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# HERITAGE, WORLD HERITAGE, AND THE FUTURE

## Perspectives on Scale, Conservation, and Dialogue

EDITED BY
B. NİLGÜN ÖZ AND CHRISTINA LUKE

ANAMED
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# Conservation and the Archaeological Gaze: Field Manuals and Handbooks—Their Role in Transforming Preservation Knowledge in the Nineteenth and Twentieth Centuries

Caitlin R. O'Grady

**Abstract**

Preservation in the field has its origins in late nineteenth and early twentieth centuries archaeological practice with the acknowledgement that degradation could seriously compromise excavated artifacts and the data they represented. Recognition that excavation was an inherently destructive process further highlighted the power of conservation to transform recovered artifacts into data and legitimized archaeological claims to authority about the past. Conservation field and laboratory methods developed in direct response to issues faced during excavation and processing of finds, as well as others encountered following export to Europe, the UK, and USA. Field manuals and handbooks play an important role in establishing and expanding archaeological authority through the dissemination of conservation techniques and methods.

This paper investigates the social construction of archaeological expertise and its impact on discipline development, as well as the identity of associated actors engaged in preservation including scientists, as well as conservators. These manuals and handbooks act as boundary objects to maximize autonomy and control communication between a variety of participants with varying identities. Terminology used to describe preservation actions and the individuals carrying them out provides significant insight into how archaeologists perceived the process of conservation and distinguished themselves as experts. Investigation and critical assessment of these published and unpublished documents allows one to reconstruct the subtle, and not so subtle, power struggles between hard science, conservation, and archaeology in investigating the past. Finally, this process of negotiation along displinary lines resulted in a hierarchical system of expertise that continues to have ramifications for contemporary conservation practice.

## Introduction

The emergence of preservation practice in field settings is directly related to the codification of archaeology as a scientific discipline in the late nineteenth and early twentieth centuries. This coincided with a marked increase in exploration and collecting as colonial and imperialist powers sought to order, subjugate, and claim the past. Modern archaeology constructed historic narratives using bodies of collected data that retained significantly more meaning when collated with provenience and stratigraphic information. These new forms of proof and evidence, built on architecture and artifacts recovered during excavation, necessitated conservation intervention. As noted in the introduction to the 1940 *Manual on the Technique of Archæological Excavations*,

> It is precisely because archaeological research reveals such a large quantity of transient data that, by every possible means and precautions, efforts must be made to fix and preserve all the material documentation, both that which can be removed and that which has to be left in situ.[1]

The need for established and reliable conservation methods was crucial to prevent artifact loss during export from warmer, dryer climes to the wetter, cooler environments associated with Europe and North America. Systematic and formalized inquiry of urban, ritual, and burial sites required development of scientific methods of documentation, excavation, and preservation.

This paper investigates the identification and demarcation of specific knowledge, skills, and expertise, as communicated by actors engaged in the process of archaeology. Published handbooks, topic-specific publications, and archaeological reports standardized methods (tested using the scientific method) recommended for field and museum settings.[2] These publications provide insight into the development of conservation as a field where disciplinary expertise and skills were socially constructed by various participants. Viewed through this lens, these social interactions between actors are classified as boundary-work—where specific skills and expertise associated with disciplines demarcate experts and amateurs.[3] By existing at interfaces between developing fields, boundary-work facilitated knowledge production and the solidification of disciplinary identities. Further, this process involves the production of related boundary objects created during the research process (e.g. notes, reports, handbooks, maps, images, etc.) which establish and distinguish authority and expertise.[4]

1 E. Foundoukidis, "Introduction," in *Manual on the Technique of Archæological Excavations*, ed. International Museums Office (Paris: International Institute of Intellectual Co-operation, 1940), 14.

2 Alexander Scott, "The Restoration and Preservation of Objects at the British Museum," *Journal of the Royal Society of Arts* 70, no. 3618 (24 March 1922): 328; Alfred Lucas, *Antiques – Their Restoration and Preservation* (London: E. Arnold & Co., 1924), 13.

3 Thomas F. Gieryn, "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in the Professional Ideologies of Scientists," *American Sociological Review* 48, no. 6 (December 1983): 782.

4 Susan Leigh Star and James R. Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects:

Codification of "formal education and entry requirements; a monopoly over an esoteric body of knowledge and associated skills; autonomy over the terms and conditions of practice; collegial authority; a code of ethics; and, commitment to a service ideal"[5] is needed to establish disciplinary identities. This process involves the development of specific terminology to further separate and distinguish amateurs from professionals, as well as differentiate professionals themselves.[6] While disciplinary debates standardized technical lexicons, terms retain associations with the context in which they were initially utilized. The choice, definition, and application of terms used in archaeology and conservation is highly dependent on their chronological period and specific geographic location of use. Review of boundary-work, boundary objects, and terminology provides insight into the evolution of disciplinary professionals and the development of authoritative expertise. Systematic analysis of early handbooks and publications illustrates the ways archaeologists, scientists, and conservation practitioners/technicians engaged with preservation practice and each other in various settings.

## The Road to Professionalization

Professionalization in archaeology evolved over several centuries through the linked activities of antiquarians to the development of amateurs and experts. However, discipline formation is based on the recognition that site- and artifact-driven data would be lost without standardized techniques in excavation, processing, and preservation. The development and dissemination of field methods in the latter half of the nineteenth and early part of the twentieth centuries is tied to large scale excavations around the world that rapidly recovered significant archaeological assemblages. Artifact fragility meant that materials easily deteriorated during the process of recovery, documentation, processing, and export. Preventing loss of archaeological proof was an ethical imperative recognized by archaeologists and scientists,[7] which required familiarity with chemistry for those engaged in preservation activities.[8] Archaeologists and scientists involved in this process negotiated claims and authority over preservation as a realm of esoteric knowledge fundamental to their disciplinary identity. The evolution of this can be traced through review of publications produced during this period of professionalization.

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Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39," *Social Studies of Science* 19, no. 3 (August 1989), 388–89.

5 Sharyn L. Roach Anleu, "The Professionalization of Social Work? A Case Study of Three Organizational Settings," *Sociology* 26, no. 1 (February 1992): 24.

6 David Sciulli, "Professions before Professionalization," *European Journal of Sociology* 48, no. 2 (April 2007): 139.

7 J. P. Droop, *Archaeological Excavation* (Cambridge: Cambridge University Press, 1915), vii-viii; and Lucas, *Antiques* (1924), 5; W. M. Flinders Petrie, *Methods and Aims in Archaeology* (London: Macmillan and Co., Limited, 1904), 85; Sir Leonard Woolley, *Digging Up the Past* (London: Ernest Benn Limited, 1930), 15–16.

8 Droop, *Archaeological*, 37; Petrie, *Methods*, 88.

**Published Handbooks, Topic-specific Articles, and Archaeological Reports**

Critical review of handbooks, topic-specific articles, and archaeological reports, published by archaeologists and scientists between 1875 and 1955, provides insight into the disciplinary development of conservation within professional archaeological practice. These publications codified essential knowledge and skills using scientific methods, disseminated recommended preservation techniques and materials, and established an evolving and increasingly technical lexicon. Their creation is in direct response to the needs of excavation and safe recovery of archaeological proof encountered by field expeditions investigating sites around the world, but particularly Africa, the Mediterranean, and the Near East (e.g., Amarna, Carthage, Knossos, Megiddo, Mycenae, Troy, and Ur). These documents, as well as other boundary objects including films and images, scientifically substantiated methods and techniques through their publication and presentation to the academy.

