993), 154; Carlos Rodriguez-Navarro, Eric Hansen, Eduardo Sebastian, and William S. Ginell, "The Role of Clays in the Decay of Ancient Egyptian Limestone Sculptures," *Journal of the American Institute of Conservation* 36, no.2 (1997): 15; M. Ghoneim, "An Egyptian Partially Gilded Bronze Group Statue: Examination and Analysis, *Archaeometry* 57, no. 1 (2015): 133.

⁶⁸ Ghoneim, "Gilded Bronze Group," 136.

molybdenum (Mo) that has been considered diagnostic at a basic level,⁶⁹ with sulfur (S) recognized as a trace.⁷⁰ Sulfur is also a trace component in natron, so its presence alone cannot be considered diagnostic for bitumen. Evidence for bitumen through the presence of the four trace elements mentioned above was detected in the goose mummy, at both sample sites. Nickel, vanadium, and molybdenum – but not sulfur – were detected in the hawk mummy. The possible presence of bitumen is not an unexpected result for the hawk mummy, as bituminous materials are generally considered more common in the later periods of Egyptian history,⁷¹ but is for the early New Kingdom goose. Bitumen has also been employed as a varnish during the early New Kingdom, and some of these readings may be attributed to its use as a coating on the exterior of the mummy or the interior of the case.⁷² It should be noted that the analysis of the other victual mummies from MMA 1021 did not indicate bitumen on the mummies or cases. No nickel, vanadium, or molybdenum were present in the fish mummy or the ancient resin sample (Figures 50 and 54).

An overall comparison between the linen samples finds many similarities in the elemental signatures detected by the Tracer 5i analyzer, suggesting that there were no inconsistencies in the testing methods, with differences in elemental peaks attributed to

⁶⁹ Mark L. Proefke and Kenneth L. Rinehart, “Analysis of an Egyptian Mummy Resin by Mass Spectrometry,” *American Society for Mass Spectrometry* 3 (1992): 582, 588-589. New advances in gas chromatography and mass spectrometry can resolve the specific long chain aliphatic hydrocarbon signatures that signify distinct geographical origins of bitumen. This is helpful in determining where these specific bitumens come from, providing context to the objects that utilize them in construction. See, Serpico, “Resins, Amber and Bitumen,” 455-456.

⁷⁰ Serpico, “Resins, Amber and Bitumen,” 455.

⁷¹ Proefke and Rinehart, “Mummy Resin,” 589; Serpico, “Resins, Amber and Bitumen,” 466.

⁷² Serpico, “Resins, Amber and Bitumen,” 460.

residue saturation levels, or quality of contact.⁷³ Between the two linen samples, linen sample 1994.4.85 a,b has slightly higher levels of iron and calcium. Small amounts of nickel, vanadium, and molybdenum were detected in both ancient linen samples, with the darker, possibly more resin-saturated linen sample having slightly higher levels, suggesting that it is possible these linens were once in contact with bitumen. Aside from this, no significant elemental differences between the linen samples were detected by the analysis.⁷⁴

Other than the absence of nickel, vanadium, and molybdenum, and the presence of sulfur, from the fish mummy, individual elemental differences between the votive mummies are insignificant, with the only difference being the levels of detected elements prevalent in both. For the votive mummies, the hawk mummy has significantly higher levels of calcium, iron, and chlorine than the fish mummy. The higher levels detected in the hawk mummy may be attributed to better contact between the Tracer 5i and the side of the hawk, compared to the reduced surface contact between the Tracer 5i and fish mummy, the lower level of the “instrumental noise” lump in the fish mummy graph is an indication of this. Finally, both testing sites on the goose mummy (linen-covered lateral tibia and tibial epiphysis) show very similar spectra.

In the final chapter, I will discuss this data in greater detail with reference to the Egyptological literature, in order to provide insight into the manufacture of mummy 1981.1.18a. Overall, the radiographic study and pXRF analysis provided a baseline from

⁷³ Besides some difficult getting flush contact on samples, the Tracer 5i may read atmospheric space inside the analyzer, accounting for some of the “instrumental noise” present on spectra.

⁷⁴ A reading of only the plastic bag that the linen samples were contained in was also taken, but the results were skewed by the Tracer 5i reading the cotton and felt support under the bag. It did, however, detect high levels of Titanium (Ti) suggesting that this was possibly the instrument “reading itself.” This is helpful to know when analyzing element peaks in the other spectra, especially in spectra where the contact between the Tracer and sample was not completely flush.

which to assess basic questions about the mummy's production, and may even yield clues into the fowl's life before it was dispatched as a food offering.

Chapter Six: Conclusions

Through an investigation of the fowl victual mummy corpus, this thesis has discussed the procurement, processing, and production of victual mummies in order to define their classification as food offerings: were they constructed in the same manner as food intended for consumption? Were they created solely as “mummiiform” objects representing food? Or did they blend elements of both categories? Additionally, this thesis provided a better understand the history and construction of *Goose Mummy and Case 1981.1.18*, through a detailed visual analysis, radiographic study, and pXRF trace element analysis.

Though birds and fowl of many species are plentiful in Egyptian iconography and art throughout Egyptian history,¹ and the Egyptians exploited both wild-caught and captive-raised fowl for utilitarian purposes, the representation of victual mummies in the iconography remains unidentified. It is the opinion of this author that rather than depict fowl food offerings as either wrapped victual mummies or in their storage cases, they were intentionally depicted only in their pre-mummiiform states: living, sometimes amidst offering heaps; recently deceased and maintaining species identifying plumage; or as prepared carcasses – but without wrappings or case, indicating it is ready for use in the afterlife. Representations depicting attendants carrying birds intended as food offerings sometimes show them struggling against wing ties or carried by hand, which is consistent with the findings revealed by radiographic images of victual mummy 1981.1.18a. Radiographs show a midline spiral fracture of *Goose Mummy 1981.1.18*’s proper left humerus. Spiral fractures occur under twisting force of wet, rather than dry, bone, suggesting that this break happened while the bird was still alive or immediately after its

¹ Bailleul-LeSuer, *Between Heaven & Earth*, 23-24.

death and not as a result of the mummification process. It is possible that the humerus on this fowl was fractured as it struggled against bound wing restraints. Alternatively, some birds were noted as having their wings broken in captivity to prevent escape and make handling easier. It is also possible that this fracture represents a purposeful injury, meant to incapacitate the fowl, allowing for easy control by its keepers.

The lack of feathers, head, wingtips and feet confirm that this fowl was processed in the manner typical of fowl meant for consumption by the living. *Goose Mummy 1981.1.18a* suggests that fowl victual mummies were selected as offerings from the same group of healthy, prime birds that were consumed by living Egyptians. Dr. Berliner suggested that most of the organs of the goose were not present,² but the body cavity appears stuffed with an unknown material, possibly rolls or folds of cloth.³ Other fowl victuals from the tomb of Amenemhat were stuffed with rolls of cloth to help the bird keep its shape.⁴ These, however, show up as far denser on their radiographs, distinct from the loosely defined material in *Goose Mummy 1981.1.18a*. It is possible that small strips of cloth were loosely packed in the chest cavity, rather than the denser rolled filling⁵ used on other fowl victuals.

Using pXRF analysis, two preliminary conclusions can be drawn about *Goose Mummy 1981.1.18a*, though these insights remain limited due to the restrictions of

² The bronchial tube, crop, and possibly the heart and ventriculum were identified.

³ Commentary with Dr. Aimee Berliner, February 25th, 2019.

⁴ Ikram, "A Re-Analysis," 126.

⁵ McKnight notes that radiographs conducted on ibis votive mummies revealed that reeds were sometimes used to shape and support them under the exterior wrappings. However, these were not in *Goose Mummy 1981.1.18a* as the distinctive triangular shape indicative of reeds was not present on its radiographs. McKnight, *Gifts for the Gods*, 78.

elemental analysis using pXRF on organic material. No chlorine (Cl) was detected in the contemporary resin samples. Some chlorine was present in the ancient resin and linen samples, and in all three victual and votive mummy specimens. Trace amounts of sulfur (S) were also detected in the fish mummy and, highest, in *Goose Mummy 1981.1.18a*. This suggests that these victual and votive mummies had natron added as part of the preservation process. On *Goose Mummy 1981.1.8a* it may be indicative of brining or salting, suggesting a food-ways preservation technique, however, this can only be speculative at this point.

The significant presence of iron in the goose mummy coincides with the levels of iron and calcium in all other ancient objects analyzed. Iron and calcium are noticeably absent from the contemporary prepared samples of resin, suggesting that its inclusion in the ancient resin, whether deliberate or inadvertent, occurred in antiquity, possibly during the preparation of resin. It is also possible that this iron may have originated from resin melted in an iron-rich clay vessel.⁶ The presence of calcium may be suggestive of a binding-agent added as the resin was heated and prepared for application to both the victual and votive mummies, possibly as a trace component of a plant-gum additive.⁷ Both of these elements may also be unintentional surface contaminants,⁸ from the disturbed context after the tomb was opened and objects were displaced. Additionally, the presence of trace amounts of nickel, vanadium, molybdenum and sulfur were found

⁶ Hassan M. Baioumy and Ismael S. Ismael, "Composition, origin and suitability of the Aswan ball clays, Egypt," *Applied Clay Science* Vol. 102 (2014): 204; Nordstrom and Bourriau, "General Properties of Clays and Ceramic Materials," 154.

⁷ Richard Newman and Margaret Serpico, "Adhesives and Binders," in Paul T. Nicholson and Ian Shaw, eds., *Ancient Egyptian Materials and Technology* (Cambridge: Cambridge University Press, 2000), 485.

⁸ Ghoneim, "Gilded Bronze Group," 133, 136.

only in the goose mummy which may be elemental indicators of bitumen. Nickel, vanadium, and molybdenum, but no sulfur, were found on both ancient linen fragments (Figure 51) and the hawk mummy. Since these two linen samples were scanned through their hydrocarbon-based plastic bags (Figure 55) these elements may have been contributed by the packaging. Sulfur is intentionally removed from modern plastics.⁹

Part of the goal of this thesis was to determine the utility of pXRF for analysis on organic materials present in victual and votive mummies. The insensitivity of the modality to lighter elements decreases its usefulness for the analysis of these organic materials, but not without some benefit as I have shown. As work by other scholars has demonstrated,¹⁰ aids such as filters can improve reading in lighter spectra so this very convenient and non-destructive technology could be more useful in the future.

To summarize, radiographs suggest that mummy 1981.1.18a was a healthy bird, dispatched at an age prime for butchery rather than in sickness or old age. It was prepared as a fowl meant for consumption, with the head, feathers, wingtips, and feet removed. Like other victual mummies, its interior may have been stuffed with cloth to help it maintain its form and pXRF analysis suggests that it may have been preserved with a resin containing bitumen, as well as natron. It should be noted that recent analyses of other victual mummy cases from the same archaeological context indicated the presence of *Pistacia* resin and beeswax, but not bitumen, and any presence of *Pistacia*

⁹ H.M. Sonwane, V.U. Khanapure, V.R. Doss, "Desulfurization of Pyrolysis Oil Obtained from Plastic Waste by Using Adsorption Method," *International Research Journal of Engineering and Technology* 4 No. 7 (2017): 1248.

