

The Conservation Practices for Archaeological Ceramics of Sir Flinders Petrie and Others between 1880-1930

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Abstract

Publications by nineteenth-century archaeologists such as Sir William Matthew Flinders Petrie provide important insight into the surprisingly vast range of natural products and recipes used in the field and laboratory to preserve excavated ceramics. The materials used by these professionals, who were responsible for developing the field of scientifically-based archaeology, are contrasted with those used in the contemporaneous ‘menders’ trade. A survey of the available literature, dating 1880-1930, demonstrates that a wide selection of adhesives, consolidants, solvents, acids, and tools was recommended for treating ceramics during this period. A summary of recommended materials and methods for the preservation of ceramics—in particular those recovered from archaeological contexts—is presented in illustrated charts. These provide a comprehensive summary of materials that may remain extant on ceramic collections that underwent treatment during the late 19th and early 20th centuries. This paper advocates for greater attentiveness on the part of the conservator today when examining older collections and considering the retreatment of ceramics collected during this period, as they may encounter residues of these materials.

Introduction

Conservators responsible for archaeological collections have long been familiar with historic ceramic repairs. During an archaeological excavation, pottery is typically found as fragments that require reassembly in order to be studied, cataloged, and displayed in their complete or incomplete vessel form. In general, archaeological collections consist of many vessels in the form of jars, bowls, cups, vases, and other containers because these objects are commonly excavated from ancient habitation sites and have survived well as sherds. Ancient ceramics were rarely repurposed or repaired after their original breakage because it was difficult to restore their original function as a useful container. Thus, when they are excavated, they represent evidence of a particular time, place, and culture. Sherds recovered in the layered strata of an excavation trench could be compared in sequence and dated relatively because forms and styles of manufacture change over time. This tech-

nique of using ceramics to date archaeological deposits is commonplace today, but was first utilized by Sir William Matthew Flinders Petrie in 1890 (Petrie 1899).

The emerging field of conservation and its legacy of intervention by early practitioners of repair are linked, in large part, to the development of archaeology as a scientific discipline, following existing models in geology and botany. Petrie (1853-1942) stands out as a leading figure in archaeology, especially during the last two decades of the 19th century (Sease 2001). Petrie, his colleagues, and his students excavated over 50 sites throughout Egypt, Israel, and Jordan. His techniques of careful digging and full documentation of recovered finds was not ordinary at the time and he influenced many archaeologists working in the Mediterranean region. Petrie’s meticulous record-keeping in the field is reflected in extant recovered materials and his publications. Excavated artifacts are labelled with their exact find spot and notebooks include records

of associated finds, while published volumes include tables, photographs, drawings, and text.

Petrie had a lasting impact on students at the University College London (UCL) where he was a professor from 1892 until 1933 (Drower 1995, pp. 199-230). The excavated collections made by Petrie and the young professionals he influenced are now scattered across the Western hemisphere due to his long career and numerous excavations, and because he rewarded his funders with artifacts. Under Petrie's supervision, archaeologically recovered ceramics were stabilized from a wide range of sites in Egypt, Israel and Jordan. His early career in Egypt (1880-1900) focused on excavations of large architectural complexes, including temples and pyramids, and the ceramics held within them, while his later career there and in Israel and Jordan concentrated on vessels recovered from cemeteries and tombs. The quality and condition of the excavated ceramics were of great importance because he gifted artifacts to patrons, who in turn sold or donated them to other museums. As a result, artifacts recovered under Petrie or his direct supervision can be found in museum collections all over Europe and North America (Stevenson 2014, pp. 95 and Appendix 1).

Perhaps most relevant to the field of conservation is Petrie's concern for the deterioration he observed on excavated artifacts and his commitment to perfecting the use of various materials and techniques for preservation purposes. Particularly noteworthy is the publication of *The Treatment of Small Antiquities* in 1888 and the expanded chapters on preservation and packing in *Methods and Aims in Archaeology* (1904). His numerous publications describe the materials, techniques, and commentary for his approach to the preservation of delicate and fragmented finds. For example, he writes favorably about the use of paraffin wax, tapioca, and shellac (Petrie 1888 and 1904).

Petrie was not alone in recording his observations about deterioration phenomena and developing preservation protocols for use in the field and the laboratory made during his excavations in Egypt beginning in 1880. The dramatic condition changes observed in freshly excavated ceramics and metals (in particular) during archaeological expeditions in Egypt inspired German scientists such as Tischler, Voss, Rathgen and Krause, to investigate these chemical mechanisms and develop new stabilization treatments (Gilberg and Vivian 2001). Efforts to conserve the finds excavated through scientific archaeology "enable[d] objects to be photographed, described, and more particularly packed and transported in safety" (Lucas 1924, pp. 4).