Principally published in English, French, and German, these publications represent a desire to identify and categorize necessary expertise required to stabilize archaeological materials. Examination of technical terminology illustrates the boundary-work archaeologists and scientists engaged in whilst drawing and redrawing boundaries, until finally demarcating accepted disciplinary borders. Most authors are European or North American men from wealthy families with few exceptions—reflecting the demography of acknowledged experts engaged in overseas archaeological excavation (Table 1). However, as has been noted elsewhere, the contributions of women—often family members of male archaeologists—and people of colour are numerous—and their masked presence in the record is precisely because they were not viewed as experts—rather as invisible technicians or workers.[9] Unfortunately, their names and identities are difficult to trace except through photographs/interviews, unpublished archives, and brief mentions in publications, as they rarely held positions of power in excavations. Linguistic tone conveys hierarchies of expertise meant to distinguish actors including native workpeople, technicians, and experts in colonial contexts. Finally, they form the foundation of necessary pedagogical products used to instruct the next generation of conservation professionals in university and museum settings.

9 Caitlin R. O'Grady, "Gentlewomen in the Field and Museum: Unacknowledged Pioneers in the Development of Conservation as both Profession and University Discipline – the London Case," in *Engaging Conservation: Collaboration across Disciplines*, eds. Nina Owczarek, Molly Gleeson, and Lynn A. Grant (London: Archetype Publications Ltd, 2017), 3–18; Stephen Quirke, *Hidden Hands: Egyptian Workforces in Petrie Excavation Archives, 1880 – 1924*, series ed. Nicholas Reeves (London: Gerald Duckworth, 2010); Steven Shapin, "The Invisible Technician," *American Scientist* 77, no. 6 (November-December 1989): 556; Nick Shepherd, "'When the Hand that Holds the Trowel is Black'…Disciplinary Practices of Self-Representation and the Issue of 'Native' Labour in Archaeology," *Journal of Social Archaeology* 3, no. 3 (October 2003): 334–52.

Table 1. Archaeological and scientific personalities engaged in preservation in the late nineteenth and early twentieth centuries and who published on conservation topics.

| Actor | Lifespan | Disciplinary Identity | Background |
|---|---|---|---|
| Jens Jacob Asmussen Worsaae | 1821–1885 | Danish archaeologist | Director of the National Museum of Denmark and the first to use stratigraphy to prove the three-age chronological system |
| Sir William Matthew Flinders Petrie | 1853–1942 | British archaeologist | First Chair of Egyptology at University College London and worked extensively in Egypt and Palestine |
| Alexander Scott | 1853–1947 | Scottish chemist | First Director of Scientific Research at the British Museum |
| Orthon A. Rhousopoulos | 1856–1922 | Greek chemist | Chemist for the National Archaeological Museum in Greece |
| Friedrich Rathgen | 1862–1942 | German chemist | First Director of the Chemical Laboratory at the Royal Museums of Berlin |
| Alfred Lucas OBE | 1867–1945 | British chemist | Consulting Chemist to the Antiquities Service in Egypt |
| George Andrew Reisner | 1867–1942 | American archaeologist | Professor of Egyptology at Harvard University who excavated extensively in Egypt, Nubia, and Palestine |
| William Frederic Badè | 1871–1936 | American theologian and specialist in ancient languages | Dean of the Pacific School of Religion who excavated Tell en-Nasbeh in Palestine |
| Hilda Mary Isabel Urlin Petrie | 1871–1957 | Irish-born British archaeologist | Worked extensively in Egypt and Palestine with husband W. M. F. Petrie |
| Howard Carter | 1874–1939 | American archaeologist and illustrator | Excavated tomb of Tutankhamun and other sites in Egypt |
| Arthur Cruttenden Mace | 1874–1928 | Tasmanian-born British archaeologist and restorer | Worked with Petrie, Carter, and Reisner in Egypt and stabilized archaeological finds in Egypt and at the Metropolitan Museum of Art in New York |

| | | | |
|---|---|---|---|
| Clarence Stanley Fisher | 1876–1941 | American archaeologist | Archaeology Professor at the American Schools of Oriental Research who worked in Egypt with Reisner, as well as Palestine where he directed the first seasons at Megiddo (Armageddon) |
| Sir John Marshall | 1876–1958 | British archaeologist | Director General of Archaeological Survey of India from 1902–1928 |
| Sir Charles Leonard Woolley | 1880–1960 | British archaeologist | Assistant at the Ashmolean Museum who led excavations at Ur, Carchemesh, and Tell Atchana |
| Harold Sellers Colton | 1881–1970 | American archaeologist and biologist | Founder of the Museum of Northern Arizona |
| John Percival Droop | 1882–1963 | British classical archaeologist | Chair of Classical Archaeology at Liverpool University |
| Herbert Eustis Winlock | 1884–1950 | American archaeologist | Director of the Metropolitan Museum of Art who excavated and preserved finds at El-Lisht and Deir el-Bahri |
| Sir Robert Eric Mortimer Wheeler | 1890–1976 | British archaeologist | Inaugural director of the Institute of Archaeology in London who excavated major sites in the UK and India |
| Douglas Leechman | 1891–1980 | Canadian anthropologist | Anthropologist for the National Museum of Canada |
| Euripide Foundoukidis | 1894–1968 | Greek art historian | Secretary-General of the International Museums Office—International Institute of Intellectual Cooperation |
| Harold J. Plenderleith | 1898–1997 | Scottish chemist and conservation scientist | Keeper of the Research Laboratory at the British Museum and first director of the International Center for the Study of the Preservation and Restoration of Cultural Property |
| Ned J. Burns | 1899–1953 | American preparator | Chief of the Branch of Museums for the United States National Park Service |

| | | | |
|---|---|---|---|
| William Francis Grimes CBE | 1905–1988 | Welsh archaeologist | Director of the London Museum and Institute of Archaeology who excavated Sutton Hoo and preserved many of its finds |
| Dame Kathleen Mary Kenyon | 1906–1978 | British archaeologist | Oxford University professor who led excavations at Jericho (and Tell es-Sultan) |
| Robert Fleming Heizer | 1915–1979 | American archaeologist | Professor at University of California at Berkeley who conducted extensive fieldwork in the American Southwest |
| Khan Bahadur Mohammed Sana Ullah | active 1917–1946 | Indian chemist | Archaeological Chemist for the Archaeological Survey of India |
| Robert John Copland Atkinson CBE | 1920–1994 | Welsh archaeologist | Assistant keeper at the Ashmolean Museum who directed excavations at Stonehenge for the UK Ministry of Works |

**Ethical Imperative for Preservation**

Archaeologists and scientists disseminated explicit expressions of disciplinary identity in their published manuals/handbooks. Described as an ethical obligation, preservation knowledge facilitated archaeological proof, which was embodied by stable archaeological materials. Examination of specific texts reveals much about the process of negotiating disciplinary boundaries and establishing distinct identities. Some of the earliest publications focused on preservation in archaeological settings were produced by Danish and German archaeologists, including Jens Jacob Asmussen Worsaae (1821–1885), a Danish archaeologist (for all named individuals, please see Table 1 for a summary of their identify and biography). Worsaae states in his 1849 handbook, "A very important rule is, that all antiquities, even those which appear the most trivial and common, ought to be preserved."[10] Nearly 80 years later, William Frederic Badè (1871–1936), confirms Worsaae's preservation tenet. He writes, "This restoration work is extremely important, for if done systematically and perseveringly it will become a valuable aid to the scientific work of the expedition."[11] Both authors reiterate the intrinsic link between archaeological proof and preservation that considers all artifacts regardless of material, technology, or rarity.

10 J. J. A. Worsaae, *The Primeval Antiquities of Denmark*, trans. William J. Thoms (London: John Henry Parker, 1849), 156.

11 William Frederic Badè, *A Manual of Excavation in the Near East: Methods of Digging and Recording of the Tell en-Nasbeh Expedition in Palestine* (Berkeley: University of California Press, 1934), 33.

