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# Bibliography

## The Conservation and Management of the Tomb of Tutankhamen (KV 62)

A Project Bibliography

Edited by Lori Wong





The Conservation and Management of the  
Tomb of Tutankhamen (KV 62)

A PROJECT BIBLIOGRAPHY

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THE GETTY CONSERVATION INSTITUTE  
LOS ANGELES

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The Getty Conservation Institute works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The GCI serves the conservation community through scientific research, education and training, model field projects, and the dissemination of the results of both its own work and the work of others in the field. In all its endeavors, the GCI focuses on the creation and delivery of knowledge that will benefit the professionals and organizations responsible for the conservation of the world's cultural heritage.

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## ACKNOWLEDGEMENTS

Thanks are due to Neville Agnew, Principal Project Specialist, and project co-director with Jeanne Marie Teutonico, Associate Director, Programs, for review of the bibliography. The continuing development of the Tutankhamen project bibliography has been undertaken with the assistance of Gail Ostergren, Research Associate, Megan Salas, undergraduate intern (2012), Amarilli Rava, graduate intern (2010-2011), Stephen Rickerby, GCI consultant, and Jen Porter, Associate Project Specialist. Cameron Trowbridge, Manager of the GCI Information Center, and Anna Duer, Research Assistant, were responsible for the technical coordination of the bibliographic database.





## INTRODUCTION

### **Project Overview**

The Getty Conservation Institute (GCI) and Egypt's Ministry of State for Antiquities (MSA) are collaborating on the conservation and management of the Tomb of Tutankhamen (KV 62) in the Valley of the Kings. The project follows a values-based methodology where the archaeological, historic, artistic values and significance of the tomb guide conservation and management decisions.

The objectives of the project are to:

- Establish an accurate record of the present condition of the tomb and its wall paintings
- Establish the causes of deterioration of the wall paintings through a comprehensive program of visual examination, condition monitoring, and scientific investigation
- Ascertain the nature and causes of the brown spots found on the wall paintings and whether they pose a continuing risk to the wall paintings
- Study the environmental conditions of the tomb and its exterior macroclimate
- Assess the physical and environmental impact of visitors on the preservation of the tomb and establish safe visitation parameters
- Assess the geological and hydrological threats to the tomb
- Design and implement a conservation program for the tomb and its wall paintings based on diagnosis of deterioration and its causes and treatment testing and evaluation
- Create and implement a long-term condition monitoring plan for the wall paintings
- Enhance the interpretation and presentation of the tomb
- Provide training opportunities for SCA staff in all aspects of the project, from planning through treatment of the wall paintings
- Disseminate the results of the work and the information resulting from it.

For more information on the Tutankhamen project, see [http://www.getty.edu/conservation/our\\_projects/field\\_projects/tut/index.html](http://www.getty.edu/conservation/our_projects/field_projects/tut/index.html)

## **Project Components**

The project is divided into three phases. During the first phase (2009–2011), work encompassed background research and assessment, the preparation of an accurate record of the condition of the tomb and its wall paintings, the scientific analysis of materials and techniques of the paintings, study of environmental conditions, and diagnosis of the causes of deterioration. The results of this research determine conservation needs.

The second and third phases (2012–2014) occur simultaneously over a three-year period. The second phase focuses on testing, evaluation and implementation of appropriate interventions for the tomb and its wall paintings and development of a long-term condition monitoring plan. The tomb infrastructure (walkways, protective barriers, ventilation, lighting, and signage) will also be updated and improved during this phase along with recommendations for limiting visitor numbers. Throughout the course of the project, MSA conservators, scientists and staff will undergo training in conservation and site management.

In the third phase, results of the project will be evaluated and disseminated to both professional and public audiences through print, visual, and web-based media. The planned dissemination aims to promote good conservation and management practice in Egypt, enhance MSA staff professional capabilities, and advance public understanding of conservation and its practice.

## **Tomb of Tutankhamen Project Bibliography**

The bibliography is an important component of the project. It builds upon earlier research by the GCI in 1993 but was enlarged as part of the current conservation project.

Not surprisingly, there have been many publications on Tutankhamen and his tomb since Howard Carter's famous discovery in 1922. The GCI Tutankhamen project bibliography does not aim to be all encompassing in scope but is intended to serve the structure and research needs of the project.

The bulk of the bibliographic research was undertaken during the first phase of the project as part of the background research on Tutankhamen and his tomb, and provided materials relating to historical context, the excavation of the tomb in the 1920s, the Valley of the Kings, the condition of the tomb and its wall paintings, the scientific analysis of materials and techniques of the paintings, previous treatments in the tomb, study of environmental conditions, and diagnosis of the causes of deterioration. Bibliographic research during the project's second phase focused on the brown spots and topics related to proposed treatments in the tomb such as research on Egyptian plasters.

The bibliography is organized by subject. A scope note in each section explains the particular area(s) of focus and available keywords. Citations often appear in a number of categories. The bibliography is largely drawn from the English-language literature although a few non-English-language texts have been included.

## CHAPTER 1 Background and History

### 1a. Tutankhamen and his Tomb

(Keywords: Amarna, Historical, Iconography, KV 62)

Scope Note: Bibliographic research on Tutankhamen and his tomb is not exhaustive. Emphasis was placed on finding select references to understand the historical context under which the tomb was constructed, the iconography of the decoration and the postulated circumstances that caused his early death.

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Scope Note: Bibliographic research on the Valley of the Kings is not comprehensive. Emphasis was placed on finding select references to provide context on the setting of Tutankhamen's tomb.

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### 1c. 1920s Excavation

(Keywords: Excavation Notes, Excavation, Historical News Articles)

Scope Note: Emphasis was placed on published sources, news articles and also notes (held at the Griffith Institute) produced by the Carter excavation team in the 1920s to better understand the condition of the tomb and its objects at the time of discovery.

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Excavation, KV 62 Previous Treatment

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Excavation Notes, KV 62, KV

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Coffin, Death Theories, Excavation, Mummy, Treatment

James, Thomas Garnet H. 1992. *Howard Carter: The Path to Tutankhamun*. London; New York: Kegan Paul International.

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Historical, Excavation, KV, KV 62

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Excavation, Geology, KV

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Excavation, Historical, KV, KV 62

More Luxor Treasures. The Robbers of the Tombs. How Tutankhamen was Overlooked. 1923. *The Times (London)*, 07 February.

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More Treasures at Luxor. A Precious Gold Box. King's Painted Effigy. 1923. *The Times (London)*, 02 February.

Historic News Articles

Opening of the Tomb. Seals Broken. A Magnificent Spectacle. Shrine Within Shrine. Full Account. 1923. *The Times (London)*, 16 February.

Historic News Articles

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Excavation, Coffin, Deterioration, Historical, KV 62, Mummy

Pharaoh's Coffin Opened. 1924. *The Daily Mail*, 18 February.

Coffin, Historic News Articles, KV 62, Sarcophagus

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Excavation, KV, Mummy

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Excavation, KV 62

Reeves, C. Nicholas, and John H. Taylor. 1992. *Howard Carter, Before Tutankhamun*. London: British Museum Press.

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Excavation, Historical, KV

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Excavation, Historic News Articles, Plaster, Tomb Construction, KV 62

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Excavation, Iconography, KV 62

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Flooding, Historic News Articles, KV 62

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Historic News Articles

Treasures of Luxor. A Gorgeous Couch. Removal from the Tomb. 1923. *The Times (London)*, 01 February.

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Historic News Articles

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Treasures of Luxor. Tomb to be Resealed. Work Deferred Till Autumn. 1923. *The Times (London)*, 20 February.

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Valley of the Kings. Malicious Rumours. 1923. *The Times (London)*, 12 January.

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Amarna, Excavation, Historical, Iconography, KV 62

Weigall, Arthur. 1923. *The Glory of the Pharaohs*. New York; London: G. P. Putnam's Sons.

Excavation

— — —. 1924. *Tutankhamen and Other Essays*. New York: George H. Doran Co.

Excavation, Historical, Iconography, KV, KV 62

Winlock, Herbert Eustis. 1941. *Materials Used at the Embalming of King Tut-'Ankh-Amun*. Papers of the Metropolitan Museum of Art, no. 10. New York: Metropolitan Museum of Art.

Excavation, Historical, KV, KV 62, Mummy

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Excavation, KV 62

— — —. 2006. *Howard Carter and the Discovery of the Tomb of Tutankhamun*. Revised ed. Manchester: Barzan Publishing.

Excavation, KV 62

The Youthful Pharaoh. Experts' Views on King's Age. No Adults Garments in Tomb. Evidence of the Mannikin. 1923. *The Times (London)*, 06 February.

Historic News Articles

## CHAPTER 2

### Condition

#### 2a. General Condition (Keyword: Deterioration)

Scope note: Priority was placed on citations relevant to past and current condition of the tomb, particularly, deterioration and damage to the wall paintings. Examples from other sites in Egypt are also included.

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Deterioration, KV Management, KV 62, Treatment, Visitors

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Pigments, Deterioration

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Clay, Deterioration, Flooding, Geology, KV, Limestone, Rock

Burns, George, T. C. Billard, and K. M. Matsui. 1990. Salinity threat to Upper Egypt. *Nature* 344 (6261): 25.

Salt, Deterioration

Burns, George, and Kristine M. Wilson-Yang. 1991. A microstratigraphic investigation of iron ion migration in some ancient Egyptian wall paintings using PIXE Analysis. *Canadian Journal of Chemistry* 69 (2): 286-92.

Deterioration, Pigments, Treatment

Curtis, Garniss. 1995. Deterioration of the royal tombs. In *Valley of the Sun Kings: New Explorations in the Tombs of the Pharaohs: Papers from the University of Arizona International Conference on the Valley of the Kings*, edited by Richard H. Wilkinson, 129-33. Tucson: University of Arizona Egyptian Expedition.

Deterioration, Geology, KV

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Deterioration, Flooding, Geology, KV

Daniels, Vincent, Rebecca Stacey, and Andrew Middleton. 2004. The blackening of paint containing Egyptian blue. *Studies in Conservation* 49 (1): 217-30.

Binding Media, Coffin, Deterioration, Pigments

El Aal, Shaaban Abd , Andrzej Korman, Anna Stonert, Frans Munnik, and Andrzej Turos. 2009. Ion beam analysis of ancient Egyptian wall paintings. *Vacuum* 83 (Suppl. 1): S4-S8.

Deterioration, Painting Technique, Pigments

Graue, Birte, Jannes Kordilla, and Siegfried Siegesmund. 2007. Natursteinverwitterung und -konservierung der ägyptischen Grabanlage des Neferhotep (TT 49) in Theben (Ägypten) [Stone deterioration and conservation of the ancient Egyptian tomb of Neferhotep (TT 49) in Thebes (Egypt)]. *Zeitschrift der Deutschen Gesellschaft für Geowissenschaften* 158 (3): 593-615.