¹⁰ Yuval Goren, Hans Mommsen, and Jorg Klinger, "Non-destructive provenance study of cuneiform tablets using portable X-ray fluorescence (pXRF)," *Journal of Archaeological Science* 38 (2011): 688-689.

resin on the victual mummies indicates a transfer from the interior case to the mummy.¹¹ These techniques may indicate a preservation technique that included desiccation and resin-impregnation typical of mummy construction, rather than strictly a food preparation approach. Therefore, the manufacture of victual mummy 1981.1.18a seems to have combined food preparation practices with mummification techniques. Chemical analysis of the resin may further confirm or deny the presence of bitumen, and may also provide insight into the exact resin used in its formulation. In conclusion, as food offerings, fowl victual mummies clearly maintain status as food items in sustaining the dead for eternity. This status, however, appears limited only to the symbolic association of the victual mummies, and not their literal representation as mummies in the iconography, nor as a primary factor in their construction.

¹¹ Ikram, "A Re-analysis," 133-134.

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Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
001	Dyn. 18	Thebes (KV 43)	Tuthmosis IV	Wrapped bird	Dokki Museum of Agriculture	CG29704	Gaillard and Daressy 1905: 115. ²⁶⁷
002	Dyn. 18	Thebes (KV 43)	Tuthmosis IV	Wrapped bird	Dokki Museum of Agriculture	CG29705 D2935	Gaillard and Daressy 1905: 115.
003	Dyn. 18	Thebes (KV43)	Tuthmosis IV	Small wrapped duck	Dokki Museum of Agriculture	CG29706 D2936	Gaillard and Daressy 1905: 115.
004	Dyn. 18	Thebes (KV 43)	Tuthmosis IV	Wrapped goose	Dokki Museum of Agriculture	CG29707 D2937	Gaillard and Daressy 1905: 115.
005	Dyn. 18	Thebes (KV 43)	Tuthmosis IV	Small wrapped duck	Dokki Museum of Agriculture	CG29708 D2938	Gaillard and Daressy 1905: 115.
006	Dyn. 18	Thebes (KV 43)	Tuthmosis IV	Small wrapped bird	Dokki Museum of Agriculture	CG29709 D2939	Gaillard and Daressy 1905: 115.
007	Dyn. 18	Thebes (KV 36)	Maherpri	Wooden box with goose remains.	Egyptian Museum	CG24051 JE33838 S241	Lortet and Gaillard 1905: 308. Ikram 1995: 258.