The materials and methods developed for use in scientific archaeology can be compared with those advocated by the longstanding 'menders' trade. The traditional group of practitioners known as 'menders' specialized in the repair of ceramic products including earthenware, porcelain, and bone china (Thornton 1998; Garachon 2010; Albert 2012). In 1896, Charles Godfrey Leland, an American folklorist, traveller, and journalist, wrote during his years in Europe that "a thorough knowledge of this art of repairing, mending, or restoring various objects is of very great value" (1896, pp. vii).

Leland collected recipes from 'menders' and published *A Manual of Mending and Repairing* in 1896 based on his travels throughout much of Europe. Other publications written specifically for 'menders,' dating to the late 19th through early 20th centuries, include those by Ris-Paquot (2010 [1872]); Barthelet (1884); Leland (1896); and Howarth (2013 [1900]). Many of the recipes for artful restorations include natural adhesive products, and materials similar to those used in archaeology. However, as Garachon points out, "the dividing line between repairing and restoring ceramics was often vague, and the two approaches existed alongside each other and sometimes even together... until the 1960s" (2010, pp. 28).

Between 1880 and 1930, ceramics from archaeological sites were analyzed by studying the vessels themselves and noting the size, form, and surface appearance. Archaeologists developed classifications for pottery based on form and size, and the interpreted vessel functions were used to construe how space was used within a site. For archaeologists, ceramics were scientific evidence, and they were not intended to be made functional again. However, for purposes of publication photographs, exhibition and sales, it was often important for vessels to be visually attractive and complete. Thus, a distinction between the process of restoration (loss compensation) and repair (reconstruction) of archaeological ceramics is often hard to discern in field reports and articles published at the turn of the 20th century.

The works of Petrie and his contemporaries can provide important insights for conservators working with older archaeological collections, in particular those excavated and assembled during the late 19th and early 20th centuries. Preservation activities were considered a necessary archaeological endeavor that occurred during and immediately following excavation, as well as part of later analysis and publications phases. As a result, many archaeologists un-

dertook the work themselves using a range of techniques and materials, including waxes, shellac, bitumen, animal glues, and gum Arabic. Lesser-known options such as tapioca and silicate of soda (waterglass) were recommended for use as adhesives, consolidants and coatings.

Later campaigns of treatment executed and documented in collection and museum conservation reports often illustrate a failure to recognize what material had been used previously, or an understanding of why or how earlier interventions were completed. As a result, most retreated ceramics can be characterized by an uneven and incomplete removal of adhesives and fills, often resulting in further damage, as well as a loss of historic information regarding preservation interventions. By exploring the materials used for ceramic conservation during 1880-1930, a better understanding of some of the present conditions observed on ceramic vessels in museum collections is possible.

Drawing on significant experience and expertise working with pottery from numerous archaeological contexts, we reviewed the writings, teachings, and collections of Sir William Matthew Flinders Petrie in order to identify and assess these repair techniques on collections at the Institute of Archaeology, University College London (IoA-UCL). The Tell el-'Ajjul, Tell Fara, and Tell Jemmeh assemblages from Palestine were excavated in 1926-1938 when Petrie was 73-85 years of age and represent the combined work of Petrie, his colleagues, and students. Access to the Petrie collections provided the opportunity to study this era of conservation in considerable depth through comparison of published books, site reports, and articles with conservation laboratory documentation associated with several hundred ceramics. A comparison of the current condition of ceramics to the materials and techniques noted in the surveyed literature from this period can deliver insight to the complete intervention history of archaeological ceramic collections.

Surveyed Literature

Petrie's contribution during this pivotal period in the development of archaeological and ceramic conservation is profound. His 1888 and 1904 works demonstrate a keen eye for recognizing degradation processes and the impact of interventive treatments, while relating both to scientific principles and an understanding of material properties. Petrie's publications and subsequent training of future

generations of archaeologists occurs at the same time that natural and synthetic adhesives (organic and inorganic) begin to be developed commercially (Fay 2005). Along with scientific publications describing mechanisms and patents for adhesive production, a number of technical handbooks describe the physical, chemical, and mechanical properties of adhesives. Sigmund Lehner produced one of the most influential and popular handbooks used by archaeologists and scientists alike, which was published in at least 44 editions between 1877 and 1927 in both German and English (OCLC 2010).