Deterioration, Geology, Rock, Salts, Treatment

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Deterioration, Environment, Limestone, Rock, Treatment

Green, Lorna. 2001. Colour transformations of ancient Egyptian pigments. In *Colour and Painting in Ancient Egypt*, edited by W. Vivian Davies, 43-48. London: British Museum Press.

Binding Media, Deterioration, Environment, Gold, Pigments, Treatment

Guillaume, André, and Jean-Michel Piau. 2003. Stabilité de l'hypogée de Ramsès II (Vallée des Rois, Louqsor, Égypte): Modèles numériques et réalité [Stability of the tomb of Ramesses II (Valley of the Kings, Luxor, Egypt): Numerical models and reality]. *Bulletins des Laboratoires des Ponts et Chaussées* (242): 15-47.

Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone, Rock

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Deterioration, Environment, Flooding, KV Management, Treatment, Visitors

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Deterioration, Gypsum, Limestone, Plaster, Treatment



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Deterioration, KV, Painting Technique, Visitors

— — —. 2008. Monument and site conservation. In *Egyptology Today*, edited by Richard H. Wilkinson, 98-120. Cambridge; New York: Cambridge University Press.

Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, KV 62, Management, Treatment, Visitors

Khalil, Essam E. 2010. Preservation of the archeological tombs of Tutankhamen and Horemheb of the Valley of Kings, Luxor. In *Clima 2010: 10th REHVA World Congress, Sustainable Energy Use in Buildings, 9-12 May 2010, Antalya, Turkey*. Brussels: REHVA.

Deterioration, Environment, KV, KV 62, Ventilation, Visitors

Le Fur, Daniel, and Sylvie Deparis. 1990. Restauration du sanctuaire d'Alexandre à Karnak [Restoration of the sanctuary of Alexander at Karnak]. *Archéologia* (257): 36-41.

Deterioration, Environment, Salts, Treatment

Lucas, Alfred. 1923. Saving the Fabrics: Some Curiosities of Disintegration. *The Times (London)*, 03 February.

Deterioration, Historic News Articles

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Deterioration, Excavation, Historical News Articles, KV 62 Previous Treatment

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Deterioration, Excavation, Gold, Historic News Articles, KV 62 Previous Treatment

McLane, James, and John Rutherford. 2006. Diverting eons of damage. *The Explorers Club Northern California Chapter* (March-April): 4. <http://www.diggles.com/ec/2006/EC06-03.pdf>

Deterioration, Flooding, Hydrology, KV

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Deterioration, Flooding, Hydrology, KV, KV Management

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Deterioration, Geology, Gypsum, Hydrology, Painting Technique, Pigments, Plaster, Salts

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Anhydrite, Clay, Deterioration, Plaster, Rock, Salts

Pearce, Geoffrey. 1969. The conservation of wall paintings in Tomb 35 at Dra Abu el-Naga. *Expedition* 11: 38-43.

Binding Media, Deterioration, Lime, Limestone, Salts, Treatment

Preusser, Frank. 1987. First report on analyses of samples. In *Wall Paintings of the Tomb of Nefertari: Scientific Studies for Their Conservation: First Progress Report, July 1987*, edited by Miguel Angel Corzo, 82-93. Cairo; Marina del Rey, Calif.: Organisation des antiquités égyptiennes; Getty Conservation Institute.

Anhydrite, Clay, Deterioration, Gypsum, Plaster, Salts

Ragai, Jehane. 1988. Surface and bulk properties of ancient Egyptian mortars, Part III: X-ray diffraction studies (b). *Cement and Concrete Research* 18 (1): 9-17.

Anhydrite, Calcite, Deterioration, Gypsum, Plaster

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Calcite, Deterioration, Gypsum, Plaster

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Deterioration, Gypsum, Plaster

Rodriguez-Navarro, Carlos, Eric Hansen, Eduardo Sebastian, and William S. Ginell. 1997. The role of clays in the decay of ancient Egyptian limestone sculptures. *Journal of the American Institute for Conservation* 36 (2): 151-63.

Clay, Deterioration, Limestone, Rock

Rodriguez-Navarro, Carlos, Eduardo Sebastian, Eric Doehne, and William S. Ginell. 1998. The role of sepiolite-palygorskite in the decay of ancient Egyptian limestone sculptures. *Clays and Clay Minerals* 46 (4): 414-22.

Deterioration, Geology, Plaster

Romer, John, and Elizabeth Romer. 1993. *The Rape of Tutankhamun*. London: Michael O'Mara.

Deterioration, Flooding, KV 62

Rutherford, John B. 1988. Geotechnical causes of ancient tomb damage, Valley of the Kings, Egypt. In *Symposium on Geotechnical Aspects of Restoration and Maintenance of Infra-structures and Historical Monuments: November 28-December 2, 1988, Bangkok, Thailand*, 305-24. Bangkok: Asian Institute of Technology; Southeast Asian Geotechnical Society.

Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, Limestone, Visitors

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Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, Limestone, Visitors

- Rutherford, John B., and Donald P. Ryan. 1995. Tentative tomb protection priorities, *Valley of the Kings, Egypt*. In *Valley of the Sun Kings: New Explorations in the Tombs of the Pharaohs: Papers from the University of Arizona International Conference on the Valley of the Kings*, edited by Richard H. Wilkinson, 134-56. Tucson: University of Arizona Egyptian Expedition.

Deterioration, Flooding, Geology, KV 62

- Ryan, Donald P. 1995. Further observations concerning the Valley of the Kings. In *Valley of the Sun Kings: New Explorations in the Tombs of the Pharaohs: Papers from the University of Arizona International Conference on the Valley of the Kings*, edited by Richard H. Wilkinson, 157-63. Tucson: University of Arizona Egyptian Expedition.

Bats, Deterioration, Flooding, KV, KV Management, Treatment, Visitors

- Schiegl, Solveig, Karl L. Weiner, and Ahmed El Goresy. 1989. Discovery of copper chloride cancer in ancient Egyptian polychromic wall paintings and faience: A developing archaeological disaster. *Naturwissenschaften* 76 (9): 393-400.

Deterioration, Painting Technique, Pigments, Plaster

- — —. 1992. The diversity of newly discovered deterioration patterns in ancient Egyptian pigments: Consequences to entirely new restoration strategies and to the Egyptological colour symbolism. In *Materials Issues in Art and Archaeology III: Symposium Held April 27-May 1, 1992, San Francisco, California, U.S.A.*, edited by Pamela B. Vandiver, James R. Druzik, George Segal Wheeler and Ian C. Freestone, 831-57. Materials Research Society Symposium Proceedings, vol. 267. Pittsburgh, Pa.: Materials Research Society.

Deterioration, Iconography, Pigments

- Scott, David A. 2002. Copper silicates. In *Copper and Bronze in Art: Corrosion, Colorants, Conservation*, 252-67. Los Angeles: Getty Conservation Institute.

Deterioration, Historical, Pigments

- — —. 2010. Greener shades of pale: A review of advances in the characterisation of ancient Egyptian green pigments. In *Decorated Surfaces on Ancient Egyptian Objects: Technology, Deterioration and Conservation: Proceedings of a Conference Held in Cambridge, UK on 7-8 September 2007*, edited by Julie Dawson, Christina Rozeik and Margot M. Wright, 32-45. London: Archetype Publications.

Deterioration, Iconography, Painting Technique, Pigments

- Stoppelaëre, Alexandre. 1942. Dégradations et restaurations des peintures murales Égyptiennes. *Annales du service des antiquités de l'Égypte* 40: 941-50.

Deterioration, Treatment

Tite, Michael S., Mavis Bimson, and Michael R. Cowell. 1984. Technological examination of Egyptian blue. In *Archaeological Chemistry--III*, edited by Joseph B. Lambert, 215-42. Advances in Chemistry Series 205. Washington, D.C.: American Chemical Society.

Amarna, Deterioration, Pigments

Wilkinson, Ray. 1990. The shame of the Pharaohs. *Newsweek* 116 (18): 69U-69EE.

Deterioration, Flooding, KV, KV Management, KV 62, Treatment, Visitors

Wilkinson, Richard H., ed. 1995. *Valley of the Sun Kings: New Explorations in the Tombs of the Pharaohs: Papers from the University of Arizona International Conference on the Valley of the Kings*. Tucson: University of Arizona Egyptian Expedition.

Deterioration, Iconography, KV Management, Tomb Construction

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Clay, Deterioration, Geology, KV, Limestone, Rock

Wüst, Raphael A. J., and Christian Schlüchter. 2000. The origin of soluble salts in rocks of the Thebes Mountains, Egypt: The damage potential to ancient Egyptian wall art. *Journal of Archaeological Science* 27 (12): 1161-72.

Deterioration, Geology, Salts, Plaster

## 2b. Brown Spots

(Keyword: Biodeterioration)

Scope Note: Brown spots mar the painted surface and can be found throughout the tomb. Citations specific to previous microbiological investigations and more general resources on microbiological identification methods and biodeterioration were selected.

Abd El Hady, Mohammed A. 1988. Biodeterioration of monumental limestone at Mataria - Egypt. In *Fifth International Congress of Egyptology, October 29 - November 3, Cairo 1988*. Cairo: E.A.O. Press.

Biodeterioration, Limestone

Abdulla, Hesham, Eric May, Magdi Bahgat, and Ahmed Dewedar. 2008. Characterisation of actinomycetes isolated from ancient stone and their potential for deterioration. *Polish Journal of Microbiology* 57 (3): 213-20.

Biodeterioration

Abu Awad, Riad. 2009. Egypt warns pharaohs' tombs could disappear. *Agence France-Presse (AFP)* 18 August, <http://www.google.com/hostednews/afp/article/ALeqM5ivNMFoBFNok7p2H-YBzfSmaJd6OA>.

Biodeterioration

Ammar, Mokhtar S., and Asmaa A. El-Deeb. 1993. A suggested new formula for the treatment of microbial biodeterioration occurring in Tutankhamen tomb and similar antiquities objects. *Egyptian Journal of Microbiology* 28 (1): 93-117.

Biodeterioration, KV 62 Previous Treatment, Treatment

— — —. 1996. *In situ*: Validity of the newly suggested D-PI formula application for the absolute inhibition of microbial growth inside Tutankhamen tomb (TAT) for at least three years of treatment. *Egyptian Journal of Microbiology* 31 (3): 405-21.

Biodeterioration, KV 62 Previous Treatment, Treatment

Ammar, Mokhtar S., A. A. El-Esaway, M. Yassin, and Y. M. Sherif. 1998. Hydrolytic enzymes of fungi isolated from certain Egyptian antiquities objects while utilizing the industrial wastes of Sugar and Integrated Industries Company (SIIC). *Egyptian Journal of Biotechnology* 3: 60-90.

Biodeterioration, KV 62

Arai, Hideo. 1987. Microbiological studies on the conservation of paper and related cultural properties (Part 5). *Hozon kagaku = Science for Conservation* 26: 43-52.

Biodeterioration

— — —. 1988. On microorganisms in the Tomb of Nefertari, Egypt. *Hozon kagaku = Science for Conservation* (27): 13-20.