Early twentieth century authors also emphasize preservation ethics in field settings. In his 1904 archaeological handbook, British archaeologist Sir William Matthew Flinders Petrie (1853–1942) notes that "preservation of the objects that are found is the necessary duty of the finder. To disclose things only to destroy them, when a more skilful or patient worker might have added them to the world's treasure, is a hideous fault."[12] John Percival Droop (1882–1963), a British archaeologist, shared a similar sentiment that the archaeologist must have "a sense of duty towards his finds."[13] British archaeologist Sir Charles Leonard Woolley (1880–1960) notes that appropriate engagement with preservation requires planning and time, stating that "the archaeologist, therefore, has to be as careful about the preservation of objects as about the finding of them, and the demands on his time are thereby at least doubled."[14] Sir John Marshall (1876–1958), a British archaeologist, extends this obligation to preserving only original fabric in his manual regarding archaeological monuments. He writes, "it should never be forgotten that their *historical value is gone when their authenticity is destroyed* [original emphasis], and that our first duty is not to renew them but to preserve them."[15] For these authors, preservation is essential to ensure that archaeological evidence retains its status as objective, scientific proof.

Whilst archaeologists generally discuss preservation in the field, early manuals published by scientists situate preservation ethics within the scientific method. Knowledge development is framed around hypotheses based on empirical observation and tested through experimentation. The German chemist Friedrich Rathgen (1862–1942) reiterates the importance of systematic scientific observation.[16] Alfred Lucas (1867–1945), a British chemist, notes, "no object should be condemned as hopeless until it has been carefully studied and preliminary experiments made."[17] Finally, Scottish chemist Alexander Scott (1853–1947) discusses the importance of reviewing interventions to determine efficacy. He writes in 1926, "It has now been possible to give these processes prolonged trial, and their suitability has been confirmed while further experience has suggested certain modifications in detail which are outlined in the following pages."[18] By situating preservation within the sphere of scientific method and experimentation, scientists are engaging in subtle boundary-work to distinguish their expertise from that of archaeology.

12 Petrie, *Methods*, 85.
13 Droop, *Archaeological Excavation*, 6.
14 Woolley, *Digging*, 32.
15 John Marshall, *Conservation Manual: A Handbook for the Use of Archæological Officers and Others Entrusted with the Care of Ancient Monuments* (Calcutta: Superintendent Government Printing, India, 1923), 10.
16 Friedrich Rathgen, *The Preservation of Antiquities – A Handbook for Curators*, trans. George A. Auden and Harold A. Auden (Cambridge: Cambridge University Press, 1905), vi.
17 Lucas, *Antiques* (1924), 3.
18 Alexander Scott, *The Cleaning and Restoration of Museum Exhibits. Third Report upon Investigations Conducted at the British Museum* (London: His Majesty's Stationary Office, 1926), 1.

## Esoteric Body of Knowledge, Expertise, and Skills

The establishment of essential knowledge, expertise, and skills for newly developed disciplines requires explicit acknowledgement regarding how information is created, collated, and transmitted. Actors must formally identify boundaries of knowledge spheres to build disciplinary authority.[19] Handbooks and manuals, published by archaeologists and scientists during this period, note the bounds of current preservation knowledge and make published pleas for increased research and engagement by practitioners. Whilst never stated explicitly, skilled judgment is required to prevent information loss during conservation interventions. Based on knowledge, expertise, and experience to interpret observations,[20] this judgment facilitates educated decision-making in the face of incomplete information.[21] For these actors, whether they are archaeologists or scientists, judgment is the purview of the expert and carries authority that separates the professional from the skilled technician, native laborer, or amateur.

### *Knowledge*

In one of the first manuals devoted to archaeological practice, Petrie observes that the future of archaeology requires both discovery and conservation, but "unhappily the ideas of conservation have not kept pace with the work of discovery."[22] Access to resources on preservation continued to be challenging into the 1930s, a fact noted by Douglas Leechman (1891–1980), a Canadian anthropologist. In 1931, he observes that "literature dealing with the preservation of museum specimens in general and anthropological collections in particular is scanty and widely scattered."[23]

A subtle difference in approach to knowledge production is observed in publications written by scientists. These authors, rather, make statements about the need for additional research to justify preservation materials and methods. Rathgen notes the lack of codified preservation methods in his 1895 publication (1905 English translation) and asks that colleagues send "communications bearing upon the subject and may thus perhaps at some future date be able to produce a more complete work."[24] Nearly 30 years later, other European scientists including Lucas, Scott, and Orthon A. Rhousopoulos (1856–1922), a Greek chemist, continued to comment on the need

19 Eliot Freidson, "Knowledge and the Practice of Sociology," *Sociological Forum* 1, no. 4 (Autumn 1986): 688.

20 International Museums Office, *Manual on the Technique of Archæological Excavations* (Paris: International Institute of Intellectual Co-operation, 1940, 154.

21 Sharon Cather, "Choices and Judgment: The Professional Conservator at the Interface," in *Conservation of Ancient Sites on the Silk Road: Proceedings of the Second International Conference on the Conservation of Grotto Sites, Mogao Grottoes, Dunhuang, People's Republic of China, June 28 – July 3 2004*, ed. Neville Agnew (Los Angeles: Getty Conservation Institute, 2004), 24–25.

22 Petrie, *Methods*, 130.

23 Douglas Leechman, "Technical Methods in the Preservation of Anthropological Museum Specimens," *Annual Report for 1929, Bulletin No. 67* (Ottawa: National Museum of Canada, 1931), 127.

24 Rathgen, *Preservation of Antiquities,* vi–vii.

for research and professional engagement in publication.[25] In the 1930s and 1940s, professional organizations responded directly to this issue, including the UK Museums Association and the International Museums Office (IMO), by sponsoring manuals written by scientists and archaeologists.[26] As members of established disciplines, scientists are transparent in their claims to expand preservation research—likely due to their established authority on scientific topics.

### *Chemical Expertise*

Early handbooks and manuals delineate the necessary knowledge, expertise, and skills required to successfully engage in preservation. The importance of chemistry is most frequently mentioned. Petrie states that "some familiarity with chemistry and physics and properties of materials is one of the first requisites for an excavator."[27] This necessary body of knowledge is also noted by Droop,[28] whilst Lucas confirms that preservation "demand[s] a considerable amount of scientific and chemical knowledge."[29] Based on his experience working with delicate organic and inorganic artifacts from Tutankhamun's tomb in the 1920s, Lucas extends the importance of chemical knowledge to understanding deteriorated materials and technology. He states,

> the aid chemistry can render to archaeology, therefore, is not limited to analyses made for the purpose of the identification of unusual materials so as to enable them to be correctly described, or so that the substances used in their manufacture may be known, but includes problems of cleaning and preservation.[30]

Several handbooks provide additional guidance on material identification by testing physical (e.g. solubility, specific density, and structure/microstructure), mechanical (e.g. hardness and fracture), and chemical (microchemical tests) properties.[31] International standards regarding necessary preservation knowledge are established by the 1940 *Manual on the Technique of Archæological Excavations*, produced by the IMO following

25 Lucas, *Antiques* (1924), 5; O. A. Rhousopoulos, "On the Cleaning and Preservation of Antiquities," *The Museums Journal (Museums Association)* (ed. F.R. Rowley) 11, no. 5 (November 1911): 132; Alexander Scott, *The Cleaning and Restoration of Museum Exhibits. Report Upon Investigations Conducted at the British Museum*, Bulletin No. 5, Department of Scientific and Industrial Research (London: His Majesty's Stationary Office, 1921), 2.