Early publications from this period (Tischler 1883; Petrie 1888; Leland 1896; Rhusopoulos 1905; Petrie 1904; Rathgen 1905; Rhusopoulos 1911; Rathgen 1913a, 1913b; Lucas 1924; Scott 1922, 1926, 1932; Woolley 1930; Delougaz 1933) suggest a number of materials, solvents and techniques were used to stabilize and treat ceramics from archaeological and historic contexts (see figures 1-5). Unsurprisingly, similar materials were used in the preparation of fossil specimens during this period—in particular shellac, gums, gelatin, cellulose acetate and nitrate, as well as a variety of waxes, many of which are referred to in the geological literature as early as the 1830s (Howie 1984, pp. 92-93). These resources would have been available to archaeologists and probably discussed in professional society meetings, suggesting an open discourse. Building on this dialogue, the approach of archaeologists reflects a particular concern for arresting the damaging impacts of saline burial environments, as well as restoration of appearance rather than function.

A survey of the literature identifies a number of materials and methods designed to arrest deterioration due to soluble and insoluble salts. These include the use of paraffin wax as a consolidant during recovery of ceramics or shortly thereafter (Petrie 1904, pp. 88-89, 112; Rathgen 1905, pp. 71, 85; Rathgen 1913b, pp. 163; Droop 1915, pp. 26, 41; Lucas 1924, pp. 19-22, 41, 48, 101; Delougaz 1933, pp. 41-2, 55-7). In addition, authors recommended the use of water for desalination (Petrie 1888, pp. 88; Leland 1896, pp. 28; Rhusopoulos 1905, pp. 254; Petrie 1904, pp. 88; Rathgen 1905, pp. 57-67, 78; Rhusopoulos 1911, pp. 141; Rathgen 1913b, pp. 161; Lucas 1924, pp. 8, 46, 99; Scott 1926, pp. 15; Scott 1932, pp. 490; Delougaz 1933, pp. 52), as well as hydrochloric acid to mitigate against the deleterious effects of salts in ceramic fabrics (Rathgen 1905, pp. 78; Rhusopoulos 1911, pp. 141; Rathgen 1913b, pp. 161; Droop 1915, pp. 41;

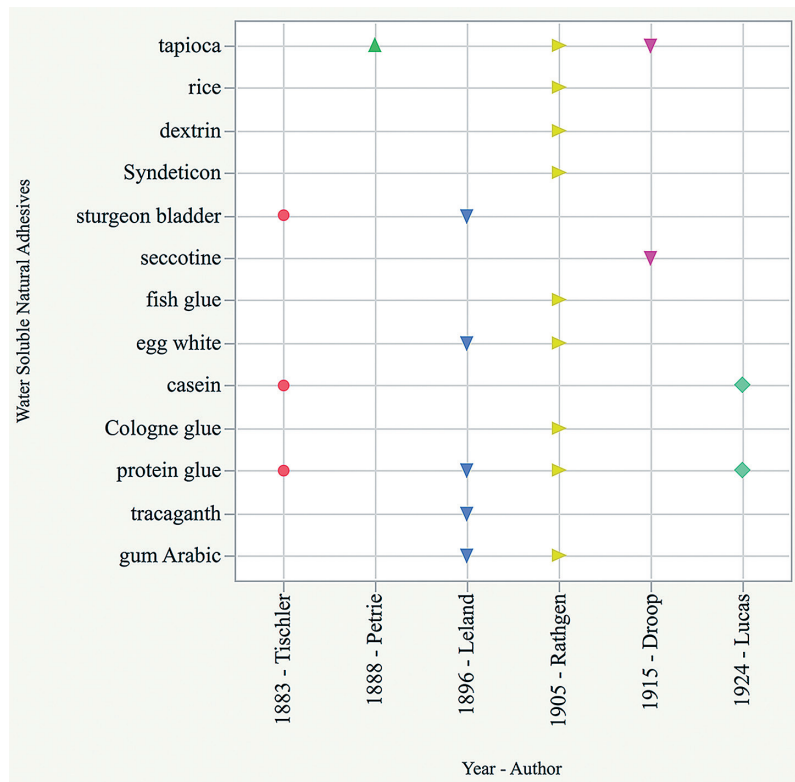


Fig. 1. Water soluble natural adhesives mentioned by surveyed authors as indicated by colored symbols (Tischler 1883 ●, Petrie 1888 ▲, Leland 1896 ▼, Rathgen 1905 ►, Droop 1915 ▼, Lucas 1924 ◆).