Biodeterioration, Plaster

- — —. 1990. The environmental analysis of archaeological sites. *Trends in Analytical Chemistry* 9 (7): 213-16.

Biodeterioration, Environment, Environmental Investigation, Ventilation

- — —. 1992. Relationship between fungi and brown spots found in various materials. In *2nd International Conference on Biodeterioration of Cultural Property, October 5-8, 1992, Yokohama, Japan: Preprint*. Yokohama: The Organizing Committee of ICBCP-2.

Biodeterioration, KV 62

- — —. 1993. Relationship between fungi and brown spots found in various materials. In *Biodeterioration of Cultural Property 2: Proceedings of the 2nd International Conference on Biodeterioration of Cultural Property, October 5-8, 1992 held at Pacifico Yokohama (Pacific Convention Plaza Yokohama)*, edited by Kenzo Toishi, 320-36. Tokyo: International Communications Specialists.

Biodeterioration, KV 62

- — —. 2000. Foxing caused by fungi: Twenty-five years of study. *International Biodeterioration & Biodegradation* 46 (3): 181-88.

Biodeterioration, KV 62

- Arai, Hideo, Noritaka Matsumura, and Hiroyuki Murakita. 1990. Induced foxing by components found in foxed areas. In *ICOM Committee for Conservation 9th Triennial Meeting: Dresden, German Democratic Republic, 26-31 August 1990: Preprints*, edited by Kirsten Grimstad, 801-03. Paris: ICOM Committee for Conservation.

Biodeterioration

- Bassi, Maria, and Clelia Giacobini. 2001. Scanning electron microscopy: A new technique in the study of the microbiology of works of art. *International Biodeterioration & Biodegradation* 48 (1-4): 55-66.

Biodeterioration

- Berteaux, J. 1968. Les microorganismes et la dégradation des peintures [Micro-organisms and the deterioration of paints]. *Peintures pigments vernis* 44 (12): 740-53.

Biodeterioration

- Bloxham, Andy. 2009. Pharaohs' tombs 'could disappear in 150 years'. *The Telegraph*, 19 August, <http://www.telegraph.co.uk/travel/travelnews/6053123/Pharaohs-tombs-could-disappear-in-150-years.html>.

Biodeterioration

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Biodeterioration

Bridge, P. J. 1973. Guano minerals from Murra-el-elevyn Cave Western Australia. *Mineralogical Magazine* 39: 467-69.

Bats, Biodeterioration

Brunet, Jacques, and Pierre Vidal. 1989. Lascaux: 25 années après sa fermeture [Lascaux: 25 years after its closing]. *European Cultural Heritage Newsletter on Research* 3 (1): 39-52.

Biodeterioration

Bullen, Heather A., Stuart A. Oehrle, Ariel F. Bennett, Nicholas M. Taylor, and Hazel A. Barton. 2008. Use of attenuated total reflectance Fourier transform infrared spectroscopy to identify microbial metabolic products on carbonate mineral surfaces. *Applied and Environmental Microbiology* 74 (14): 4553-59.

Biodeterioration

Caneva, Giulia, Maria Pia Nugari, and Ornella Salvadori. 1991. *Biology in the Conservation of Works of Art*. Rome: ICCROM.

Biodeterioration

— — —, eds. 2008. *Plant Biology for Cultural Heritage: Biodeterioration and Conservation*. Los Angeles: Getty Conservation Institute.

Biodeterioration

Caneva, Giulia, and Alessandra Pacini. 2008. Biodeterioration problems in relation to geographical and climatic contexts. In *Plant Biology for Cultural Heritage: Biodeterioration and Conservation*, edited by Giulia Caneva, Maria Pia Nugari and Ornella Salvadori, 219-37. Los Angeles: Getty Conservation Institute.

Biodeterioration, Environment

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Biodeterioration

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Biodeterioration

## CHAPTER 3

# Original Materials and Technology

### 3a. Tomb Construction

(Keywords: Tomb Construction)

Scope Note: Research was undertaken on Egyptian tomb construction to further understanding of how the tomb was made. Examples from other sites in Egypt are also included.

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Amarna, Historical, KV, KV 62, Tomb Construction

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Tomb Construction

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Coffin, Grids, Historical, Iconography, KV, Painting Technique, Sarcophagus, Tomb Construction

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KV, KV Management, KV 62, Tomb Construction

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Historical, Iconography, Painting Technique, Pigments, Tomb Construction

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Binding Media, Grids, Ground Layer, Painting Technique, Pigments, Tomb Construction

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KV 62, Tomb Construction

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Excavation, KV, Tomb Construction

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Excavation Notes, KV 62, Tomb Construction

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Iconography, KV, Tomb Construction

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Gypsum, Iconography, KV 62, Plaster, Tomb Construction

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Amarna, Gypsum, Plaster, Tomb Construction, KV

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Historical, Tomb Construction

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Coffin, KV 62, Mummy, Sarcophagus, Tomb Construction

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Amarna, KV, Tomb Construction

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Amarna, Historical, KV, KV 62, Tomb Construction

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Binding Media, Grids, Ground Layer, Gypsum, Historical, Iconography, KV, Lime, Limestone, Painting Technique, Pigments, Plaster, Rock, Tomb Construction

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Amarna, Coffin, Historical, Iconography, KV 62, Sarcophagus, Tomb Construction

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Death Theories, Historical, Iconography, KV 62, Mummy, Tomb Construction

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Environment, Flooding, Geology, Hydrology, KV, Tomb Construction

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Flooding, Geology, Hydrology, KV, Tomb Construction, Treatment



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Historical, Iconography, Painting Technique, Tomb Construction

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Binding Media, Calcite, Clay, Ground Layer, Gypsum, Historical, Iconography, Painting Technique, Pigments, Plaster, Tomb Construction

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Iconography, KV, Tomb Construction

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Clay, Excavation Notes, Iconography, KV 62, Plaster, Tomb Construction

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Grids, Historical, Iconography, Painting Technique, Pigments, Plaster, Tomb Construction

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Historical, Iconography, Painting Technique, Tomb Construction

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Geology, Historical, Pigments, Plaster, Tomb Construction

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Grids, Iconography, Painting Technique, Tomb Construction

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Calcite, Clay, Ground Layer, Gypsum, Lime, Plaster, Tomb Construction

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Gypsum, Historical, Plaster, Tomb Construction

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Gypsum, Plaster, Tomb Construction

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Anhydrite, Binding Media, Gold, Ground Layer, Gypsum, Painting Technique, Pigments, Plaster, Tomb Construction

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Amarna, Historical, KV, Limestone, Rock, Tomb Construction

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### 3b. Wall Paintings

(Keywords: Binding Media, Grids, Ground Layer, Painting Technique, Pigments, Varnish)

Scope Note: Focus was placed on researching the materials and techniques of the wall paintings. This was undertaken as background to the analytical investigation. Bibliographic research on plasters is included in a separate section (3c).

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Iconography, Pigments

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Historical, Iconography, Painting Technique, Pigments

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Clay, Ground Layer, Hib, Painting Technique, Pigments, Plaster, Tomb Construction, Treatment

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Anhydrite, Binding Media, Clay, Ground Layer, Gypsum, Plaster

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Historical, Painting Technique

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Amarna, Deterioration, Pigments

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Anhydrite, Calcite, Gypsum, KV, Pigments, Plaster

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Painting Technique, Pigments

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Amarna, Anhydrite, Calcite, Clay, Gypsum, Lime, Painting Technique, Plaster

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Amarna, Historical, Painting Technique, Pigments

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Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone, Pigments, Plaster, Rock

### 3c. Egyptian Plasters

(Keywords: Anhydrite, Calcite, Clay, Gypsum, Hib, Lime, Plaster)

Scope Note: Research on Egyptian plasters focused on the binder and aggregate composition. This was undertaken as background to the analytical investigation of plasters from the tomb carried out to further the general knowledge on plasters and to enable more compatible conservation repair materials to be formulated.

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Gypsum, Lime, Pigments, Plaster

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Lime, Plaster

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Biodeterioration, Plaster

Aubry, Marie-Pierre, William A. Berggren, Christian Dupuis, Emily Poorvin, Holeil Ghaly, David Ward, Chris King, Robert W. O'B. Knox, Khaled Ouda, and Wael Fathy Hassan. Forthcoming. Tiga: A geoarcheologic project in the Theban Necropolis, West Bank, Egypt. In *Proceedings of the Tenth International Congress of Egyptologists, University of the Aegean, Rhodes, 22-29 May 2008*, edited by P. Kousoulis and N. Lazaridis. Leuven: Peeters Publishers.

Calcite, Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone

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Clay, Plaster

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Lime, Plaster



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Lime, Painting Technique, Plaster

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Binding Media, Clay, Gypsum, KV 62, Lime, Painting Technique, Plaster

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Clay, Ground Layer, Gypsum, Lime, Painting Technique, Plaster

Brysaert, Ann. 2007. A technological approach to the painted plaster of Tell El-Dab'a, Egypt: Microscopy and scientific analysis. In *Tauredor Scenes in Tell El-Dab'a (Avaris) and Knossos*, 151-62. Denkschriften der Gesamtakademie, Bd. 43; Untersuchungen der Zweigstelle Kairo des Österreichischen Archäologischen Institutes, Bd. 27. Wien: ÖAW, Verlag der Österreichischen Akademie der Wissenschaften.

Lime, Pigments, Plaster

Bukovansky, Michal, Donald P. Richards, and Kent R. Weeks. 1997. Influence of slope deformations on the tombs in the Valley of the Kings, Egypt. In *Engineering Geology and the Environment: Proceedings: International Symposium on Engineering Geology and the Environment: Athens, Greece, 23-27 June, 1997*, edited by Paul G. Marinos, G. C. Koukis, G. C. Tsiambaos and G. C. Stournaras, 3077-82. Rotterdam: A. A. Balkema.

Clay, Deterioration, Flooding, Geology, KV, Limestone, Rock

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Anhydrite, Deterioration, Environment, Flooding, Ground Layer, Gypsum, Hydrology, Plaster, Salts, Treatment, Ventilation

Capriotti, Giorgio. 2008. The technique of Egyptian wall painting. In *Egyptian Wall Painting*. English language ed., 1st ed., edited by Francesco Tiradritti, 62-84. New York: Abbeville Press Publishers.

Anhydrite, Clay, Calcite, Grids, Gypsum, Painting Technique, Pigments, Plaster

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Gypsum, Iconography, KV 62, Plaster, Tomb Construction

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Lime, Plaster

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Anhydrite, Calcite, Gypsum, KV, Pigments, Plaster

Weatherhead, Frances J. 2007. *Amarna Palace Paintings*. Excavation Memoir, vol. 78. London: Egypt Exploration Society.

Amarna, Plaster

— — —. 2007. Appendix 2: Characteristics of pavement plaster. In *Amarna Palace Paintings*, 361-75. Excavation Memoir, vol. 78. London: Egypt Exploration Society.