26 International Museums Office, *Manual*.

27 Petrie, *Methods*, 85.

28 Droop, *Archaeological*, 37.

29 Lucas, *Antiques* (1924), 3.

30 A. Lucas, "Appendix II: The Chemistry in the Tomb," in *The Tomb of Tut-Ankh-Amen. Discovered by the Late Earl of Carnarvon and Howard Carter. Volume II. The Burial Chamber,* author Howard Carter (1927; repr., London: Gerald Duckworth & Co. Ltd., 2001), 188.

31 Lucas, *Antiques* (1924), 116–28; Alfred Lucas, *Antiques – Their Restoration and Preservation*, second ed. (London: E. Arnold & Co., 1932), 221–32; Scott, *Cleaning and Restoration*(1926), 15–16.

the 1937 Cairo International Conference on Excavations. Archaeologists must retain expertise, including "the elements of practical chemistry to be applied in ensuring the prompt protection of a variety of materials that are threatened with disintegration as from the moment they are unearthed."[32] Both archaeologists and scientists specifically codify chemistry as a necessary area of expertise required for preservation, further linking this to an ethical imperative.

The value of chemistry is recognized as an essential competency in museum spaces, as well as the archaeological field. In the preface to his 1921 government-sponsored report on preservation, Scott emphasizes the contributions of chemistry to preservation where "science is capable of rendering valuable service."[33] This continues to be highlighted throughout the 1930s and 1940s. When describing successful stabilization of anthropological specimens, Leechman states that "a knowledge of the chemistry of materials involved and of the effect of the various chemical and physical processes employed" is necessary.[34] Ned J. Burns (1899–1953), an American preparator, also highlights chemistry as vital knowledge and a prerequisite before engaging in treatment. He asserts that

> It is essential to know, first, the physical and chemical properties of the object to be cleaned; secondly, the most effective method of arresting further deterioration …; and, thirdly, the nature and effect of chemical formulas and processes to be employed in effecting a restoration.[35]

Leechman and Burns demonstrate increasing recognition that preservation relied on chemistry and chemical concepts, as well as experimentation expanding the intellectual scope of the scientific method as a governing framework. Comments by Howard Carter (1874–1939), an American archaeologist, and Arthur Cruttenden Mace (1874–1928), a Tasmanian-born English archaeologist, note this practice when describing work at the newly discovered tomb of Tutankhamun. They write that Lucas "at once began experimenting on preservatives for the various classes of objects" upon his 20 December 1922 arrival to the recently discovered burial chamber.[36] Indian chemist Khan Bahadur Mohammed Sana Ullah (active 1917–1946) describes this experimental process when establishing appropriate materials for preservation of Ajanta cave frescoes.[37] For

32 International Museums Office, *Manual*, 192–93.
33 Scott, *Cleaning and Restoration* (1921), 3.
34 Leechman, "Technical Methods," 128.
35 Ned J. Burns, *Field Manual for Museums* (Washington, D.C.: United States Government Printing Office, 1941), 118–19.
36 Howard Carter and A. C. Mace, *The Tomb of Tut-Ankh-Amen Volume 1* (London: Cassell and Company, Ltd., 1923), 109.
37 Khan Bahadur Mohammed Sana Ullah, "Science and Conservation," in *Revealing India's Past* (*A Co-Operative Record of Archæological Conservation and Exploration in India and Beyond* (London: The India Society, 1939), 88.

each, the selection of materials and techniques is based on knowledge about the artifact and observed degradation. Decision-making required knowledge, experimentation, and expertise built on recognizable authority.

Expertise in chemistry extends to the selection and use of materials. Archaeologists and scientists specifically report recommended treatment materials (chemicals and tools, etc.). Many note that access to sufficiently pure materials was challenging for remote field situations, including Lucas, who noted this factor whilst working in Egypt.[38] Procurement of supplies was a necessary step of the planning process of excavation work and continues to be a critical component for contemporary archaeological projects—despite increased access to resources. As Petrie notes, "the excavator must be ready for all emergencies, for all classes of objects in all stages of decay, and deal with each without delays, and often with scanty and unsuitable means at hand for their treatment."[39] Unfortunately, it is not always possible to plan appropriately, as Carter states following his discovery of Tutankhamun's burial chamber. Numerous trips to Cairo were required to purchase supplies including a

> steel gate … [as well as] photographic material, chemicals, a motor-car, packing-boxes of every kind, with thirty-two bales of calico, more than a mile of wadding, and as much again of surgical bandages. Of these last two important items I was determined to not run short.[40]

Sufficient preparation in sourcing requisite preservation supplies is tied to ethics. The IMO states that "before digging starts, the excavator must satisfy himself that sufficient material is available for the conservation and packing of finds."[41] Preparation is critical and must account for unexpected finds and their preservation, storage, and security needs—particularly if sites are in remote locations and funds are limited.

Handbooks and articles frequently reference suggested adhesives, chemicals, solvents, and tools for use in the field and museum laboratories. Recommended materials are entioned within the context of describing specific treatment methods. Odegaard and O'Grady summarise trends in recommended adhesives, fillers, acids, solvents, and tools for the period 1880–1930,[42] which are expanded here. During this period, natural materials are predominantly used, including wax (beeswax and paraffin), protein-based adhesives (e.g. carpenter's glue, casein, Cologne glue, gelatine, fish glue, seccotine, and

38 Lucas, *Antiques* (1924), 124.
39 Petrie, *Methods*, 85.
40 Carter and Mace, *Tomb of Tut-Ankh-Amen* , 107.
41 International Museums Office, *Manual*, 96.
42 Nancy Odegaard and Caitlin R. O'Grady, "The Conservation Practices for Archaeological Ceramics of Sir Flinders Petrie and Others between 1880-1930," in *Recent Advances in Glass and Ceramics Conservation 2016*, eds. H. Roemich and L. Fair (Paris: International Council of Museums – Committee for Conservation (ICOM-CC), 2016), 87–90.

Syndeticon), starches (tapioca, rice, and dextrin), and resins (shellac).[43] Industrially produced adhesives are also noted, including cellulose nitrates (e.g. Ambroid®, celluloid, collodion, Duco, Durofix, HMG, nitrocellulose, and Plastic Wood), cellulose acetates (e.g. Cellon/Zellon, Necol, and non-inflammable Plastic Wood), and polyvinyl acetals/acetates (e.g. Alvar, Mowilith®).[44] Finally, a range of acids, chemicals, and solvents are also reported.

In some cases, handbooks and manuals include lists of relevant materials for preservation. This practice, first initiated by Petrie,[45] is generally associated with later publications during the 1940s/1950s. Harold Sellers Colton (1881–1970), an American archaeologist and biologist, Sana Ullah, and Sir Robert Eric Mortimer Wheeler (1890–1976), a British archaeologist, each prepared supply lists to facilitate excavation planning.[46] Robert F. Heizer (1915–1979), an American archaeologist, includes a more truncated list of supplies in his 1950 manual prepared for beginning archaeology students.[47] Lucas and Burns provide lists of necessary chemicals and equipment that support museum preservation.[48] It is interesting to note that Lucas's list of necessary chemicals was