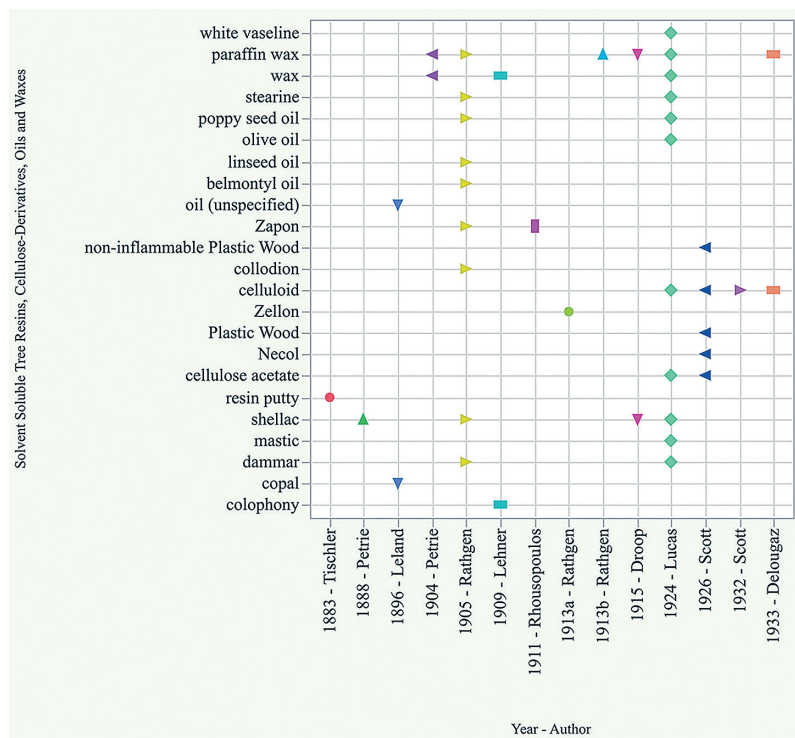


Fig. 2. Solvent soluble tree resins, cellulose-derivatives, oils, and waxes mentioned by surveyed authors as indicated by colored symbols (Tischler 1883 ●, Petrie 1888 ▲, Leland 1896 ▼, Petrie 1904 ◀, Rathgen 1905 ►, Lehner 1909 —, Rhousopoulos 1911, Rathgen 1913a ●, Rathgen 1913b ▲, Droop 1915 ▼, Lucas 1924 ◆, Scott 1926 ◀, Scott 1932 ▶, Delougaz 1933 —).

Lucas 1924, pp. 42, 99-100; Scott 1926, pp. 20-21). Plaster of Paris is frequently recommended as a material for loss compensation (Leland 1896, pp. 13, 17; Rathgen

1905, pp. 88; Droop 1915, pp. 41; Lucas 1924, pp. 18-19, 41, 43, 48, 101; Scott 1926, pp. 62-63; Delougaz 1933, pp. 42). Finally, most publications comment on the impor-