Amarna, Anhydrite, Calcite, Clay, Gypsum, Lime, Painting Technique, Plaster

Weaver, Charles E. 1989. *Clays, Muds, and Shales*. Developments in Sedimentology 44. Amsterdam; New York: Elsevier.

Clay, Rock

Weeks, Kent R., ed. 2000. *KV 5: A Preliminary Report on the Excavation of the Tomb of the Sons of Rameses II in the Valley of the Kings*. Publications of the Theban Mapping Project II. Cairo: American University in Cairo Press.

Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone, Pigments, Plaster, Rock

Wilson-Yang, Kristine M., T. C. Billard, and George Burns. 1982. Chemistry and physics in the tomb of Nefertari (No. 66, Valley of the Queens). *The Journal of the Society for the Study of Egyptian Antiquities* 12 (1): 9-11.

Deterioration, Environment, Plaster, Treatment

Winkels, Alexandra. 2007. Restauratorisch-naturwissenschaftliche Untersuchung von tuthmosidischen Putzen aus Ezbet Helmi / Tell el-Daba: Ein Beitrag zur Erforschung altägyptischer Kalkputztechnik. *Ägypten und Levante: Zeitschrift für ägyptische Archäologie und deren Nachbargebiete* 17: 273-93.

Lime, Plaster

Wüst, Raphael A. J., and J. McLane. 2000. Rock deterioration in the royal tomb of Seti I, Valley of the Kings, Luxor, Egypt. *Engineering Geology* 58 (2): 163-90.

Clay, Deterioration, Geology, KV, Limestone, Rock

Wüst, Raphael A. J., and Christian Schlüchter. 2000. The origin of soluble salts in rocks of the Thebes Mountains, Egypt: The damage potential to ancient Egyptian wall art. *Journal of Archaeological Science* 27 (12): 1161-72.

Deterioration, Geology, Salts, Plaster

## CHAPTER 4

### Sarcophagus, Coffin and Mummy

#### 4a. Sarcophagus

(Keyword: Sarcophagus)

Scope Note: Research was undertaken to support the investigation of Tutankhamen's quartzite sarcophagus.

Allen, T. George. 1924. Discoveries at the tomb of Tutenkhamon. *Current History* 20 (3): 363-73.

Amarna, Excavation, Historical, Iconography, KV 62, Sarcophagus

Bogoslovsky, Evgeni S. 1980. Hundred Egyptian draughtsmen. *Zeitschrift für Ägyptische Sprache und Altertumskunde* 2 (107): 89-116.

Coffin, Grids, Historical, Iconography, KV, Painting Technique, Sarcophagus, Tomb Construction

Davis, Doris Auger. 2002-03. Tutankhamun's final burial. *The Ostrakon* 14 (1): 10-14.

Coffin, KV 62, Mummy, Sarcophagus, Tomb Construction

De Luca, Araldo. 2006. Field note. *Archaeology* 59 (6): 72.

KV 62, Sarcophagus, Treatment

Eaton-Krauss, Marianne. 1992. The sarcophagus in the tomb of Tutankhamun. In *After Tut'ankhamun: Research and excavation in the Royal Necropolis at Thebes*, edited by C. Nicholas Reeves, 85-90. Studies in Egyptology. London; New York: Kegan Paul.

Historical, Iconography, KV 62, Sarcophagus

— — —. 1993. *The Sarcophagus in the Tomb of Tutankhamun*. Oxford: Griffith Institute, Ashmolean Museum.

Amarna, Historical, Iconography, KV 62, Sarcophagus, Tomb Construction

— — —. 1994. Tutankhamun's sarcophagus: An addition and two corrections. *Journal of Egyptian Archaeology* 80: 217-18.

Biodeterioration, Excavation, KV 62, Sarcophagus

— — —. 1998. The sarcophagus in the tomb of Tutankhamun: A clarification. *Journal of Egyptian Archaeology* 84: 210-12.

Amarna, Iconography, KV 62, Sarcophagus

— — —. 2009-10. The burial of Tutankhamen, part one. *KMT: A Modern Journal of Ancient Egypt* 20 (4): 34-47.

Amarna, Coffin, Historical, Iconography, KV 62, Sarcophagus, Tomb Construction

Edwards, I. E. S., Harry Burton, and Lee Boltin. 1976. *Tutankhamun: His Tomb and its Treasures*. New York: Metropolitan Museum of Art.

Coffin, KV 62, Sarcophagus

El Goresy, Ahmed. 2000. Polychromatic wall painting decorations in monuments of pharaonic Egypt: Compositions, chronology and painting techniques. In *The Wall Paintings of Thera: Proceedings of the First International Symposium: Petros M. Nomikos Conference Centre, Thera, Hellas, 30 August - 4 September 1997*, edited by Susan Sherratt, 49-70. Piraeus, Greece: Petros M. Nomikos and the Thera Foundation.

Ground Layer, Painting Technique, Pigments, Plaster, Sarcophagus

Fox, Penelope. 1951. *Tutankhamun's Treasure*. London, New York: Oxford University Press.

Coffin, Iconography, Mummy, Sarcophagus

Hawass, Zahi, and Sandro Vannini. 2008. *King Tutankhamun: The Treasures of the Tomb*. New York: Thames & Hudson.

Coffin, Iconography, KV 62, Sarcophagus

Hayes, William C. 1935. *Royal Sarcophagi of the XVIII Dynasty*. Princeton Monographs in Art and Archaeology XIX. Princeton: Princeton University Press.

Sarcophagus

Jaksch, Heiner. 1985. Farbpigmente aus Wandmalereien altägyptischer Gräber und Tempel: Technologien der Herstellung und mögliche Herkunftsbeziehungen. Ph.D. diss., Universität Heidelberg.

Binding Media, KV 62, Pigments, Sarcophagus

Newman, Richard. 1993. Analysis of red paint and filling material from the sarcophagus of Queen Hatshepsut and King Thutmose I. *Journal of the Museum of Fine Arts, Boston* 5: 62-65.

Binding Media, Pigments, Sarcophagus

Pharaoh's Coffin Opened. 1924. *The Daily Mail*, 18 February.

Coffin, Historic News Articles, KV 62, Sarcophagus

Rocchi, Federico. 1996. Two observations on the sarcophagus in KV 62. *Discussions in Egyptology* 34: 87-90.

Amarna, Historical, Iconography, KV 62, Sarcophagus

Roehrig, Catharine H. 2007. Chamber Ja in royal tombs in the Valley of the Kings. In *Sacred Space and Sacred Function in Ancient Thebes*, edited by Peter Dorman and Betsy M. Bryan, 117-38. *Studies in Ancient Oriental Civilization*, no. 61. Chicago: Oriental Institute of the University of Chicago.

Historical, Iconography, KV, KV 62, Sarcophagus, Tomb Construction

Secrets and splendors in the tomb of the Egyptian King Tutenkhamon. 1924. *Current History* 20 (3): 345-60.

Iconography, KV 62, Sarcophagus

Scott, Alexander. 1963. Appendix IV: Notes on objects from the tomb of King Tut-ankh-Amen. In Vol. 2 of *The Tomb of Tut-ankh-Amen*, edited by Howard Carter and Arthur C. Mace, 197-216. New York: Cooper Square Publishers.

Biodeterioration, KV 62, Sarcophagus

Serpico, Margaret Teresa. 1997. *Mediterranean Resins in New Kingdom Egypt: A Multidisciplinary Approach to Trade and Usage*. Ph.D. diss., University College London.

Amarna, Coffin, Historical, Iconography, KV 62, Painting Technique, Sarcophagus, Varnish



**4b. Coffin**

(Keywords: Coffin, Gesso, Gold, Red Gold)

Scope Note: Bibliographic research was undertaken on the outermost gilded coffin with focus on the investigation and conservation of other Egyptian wooden coffins, particularly gold techniques and condition. A specific area concerned the outermost coffin's red patina.

Aldred, Cyril. 1979. *Tutankhamun: Craftsmanship in Gold in the Reign of the King*. Mount Vernon, N.Y.: Artist's Limited Edition.

Gold, Historical, KV 62

Allen, Susan J., and Harry Burton. 2006. *Tutankhamun's Tomb: The Thrill of Discovery*. New York; New Haven: Metropolitan Museum of Art; Yale University Press.

Coffin

Ambers, Janet. 2008. Pigments. In *The Nebamun Wall Paintings: Conservation, Scientific Analysis and Display at the British Museum*, edited by Andrew Middleton and Ken Uprichard, 31-39. London: Archetype Publications Ltd. in association with the British Museum.

Gold, Ground Layer, Pigments

Ambers, Janet, Rebecca Stacey, and John H. Taylor. 2007. Writing that cannot be erased: Investigations of a box of pigmented inlays from the tomb chapel of an Old Kingdom noble. *British Museum Technical Research Bulletin* 1: 49-54.

Coffin, Pigments

Black, J. Anderson. 1977. The craft of King Tut's jewels. *Craft Horizons* 37 (1): 19-23.

Gold, KV 62

Bogoslovsky, Evgeni S. 1980. Hundred Egyptian draughtsmen. *Zeitschrift für Ägyptische Sprache und Altertumskunde* 2 (107): 89-116.

Coffin, Grids, Historical, Iconography, KV, Painting Technique, Sarcophagus, Tomb Construction

Carter, Howard. 2007. *The Tomb of Tutankhamen*. London: Max Press.

Coffin, Excavation, Gold, KV 62

Colinart, Sylvie. 2001. Analysis of inorganic yellow colour in ancient Egyptian painting. In *Colour and Painting in Ancient Egypt*, edited by W. Vivian Davies, 1-4. London: British Museum Press.

Gold, Iconography, Painting Technique, Pigments

Colinart, Sylvie, and Elisabeth Delange. 1998. Dorure des sarcophages de l'Égypte Ancienne: le cartonnage de Ta cheret pa ankh [The gilding of ancient Egyptian sarcophagi: The cartonnage of Ta cheret pa ankh]. *Technè: La science au service de l'histoire de l'art et des civilisations* (7): 43-44.

Coffin, Gold

— — —. 1998. Une polychromie complexe [A complex polychrome]. *Technè: La science au service de l'histoire de l'art et des civilisations* (7): 39-40.

Coffin, Pigments

Colinart, Sylvie, and Sandrine Pagès-Camagna. 2001. Egyptian polychromy: Pigments of the "Pharaonic palette". In *The Polychromy of Antique Sculptures and the Terracotta Army of the First Chinese Emperor: Studies on Materials, Painting Techniques and Conservation: International Conference in Xi'an, Shaanxi History Museum, March 22-28, 1999*, edited by Wu Yongqi, Zhang Tinghao, Michael Petzet, Erwin Emmerling and Catharina Blänsdorf, 85-88. Arbeitsheft (Bayerisches Landesamt für Denkmalpflege) 111. Munich: Bayerisches Landesamt für Denkmalpflege.