²⁶⁷ This corpus is based off the research done by Salima Ikram, *Choice Cuts*, 237-296; see also Baillet-LeSuer, *Live Avian Resources*, 575-581.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
008	Dyn. 18	Thebes (KV 36)	Maherpri	Goose shaped box with wrapped <i>Anser albifrons</i>	Egyptian Museum	CG24052 JE33839 S242	Lortet and Gaillard 1905: 308. Ikram 1995: 258.
009	Dyn. 18	Thebes (KV 36)	Maherpri	Duck shaped wooden box with duck remains.	Egyptian Museum	CG24053 JE33840 S244	Lortet and Gaillard 1905: 309. Ikram 1995: 258.
010	Dyn. 18	Thebes (KV 36)	Maherpri	Teardrop shaped box with pigeon or duck remains.	Egyptian Museum	CG24054 JE33841 S245	Lortet and Gaillard 1905: 309. Ikram 1995: 258.
011	Dyn. 18	Thebes (KV 36)	Maherpri	Wooden box for a pigeon or duck.	Egyptian Museum	CG24055 JE33842 S246	Daressy 1902: 23. Ikram 1995: 258.
012	Dyn. 18	Thebes (KV 35) (KV 34)	Amenhotep II & Thuthmosis III	Goose, <i>Anser albifrons</i> .	Egyptian Museum	L&G177 S5	Lortet and Gaillard 1905: 177. Ikram 1995: 242.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
013	Dyn. 18	Thebes (KV 35) (KV 34)	Amenhotep II & Thuthmosis III	Goose, <i>Anser albifrons</i> , broken with humerus, femur, and sternum identifiable.	Egyptian Museum	L&G209 S6	Lortet and Gaillard 1905: 177. Ikram 1995: 242.
014	Dyn. 18	Thebes (KV 62)	Tutankhamun	Three pigeons in an oval box.	Egyptian Museum	JE61439 S223	Carter 1932 Ikram 1995: 254.
015	Dyn. 18	Thebes (KV 62)	Tutankhamun	Goose in an oval box.	Egyptian Museum	JE61400 S224	Carter 1932 Ikram 1995: 254.
016	Dyn. 18	Thebes (KV 62)	Tutankhamun	Goose in an oval box.	Egyptian Museum	JE61397 S225	Carter 1932 Ikram 1995: 254.
017	Dyn. 18	Thebes (KV 62)	Tutankhamun	Goose in an oval box.	Egyptian Museum	JE61396 S226	Carter 1932 Ikram 1995: 254.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
018	Dyn. 18	Thebes (KV 62)	Tutankhamun	Goose in an oval box.	Egyptian Museum	JE61399 S227	Carter 1932: Ikram 1995: 254.
019	Dyn. 18	Thebes (KV 62)	Tutankhamun	Duck in a box.	Egyptian Museum	JE61401 S228	Carter 1932: Ikram 1995: 254.
020	Dyn. 18	Thebes (KV 62)	Tutankhamun	Three pigeons in an oval box.	Egyptian Museum	JE61441 S229	Carter 1932: Ikram 1995: 254.
021	Dyn. 18	Thebes (KV 62)	Tutankhamun	Goose organ, possibly a liver, in goose shaped box.	Egyptian Museum	JE61390 S230	Carter 1932: Ikram 1995: 254.
022	Dyn. 18	Thebes (KV 46)	Yuya & Thuya	Wrapped pigeon or small bird in a box.	Egyptian Museum	CG51086 JE95341 S251	Quibell 1908: 4. Ikram 1995: 260.
023	Dyn. 18	Thebes (KV 46)	Yuya & Thuya	Wrapped goose in a wooden case with carved wings and legs.	Egyptian Museum	CG51092 JE95336 a,b S257	Quibell 1908: 4. Ikram 1995: 261.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
024	Dyn. 18	Thebes (KV 46)	Yuya & Thuya	Box containing a small duck, pigeon, or a dove.	Egyptian Museum	CG51094 JE95332 S259	Quibell 1908: 4. Ikram 1995: 261.
025	Dyn. 18	Thebes (KV 46)	Yuya & Thuya	Wrapped goose in a wooden case with carved wings and legs. Heavily coated with resin.	Egyptian Museum	CG51095 JE95335a-c S260	Quibell 1908: 4. Ikram 1995: 261.
026	Dyn. 18	Thebes (KV 46)	Yuya & Thuya	Large wrapped goose that is missing the carpals and tarsals.	Egyptian Museum	CG51096 JE95328 S261	Quibell 1908: 4. Ikram 1995: 261.
027	Dyn. 18	Thebes (KV 46)	Yuya & Thuya	Wrapped duck in a case. Ikram notes that this may be from another burial.	Egyptian Museum	JE95333 a,b S267	Quibell 1908: 4. Ikram 1995: 261.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
028	Dyn. 18	Thebes (QV 46)	Imhotep	Wooden duck shaped box with no wing/leg details. Contains a duck.	Turin Museum	T5084 S289	Ikram 1995: 265.
029	Dyn. 18	Thebes (QV 46)	Imhotep	Wooden duck shaped box with no wing/leg details. Contains a duck.	Turin Museum	T5085 S290	Ikram 1995: 265.
030	Dyn. 18	Thebes (QV 46)	Imhotep	Wooden duck shaped box with no wing/leg details. Contains a duck.	Turin Museum	T5083 S291	Ikram 1995: 265.
031	Dyn. 18	Thebes (QV 46)	Imhotep	Wooden case shaped as a headless bird with a small bird inside.	Turin Museum	T5088 S308	Ikram 1995: 267.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
032	Dyn. 18	Thebes (QV 46)	Imhotep	“Preserved duck.” Ikram notes that this duck is lost.	Turin Museum	T5099 S309	Ikram 1995: 268.
033	Dyn. 18	Thebes (QV 46)	Imhotep	“Preserved duck.” Ikram notes that this duck is lost.	Turin Museum	T5100 S310	Ikram 1995: 268.
034	Dyn. 18	Thebes (TT358)	Queen Meryetamun	Sycamore box in duck shape with a duck leg inside.	Metropolitan Museum of Art	M30.3.21 a,b S417	Ikram 1995: 281. Winlock, H.E. 1973: 28-29.
035	Dyn. 18	Thebes (TT358)	Queen Meryetamun	Sycamore box in duck shape.	Metropolitan Museum of Art	Unknown. Listed as “catalogue no. 24.”	Winlock, H.E. 1973: 28-29, Plate XXVIII.
035	Dyn. 18	Thebes (KV 60)	Unknown female burial	Avian neck vertebrae.	Egyptian Museum	60-89-C21-B60 S419	Ikram 1995: 282.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
036	Dyn. 18	Thebes (KV 60)	Unknown female burial	Two mummified avian tibiae and femurs.	Egyptian Museum	60-89-B-2 S420	Ikram 1995: 282.
037	Dyn. 18	Thebes (KV 60)	Unknown female burial	Mummified avian vertebrae.	Egyptian Museum	60-89-B/BA S420 or S421	Ikram 1995: 282.
038	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser anser</i> or <i>Anser fabilis</i> . Interior ball of cloth.	American Museum of Natural History	MMA 19.3.212 S314	Goodman 1987: 68-71. Ikram 1995: 269.
039	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser anser</i> . Unknown if viscera is present.	Metropolitan Museum of Art	MMA 19.3.213 S315	Goodman 1987: 68-71. Ikram 1995: 269.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
040	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser anser</i> or <i>Anser fabilis</i> . Interior ball of cloth.	American Museum of Natural History	MMA 19.3.214/215 S316	Goodman 1987: 68-71. Ikram 1995: 269.
041	Dyn. 18	Thebes	Amenhemhat Q	Fragmentary remains of wrapped goose, <i>Anser anser</i> or <i>Anser fabilis</i> .	American Museum of Natural History	MMA 19.3.216 S317	Goodman 1987: 68-71. Ikram 1995: 269.
042	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser anser</i> or <i>Anser fabilis</i> . Both legs missing.	American Museum of Natural History	MMA 19.3.217 S318	Goodman 1987: 68-71. Ikram 1995: 269.
043	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> or <i>Anser erythropus</i> . Viscera removed.	American Museum of Natural History	MMA 19.3.218 S319	Goodman 1987: 68-71. Ikram 1995: 270.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
044	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> . Viscera removed, interior ball of cloth.	American Museum of Natural History	MMA 19.3.219 S320	Goodman 1987: 68-71. Ikram 1995: 270.
045	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> or <i>Anser erythropus</i> . Viscera partially removed, interior ball of cloth.	American Museum of Natural History	MMA 19.3.220 S321	Goodman 1987: 68-71 Ikram 1995: 270.
046	Dyn. 18	Thebes Deir el-Bahri	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> .	Art Museum at the University of Memphis Boston Museum of Fine Arts	MMA 19.3.221 MFA 37.554 a UM 1981.1.18a,b S322	Goodman 1987: 68. Ikram 1995: 270.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
047	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> .	Oriental Institute	O18275 S323	Goodman 1987: 68-71. Ikram 1995: 270.
047	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> .	Boston Museum of Fine Arts	MMA 19.3.223 B? S324	Goodman 1987: 68. Ikram 1995: 270.
048	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser</i> .	American Museum of Natural History	MMA 19.3.224 S325	Goodman 1987: 68-71. Ikram 1995: 270.
049	Dyn. 18	Thebes	Amenhemhat Q		American Museum of Natural History	MMA 19.3.225 S326	Goodman 1987: 68-71. Ikram 1995: 270.
050	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser</i> .	American Museum of Natural History	MMA 19.3.226 S327	Goodman 1987: 68-71. Ikram 1995: 270.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
051	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> .	American Museum of Natural History	MMA 19.3.227 S328	Goodman 1987: 68-71. Ikram 1995: 271.
052	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> .	American Museum of Natural History	MMA 19.3.228 S329	Goodman 1987: 68-71. Ikram 1995: 271.
053	Dyn. 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas acuta</i> . Large blood clots and interior ball of cloth.	California Academy of Sciences	MMA 19.3.229 CA 389-2672 S330	Goodman 1987: 68-71. Ikram 1995: 271.
054	Dyn. 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas acuta</i> . Large blood clots and interior ball of cloth.	American Museum of Natural History	MMA 19.3.230 S331	Goodman 1987: 68-71. Ikram 1995: 271.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
055	Dyn. 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas acuta</i> . Blood soaked strips of cloth.	American Museum of Natural History	MMA 19.3.231 S332	Goodman 1987: 68-71. Ikram 1995: 271.
056	Dyn. 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas acuta</i> . Clear breastbone, bandages dark from resin.	California Academy of Sciences	MMA 19.3.232 CA389-2673 S333	Goodman 1987: 68-71. Ikram 1995: 271.
057	Dyn. 18	Thebes	Amenhemhat Q	Wrapped goose, <i>Anser albifrons</i> . Three balls of linen, viscera removed.	American Museum of Natural History	MMA 19.3.233 S334	Goodman 1987: 68-71. Ikram 1995: 271.
058	Dyn 18.	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas querquedula</i> .	American Museum of Natural History	MMA 19.3.234 S335	Goodman 1987: 68-71. Ikram 1995: 271.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
059	Dyn. 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas querquedula</i> .	American Museum of Natural History	MMA 19.3.235 S336	Goodman 1987: 68-71. Ikram 1995: 271.
060	Dyn. 18	Thebes	Amenhemhat Q	Small mummified pigeon.	California Academy of Sciences	MMA 19.3.236 CA389-2675 S337	Goodman 1987: 68-71. Ikram 1995: 271.
061	Dyn. 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas querquedula</i> .	American Museum of Natural History	MMA 19.3.237 S338	Goodman 1987: 68-71. Ikram 1995: 271.
062	Dyn 18	Thebes	Amenhemhat Q	Wrapped duck, <i>Anas querquedula</i> .	American Museum of Natural History	MMA 19.3.238 S339	Goodman 1987: 68-71. Ikram 1995: 272.
063	Dyn. 18	Thebes	Amenhemhat Q	Wrapped pigeon or dove.	Boston Museum of Fine Arts	MMA 19.3.239 S340	Goodman 1987: 68. Ikram 1995: 272.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
064	Dyn. 18	Thebes	Amenhemhat Q	Wrapped pigeon or dove.	Boston Museum of Fine Arts	MMA 19.3.240 S341	Goodman 1987: 68. Ikram 1995: 272.
065	Dyn. 18	Thebes	Amenhemhat Q	Wrapped turtle dove. Small cloth in interiors.	American Museum of Natural History	MMA 19.3.241 S342	Goodman 1987: 68- 71. Ikram 1995: 272.
066	Dyn. 18	Thebes	Amenhemhat Q	Wrapped turtle dove, ball of linen in interior. Includes lungs and kidneys.	American Museum of Natural History	MMA 19.3.242 S343	Goodman 1987: 68- 71. Ikram 1995: 272.
067	Dyn. 18	Thebes	Amenhemhat Q	Wrapped turtle dove, ball of linen in interior.	American Museum of Natural History	MMA 19.3.243 S344	Goodman 1987: 68- 71. Ikram 1995: 272.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
068	Dyn. 18	Thebes	Amenhemhat Q	Wrapped bird	California Academy of Sciences	MMA 9.3.273 CA389-2688 S345	Goodman 1987: 68-71. Ikram 1995: 272.
069	Dyn. 18	Thebes	Amenhemhat Q	Wooden case in the shape of a headless duck, duck inside.	Metropolitan Museum of Art	MMA 19.3.275 S346	Goodman 1987: 68-71. Ikram 1995: 272. Ikram 2013: 124-126.
070	Dyn. 18	Thebes	Amenhemhat Q	Wooden case in the shape of a bird, half plastered. Wrapped goose within, <i>Anser anser</i> possibly.	Metropolitan Museum of Art	MMA 19.3.280 S348	Goodman 1987: 68-71. Ikram 1995: 272. Ikram 2013: 128-129.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
071	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box, carved legs and wings. Contains a wrapped goose.	Metropolitan Museum of Art	MMA 19.3.281 S349	Goodman 1987: 68-71. Ikram 1995: 273. Ikram 2013: 129-130.
072	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box, interior coated in resin. Radiographs indicate a wrapped duck within.	Boston Museum of Fine Arts	MMA 19.3.283 a,b, MFA 37.553 S351	Goodman 1987: 68. Ikram 1995: 273.
073	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box lid. Wrapped duck within.	Metropolitan Museum of Art	MMA 19.3.284 a S352	Goodman 1987: 68-71. Ikram 1995: 273.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
074	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box, interior coated in resin. Wrapped duck within.	Metropolitan Museum of Art	MMA 19.3.286 a,b S354	Goodman 1987: 68-71. Ikram 1995: 273.
075	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box, interior coated in resin. Wrapped quail, pigeon, or dove within.	Metropolitan Museum of Art	MMA 19.3.289 a,b S357	Goodman 1987: 68-71. Ikram 1995: 273. Ikram 2013: 130-131.
076	Dyn. 18	Thebes	Amenhemhat Q	Wooden bird shaped box, interior coated in resin. Wrapped quail, pigeon, or dove within.	Boston Museum of Fine Arts	MMA 19.3.290 a,b B37.551 S358	Goodman 1987: 68-71. Ikram 1995: 273-274.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
077	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box, interior coated with resin. Wrapped quail, pigeon, or dove within.	Boston Museum of Fine Arts	MMA 19.3.291 a,b B37.552 S359	Goodman 1987: 68. Ikram 1995: 274.
078	Dyn. 18	Thebes	Amenhemhat Q	Wooden headless bird shaped box, with small bird mummy visible through radiographs.	Metropolitan Museum of Art	MMA 19.3.276 S347	Goodman 1987: 68-71. Ikram 1995: 272. Ikram 2013: 126-128.
079	Dyn. 19	Thebes (QV 51)	Queen Isit	Tear shaped sycamore box with mummified goose or duck.	Egyptian Museum	S433	Lortet & Gaillard 1908: 145. Ikram 1995: 283.

Table: Fowl Vidual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
080	Dyn. 19	Thebes (QV 51)	Queen Isit	Tear shaped sycamore box with mummified goose or duck.	Egyptian Museum	S434	Lortet & Gaillard 1908: 145. Ikram 1995: 283.
081	Dyn. 19	Thebes	Queen Isit	Tear shaped sycamore box with mummified goose or duck.	Egyptian Museum	S435	Lortet & Gaillard 1908: 145. Ikram 1995: 283.
082	Dyn. 19	Thebes	Queen Isit	Tear shaped sycamore box with mummified goose or duck.	Egyptian Museum	S436	Lortet & Gaillard 1908: 145. Ikram 1995: 283.
083	Dyn. 21	Thebes Deir el- Bahri	Queen Isitemkheb D	Wrapped duck with feet and wing removed.	Egyptian Museum	JE46879 S269	Ikram 1995: 262.

Table: Fowl Victual Mummy Corpus

	Date	Location	Tomb Owner	Description	Current Location	Accession & Ikram 1995 Numbers	Bibliography
084	Dyn 21.	Thebes Deir el- Bahri	Queen Isitemkheb D	Wrapped duck with feet and wing tips removed.	Egyptian Museum	JE46885 S271	Ikram 1995: 263.
085	Dyn. 21	Thebes Deir el- Bahri	Queen Isitemkheb D	Reed and papyrus box with bird or duck.	Egyptian Museum	JE26263 S272	Ikram 1995: 263.
086	Dyn. 21	Thebes Deir el- Bahri	Queen Isitemkheb D	Small mummified bird or duck.	Egyptian Museum	C2308 S276	Ikram 1995: 263.

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Figure 3. Detail from the scene of Menna and family hunting in the marshes, Tomb of Menna. Nina de Garis (1881-1965), Twentieth Century; original New Kingdom. Dynasty 18. Original from Egypt, Upper Egypt, Thebes, Sheikh Abd el-Qurna, Tomb of Menna (TT 69), north wall. H. 101 cm, W. 189 cm. Metropolitan Museum of Art, MMA 30.4.48.