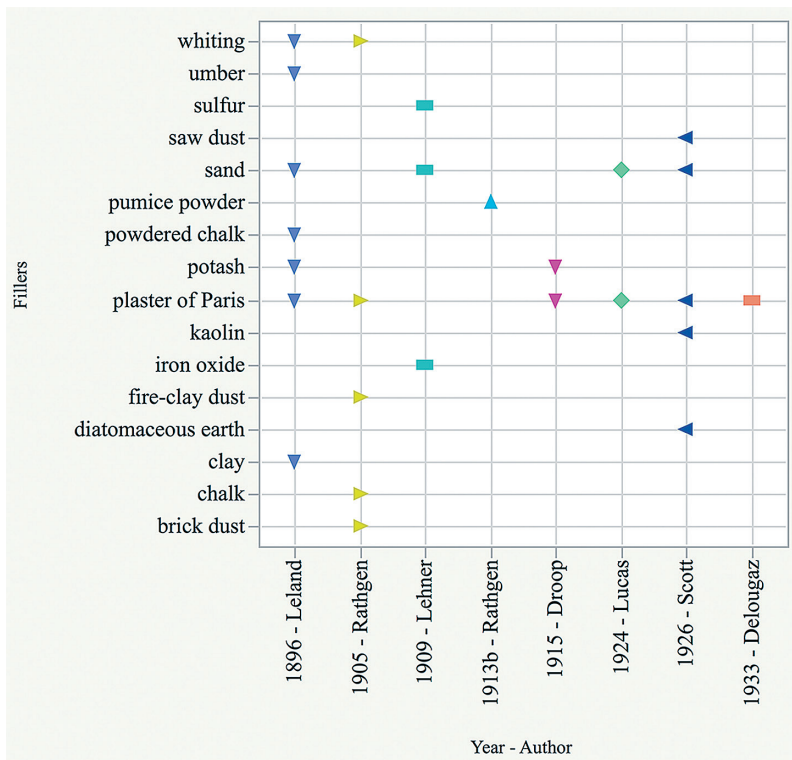


Fig. 3. Fillers mentioned by surveyed authors as indicated by colored symbols (Leland 1896 ▽, Rathgen 1905 ▶, Lehner 1909 ■, Droop 1915 ▾, Lucas 1924 ◆, Scott 1926 ◀, Delougaz 1933 ▶).

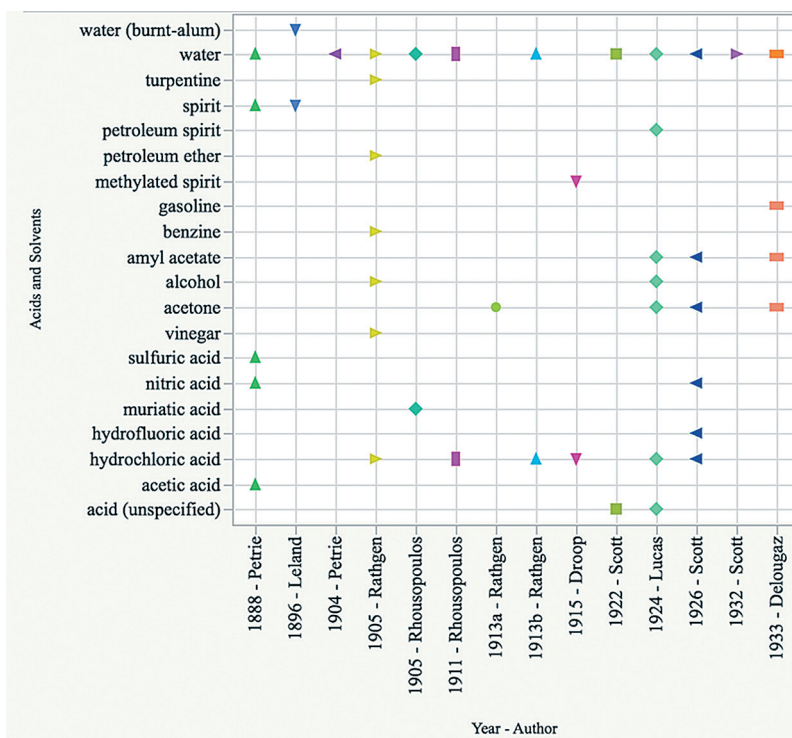


Fig. 4. Acids and solvents mentioned by surveyed authors as indicated by colored symbols (Petrie 1888 ▲, Leland 1896 ▽, Rhusopoulos 1905 ◆, Petrie 1904 ◀, Rathgen 1905 ▶, Rhusopoulos 1911 ■, Rathgen 1913b ▲, Droop 1915 ▾, Scott 1922 ■, Lucas 1924 ◆, Scott 1926 ◀, Scott 1932 ▶, Delougaz 1933 ▶).

tance of stabilizing low-fired clay objects through baking (Rathgen 1905, pp. 83-84; 1913, pp. 162; Scott 1922, pp. 337-338; Lucas 1924, pp. 42, 100; Delougaz 1933, pp. 45-53).

A wider range of adhesives and additives are suggested for consolidation and mending. These include a number of water-soluble proteinaceous glues such as casein, egg white, Cologne (an animal glue made from leather straps)