Coffin, Pigments

Daniels, Vincent, Rebecca Stacey, and Andrew Middleton. 2004. The blackening of paint containing Egyptian blue. *Studies in Conservation* 49 (1): 217-30.

Binding Media, Coffin, Deterioration, Pigments

Davis, Doris Auger. 2002-03. Tutankhamun's final burial. *The Ostrakon* 14 (1): 10-14.

Coffin, KV 62, Mummy, Sarcophagus, Tomb Construction

Dieke, G. H. 1993. Robert Williams Wood: 1868-1955. In Vol. 62 of *Biographical Memoirs*, 441-64. Washington, D.C.: National Academy of Sciences. <http://www.nap.edu/html/biomems/rwood.pdf>

Coffin

Dodson, Aidan. 1998. On the burial of Maihirpri and certain coffins of the eighteenth dynasty. In *Proceedings of the Seventh International Congress of Egyptologists, Cambridge, 3-9 September 1995*, edited by Christopher J. Eyre, 331-38. *Orientalia Lovaniensia Analecta* 82. Leuven: Peeters.

Coffin, Gold, Plaster

Donadoni Roveri, Anna Maria, ed. 1987. *Egyptian Civilization*. 3 vols. Milan: Electa.

Binding Media, Gold, Historical, Iconography, KV 62, Painting Technique, Pigments

Donatelli, Laura. 1987. Measuring instruments, tools and weapons. In *Egyptian Civilization*, edited by Anna Maria Donadoni Roveri, 176-84. Milan: Electa.

Binding Media, Gold, Historical, Iconography, KV 62, Painting Technique, Pigments

Drayman Weisser, Terry, ed. 2000. *Gilded Metals: History, Technology and Conservation*. London: Archetype Publications in association with the American Institute for Conservation of Historic and Artistic Works.

Gold

Eaton-Krauss, Marianne. 2009-10. The burial of Tutankhamen, part one. *KMT: A Modern Journal of Ancient Egypt* 20 (4): 34-47.

Amarna, Coffin, Historical, Iconography, KV 62, Sarcophagus, Tomb Construction

Eaton-Krauss, Marianne, and E. Graefe. 1985. *The Small Golden Shrine from the Tomb of Tutankhamun*. Oxford: Griffith Institute.

Gold, KV 62

Edwards, I. E. S. 1976. *Tutankhamun's Jewelry*. New York: Metropolitan Museum of Art.

Gold, KV 62

Edwards, I. E. S., Harry Burton, and Lee Boltin. 1976. *Tutankhamun: His Tomb and its Treasures*. New York: Metropolitan Museum of Art.

Coffin, KV 62, Sarcophagus

Edwards, I. E. S., and Alan W. Shorter. 1938. *A Handbook to the Egyptian Mummies and Coffins Exhibited in the British Museum*. London: The British Museum.

Coffin, Mummy

el-Mallakh, Kamal, and Arnold C. Brackman. 1978. *The Gold of Tutankhamen*. New York: Newsweek Books.

Gold, Excavation, KV 62

Endt, David W. von, and Mary T. Baker. 1991. The chemistry of filled animal glue systems. In *Gilded Wood: Conservation and History*, edited by Deborah Bigelow and Catherine E. Hutchins, 155-62. Madison, Conn.: Sound View Press.

Coffin, Gesso

Ertman, Earl L. 2003. The identity of the king and queen on Tutankhamun's throne. In Vol. 2 of *Egyptology at the Dawn of the Twenty-First Century: Proceedings of the Eighth International Congress of Egyptologists, Cairo, 2000*, edited by Zahi A. Hawass and Lyla Pinch Brock, 209-14. Cairo; New York: American University in Cairo Press.

Amarna, Gold, Historical, Iconography, KV 62

Fink, Colin G. 1948. Metal articles found in the tomb of Tut-Ankh-Amen. *Journal of the Electrochemical Society* 94 (2): 16N.

Gold, KV 62

Fox, Penelope. 1951. *Tutankhamun's Treasure*. London, New York: Oxford University Press.

Coffin, Iconography, Mummy, Sarcophagus

Frantz, James H., and Deborah Schorsch. 1990. Egyptian red gold. *Archeomaterials* 4 (1): 133-52.

Amarna, Coffin, Gold, Red Gold

Gänsicke, Susanne. 1994. King Aspelta's vessel hoard from Nuri in the Sudan. *Journal of the Museum of Fine Arts, Boston* 6: 14-40.

Binding Media,of fin, Pigments

- — —. 2008. Artifact conservation and Egyptology. In *Egyptology Today*, edited by Richard H. Wilkinson, 163-85. New York: Cambridge University Press.

Coffin, Treatment

- Gänsicke, Susanne, Pamela Hatchfield, Abigail Hykin, Marie Svoboda, and C. Mei-An Tsu. 2003. The ancient Egyptian collection at the Museum of Fine Arts, Boston. Part 1, a review of treatments in the field and their consequences. *Journal of the American Institute for Conservation* 42 (2): 167-92.

Coffin, Gold, Treatment

- — —. 2003. The ancient Egyptian collection at the Museum of Fine Arts, Boston. Part 2, a review of former treatments at the MFA and their consequences. *Journal of the American Institute for Conservation* 42 (2): 193-245.

Coffin, Gold, Treatment

- Gottzman, Sandra. 1999. Investigation and conservation of an Egyptian mummy board from the Royal Albert Memorial Museum, Exeter. *SSCR Journal: The Quarterly News Magazine of the Scottish Society for Conservation and Restoration* 10 (2): 5-10.

Coffin, Treatment

- Green, Lorna. 2001. Colour transformations of ancient Egyptian pigments. In *Colour and Painting in Ancient Egypt*, edited by W. Vivian Davies, 43-48. London: British Museum Press.

Binding Media, Deterioration, Environment, Gold, Pigments, Treatment

- Griffin, Patricia S. 1999. Observations on the use of surface coatings and varnishes in Egyptian art from the late 18th Dynasty. In *The Materials, Technology, and Art of Conservation. Studies in Honor of Lawrence J. Majewski on the Occasion of his 80th Birthday, February 10, 1999*, edited by Rebecca Anne Rushfield and Mary W. Ballard, 30-64. New York: New York University. Institute of Fine Arts. Conservation Center.

Calcite, Coffin, Ground Layer, Painting Technique, Varnish

- Hatchfield, Pamela. 1988. The use of cellulose ethers in the treatment of Egyptian polychromed wood. In *Conservation of Ancient Egyptian Materials: Preprints of the Conference Organised by the United Kingdom Institute for Conservation, Archaeology Section, Held at Bristol, December 15-16th, 1988*, edited by Sarah C. Watkins and Carol E. Brown, 71-78. London: Institute of Archaeology Publications.

Coffin, Treatment

- Hatchfield, Pamela, and Michele Marincola. 1994. Compensating losses: Tissue paper fills for sculpture. *Objects Speciality Group Postprints 2*: 57-71.

Coffin, Treatment

- Hatchfield, Pamela, and Richard Newman. 1991. Ancient Egyptian gilding methods. In *Gilded Wood: Conservation and History*, edited by Deborah Bigelow and Catherine E. Hutchins, 27-47. Madison, Conn.: Sound View Press.

Binding Media, Coffin, Gold, Ground Layer, Red Gold

- Hawass, Zahi, and Kenneth Garrett. 2005. *Tutankhamun and the Golden Age of the Pharaohs*. Washington, D.C.: National Geographic.
- Coffin, Death Theories, Excavation, Mummy, Treatment
- Hawass, Zahi, and Sandro Vannini. 2008. *King Tutankhamun: The Treasures of the Tomb*. New York: Thames & Hudson.
- Coffin, Iconography, KV 62, Sarcophagus
- Hepper, F. Nigel. 1990. *Pharaoh's Flowers: The Botanical Treasures of Tutankhamun*. London: HMSO.
- Coffin, Gold, Iconography, KV 62
- Jaeschke, Richard, and Helena Jaeschke. 1988. Early conservation techniques in the Petrie Museum. In *Conservation of Ancient Egyptian Materials: Preprints of the Conference Organised by the United Kingdom Institute for Conservation, Archaeology Section, Held at Bristol, December 15-16th, 1988*, edited by Sarah C. Watkins and Carol E. Brown, 17-23. London: UKIC Archaeology Section.
- Gold, Historical, Treatment
- James, Harry. 1988. Painting techniques on stone and wood. In *Conservation of Ancient Egyptian Materials: Preprints of the Conference Organised by the United Kingdom Institute for Conservation, Archaeology Section, Held at Bristol, December 15-16th, 1988*, edited by Sarah C. Watkins and Carol E. Brown, 55-59. London: UKIC Archaeology Section.
- Binding Media, Coffin, Grids, Ground Layer, Gypsum, Limestone, Painting Technique, Plaster
- James, Thomas Garnet H. 1972. Gold technology in ancient Egypt: Mastery of metal working methods. *Gold Bulletin* 5 (2): 38-42.
- Coffin, Gold, Historical, KV 62
- — —. 2000. *Tutankhamun: The Eternal Splendour of the Boy Pharaoh*. London; New York: Tauris Parke.
- Coffin, Gold
- Johnson, Colin, Kerry Head, and Lorna Green. 1995. The conservation of a polychrome Egyptian coffin. *Studies in Conservation* 40 (2): 73-81.
- Coffin, Gesso, Treatment
- Kariya, Hiroko, Lisa Bruno, Jakki Godfrey, and Tina March. 2010. Treatment of a Dynasty 18 painted coffin, 37.47E a-e (Abbott Collection 405A). In *Decorated Surfaces on Ancient Egyptian Objects: Technology, Deterioration, and Conservation: Proceedings of a Conference Held in Cambridge, UK on 7-8 September 2007*, edited by Julie Dawson, Christina Rozeik and Margot M. Wright, 97-105. London: Archetype Publications.
- Coffin, Pigments, Treatment
- Kuffer, Alexandra. 2011. The Swiss coffin project: Rediscovering forgotten treasures in Swiss museums. *KMT: A Modern Journal of Ancient Egypt* 22 (3): 19-34.
- Coffin, Mummy

Lee, Lorna, and Stephen Quirke. 2000. Painting materials. In *Ancient Egyptian Materials and Technology*, edited by Paul T. Nicholson and Ian Shaw, 104-20. Cambridge: Cambridge University Press.

Calcite, Gold, Gypsum, Pigments, Plaster

Leospo, Enrichetta, Gian Luigi Nicola, Kristine Doneux, Elvira D'Amicone, Silvio Curto, Luigi Vigna, Alessandro Roccati, and Roberto Arosio. 1989. Materiali lignei. In *Dal Museo al Museo: passato e futuro del Museo egizio di Torino*, edited by Anna Maria Donadoni Roveri, 35-81. Torino: U. Allemandi.

Coffin

Lucas, Alfred. 1911. *Preservative Materials Used by the Ancient Egyptians in Embalming*. Survey Department Paper, no. 12. Cairo: National Printing Dept.