43 Badè, *Manual*, 7, 33; Howard Carter, *The Tomb of Tut-Ankh-Amen Discovered by the Late Earl of Carnarvon and Howard Carter. Volume II. The Burial Chamber*, (1927; repr., London: Gerald Duckworth & Co. Ltd., 2001), 80–81; Carter and Mace, *Tomb of Tut-Ankh-Amen*, 158; Harold Sellers Colton, *Field Methods in Archaeology. Prepared for Archaeological Expeditions of the Museum of Northern Arizona*, second ed. (Flagstaff, Arizona: Northern Arizona Society of Science and Art, 1953), 15; Droop, *Archaeological*, 41; Robert F. Heizer, ed., *A Manual of Archaeological Field Methods*, revised ed. (Milbrae, California: The National Press, 1950), 54; International Museums Office, *Manual*, 105; T. M. N. Lewis and Madeline D. Kneberg Lewis, "Appendix C. Manual of Field and Laboratory Techniques Employed by the Division of Anthropology, University of Tennessee, Knoxville, Tennessee," [Reprint 1939 original], in *The Prehistory of the Chickamauga Basin in Tennessee, Volume II*, comp. and ed. Lynne P. Sullivan (Knoxville: University of Tennessee Press, 1995), 618; Lucas, *Antiques* (1924), 31–32, 106; Lucas, *Antiques* (1932), 41, 54, 117; Williams C. Orchard, "Pottery Repairing and Restoring," *Indian Notes* 2, no. 4 (October 1925): 303, 307; Plenderleith, *Preservation of Antiquities*, 15, 19, 25; W. M. Flinders Petrie, "The Treatment of Small Antiquities," *The Archaeological Journal* 45 (1888): 89; F. Rathgen, "The Decay and Preservation of Antiquities," *The Museums Journal (Museums Association)*, 13, no. 5 (November 1913): 163; Rathgen, *Preservation*, 71–72; Khan Bahadur Mohd. Sana Ullah, "Notes on the Preservation of Antiquities in the Field," *Ancient India: Bulletin of the Archaeological Survey of India* 1, no. 1 (January 1946): 88; Woolley, *Digging*, 90–92.

44 Carter and Mace, *Tomb of Tut-Ankh-Amen*, 124; Colton, *Field Methods*, 15; Heizer, *Manual*, 54; International Museums Office, *Manual*, 153; Kathleen Kenyon, *Beginning in Archaeology* (London: Phoenix House Limited, 1952), 150–51; André Leroi-Gourhan, *Les Fouilles Préhistoriques (Technique et Méthodes)* (Paris: Editions A. Et J. Picard, 1950), 36; Comte Robert du Mesnil du Buisson, *Le Technique des Fouilles Archéologiques: Les Principes Généraux* (Paris: Librairie Orientaliste Paul Geuthner, 1934), 195; Orchard, "Pottery Repairing and Restoring," 301, 308; Oxford University Archaeological Society, *Notes on Archaeological Technique* (Oxford: Oxford University Archaeological Society, 1940), 16–17; Plenderleith, *Preservation of Antiquities*, 22; Sana Ullah, "Science and Conservation," 88, 90; Alexander Scott, "Appendix IV. Notes on Objects from the Tomb of King Tut-Ankh-Amen," in *The Tomb of Tut-Ankh-Amen Discovered by the Late Earl of Carnarvon and Howard Carter. Volume II. The Burial Chamber*, author Howard Carter, (1927; repr., London: Gerald Duckworth & Co. Ltd., 2001), 198; Scott, *Cleaning Third Report*, 61–62.

45 Petrie, *Methods*, 112–13.

46 Colton, *Field Methods*, 15; Sana Ullah, "Notes," 81–82; Mortimer Wheeler, *Archaeology from the Earth* (Oxford: The Clarendon Press, 1954), 169–70.

47 Heizer, *Manual*, iii, 54.

48 Burns, *Field Manual*, 221–39; Lucas, *Antiques* (1924), 129–32.

deliberately omitted from the second edition of his handbook (1932), "as it has been found more satisfactory that the information should be distributed throughout the book, either in the text or in footnotes."[49] This is a curious justification, as it is contrary to the practical planning approach used elsewhere.

In terms of tools, specific focus is placed on those used for excavation, preservation, transport, and storage. Mentioned frequently are bellows, brushes (various sizes and degrees of flexibility), clamps, metal knives, and tweezers.[50] William Francis Grimes (1905–1988), a Welsh archaeologist, excavated fragile metal and organic finds at Sutton Hoo in the 1940s using a curved bodkin. The tool "remained sharp … [and] was particularly useful for negotiating hollows, angles and undercutting."[51] Other gear used for consolidation and reconstruction include glue-pots (double boilers in the museum) and Primus stoves (in the field).[52] Depending on supplies and resources, Scott notes it is possible to substitute other materials for a purpose-built equipment.[53] Scientific apparatus is also recommended by scientists for use with preservation, including custom-made tubs/basins for washing/desalinating materials and conducting electrolytic treatment of metals, as well as air pumps, balances, chemical glassware, stills, and ovens.[54] However, the practice of incorporating specialist scientific equipment in the field continued to be a challenge.[55] Despite this, many of the aforementioned tools and equipment continue to be used in field and museum conservation laboratories.

Paper bags, wood boxes (often constructed on site), cotton wool/bandages, paper, and moss were used for transport/storage in the field and during export.[56] Robert John Copland Atkinson (1920–1994), a Welsh archaeologist, notes that slow drying of wet wood is best accomplished by "pack[ing] the wood as soon as excavated in a tin, surrounded by several layers of damp moss, and to leave it for about six months with the lid on."[57] In some cases, archaeologists advocate the use of recycled containers for storage and transport—especially when budgets are limited. Droop notes that pill boxes

49 Luas, *Antiques* (1932), 7.

50 Badè, *Manual*, 27; Droop, *Archaeological*, 41; Clarence S. Fisher, *The Excavation of Armageddon* (Chicago: University of Chicago Press, 1929), 30; Heizer, *Manual*, 54; International Museums Office, *Manual*, 115

51 W. F. Grimes, "The Sutton Hoo Ship-Burial. VII. The Salvaging of the Finds," *Antiquity* 14, no. 53 (March 1940): 74.

52 Badè, *Manual*, fig. 7; Carter, *Tomb of Tut-Ankh-Amen, Volume II*, 87; Lucas, *Antiques* (1924), 14; Lucas, *Antiques* (1932), 28.

53 Lucas, *Antiques* (1932), 28.

54 Droop, *Archaeological*, 43–44; Alfred Lucas, "Alfred Lucas's Notes on Conservation of Objects from the Tomb of Tutankhamun. Season 1922–3," Griffith Institute, University of Oxford, Tutankhamun: Anatomy of an Excavation (January 13, 2015), http://www.griffith.ox.ac.uk/discoveringTut/conservation/4lucasn4.html, TAA i.2.12a.1.15; Plenderleith, *Preservation*, 40; Rathgen, *Preservation of Antiquities*, figs. 13–15, 24; Sana Ullah, "Notes," 81–82.

55 International Museums Office, *Manual*, 143.

56 R. J. C. Atkinson, *Field Archaeology* (London: Methuen & Co. Ltd, 1946), 215–16; Grimes, "The Sutton Hoo Ship-Burial. VII," 70; Heizer, *Manual*, 55; Kenyon, *Beginning*, 145–54; Petrie, *Methods*, 105–13.

57 Atkinson, *Field Archaeology*, 215–16.

are useful for organized storage of small finds,[58] while Heizer recommends using a "coffee-can or large tin"[59] for transporting wood fragments. Colton also encouraged this frugal practice, stating,

> Almost everything can be used to advantage – match boxes, cracker boxes, oatmeal boxes, tea and coffee cans, and ordinary tin cans. One cannot give specific methods of packing, but cotton, toilet paper and newspaper are useful.[60]

Whilst rarely articulated in handbooks, the reuse of food storage containers is also not uncommon and can be found in many of today's collections.[61]

The range of preservation treatment materials, chemicals, and tools articulated in these handbooks are easily categorized in terms of the period in which they were recommended and their disciplinary origins. Prior to WWI, most archaeologists recommend natural treatment materials and tools/equipment with multiple functions. During this same period, scientists suggest the use of chemicals and chemical equipment, in addition to natural materials for preservation. Following WWI and subsequent discoveries in the chemical industry, there is a marked shift towards the use of industrially produced polymers and chemicals by each group. However, the inclusion of increasingly sophisticated laboratory equipment continues to be at the recommendation of scientists.