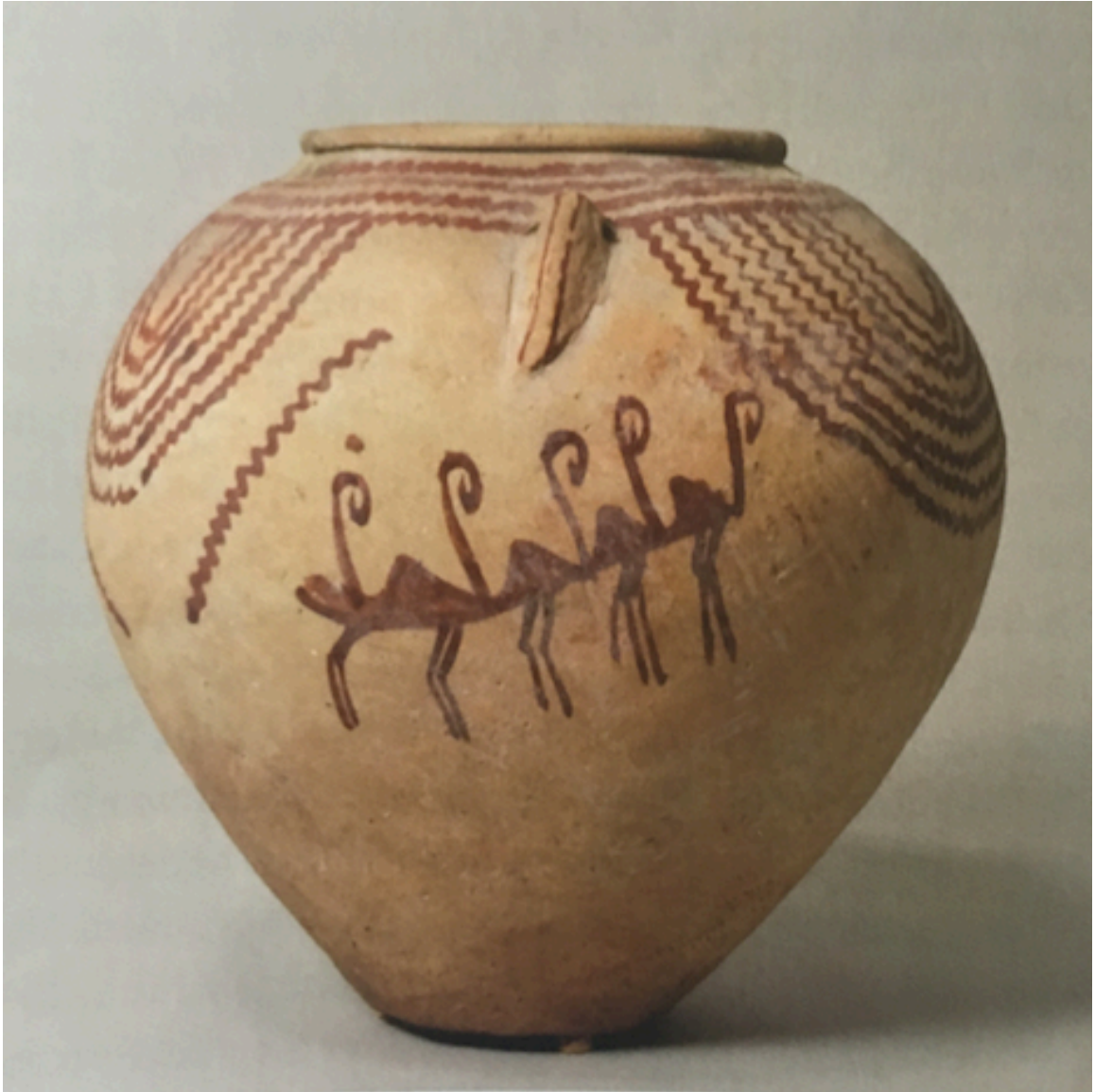


Figure 4. Naqada II C-D decorated ware showing flamingos. Oriental Institute Museum, E5234. Rozenn Bailleul-LeSuer, *Between Heaven and Earth: Birds in Ancient Egypt*, (Chicago: Oriental Museum Publications, 2012), pl. 9.5



Figure 5. An artist's rendering of a fowling scene showing use of the clap-net from the tomb of Khnumhotep II at Beni Hassan. Special Collections Center of the University of Chicago Library. Rozenn Bailleul-LeSuer, *Between Heaven and Earth: Birds in Ancient Egypt* (Chicago: Oriental Museum Publications, 2012), pl. C6.



Figure 6. Fowling trapping quail with a ground net in the Dynasty 6 tomb of Mereruka at Saqqara. Rubbing by Ward Patterson. Darby Ghalioungui Grivetti, *Food: The Gift of Osiris* (London: Academic Press, 1977), pl. 6.4.

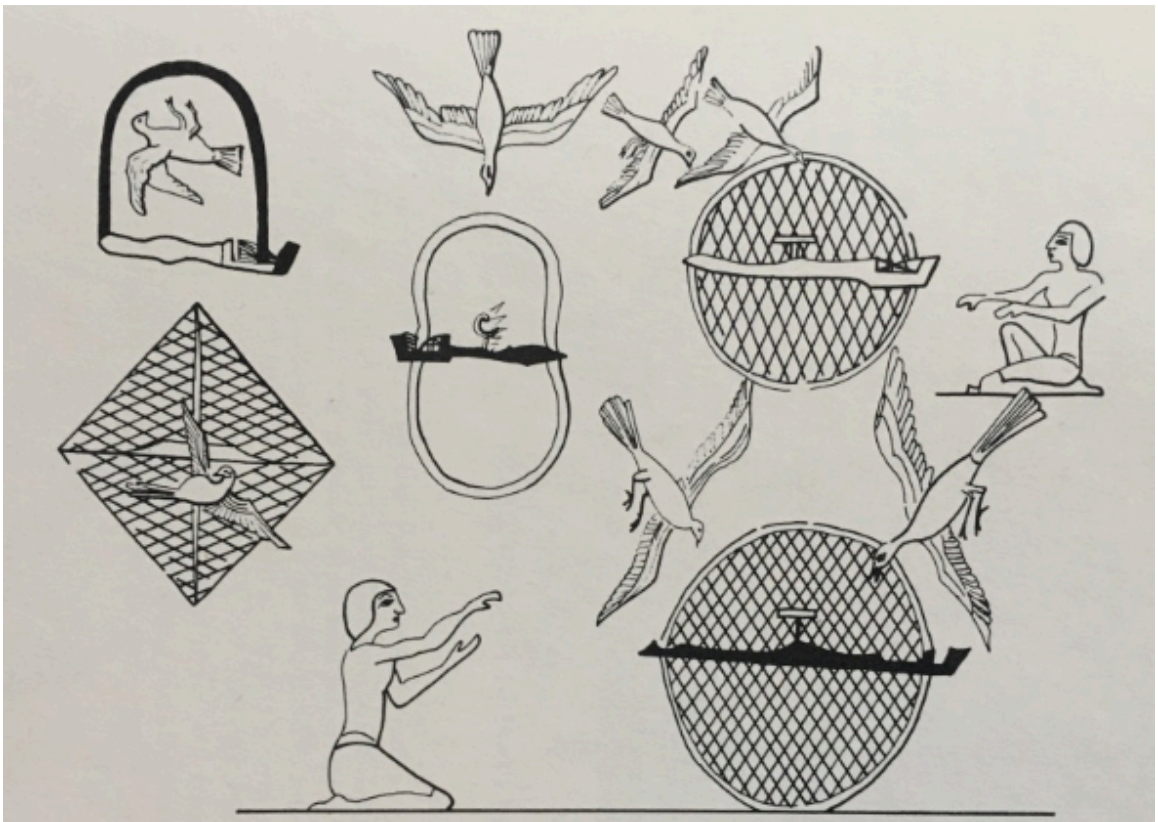


Figure 7. Various Egyptian bird traps depicted in the Dynasty 11 tombs of Khety and Baqt III at Beni Hassan. Redrawn from Wilkinson (1878) Vol. 2, p. 103, Fig. 362. Darby Ghalioungui Grivetti, *Food: The Gift of Osiris* (London: Academic Press, 1977), pl. 6.5a.

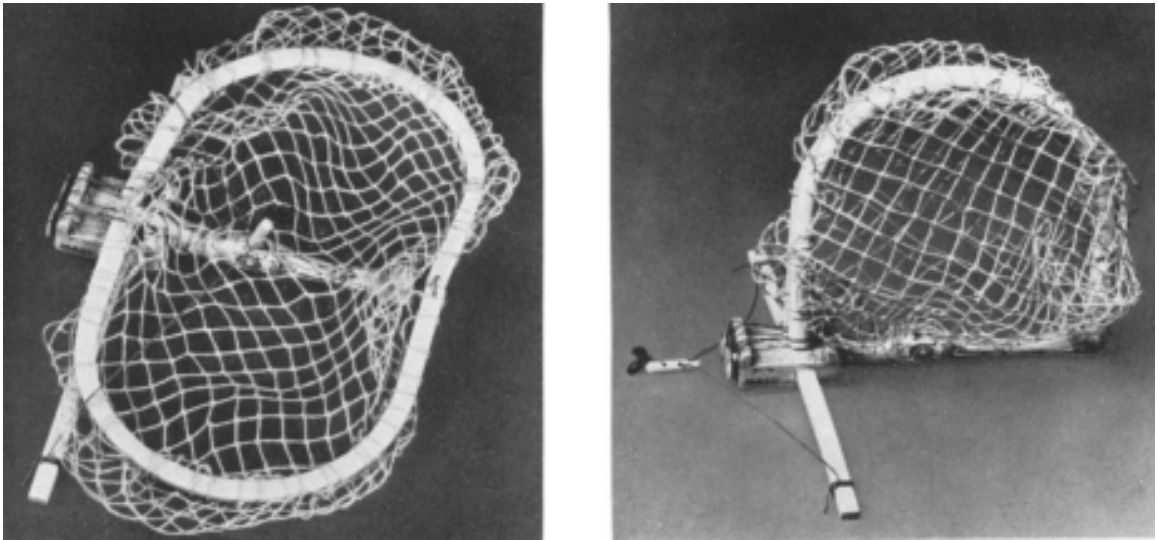


Figure 8. A bird trap, with missing parts recreated to make a complete trap. The left image depicts the trap set and the right image shows it sprung. Nora Scott. "An Egyptian Bird Trap." *The Metropolitan Museum of Art Bulletin* Vol. 35, No. 8 (1940): 164. pl. 1, 2.