Binding Media, Coffin, Mummy

— — —. 1914. The question of the use of bitumen or pitch by the ancient Egyptians in mummification. *The Journal of Egyptian Archaeology* 1 (4): 241-45.

Coffin, Mummy

— — —. 1923. Luxor Tomb Problem: Scarlet on Gold. *The Times (London)*, 19 March.

Gold, Historic News Articles, Red Gold

— — —. 1923. Tutankhamen's Tomb: Some Interesting Chemical Problems. *The Egyptian Gazette*, 22 March.

Deterioration, Excavation, Gold, Historic News Articles, KV 62 Previous Treatment

— — —. 1963. Appendix II: The chemistry of the tomb. In Vol. 2 of *The Tomb of Tut-ankh-Amen*, edited by Howard Carter and Arthur C. Mace, 162-88. New York: Cooper Square Publishers.

Clay, Gold, Gypsum, Environment, Pigments, Plaster, Red Gold, Ventilation

Mecklenburg, Marion F. 1991. Some mechanical and physical properties of gilding gesso. In *Gilded Wood: Conservation and History*, edited by Deborah Bigelow and Catherine E. Hutchins, 163-70. Madison, Conn.: Sound View Press.

Coffin, Environment, Gesso, Gold

Michalski, Stefan. 1991. Crack mechanisms in gilding. In *Gilded Wood: Conservation and History*, edited by Deborah Bigelow and Catherine E. Hutchins, 171-81. Madison, Conn.: Sound View Press.

Coffin, Gesso

Miller, Eric. 2008. Painterly technique. In *The Nebamun Wall Paintings: Conservation, Scientific Analysis and Display at the British Museum*, edited by Andrew Middleton and Ken Uprichard, 61-67. London: Archetype Publications Ltd. in association with the British Museum.

Anhydrite, Binding Media, Gold, Ground Layer, Gypsum, Painting Technique, Pigments, Plaster, Tomb Construction

Müller, Hans Wolfgang, and Eberhard Thiem. 1999. *The Royal Gold of Ancient Egypt*. London: I.B. Tauris.

Coffin, Gold, KV 62

Newell, Lyman C. 1933. Chemistry in the service of Egyptology. *Journal of Chemical Education* 10 (5): 259-66.

Calcite, Coffin, Gold, Gypsum, Lime, Pigments, Plaster, Treatment

Newman, Richard. 1990. Technical examination of an ancient Egyptian royal pectoral. *Journal of the Museum of Fine Arts, Boston* 2: 30-37.

Coffin, Gold, Gypsum, Plaster

Newman, Richard, and Susana M. Halpine. 2001. The binding media of ancient Egyptian painting. In *Colour and Painting in Ancient Egypt*, edited by W. Vivian Davies, 22-27. London: Brith Museum Press.

Binding Media, Coffin, Painting Technique, Varnish

Notton, J. H. F. 1974. Ancient Egyptian gold refining: A reproduction of early techniques. *Gold Bulletin* 7 (2): 50-56.

Coffin, Gold, Historical

Oddy, Andrew, Philippa Pearce, and Lorna Green. 1988. An unusual gilding technique on some Egyptian bronzes. In *Conservation of Ancient Egyptian Materials: Preprints of the Conference Organised by the United Kingdom Institute for Conservation, Archaeology Section, Held at Bristol, December 15-16th, 1988*, edited by Sarah C. Watkins and Carol E. Brown, 35-39. London: UKIC Archaeology Section.

Coffin, Gesso, Gold

Parkes, Phil, and David Watkinson. 2010. Computed tomography and X-radiography of a coffin from Dynasty 21/22. In *Decorated Surfaces on Ancient Egyptian Objects: Technology, Deterioration and Conservation: Proceedings of a Conference Held in Cambridge, UK on 7-8 September 2007*, edited by Julie Dawson, Christina Rozeik and Margot M. Wright, 58-66. London: Archetype Publications.

Coffin, Mummy, Pigments

Partridge, Robert B. 1994. *Faces of Pharaohs: Royal Mummies and Coffins from Ancient Thebes*. London: Rubicon Press.

Excavation, Coffin, Deterioration, Historical, KV 62, Mummy

— — —. 1996. Tutankhamun's gold coffin: An ancient change in design? *Göttinger Miszellen* 150: 93-98.

Coffin, Gold, Historical

Plenderleith, Harold J., and Alfred E. A. Werner. 1971. *The Conservation of Antiquities and Works of Art: Treatment, Repair and Restoration*. 2nd ed. London; New York: Oxford University Press.

Gold, Red Gold, Treatment

Pharaoh's Coffin Opened. 1924. *The Daily Mail*, 18 February.

Coffin, Historic News Articles, KV 62, Sarcophagus

Rifai, Mai M., and Nesrin M. N. El Hadidi. 2010. Investigation and analysis of three gilded wood samples from the tomb of Tutankhamun. In *Decorated Surfaces on Ancient Egyptian Objects: Technology, Deterioration and Conservation: Proceedings of a Conference Held in Cambridge, UK on 7-8 September 2007*, edited by Julie Dawson, Christina Rozeik and Margot M. Wright, 16-24. London: Archetype Publications.

Coffin, Gesso, Gold, KV 62, Red Gold

Roberts, P. M. 1973. Gold brazing in antiquity: Technical achievements in the earliest civilisations. *Gold Bulletin* 6 (4): 112-19.

Coffin, Gold

Schorsch, Deborah. 1984. Egyptian red gold. In *Papers Presented at the Art Conservation Training Programs Conference: May 2-4, 1984, Center for Conservation and Technical Studies, Harvard University Art Museums, Cambridge, Massachusetts*, 1. Cambridge, Mass.: Center for Conservation and Technical Studies, Harvard University Art Museums.

Coffin, Gold, Red Gold

— — —. 2001. Precious-metal polychromy in Egypt in the time of Tutankhamun. *The Journal of Egyptian Archaeology* 87: 55-71.

Coffin, Gold, Historical, Iconography, Red Gold

Secret of purple gold solved in laboratory. 1933. *Popular Science* 123 (4): 97. <http://books.google.com/books?id=6CcDAAAAMBAJ>

Coffin, Gold, KV 62

Serpico, Margaret, and Raymond White. 2001. The use and identification of varnish on New Kingdom funerary equipment. In *Colour and Painting in Ancient Egypt*, edited by W. Vivian Davies, 33-43. London: British Museum Press.

Coffin, Historical, Iconography, Painting Technique, Varnish

Serpico, Margaret Teresa. 1997. Mediterranean Resins in New Kingdom Egypt: A Multidisciplinary Approach to Trade and Usage. Ph.D. diss., University College London.

Amarna, Coffin, Historical, Iconography, KV 62, Painting Technique, Sarcophagus, Varnish

Singer, Charles. 1954. Some early goldwork. *Endeavour* 13: 86-93.

Coffin, Gold, KV 62

Spielmann, Percy E. 1932. To what extent did the ancient Egyptians employ bitumen for embalming? *The Journal of Egyptian Archaeology* 18 (3/4): 177-80.

Coffin, Mummy



Stein, Renée, and Peter Lacovara. 2010. Observations on the preparation layers found on ancient Egyptian decorated coffins in the Michael C. Carlos Museum. In *Decorated Surfaces on Ancient Egyptian Objects: Technology, Deterioration and Conservation: Proceedings of a Conference Held in Cambridge, UK on 7-8 September 2007*, edited by Julie Dawson, Christina Rozeik and Margot M. Wright, 3-8. London: Archetype Publications.

Coffin, Gold, Ground Layer, Pigments

Stein, Renée, Katherine Singley, Mimi Leveque, Alexandra Klingelhofer, and Ronald Harvey. 2001. Restoration revisited: Ancient and modern repairs encountered in the conservation of an ancient Egyptian collection. *Objects Specialty Group Postprints* 8: 3-14.

Coffin, Treatment

Teeter, Emily. 1981. Enameling in ancient Egypt? *American Journal of Archaeology* 85 (3): 319.

Coffin

Uda, Masayuki, Sakuji Yoshimura, Atsushi Ishizaki, Daisuke Yamashita, and Y. Sakuraba. 2007. Tutankhamun's golden mask investigated with XRDF. *International Journal of PIXE* 17 (1-2): 65-76.

Coffin, Gold

Waly, Nahed M. 1996. Identified wood specimens from Tut Ankh Amon funerary furniture. *Taeckholmia* 16: 61-74.

Coffin, KV 62

Wolters, Jochem. 1982. Granulation: A re-assessment of an ancient craft. *Endeavour* 6 (1): 2-9.

Gold

Wood, R. M. 1934. The purple gold of Tutankhamun. *The Journal of Egyptian Archaeology* 20 (1/2): 62-65.

Coffin, Gold

Zidan, Y., T. Handoussa, H. Hosni, and N. M. N. El Hadidi. 2006. The conservation of a wooden Graeco-Roman coffin box. *e-Preservation Science* 3: 27-33.

Biodeterioration, Coffin, Treatment

#### 4c. Mummy

(Keyword: Death Theories, Mummy)

Scope Note: Limited bibliographic research was undertaken on the mummy, including theories on how the Pharaoh had died.

Aufderheide, Arthur C. 2003. *The Scientific Study of Mummies*. Cambridge, UK; New York: Cambridge University Press.

Mummy

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Death Theories, Mummy

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## CHAPTER 5

# Conservation Treatment

(Keywords: Previous Treatment, Treatment)

Scope Note: Emphasis was placed on finding select references to investigate previous treatments in the tomb, as context for current conservation practice in Egypt, and to inform proposed treatments in the tomb.

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Anhydrite, Gypsum, Plaster, Treatment

Middleton, Andrew, and Ken Uprichard, eds. 2008. *The Nebamun Wall Paintings: Conservation, Scientific Analysis and Display at the British Museum*. London: Archetype Publications Ltd. in association with the British Museum.

Ground Layer, Painting Technique, Treatment

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Gold, Red Gold, Treatment

Porta, Eduardo. 1993. Les interventions anciennes dans les tombes pharaoniques de la vallée des rois et de la vallée des reines [Old interventions in the Pharaonic tombs of the Valley of the Kings and the Valley of the Queens]. In *Peintures murales: Journées d'études de la S.F.I.I.C., Dijon, 25-27 mars 1993*, edited by Marcel Stefanaggi, 193-200. Champs-sur-Marne: International Institute for Conservation of Historic and Artistic Works. Section française.

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Environment, Hydrology, Plaster, Salts, Treatment

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Biodeterioration, Deterioration, Treatment

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Biodeterioration, Environment, Treatment

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Deterioration, Flooding, KV, KV Management, KV 62, Treatment, Visitors

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Deterioration, Environment, Plaster, Treatment

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Deterioration, Limestone, Treatment

Zidan, Y., T. Handoussa, H. Hosni, and N. M. N. El Hadidi. 2006. The conservation of a wooden Graeco-Roman coffin box. *e-Preservation Science* 3: 27-33.