### *Documentation, Laboratory, and Hand Skills*

Archaeologists and scientists discuss specific documentation, laboratory, and hand skills necessary for preservation in the field and museum laboratories. Petrie standardized documentation of archaeological materials in a clean, interpretable state.[62] This practice is an integral component of the scientific method whereby evidence is documented and presented to the academy. Extending documentation to stages of intervention functioned as proof of the efficacy of proposed preservation methods and were supplemented by written observations. Building on Rathgen's inclusion of images for archaeological metal and clay tablet treatments,[63] Scott is one of the first to systematically include these in his 1926 manual.[64] Elsewhere, authors omitted or did not consider photographic

58 Droop, *Archaeological*, 43.
59 Heizer, *Manual*, 55.
60 Colton, *Field Methods*, 22.
61 Megan Narvey, "Cigarettes, Brains, and Egyptian Archaeology," University of Cambridge Museums, Behind the Scenes, Culture, Goal 1, News, Research, December 7, 2015, https://camunivmuseums.wordpress.com/2015/12/07/cigarettes-brains-and-egyptian-archaeology/.
62 Frederick N. Boher, *Exposures: Photography and Archaeology*, Exposures series (London: Reaktion Books Ltd, 2011), 83; Petrie, *Methods*, 73–84.
63 Rathgen, *Preservation of Antiquities*, see 113–16, figs. 9–12, 25–35 for treatment of metals and figs. 16–23 for clay tablets.
64 Scott, *Cleaning Third Report*, see figs. 18–24a for treatment documentation of archaeological metals.

treatment documentation important to report, likely because the publication's primary function was to discuss archaeological discoveries.

Laboratory and hand skills have their origin in manual dexterity and are framed as being technical or artistic in origin. Wheeler called these skills "watch-makers' jobs" whereby "the extraction of delicate objects from the earth demands the highest skill, patience, and knowledge available, and is not lightly delegated."[65] The IMO manual notes that "the best practical work is done in the field or in the laboratory by those who have a trained hand who, by practising, have become expert in delicate manipulation."[66] Dame Kathleen Mary Kenyon (1906–1978), a British archaeologist, also highlights the importance of manual dexterity when dealing with delicate finds, which "requires special training and technical knowledge."[67] Finally, the dexterous labor required for preservation was rarely recognized by broader audiences, as "few people, looking at such an object in the glass case of the museum, realise what it cost to get it there."[68] This speaks to Wheeler's assessment that invisibility of preservation as a "watch-maker's job" representing a continuing battle for recognition of conservation work and expertise.[69]

Scientists note the importance of laboratory skills in preservation activities. Lucas's unpublished treatment notes for Tutankhamun's tomb artifacts illustrate the use of solvent solubility for material identification. He describes testing a "black pitch-like material (?) From libation"[70] associated with the third coffin (No. 255) using a range of solvents. Microchemical spot testing is another laboratory skill frequently used in the field for material identification and was used extensively by Scott.[71] Further, he notes that ingenuity was needed to achieve satisfactory results with "very rudimentary chemical apparatus and minute quantities of material."[72] Problem-solving involving solubility and microchemical spot testing continues to be an integral part of conservation work in the field and laboratory in the face of minimal resources.[73]

### Disciplinary Autonomy over the Terms and Conditions of Practice

Handbooks and related publications also provide insight into how archaeologists and scientists dictated the conditions and organization of preservation practice. Disciplinary autonomy developed as actors acknowledged the primacy of their knowledge, skill,

65 Wheeler, *Archaeology from the Earth*, 105.
66 International Museums Office, *Manual*, 154.
67 Kenyon, *Beginning*, 150.
68 Woolley, *Digging*, 87–88.
69 Shapin, "Invisible Technician," 556-8.
70 Alfred Lucas, "Alfred Lucas's Notes on Conservation of Objects from the Tomb of Tutankhamun. Season 1925–6," Griffith Institute, University of Oxford, Tutankhamun: Anatomy of an Excavation, January 13, 2015. http://www.griffith.ox.ac.uk/discoveringTut/conservation/4lucasn4.html, TAA i.2.12a.4.3.
71 Scott, "Appendix IV," 203–4.
72 Scott, "Appendix IV," 197.
73 Nancy Odegaard, Scott Carroll, and Werner S. Zimmt, *Material Characterization Tests: For Objects of Art and Archaeology*, second ed. (London: Archetype Publications Ltd, 2005).

and judgment in making preservation decisions. As detailed previously, archaeologists must have chemical knowledge, which is an ethical obligation to research. However, the corollary—whereby scientists have training in archaeological knowledge and techniques—is never stated. Rather, scientists retain their primacy as authorities in chemical knowledge. This is substantiated by Carter and Mace, who describe necessary structures and expertise needed to safely recover and stabilize artifacts from Tutankhamun's burial chamber. They write, "Then came consideration of their preservation, their removal, and their description – the work of a chemist, of a man experienced in the handling of antiquities, and finally of an archaeologist."[74] Whilst many inhabited more than one of these roles in the field, including Carter and Mace, scientists are more frequently retained to solve identified preservation and analytical problems. Chemists Lucas, Harold J. Plenderleith (1898–1997), and Scott were specifically engaged to answer questions related to finds from Tutankhamun's tomb, whilst Sana Ullah performed the same function at Mohenjo-Daro, Harappa, and Taxila.[75] These structures continue to influence the organized work on current archaeological projects—whereby scientists are experts who make short site visits to solve identified problems. The spatial and temporal organization of labor—from discovery to final interpretation by the archaeologist—is feasible to reconstruct from publications and is discussed elsewhere.[76] In summary, handbooks clearly ascribe explicit allocation of area as to various aspects of archaeological fieldwork. Preservation actions required both space and security to facilitate artifact stabilization and reconstruction whether work was located indoors or outdoors.[77] To achieve this, expedition complexes utilized architecture to separate and order labor during the processing and preservation of artifacts, establishing actor hierarchies as they move from specialist to specialist.[78]

More importantly, both archaeologists and scientists note the limits of field preservation. For example, during recovery of artifacts from Jericho, Tutankhamun's burial chamber, and Ur, many interventions focused purely on stabilization in situ to prevent damage during the removal process and retain relevant archaeological or scientific data.[79] Kenyon notes that the aim of in situ treatments is to "not damage or discolour the object, and does not interfere with any future laboratory treatment."[80] In many documents, archaeologists and scientists recommend that fragile and delicate materials only be treated to ensure they can be safely transported/exported to a more fully equipped museum laboratory "where proper facilities exist and chemical

74 Carter and Mace, *Tomb of Tut-Ankh-Amen*, xiii, 105.
75 Lucas, "Appendix II," 162–88; Sana Ullah, "Science and Conservation," 87; Scott, "Appendix IV," 207.
76 Caitlin R. O'Grady, "Mending, Sticking and Repairing: Reconstructing Conservation Expertise in Archaeology in the Nineteenth and Twentieth Centuries," in *Histories of Conservation and Art History in Modern Europe*, eds. Sven Dupré and Jenny Boulboullé (London: Routledge, 2022), 87–88.
77 Badè, *Manual,* figs. 6–7; Carter and Mace, *Tomb of Tut-Ankh-Amen*, 128.
78 Fisher, *Armageddon*, 23–24
79 Carter and Mace, *Tomb of Tut-Ankh-Amen*, 123–24; Kenyon, *Beginning*, 66; Woolley, *Digging,* 85–86, pl. XXVII.
80 Kenyon, *Beginning*, 150.