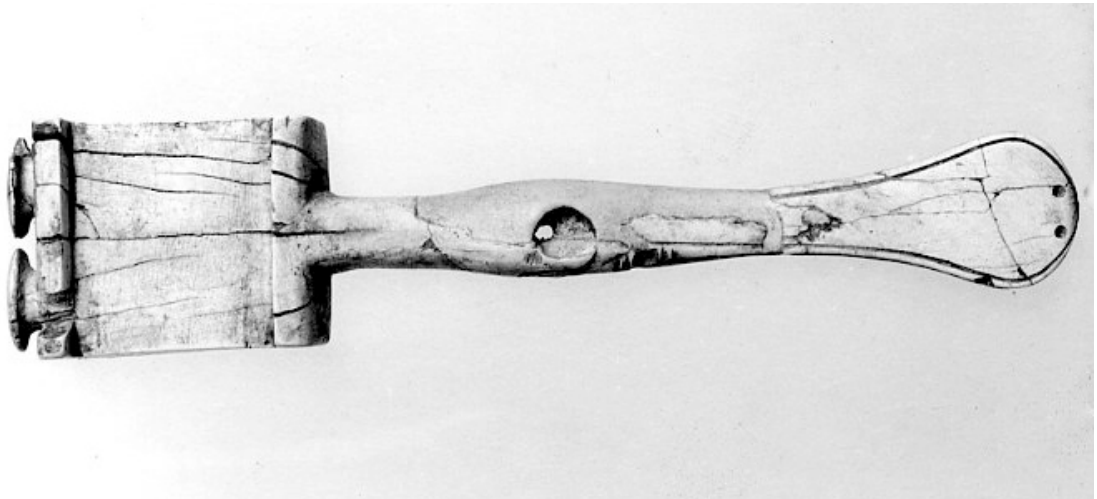


Figure 9. Handle of Egyptian model bird trap. Metropolitan Museum of Art, MMA 30.8.221. https://commons.wikimedia.org/wiki/File:Handle_for_a_Model_Bird_Trap_MET_30-8-221_bottom.jpg (accessed October 12th, 2018).



Figure 10. Middle Kingdom wooden Egyptian throwstick from Beni Hassan. Liverpool University, Institute of Archaeology, 55.82.82.
<http://www.liverpoolmuseums.org.uk/wml/collections/antiquities/ancient-egypt/item-295878.aspx> (accessed November 4th, 2018).

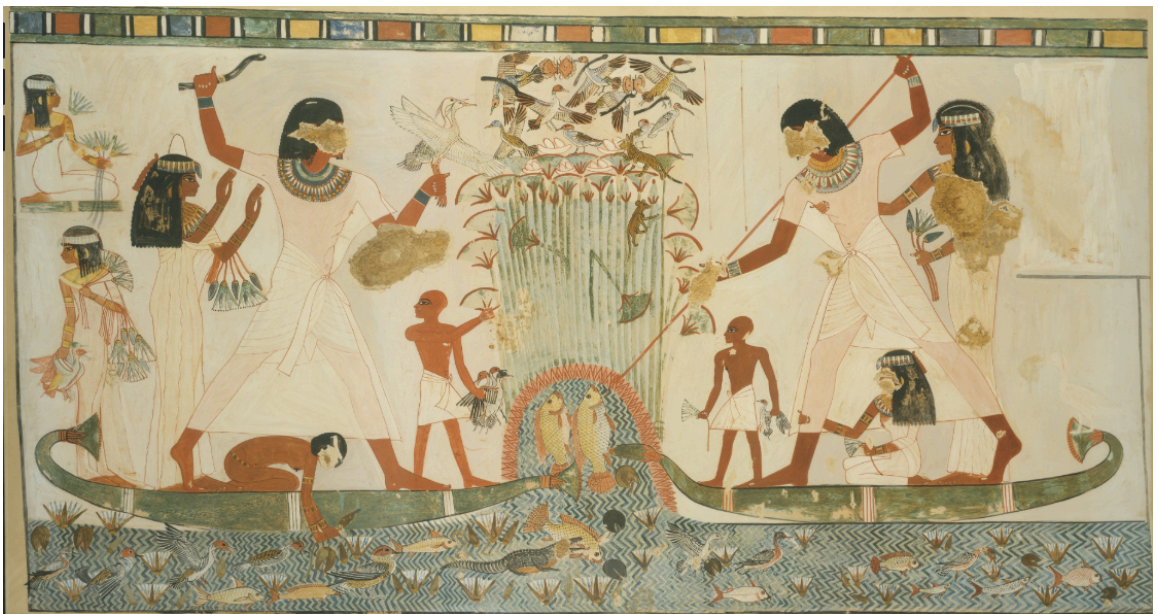


Figure 11. Menna and Family Hunting in the Marshes, Tomb of Menna. Nina de Garis (1881-1965), Twentieth Century; original New Kingdom. Dynasty 18. Original from Egypt, Upper Egypt, Thebes, Sheikh Abd el-Qurna, Tomb of Menna (TT 69), north wall. H. 101 cm, W. 189 cm. Metropolitan Museum of Art, 30.4.48.
<https://www.metmuseum.org/art/collection/search/548437> (accessed March 1st, 2019).



Figure 12. Pond and poultry-yard scene from the Dynasty 5 mastaba from the tomb of Ti. Photograph used with permission of the Ministry of Culture and the official of the Centre for Documentation – Cairo, ARE (1969). Darby Ghalioungui Grivetti, *Food: The Gift of Osiris* (London: Academic Press, 1977), pl. 6.14a.



Figure 13. Care and feeding of poultry and preparation of feeding pellets from the tomb of Mereruka at Saqqara. Rubbing by Ward Peterson (1969). Darby Ghalioungui Grivetti, *Food: The Gift of Osiris* (London: Academic Press, 1977), pl. 6.17.



Figure 14. Detail of force feeding of hyena from the tomb of Mereruka at Saqqara. https://www.osirisnet.net/mastabas/mererouka/e_mereruka_06.htm (accessed February 13th, 2019).



Figure 15. Dynasty 18 relief depicting Akhenaten sacrificing a duck. New Kingdom, Amarna period. H. 24.5 cm, W. 54.5 cm, Th. 7 cm. Metropolitan Museum of Art, MMA 1985.328.2.

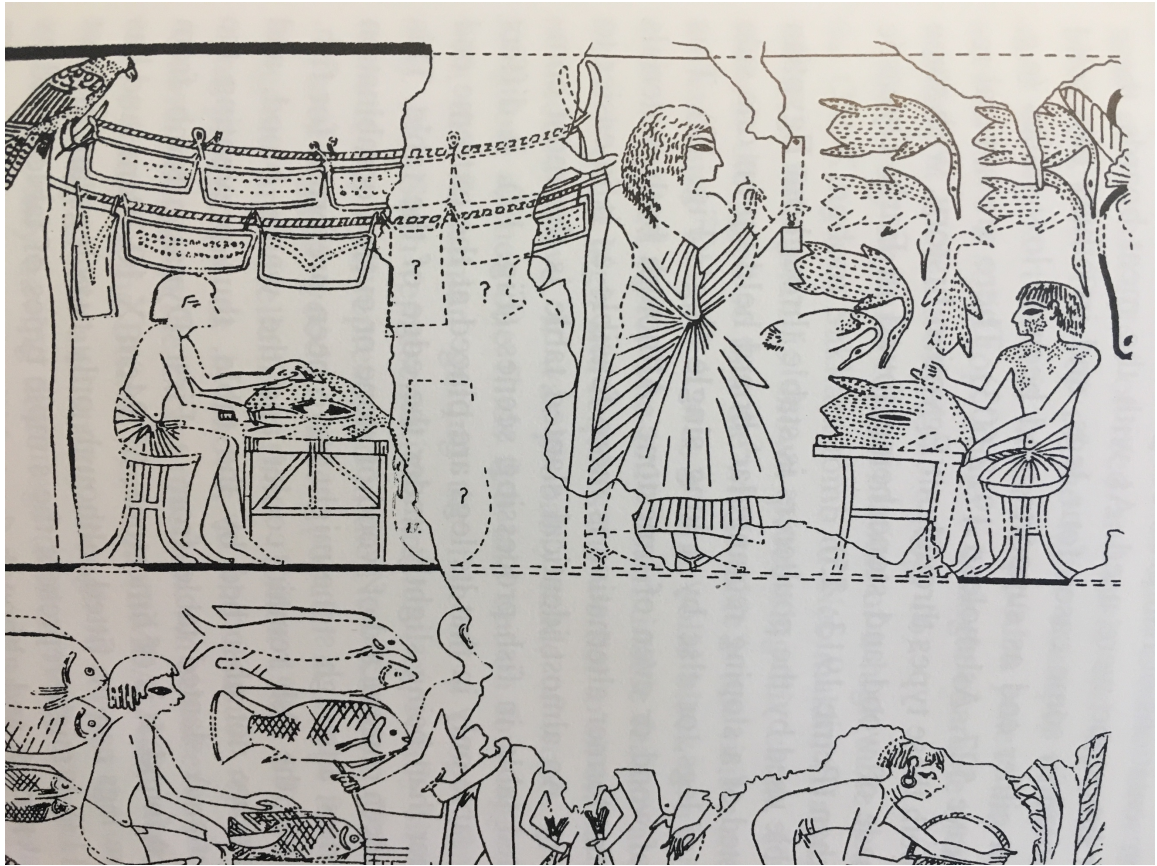


Figure 16. Detail from the tomb of Ipuuy (TT 217) depicting plucked fowl being processed by attendants seated on low stools. Salima Ikram, *Choice Cuts: Meat Production in Ancient Egypt* (Leuven: Peeters Press, 1995), pl. 16.



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https://www.osirisnet.net/tombes/nobles/nakht52/e_nakht_05.htm (accessed February 13th, 2019).



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https://www.osirisnet.net/mastabas/iroukaptah/e_iroukaptah_03.htm (accessed February 13th, 2019).



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Figure 24. Virtual mummy in case from the tomb of Yuya and Tuya (KV 46). Photo by Anna-Marie Kellen, Courtesy of the Egyptian Museum, Cairo. Salima Ikram, "An Eternal Aviary: Bird Mummies from Ancient Egypt." In *Between Heaven and Earth: Birds in Ancient Egypt* (Chicago: Oriental Museum Publications, 2012), pl. 3.1.



Figure 25. The goose mummy and case ready for visual analysis. Art Museum of the University of Memphis, IEAA 1981.11.18a,b. Photo by Paige Brevick, March 7th, 2018.