Biodeterioration, Coffin, Treatment

## CHAPTER 6 Environmental Conditions

### 6a. Environmental Conditions

(Keywords: Environment, Environmental Investigations, Ventilation)

Scope Note: Select references on the environmental conditions of the tomb and its environs were sought. These included microclimatic studies of tomb conditions and macroclimatic investigations of the exterior as well as issues of tomb ventilation. Examples from other sites in Egypt are also included.

Abdel-Aziz, Omar A. A., and Essam E. Khalil. 2005. Air flow regimes and thermal patterns in climatized tombs in the Valley of the Kings. In *43rd AIAA Aerospace Sciences Meeting and Exhibit: 10-13 January 2005, Reno, Nevada*, 1209-16. Reston, Va.: American Institute of Aeronautics and Astronautics.

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Environment, Environmental Investigation, KV Management, KV 62, Ventilation, Visitors

Abo-Elmagd, M., S. M. Metwally, S. A. El-Fiki, H. M. Eissa, and E. Salama. 2007. Passive and active measurements of radon-related parameters inside ancient Egyptian tombs in Luxor. *Radiation Measurements* 42 (1): 116-20.

Environmental Investigation, KV

Arai, Hideo. 1990. The environmental analysis of archaeological sites. *Trends in Analytical Chemistry* 9 (7): 213-16.

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Attia, Fatma Abdel Rahman. 1989. Use of groundwater for irrigation in the Nile valley. *International Journal of Water Resources Development* 5 (2): 91-98.

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Environment, Environmental Investigation, Management, Visitors

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Environment, Environmental Investigation, KV, Ventilation, Visitors

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Environment, KV, KV Management, Treatment, Ventilation

Hafez, A. F., and A. S. Hussein. 2001. Radon activity concentrations and effective doses in ancient Egyptian tombs of the Valley of the Kings. *Applied Radiation and Isotopes* 55 (3): 355-62.

Environment, Environmental Investigation, KV

Hawass, Zahi. 1995. The Egyptian monuments: Problems and solutions. *International Journal of Cultural Property* 4 (1): 105-18.

Deterioration, Environment, Flooding, KV Management, Treatment, Visitors

Jones, Michael. 2008. Monument and site conservation. In *Egyptology Today*, edited by Richard H. Wilkinson, 98-120. Cambridge; New York: Cambridge University Press.

Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, KV 62, Management, Treatment, Visitors

Khalil, Essam E. 2006. 21st century CFD prediction of flow regimes and thermal patterns in 15th century BC tombs of the Valley of Kings. In Vol. 3 of *A Collection of Technical Papers: 44th AIAA Aerospace Sciences Meeting, Reno, Nevada, 9-12 January 2006*, 1647-54. Reston, Va.: American Institute of Aeronautics and Astronautics.

Environment, Environmental Investigation, KV, Ventilation

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Deterioration, Environment, KV, KV 62, Ventilation, Visitors

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Deterioration, Environment, Salts, Treatment

Lucas, Alfred. 1924. Note on the temperature and humidity of several tombs in the valley of the tombs of the kings at Thebes. *Annales du service des antiquités de l'Égypte* 24: 12-14.

Environment, KV, Ventilation

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Clay, Gold, Gypsum, Environment, Pigments, Plaster, Red Gold, Ventilation

Pain, Stephanie. 1990. Sir Joseph's buried treasure. *New Scientist* 125 (1708): 57-61.

Environment, Historical, KV 62

Samaan, Eileen. 1995. January in Upper Egypt: And then the rains came. *Egypt Today* 16 (1): 55-56.

Environment, Flooding

Smith, Scot E. 1986. Drought and water management: The Egyptian response. *Journal of Soil and Water Conservation* 41 (5): 297-300.

Environment, Hydrology

Wilkinson, John Gardner. 1835. *Topography of Thebes, and General View of Egypt: Being a Short Account of the Principal Objects Worthy of Notice in the Valley of the Nile...with Remarks on the Manners and Customs of the Ancient Egyptians and the Productions of the Country*. London: J. Murray.

Environment

## 6b. Flooding and Hydrological Studies

(Keywords: Flooding, Hydrology)

Scope Note: Flash flooding is the greatest threat to tombs in the Valley of the Kings. Emphasis was placed on finding select references on the history of past flooding in the valley, topographic, previous hydrological studies and proposed flood prevention methods and solutions.

Abu-Zid, Mahmoud. 1991. Physical features and drainage priorities in Egypt. *International Journal of Water Resources Development* 7 (3): 146-53.

Hydrology

Alam, Mahmood. 1989. Water resources of the Middle East and North Africa, with particular reference to deep artesian ground water resources of the area. *Water International* 14 (3): 122-27.

Environment, Hydrology

Aubry, Marie-Pierre, William A. Berggren, Christian Dupuis, Emily Poorvin, Holeil Ghaly, David Ward, Chris King, Robert W. O'B. Knox, Khaled Ouda, and Wael Fathy Hassan. Forthcoming. Tiga: A geoarcheologic project in the Theban Necropolis, West Bank, Egypt. In *Proceedings of the Tenth International Congress of Egyptologists, University of the Aegean, Rhodes, 22-29 May 2008*, edited by P. Kousoulis and N. Lazaridis. Leuven: Peeters Publishers.

Calcite, Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone

Brock, Lyla Pinch. 1996. The Theban flood of 1994: Ancient antecedents and the case of KV55. *Varia Aegyptiaca* 11 (1): 1-16.

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Clay, Deterioration, Flooding, Geology, KV, Limestone, Rock

Burns, George, Kristine M. Wilson-Yang, and Jacqueline E. Smeaton. 1989. Archaeological sites as physicochemical systems: Macroarchaeometry of the tomb of Nefertari, Valley of the Queens, Egypt. In *Archaeological Chemistry IV*, edited by Ralph O. Allen, 289-310. Advances in Chemistry Series 220. Washington, DC: American Chemical Society.

Anhydrite, Deterioration, Environment, Flooding, Ground Layer, Gypsum, Hydrology, Plaster, Salts, Treatment, Ventilation

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Excavation, Flooding, Hydrology, KV, KV 62

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Curtis, Garniss, and John Rutherford. 1981. Expansive shale damage, Theban Royal Tombs, Egypt. In *Soil Mechanics and Foundation Engineering, Tenth International Conference: Proceedings of the Tenth International Conference on Soil Mechanics and Foundation Engineering, Stockholm 15-19 June 1981*, 71-74. Rotterdam: Balkema.

Deterioration, Flooding, Geology, KV

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Geology, KV, Flooding, Management, Environment, KV Management, Hydrology

Eldred, Dwain. 2007. Tomb raider cracks it. *Geoscientist* 17 (1): 9. <http://www.geolsoc.org.uk/Geoscientist/Archive/January-2007/Tomb-raider-cracks-it>

Flooding, Geology, KV

Fracture zones endanger tombs in Valley of Kings. 2009. *e! Science News*, 18 October, <http://esciencenews.com/articles/2009/10/18/fracture.zones.endanger.tombs.valley.kings>.

Environment, Flooding, Geology, Hydrology, KV, Tomb Construction

Geological feature key to finding, protecting tombs. 2006. *ScienceDaily* (October 23). <http://www.sciencedaily.com/releases/2006/10/061023091908.htm>

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Deterioration, Geology, Hydrology

Jones, Michael. 2008. Monument and site conservation. In *Egyptology Today*, edited by Richard H. Wilkinson, 98-120. Cambridge; New York: Cambridge University Press.

Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, KV 62, Management, Treatment, Visitors

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Environment, Hydrology, Plaster, Salts, Treatment

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Deterioration, Flooding, KV 62

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Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, Limestone, Visitors

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Flooding, KV, KV Management

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Deterioration, Flooding, Geology, KV 62

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Bats, Deterioration, Flooding, KV, KV Management, Treatment, Visitors

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Environment, Flooding

Smith, Scot E. 1986. Drought and water management: The Egyptian response. *Journal of Soil and Water Conservation* 41 (5): 297-300.

Environment, Hydrology

Strudwick, Nigel. 1995. News from Luxor. 16 January, <http://www.fitzmuseum.cam.ac.uk/er/lxr/luxor.html>.

Flooding, KV

Treasure Tomb. Danger of Flood. Race to Re-Bury a King's Relics. 1922. *The Daily Mail* 16 December.

Flooding, Historic News Articles, KV 62

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Flooding, Historic News Articles

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Deterioration, Flooding, KV

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Flooding, Hydrology, KV, KV Management, KV 62

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Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone, Pigments, Plaster, Rock

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Geology, Hydrology, KV, KV Management, Tomb Construction

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Geology, Hydrology, KV, KV Management, Tomb Construction

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Deterioration, Flooding, KV, KV Management, KV 62, Treatment, Visitors

Wilson-Yang, Kristine M., and George Burns. 1989. The stability of the tomb of Nefertari 1904-1987. *Studies in Conservation* 34 (4): 153-70.

Deterioration, Environmental Investigation, Flooding, Salts

## 6c. Geomorphology, Geology and Geotechnical Studies

(Keywords: Geology, Rock, Salts)

Scope Note: Study of the topography and geology of the Valley of the Kings is important for an understanding of the construction and decoration of the tombs and their past and current condition. Emphasis was placed on identifying references on the geology and mapping of the Theban Mountains.

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Deterioration, Geology, KV

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Calcite, Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone

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Geology

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Flooding, Geology, KV, KV 62

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Clay, Deterioration, Flooding, Geology, KV, Limestone, Rock

Burns, George, Kristine M. Wilson-Yang, and Jacqueline E. Smeaton. 1989. Archaeological sites as physicochemical systems: Macroarchaeometry of the tomb of Nefertari, Valley of the Queens, Egypt. In *Archaeological Chemistry IV*, edited by Ralph O. Allen, 289-310. Advances in Chemistry Series 220. Washington, DC: American Chemical Society.

Anhydrite, Deterioration, Environment, Flooding, Ground Layer, Gypsum, Hydrology, Plaster, Salts, Treatment, Ventilation

Cross, Stephen W. 2009. The hydrology of the Valley of the Kings. *The Heritage of Egypt* 2 (1): 5-23.

Environment, Flooding, Geology, Hydrology, KV, KV 62

Curtis, Garniss. 1995. Deterioration of the royal tombs. In *Valley of the Sun Kings: New Explorations in the Tombs of the Pharaohs: Papers from the University of Arizona International Conference on the Valley of the Kings*, edited by Richard H. Wilkinson, 129-33. Tucson: University of Arizona Egyptian Expedition.