processes can be carried out."[81] Publications recommend limited field treatment for wet/waterlogged wood, corroded metals, degraded pottery, and artifact clusters, so that they can be examined and stabilized under more controlled conditions.[82] The IMO further notes that museum laboratories offer "expert assistance, which excavators may receive in general preservation work, in revealing ornament and preparation of materials for exhibition."[83] Whilst statements like this exist, archaeologists continued to claim responsibility for artifacts and their display, as is remarked by Woolley in reference to preparations required for stabilizing and reconstructing recovered material from Ur at the British Museum.[84] Like publication, exhibition was an important mechanism for engaging academic circles, as well as the public—particularly as a source of project funding.[85]

**Codification of Lexicons Used in Preservation**

The importance of terminology used to describe preservation actions cannot be understated, as the standardization of language is used by experts to distinguish themselves from other experts, technicians, and amateurs. Similar to most developing disciplines, language used to describe preservation and conservation treatments became increasingly more technical, forming a distinct lexicon.[86] Discussed in detail by O'Grady, this process is exemplified by the elimination of non-technical terms like "mending" and "sticking" to describe reconstruction; the use of "preservative" for treatment chemicals used in stabilization; and, "cement" to describe adhesives.[87] Once language was codified, some handbooks incorporate glossaries covering archaeological, preservation, and regionally specific vocabulary. These glossaries, mostly written by archaeologists, are a rare occurrence, and few examples exist in this period.[88] Where used, they describe and define primarily archaeological actions—rather than preservation—suggesting that preservation terminology was not as critical to classify. Scientists likely omitted these, as lexicons already existed for the specific language of science and chemistry.

81 Woolley, *Digging*, 94–95.

82 Atkinson, *Field Archaeology*, 215–16; Forrest E. Clements, "Notes on Archaeological Methods," *American Antiquity* 1, no. 3 (January 1936), 193; International Museums Office, *Manual*, 135–36, 143; Kenyon, *Beginning*, 148; Orchard, "Pottery Repairing," 299.

83 International Museums Office, *Manual*, 143.

84 Caitlin R. O'Grady, "The Model Conservator: Unpicking the Past to Understand Discipline Development," in *ICOM-CC 18th Triennial Conference Preprints, Copenhagen, 4–8 September 2017,* ed. J. Bridgland, article 1906 (Paris: International Council of Museums, 2017), 4

85 Amara Thornton, "Exhibition Season: Annual Archaeological Exhibitions in London, 1880s-1930s," *Bulletin of the History of Archaeology* 25, no. 2 (2015): 2–3, http://dx.doi.org/10.5334/bha.252.

86 Anleu, "Professionalization," 24.

87 O'Grady, "Mending, Sticking," 84–85.

88 Atkinson, 208–13; Badè, *Manual*, 2.

### *Hierarchical and Colonial/Imperial Bias*

Language also reveals disciplinary, colonial, and imperial biases by codifying a hierarchy of actors associated with preservation. Archaeologists and scientists provide commentary regarding existing hierarchies in field and laboratory settings established on socially constructed and acknowledged concepts of expertise and authority. While archaeologists perpetuate their ethical obligation to preservation, scientists use chemical expertise to bound preservation activities. Sana Ullah highlights this in 1946, stating, "All problems requiring sound chemical knowledge or objects demanding expert treatment should be referred to the Archaeological Chemist of the Archaeological Survey of India."[89] Reliance on scientists is also noted by Carter, who requested that Scott participate in the 1923–1924 Tutankhamun field season.[90]

Many archaeological handbook publications discuss preservation strategies that allocate work to a native workforce. This practice was common in Egypt (and elsewhere), where Petrie and George Andrew Reisner (1867–1942), an American archaeologist, as well as others, trained and worked with individuals over multiple seasons and several sites. For many, this was a complicated relationship, where respect for skill and training coexisted with demeaning attitudes based on cultural, racial, and social hierarchies. Petrie devoted an entire chapter to managing local staff in his 1904 manual.[91] He writes:

> The effect of selection and training is astonishingly seen on comparing some old hands, who have five or ten years at the business, side by side with new lads. There is as much difference between the fellah and an educated Englishman. A gang of well-trained men need hardly any direction, especially in cemetery work; and their observations and knowledge should always be listened to, and will often determine matters.[92]

This complicated relationship is opportunistic and pragmatic when one considers the aims of archaeological excavation and research. Petrie retained a group of five Egyptians from the local village of Quft with whom he first worked at Lahun in 1888–1890. In an 1892 letter to his wife Hilda Mary Isabel Urlin Petrie (1871–1957), an Irish-born British archaeologist, Petrie explains he valued working with these young men due to their uncomplaining devotion to work, skills in reading and writing, and jovial nature.[93] The Petries continued to use trained Egyptian workmen once they shifted excavations to Palestine in 1926.[94] Many colleagues recognized the manual skills and experience of

89 Sana Ullah, "Notes," 77.
90 Carter, *Tomb of Tut-Ankh-Amen*, xix.
91 Petrie, *Methods*, 20–47.
92 Petrie, *Methods*, 21–22.
93 Margaret S. Drower, ed. *Letters from the Desert. The Correspondence of Flinders and Hilda Petrie* (Oxford: Aris and Phillips, 2004), "13 – 21 November 1891 letter from W.M.F. Petrie letter to his wife Hilda Petrie," 81.
94 Quirke, *Hidden Hands*, 97.

Qufti workpeople, who had a reputation of being reliable and honest.[95] In fact, Quirke's review of Petrie's notebooks and letters indicates that numerous British archaeologists (and others) requested the services of skilled laborers under his employ for their own projects.[96]

Reisner adopted many of the methods described in Petrie's manual, including his reliance on trained local laborers, after he hired Mace, who had previously worked with Petrie at Abydos, and the experienced Qufti workpeople associated with the project.[97] Reisner continued to employ these workpeople in Sudan, where he excavated several cemeteries in 1907.[98] Like Petrie, Reisner's relationships with the native workforce valued their skills but stipulated their work be supervised, stating, "For ten years we have had a skilled Egyptian workman fitting and mending the vessels under the supervision of staff."[99] For both, local skilled laborers, who despiteretaining considerable judgment in the field, were not capable of working independently of project staff, thereby enforcing colonial/imperial hierarchies.[100]

Few archaeologists name and reference members of their native workforce in publication. Fisher and Badè, who each directed projects in Palestine, are an exception. Fisher, who worked with Reisner, engaged skilled Qufti laborers and paid their travel costs to Palestine, including "a native boy trained to this work … [of] fitting and gluing them [pottery] together."[101] He also refers to two Egyptian participants, including Labib Effendi Sorial, an architect, illustrator, and clerk from Luxor, and William Effendi Gad, his assistant from Luxor.[102] Badè, who excavated Tell en-Nasbeh in the 1920s and 30s, also utilized an Egyptian workforce, noting that "several Egyptian restorers who became fairly expert"[103] were instrumental in conserving recovered artifacts. Further, Badè writes, "Two of them, especially Mahmoud Kurayem, have repeatedly been in service since 1926."[104] Whilst Egyptian team members were recognized and valued for their skill, project hierarchies required their supervision by Western team members.[105]

95 Margaret S. Drower, *Flinders Petrie – A Life in Archaeology*, second ed. (Madison: University of Wisconsin Press, 1995), 214.
96 Quirke, *Hidden Hands*, 136.
97 Drower, *Flinders Petrie*, 431.
98 Drower, *Flinders Petrie*, 214.
99 George A. Reisner, "Note on Objects Assigned to the Museum by the Egyptian Government," *Bulletin of the Museum of Fine Arts*, 36, no. 214 (April 1938): 32.
100 Eric H. Cline, *Digging Up Armageddon: The Search for the Lost City of Solomon* (Princeton, New Jersey: Princeton University Press, 2020), 301–8.
101 Cline, *Digging Up Armageddon*, 21; Fisher, *Armageddon*, 17, 36.
102 Fisher, *Armageddon*, 24.
103 Badè, *Manual*, 32.
104 Badè, *Manual*, 32.
105 Badè, *Manual*, 31; Jeffrey R. Zorn, "Tell en-Nasbeh in the 20th and 21st Centuries," in *"As for Me, I Will Dwell at Mizpah …": The Tell en-Nasbeh Excavations after 85 Years*, eds. Jeffrey R. Zorn and Aaron J. Brody (Piscataway, NJ: Gorgias Press LLC, 2014), fig. 1.4.