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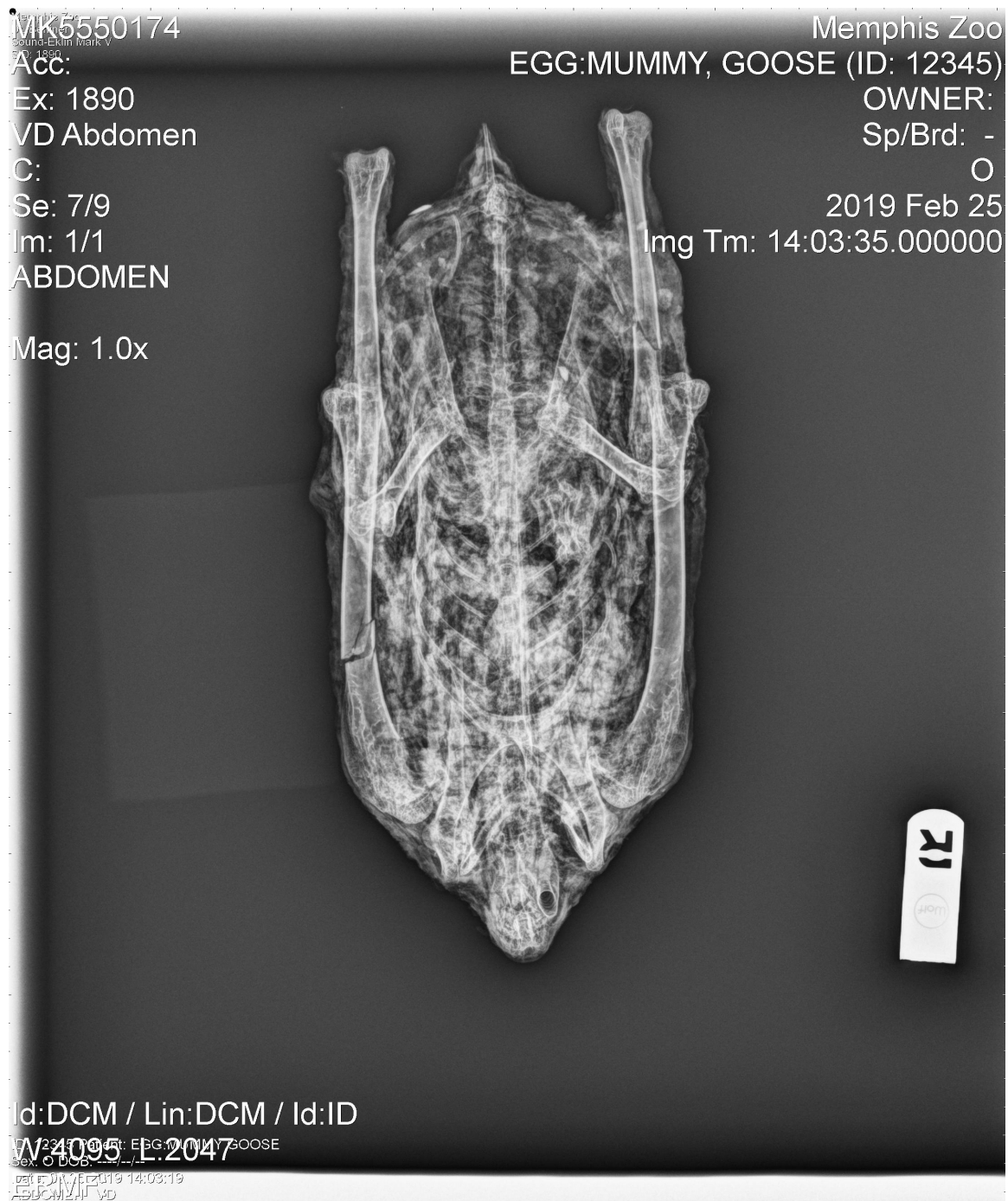


Figure 40. Ventrodorsal orientation of mummy. Art Museum of the University of Memphis, IEAA 1981.1.18a. Image courtesy of Dr. Aimee Berliner, Memphis Zoo, February 25th, 2019.



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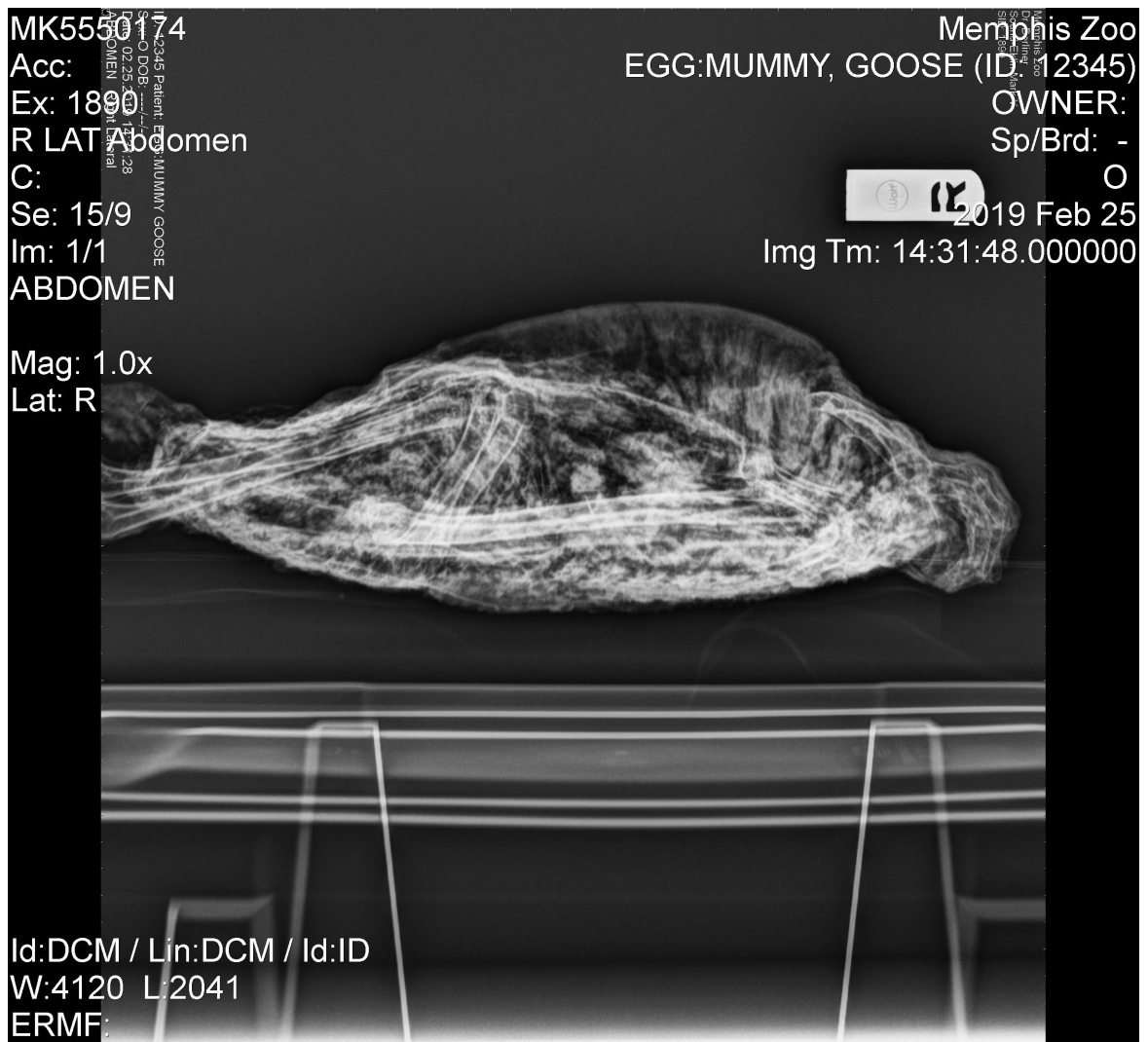


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Figure 44. Small stone or stucco fragment wedged between wrappings. Art Museum of the University of Memphis, IEAA 1981.1.18a. Photo by Paige Brevick, March 7th, 2018.



Figure 45. Image of goose mummy with neck bones exposed. Art Museum of the University of Memphis, 1981.1.18a. Photo by Paige Brevick, March 7th, 2018.



Figure 46. pXRF conducted on goose mummy under the proper right keel. Art Museum of the University of Memphis, IEAA 1981.1.18a. Photo by Paige Brevick, March 1st, 2019.



Figure 47. pXRF conducted on goose mummy on the proper right tibia. Art Museum of the University of Memphis, 1981.1.18a. Photo by Paige Brevick, March 1st, 2019.



Figure 48. pXRF conducted on goose mummy at the distal end of the proper left tibia. Art Museum of the University of Memphis, 1981.1.18a. Photo by Paige Brevick, March 1st, 2019.

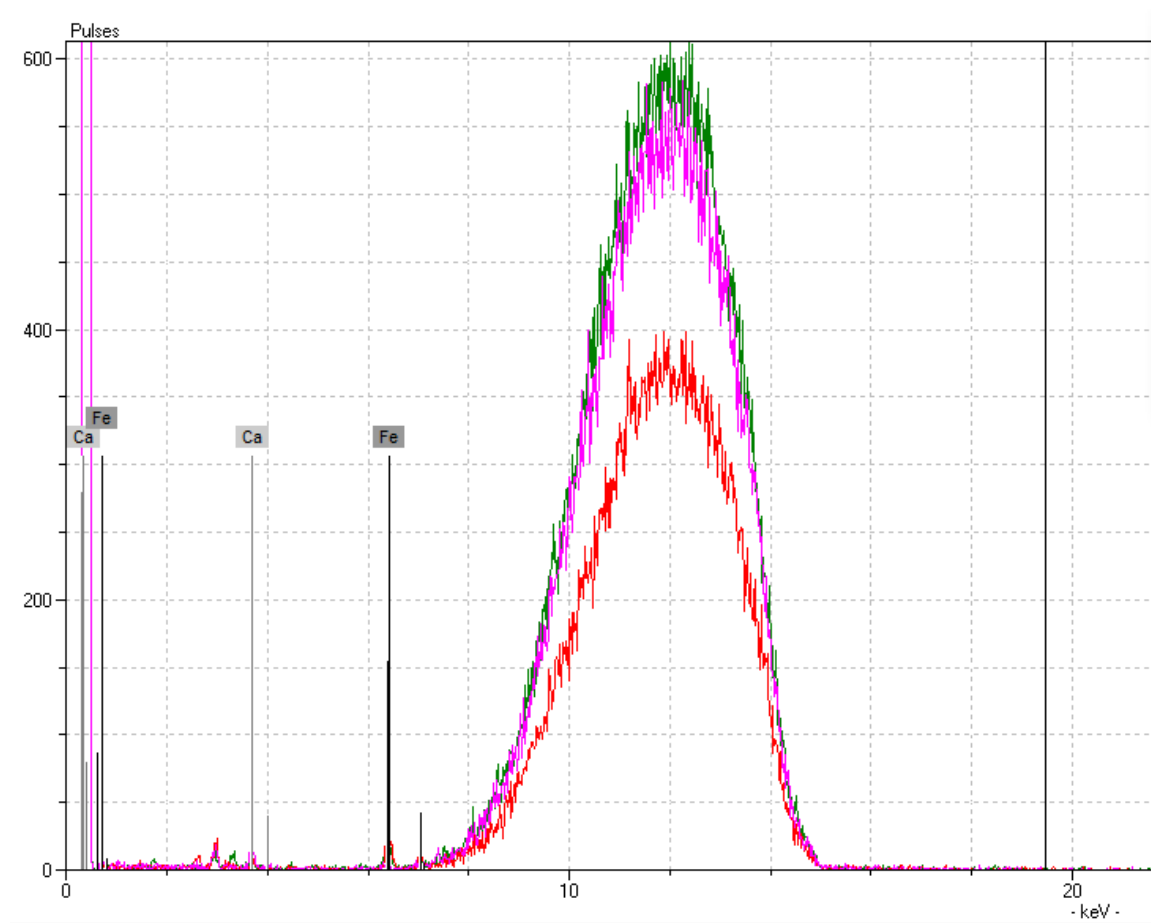


Figure 49. Modern resin samples analyzed using pXRF. *Pinus ponderosa* is represented in green. *Pistacia lentiscus* is represented in pink. *Pinus nigra* is represented in red.