Deterioration, Geology, KV

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Deterioration, Flooding, Geology, KV

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Geology, KV, Flooding, Management, Environment, KV Management, Hydrology

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Binding Media, Grids, Ground Layer, Gypsum, Historical, Iconography, KV, Lime, Limestone, Painting Technique, Pigments, Plaster, Rock, Tomb Construction

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Geology, KV, Limestone, Rock

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Geology

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Flooding, Geology, KV

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Environment, Flooding, Geology, Hydrology, KV, Tomb Construction

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Geology

Geological feature key to finding, protecting tombs. 2006. *ScienceDaily* (October 23). <http://www.sciencedaily.com/releases/2006/10/061023091908.htm>

Flooding, Geology, Hydrology, KV, Tomb Construction, Treatment

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Clay, Deterioration, Geology

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Deterioration, Geology, Rock, Salts, Treatment

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Deterioration, Environment, Limestone, Rock, Treatment

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Geology

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Geology, KV

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Plaster, Geology

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Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone, Rock

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Deterioration, Geology, Hydrology

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Clay, Geology, Plaster

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Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, KV 62, Management, Treatment, Visitors

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Deterioration, Environment, Salts, Treatment

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Geology, Historical, Pigments, Plaster, Tomb Construction,

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Excavation, Geology, KV

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Plaster, Pigments, Rock, Salts, Treatment

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Flooding, Geology, Hydrology, KV

Moussa, Abu Bakr Mohamed Abu Bakr, Nikolaos Kantiranis, Konstantinos S. Voudouris, John A. Stratis, Mona F. Ali, and Vasilios Christaras. 2009. Diagnosis of weathered Coptic wall paintings in the Wadi El Natrun region, Egypt. *Journal of Cultural Heritage* 10 (1): 152-57.

Deterioration, Geology, Gypsum, Hydrology, Painting Technique, Pigments, Plaster, Salts

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Flooding, Geology, KV

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Flooding, Geology, KV

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Clay, Geology, Plaster

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Clay, Deterioration, Limestone, Rock

Rodriguez-Navarro, Carlos, Eduardo Sebastian, Eric Doehne, and William S. Ginell. 1998. The role of sepiolite-palygorskite in the decay of ancient Egyptian limestone sculptures. *Clays and Clay Minerals* 46 (4): 414-22.

Deterioration, Geology, Plaster

Romer, John. 1992. History and experience in the Valley of the Kings. In Vol. 1 of *Sesto Congresso internazionale di egittologia: Atti*. 2nd ed., 543-48. Turin: International Association of Egyptologists.

Flooding, Geology, Hydrology, KV



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Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, Limestone, Visitors

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Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, Limestone, Visitors

Rutherford, John B., and Donald P. Ryan. 1995. Tentative tomb protection priorities, Valley of the Kings, Egypt. In *Valley of the Sun Kings: New Explorations in the Tombs of the Pharaohs: Papers from the University of Arizona International Conference on the Valley of the Kings*, edited by Richard H. Wilkinson, 134-56. Tucson: University of Arizona Egyptian Expedition.

Deterioration, Flooding, Geology, KV 62

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Clay, Geology

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Geology

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Geology, KV

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Geology

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Geology, KV

Szczepanowska, Hanna M., and A. Ralph Cavaliere. 2004. Tutankhamun Tomb: A closer look at biodeterioration - Preliminary report. In *Schimmel: Gefahr für Mensch und Kulturgut durch Mikroorganismen = Fungi: A Threat for People and Cultural Heritage through Micro-Organisms*, edited by Angelika Rauch, Silvia Miklin-Kniefacz and Anne Harmssen, 42-47. VdR Schriftenreihe 1. Bonn; Stuttgart: VDR, Verband der Restauratoren; K. Theiss.

Biodeterioration, Environment, Geology, KV 62, Treatment

Tobia, Sami K., and Edward V. Sayre. 1974. An analytical comparison of various Egyptian soils, clays, shales, and some ancient pottery by neutron activation. In Vol. 3 of *Recent Advances in Science and Technology of Materials*, edited by Adli Bishay, 99-128. New York: Plenum Publishing Corporation.

Clay, Geology

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Clay, Rock

Weeks, Kent R., ed. 2000. *KV 5: A Preliminary Report on the Excavation of the Tomb of the Sons of Rameses II in the Valley of the Kings*. Publications of the Theban Mapping Project II. Cairo: American University in Cairo Press.

Clay, Deterioration, Flooding, Geology, Hydrology, KV, Limestone, Pigments, Plaster, Rock

Weeks, Kent R., and Nigel J. Hetherington. 2006. Current risk factors. In *The Valley of the Kings, Luxor, Egypt Site Management Masterplan*, 53-69. Cairo: Theban Mapping Project.

Geology, Hydrology, KV, KV Management, Tomb Construction

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Geology, Hydrology, KV, KV Management, Tomb Construction

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Geology, KV

Wilson-Yang, Kristine M., and George Burns. 1989. The stability of the tomb of Nefertari 1904-1987. *Studies in Conservation* 34 (4): 153-70.

Deterioration, Environmental Investigation, Flooding, Salts

Wüst, Raphael A. J. 1995. Geologisch-geotechnische Untersuchungen im thebanischen Gebirge, Teil Süd, Luxor, Ägypten. Diplomarbeit, Universität Bern, Philosophisch-Naturwissenschaftliche Fakultät, 1995.

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Clay, Deterioration, Geology, KV, Limestone, Rock

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Deterioration, Geology, Salts, Plaster

## CHAPTER 7

# Site and Visitor Management/Interpretation

(Keywords: KV Management, Management, Visitors)

Scope Note: The tomb of Tutankhamen is one of the most heavily visited sites on the Theban West Bank. Select references were sought to provide context on tourism at sites in Egypt in order to make recommendations that will both improve the visitor experience and protect the tomb. Site management related references specific to Kings Valley are included.

Abdel-Aziz, Omar A. A., and Essam E. Khalil. 2005. Air flow regimes and thermal patterns in climatized tombs in the Valley of the Kings. In *43rd AIAA Aerospace Sciences Meeting and Exhibit: 10-13 January 2005, Reno, Nevada*, 1209-16. Reston, Va.: American Institute of Aeronautics and Astronautics.

Environmental Investigation, KV, KV Management, Ventilation

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Environmental Investigation, KV, KV Management, Ventilation

— — —. 2005. Understanding air flow patterns and thermal behaviour in "King Tutankhamen tomb". In *Proceedings of the ASME Heat Transfer Division--2005: Presented at 2005 ASME International Mechanical Engineering Congress and Exposition: November 5-11, 2005, Orlando, Florida, USA*, 115-21. HTD, vol. 376. New York, N.Y.: American Society of Mechanical Engineers.

Environment, Environmental Investigation, KV Management, KV 62, Ventilation, Visitors

Adams, Guy. 2009. The secrets of Tutankhamun's decaying tomb. *The Independent*, 7 December, <http://www.independent.co.uk/news/science/the-secrets-of-tutankhamuns-decaying-tomb-1835521.html>.

Deterioration, KV Management, KV 62, Treatment, Visitors

Brock, Edwin C., and Kent R. Weeks, eds. 2006. *The Valley of the Kings, Luxor, Egypt Site Management Masterplan: Appendix I, Accessible KV Tombs: Detailed Descriptions and Current Condition Surveys*. Publications of the Theban Mapping Project V. Cairo: Theban Mapping Project.

KV, KV Management, KV 62, Tomb Construction

Chase-Harrell, Pauline. 1989. The use of interpretive techniques to increase visitor understanding and reduce pressure on fragile resources: The West Bank of the Nile at Luxor. In *International Perspectives on Cultural Parks: Proceedings of the First World Conference, Mesa Verde National Park, Colorado, 1984*, 171-77. Denver, Colo.: U.S. National Park Service in association with the Colorado Historical Society.

KV, KV Management, Visitors

Curtis, Garniss H., John Romer, Marc Monaghan, Mark Ciccarello, and Joseph Esherick. 1979. *Theban Royal Tomb Project*. Brooklyn: Brooklyn Museum.

Geology, KV, Flooding, Management, Environment, KV Management, Hydrology

El-Aref, Nevine. 2002. Replica royal tombs at Giza. *Al-Ahram Weekly* (597). <http://weekly.ahram.org.eg/2002/597/hr1.htm>

KV, Visitors

— — —. 2009. The cost of fame. *Al-Ahram Weekly* (972). <http://weekly.ahram.org.eg/2009/972/eg2.htm>

KV 62, Treatment, Visitors

— — —. 2009. Seeing double. *Al-Ahram Weekly* (962). <http://weekly.ahram.org.eg/2009/962/he2.htm>

KV Management, KV 62, Visitors

Ezzeldin, Hussein M., S. Mourad, and Essam E. Khalil. 2006. Thermal comfort in the tombs of the Valley of Kings using PMV model. In *4th International Energy Conversion Engineering Conference and Exhibit (IECEC), 26 - 29 June 2006, San Diego, California*, 1241-49. Reston, Va.: American Institute of Aeronautics and Astronautics.

Environment, Environmental Investigation, KV, Ventilation, Visitors

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Environment, KV, KV Management, Treatment, Ventilation

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KV Management, KV 62, Treatment

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Excavation, Historical, KV 62, Mummy, Visitors

Hawass, Zahi. 1995. The Egyptian monuments: Problems and solutions. *International Journal of Cultural Property* 4 (1): 105-18.

Deterioration, Environment, Flooding, KV Management, Treatment, Visitors

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KV Management, Visitors

Hetherington, Nigel J. 2009. An assessment of the role of archaeological site management in the Valley of the Kings, Luxor, Egypt. In *Managing Egypt's Cultural Heritage: Proceedings of the First Egyptian Cultural Heritage Organisation Conference on: Egyptian Cultural Heritage Management*, edited by Lawrence S. Owens and Aloisia De Trafford, 149-63. Egyptian Cultural Heritage Organisation Discourses on Heritage Management Series, no. 1. London: Golden House.

KV Management, Visitors

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KV 62, Treatment, Visitors

Jones, Michael. 2003. The work of the American Research Center in Egypt in the tomb of Sety I in the Valley of the Kings, 1998-1999. In Vol. 1 of *Egyptology at the Dawn of the Twenty-First Century: Proceedings of the Eighth International Congress of Egyptologists, Cairo, 2000*, edited by Zahi A. Hawass and Lyla Pinch Brock, 252-61. Cairo; New York: American University in Cairo Press.

Deterioration, KV, Painting Technique, Visitors

— — —. 2008. Monument and site conservation. In *Egyptology Today*, edited by Richard H. Wilkinson, 98-120. Cambridge; New York: Cambridge University Press.

Deterioration, Environment, Flooding, Geology, Historical, KV, KV Management, KV 62, Management, Treatment, Visitors

Khalil, Essam E. 2006. Preserving the tombs of the pharaohs. *ASHRAE Journal* 48 (12): 34-38.

Environment, Environmental Investigation, KV, KV Management, Treatment, Ventilation, Visitors

— — —. 2010. Calculations of air flow regimes thermal and moisture patterns in climatized archaeological Church of Christ in Cairo. In *Clima 2010: 10th REHVA World Congress, Sustainable Energy Use in Buildings, 9-12 May 2010, Antalya, Turkey*. Brussels: REHVA.

Environment, Ventilation, Visitors

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Deterioration, Environment, KV, KV 62, Ventilation, Visitors

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Excavation, KV 62, Visitors

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