Effectively for these archaeologists, preservation in the field context built on academic relationships that dictated access to a skilled workforce. Preservation skills transfer was mandated by inherent structures initiated by academic archaeologists from Western backgrounds. Archaeologists settled at the top of project hierarchies, regardless of disparities in technical skill and preservation experience.[106] This effectively siloed skilled Egyptian restorers and curtailed their autonomy and decision-making abilities. Further, it was impossible for members of the native workforce—no matter how experienced and skilled—to fill equivalent roles on expeditions to their Western counterparts.

There are numerous issues with this colonial and imperialistic paradigm of archaeological work that continue to be unpacked by various scholars.[107] One can observe a discernible shift in the construction of hierarchical relationships between archaeological expeditions and local stakeholders in later years, and this is noted by the IMO following the 1937 Cairo conference. Euripide Foundoukidis (1894–1968), an art historian who worked for the IMO, notes these collaborative relationships are key to safeguarding the archaeological record. He states that this "may be a determining factor in the subsequent preservation of the archaeological documents discovered."[108]

**Boundary-work and Boundary Objects**

Disciplinary development during this period is contingent on the social construction of knowledge, skills, and expertise through boundary-work and the creation of boundary objects. Handbooks, manuals, and topic-specific publications co-existed with other boundary objects. These engaged a broader audience and situated preservation in archaeological and scientific spheres of influence. Newspaper reports discussing archaeological finds, as well as exhibitions including conserved artifacts and expedition-produced films, are critical components of this process, which highlighted the expertise and authority of the archaeologist.[109] Proximity and tangible access to the products of preservation activities established conservation as an integral—though often obscured—part of archaeology and science. Whilst archaeologists and scientists were named and visible participants, the work of technicians and native workforces remained mostly anonymous.

106 O'Grady, "Model Conservator," 2.

107 William Carruthers and Stéphane Van Damme, "Disassembling Archeology, Reassembling the Modern World," *History of Science* 55, no. 3 (September 2017): 260–1, https://doi.org/10.1177/0073275317719849; Quirke, *Hidden Hands*, 9–12; Christina Riggs, "Shouldering the Past: Photography, Archaeology, and Collective Effort at the Tomb of Tutankhamun," *History of Science* 55, no. 3 (2017): 340–2, https://doi.org/10.1177/0073275316676282; Shepherd, "When the Hand," 346–67.

108 Foundoukidis, "Introduction," 10.

109 O'Grady, "Mending, Sticking," 87–88; O'Grady, "The Model Conservator," 3–4; Caitlin R. O'Grady, "Waxing Enthusiastic: Transmission and Migration of Consolidation Materials in the Early Twentieth Century," in *Migrants: Art, Artists, Materials, and Ideas Crossing Borders*, eds. Lucy Wrapson, Victoria Sutcliffe, Sally Woodcock, and Spike Bucklow (London: Archetype Publications, 2019), 64; Thornton, "Exhibition Season," 2–3, 7.

Photographic documentation presented carefully constructed images of expertise as Carter, Mace, and Lucas carefully transported and stabilized finds from Tutankhamun's tomb, even as they directed the work of unnamed Egyptian laborers.[110] Similar themes are found in films produced by expeditions.[111] For example, the Metropolitan Museum of Art film documenting excavations at Deir el-Bahri shows American archaeologist Herbert Eustis Winlock (1884–1950) skilfully applying wax to Menkheperre's inner coffin in a field laboratory followed by depictions of anonymous Egyptian laborers packing the coffin for export to New York.[112] Similar scenes depicting mostly unidentified female participants engaged in preservation are also curated in the Wellcome-Marston Tell ed-Duweir expedition films.[113] These images and films magnify the role of archaeologists and scientists as recognizable authorities who controlled and dictated the terms of preservation, whilst anonymising the skilled and obscuring the labor required to achieve it.

## Conclusion

Conservation as a recognizable discipline has its origins in the professionalization of archaeology during the late nineteenth–early twentieth centuries. During this period, preservation gained traction as an ethical mandate implemented by archaeologists and scientists interested in reconstructing narratives of the past. The introduction of new preservation techniques and strategies facilitated presentation of reconstructed archaeological sites and well-preserved artifacts in publication and exhibition. These boundary objects not only fuelled public interest and mania about the past but also solidified experts as visible and anonymised other participants.

Archaeologists and scientists published handbooks, manuals, and topic-specific articles on preservation to share and codify knowledge, as well as make claims of expertise. Further, these established necessary documentation, laboratory, and manual skills, as well as standardised terminology and lexicons used in preservation. Established disciplinary networks ensured that academic colleagues shared their experiences, whilst influencing and inculcating collaborators and students engaged on expeditions. This is particularly evident in the archaeological network that dominated scientific explorations and related preservation work in Egypt during this period. Archaeologists and scientists exchanged information, expertise, and labor within socially constructed boundaries—dominated by disciplinary and colonial frameworks.

Critical assessment of publications from this period provides insight into the complicated relationships archaeologists and scientists had with preservation.

110 Riggs, "Shouldering the Past," 344–48, figs. 1–2, 4.

111 O'Grady, "Gentlewomen," 10.

112 Metropolitan Museum of Art, "Digging into the Past: Egyptian Excavations of the Metropolitan Museum of Art," (Prelinger Archives, ca. 1920s), https://archive.org/details/0998_Digging_Into_the_Past_Egyptian_Excavations_of_the_Metropolitan_01_00_44_21.

113 O'Grady, "Gentlewomen," 9–10; O'Grady, "Waxing Enthusiastic," 63.

Concerted effort is spent building and substantiating the knowledge base underpinning preservation, whilst also drawing boundaries around necessary expertise for engagement. This give and take is evident in attitudes towards how chemical knowledge, laboratory, and manual hand skills were co-opted by either discipline. Tensions exist as archaeologists and scientists bound the scope of preservation achievable in the field when compared to that of better equipped museum laboratories. Ultimately, as preservation problems coincided with specific questions about artifact material identification and degradation, chemists became integral experts. This is illustrated by Sana Ullah's work for the Archaeological Survey of India, as well as the chemists (Lucas, Plenderleith, and Scott) and other specialists engaged by Carter to analyse and preserve artifacts from Tutankhamun's burial chamber. Conflict is also present where preservation actions extend to include practitioners other than archaeologists and scientists. Training initiated and controlled by experts provided a mechanism for skills transfer to a native workforce or family members participating in the expedition. Whilst trained laborers had expertise and their judgment was trusted in terms of the manual aspects of preservation, archaeologists and scientists severely limited the scope of their judgment through existing project and labor hierarchies.

Modern conservation and its intersection with archaeology and science continues to be negotiated. As archaeologists and scientists shifted the bulk of preservation work to an anonymous workforce, they also created a framework where practitioners worked in service of and were supervised by other professionals. This effectively divorced practice from academic and public view – subverting the acknowledged value of the knowledge, expertise, and skills required to stabilize and conserve artifacts for use as data presented in publication and exhibits. Acceptance and recognition of the contributions of conservation is a primary concern for most modern conservation departments in academic or museum institutions. Considered to be expensive in terms of necessary resources and infrastructure, as well as time-consuming in terms of the produced research, conservators are engaged in a constant battle to highlight the relevance and importance of their field. However, shifts towards collaborative research projects in which all participants (conservators, archaeologists, scientists, and other stakeholders) play integral roles has shifted this tide.

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