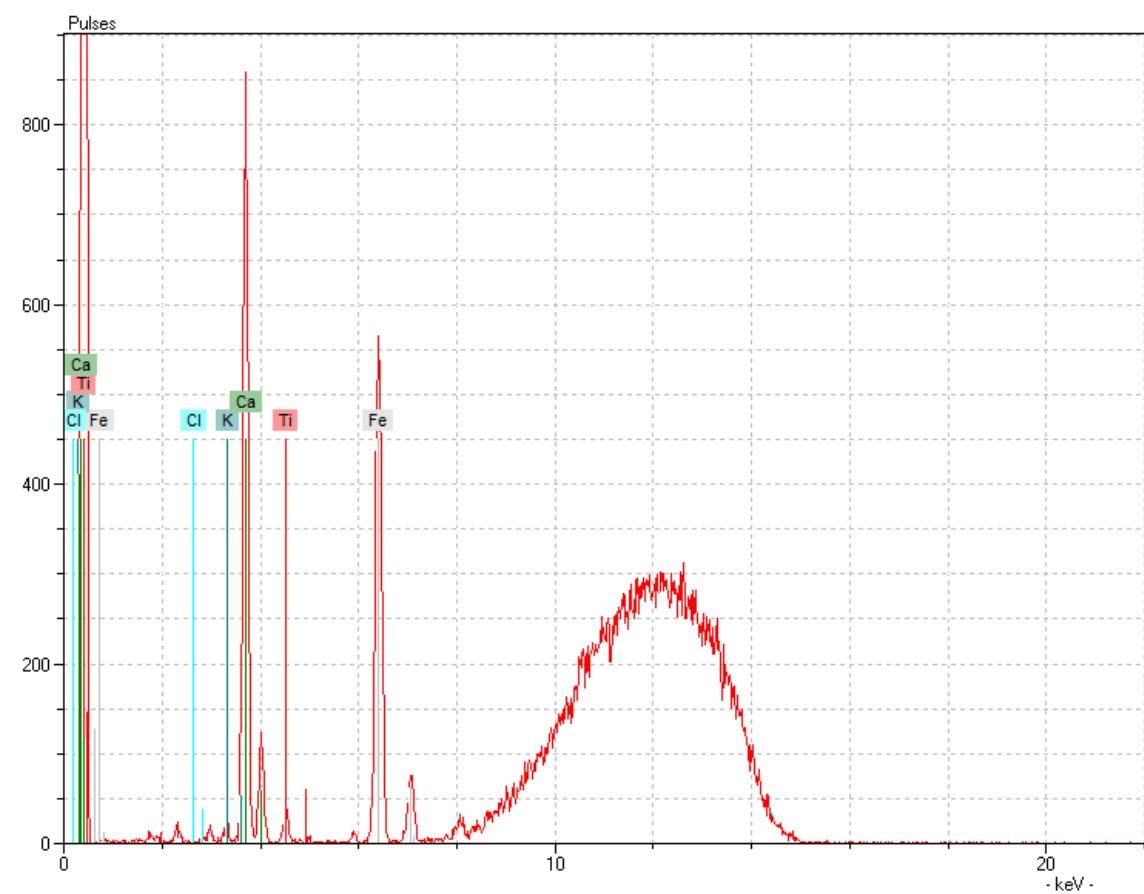


Figure 50. Ancient resin sample analyzed using pXRF from western Thebes at the Wadi el Habl, Art Museum of the University of Memphis, IEAA 1987.5.7.

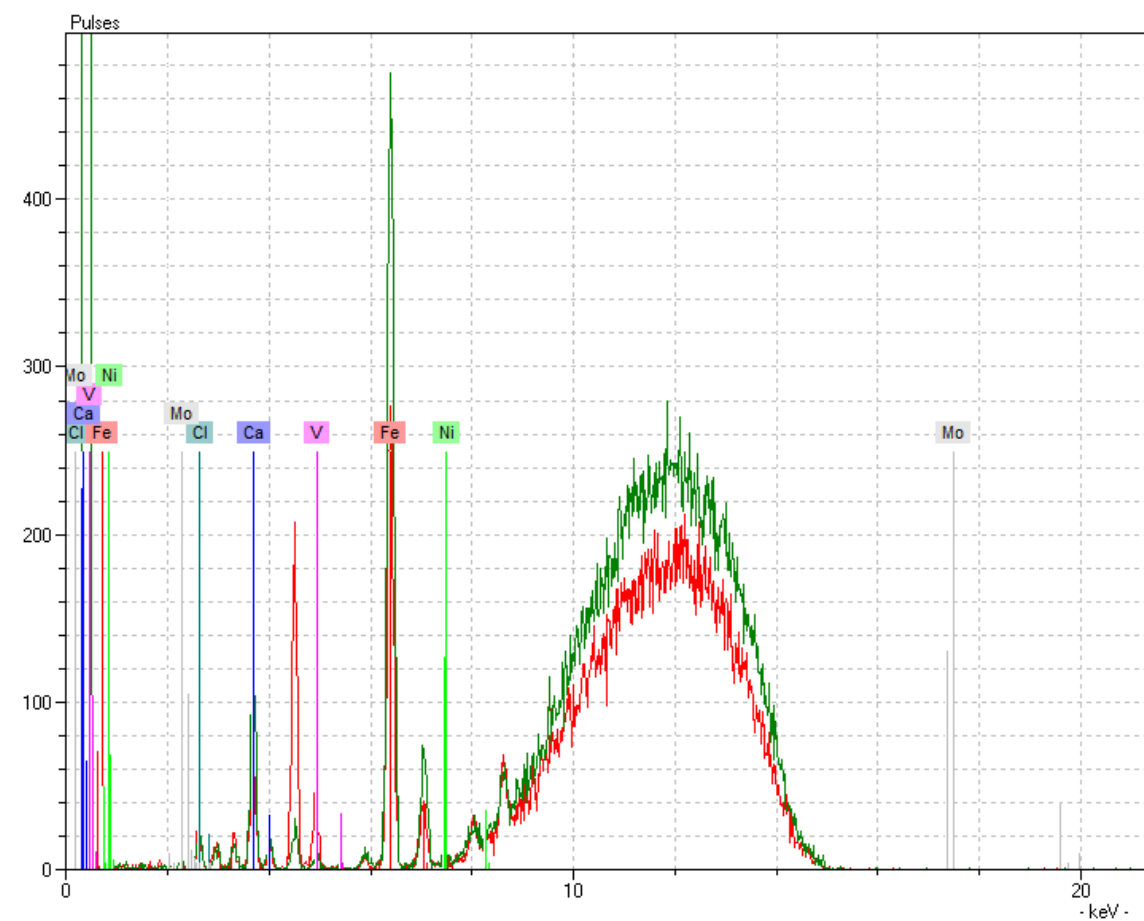


Figure 51. Two ancient linen samples analyzed using pXRF. Resin-saturated linen sample, IEAA 1994.4.94a,b represented in green. Light colored, open weave linen sample, IEAA 1994.4.85c represented in red.

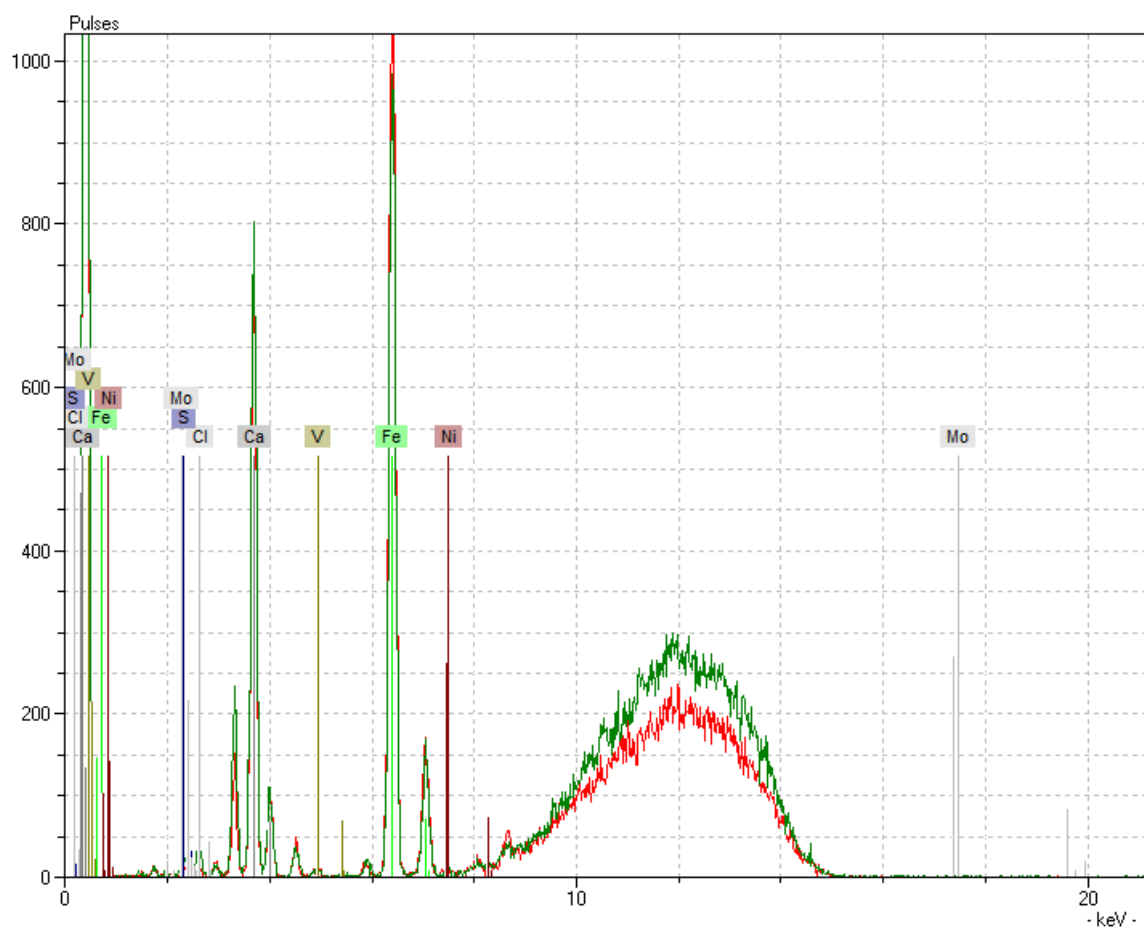


Figure 52. Goose mummy analyzed using pXRF. Art Museum of the University of Memphis, IEAA 1981.1.18a. Proper right tibia sample site represented in green. Proper left bone epiphysis represented in red.

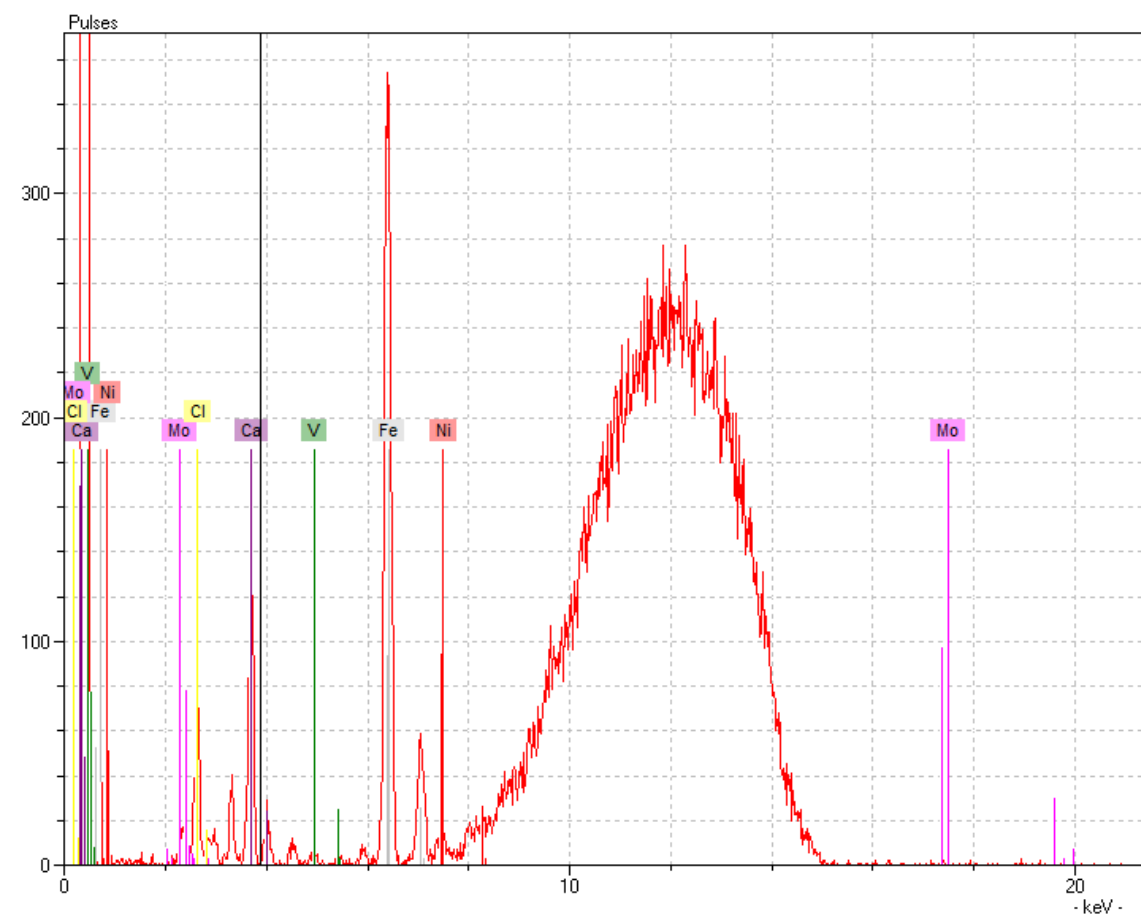


Figure 53. Hawk mummy analyzed using pXRF. Art Museum of the University of Memphis, IEAA 1994.4.242.

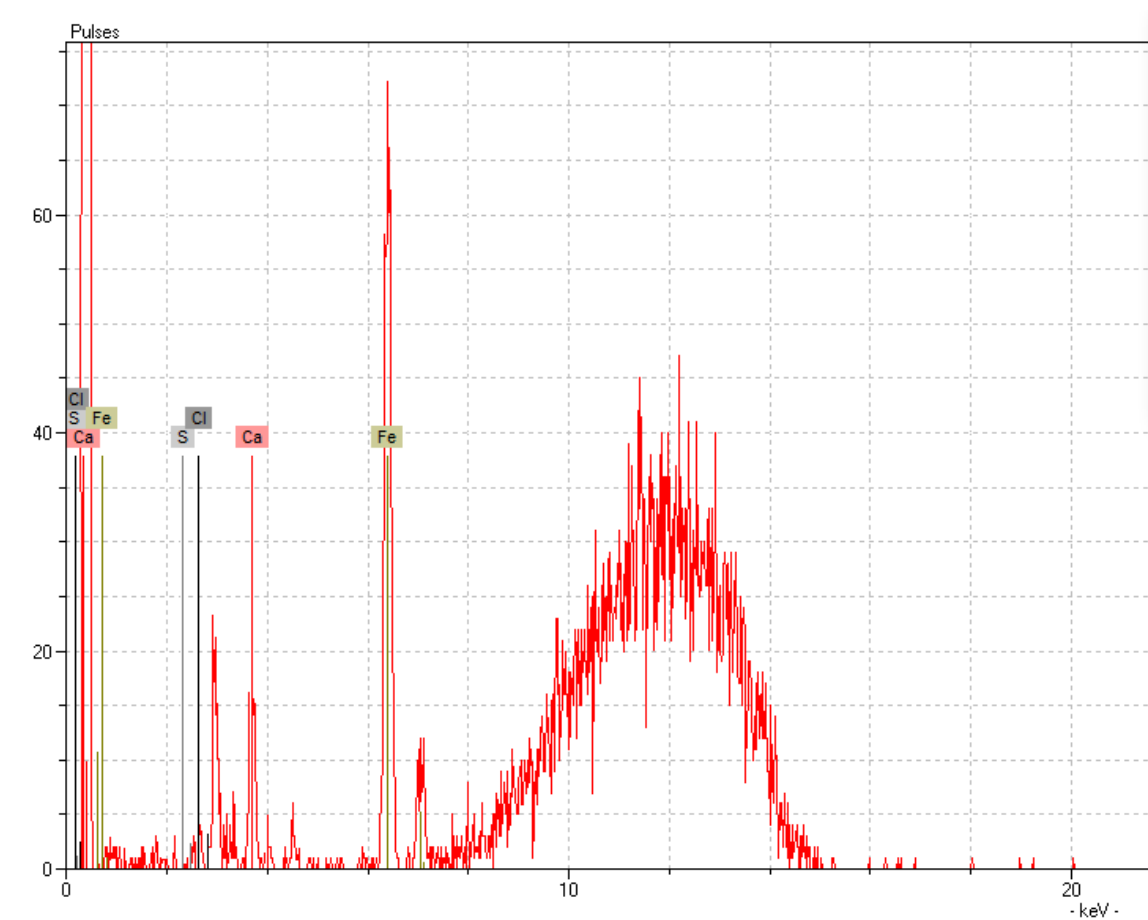


Figure 54. Fish mummy analyzed using pXRF. Art Museum of the University of Memphis, IEAA 1994.4.27.

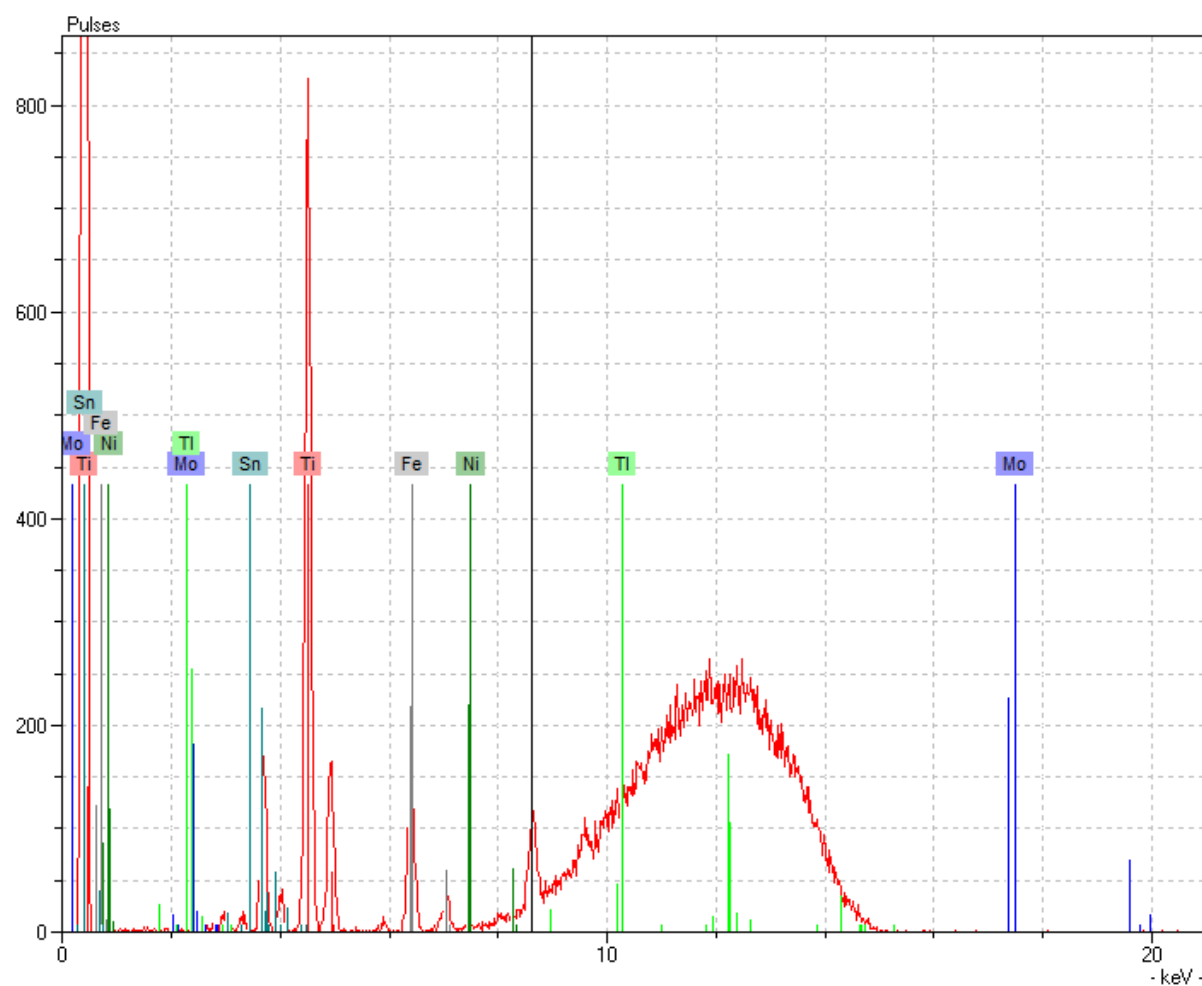


Figure 55. Polyethylene bag analyzed using pXRF. Art Museum of the University of Memphis, IEAA.