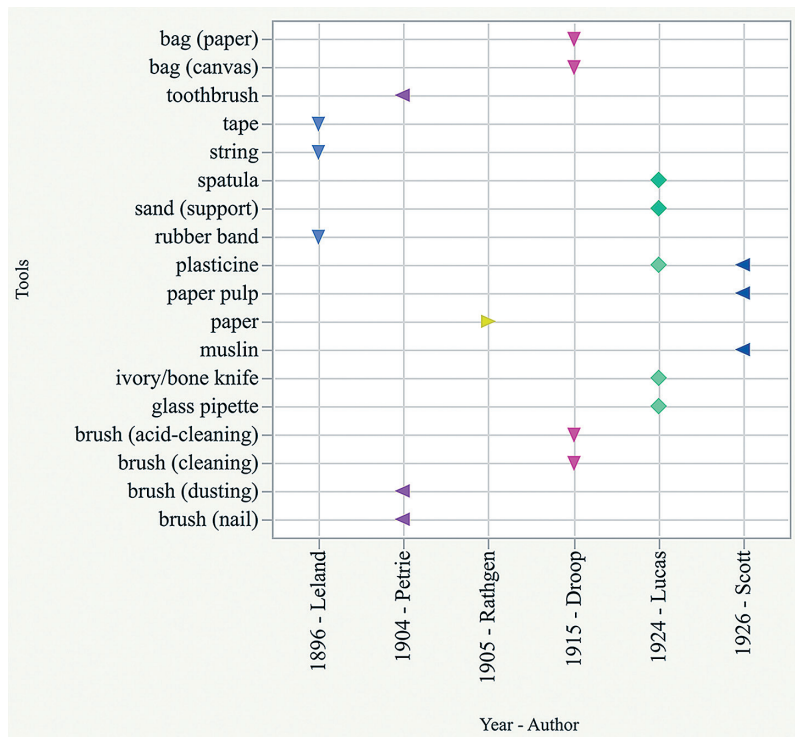


Fig. 5. Tools mentioned by surveyed authors as indicated by colored symbols (Petrie 1904 ▲, Rathgen 1905 ▲, Droop 1915 ▼, Lucas 1924 ◆, Scott 1926 ▲).

(Doerner 1934), fish and hide glues, as well as seccotine (a refined fish glue patented in 1894 by John Stevenson MA) (Room 1982, pp. 156), and Syndeticon [reported as liquid fish-glue (Rathgen 1905, pp. 87) or mixture of burnt lime, sugar and good glue (Leland 1896, pp. 243)] (figure 1). Sugars (gum Arabic, tragacanth), starches (dextrin, rice, and tapioca), and solvent soluble tree resins (colophony, copal, dammar, mastic, and shellac) are recommended, as are a number of waxes and petroleum derivatives (figure 2). The use of synthetically produced adhesives focuses particularly on cellulose derivatives including acetates (Necol, Plastic Wood, and Zellon) and nitrates (celluloid, collodion, non-inflammable Plastic Wood, and Zapon) (figure 2). A number of fillers are included as additives for adhesives, protective coatings, and loss compensation (figure 3).

Surveyed authors also note the importance of a wide variety of acids, solvents, and tools for use with the previously-mentioned materials and techniques, and make specific recommendations for their use (figures 4 and 5). Authors cite problems associated with the purity of solvents available in remote field locations where language barriers may exist and note the deleterious impact of potential contaminants on long-term preservation (Lucas 1924, pp. 129). Notably, most publications acknowledge the difficulty in

sourcing materials for preservation by indicating where materials are easily available in remote locations and discussing in what cases practitioners should ensure the purity of materials and solvents before use in treatment. This attests to an ethic of sustainable preservation. The lists included in figures 4 and 5 might assist current conservation efforts with identifying residues, deposits, or marks left by the use of such acids, solvents, and tools. For example, acids and solvents may have left residues or deposits if they were contaminated or were not thoroughly rinsed after the treatment. Also, tool marks left on the surface of ceramics may suggest the type of adhesive, consolidant, or filler that was once used.

Efforts to identify and understand these early historic interventions can be problematic, particularly if the object has undergone a number of campaigns of repair. However, careful assessment of the object in tandem with primary and secondary sources, including original treatment records and archaeological handbooks, enables the conservator to better interpret the evidence preserved in ceramic objects.

*Survey of Petrie
Palestinian Ceramic Collections
at the Institute of Archaeology,
University College London*

The Petrie Palestinian collections, held by the IoA-UCL, include artifacts recovered from the Tell el-'Ajjul, Tell Fara, and Tell Jemmeh excavations carried out by Petrie between 1926 and 1938 (Sparks and Ucko 2007, pp. 13). Approximately 20,000 objects have served as a study and teaching resource since their acquisition from Petrie in 1935, following his 1934 retirement from UCL. The collection has had a convoluted history and received piecemeal preservation attention until the 1990s when flexible storage and archival support materials were upgraded (Sparks and Ucko 2007, pp. 16-17). Stabilization of artifacts by staff and students began as early as the 1930s following their unpacking, cataloguing, and organization by Dame Kathleen Kenyon, a respected archaeologist best known for excavating Jericho (Sparks and Ucko 2007, pp. 15-16). Unpublished records predominantly take two forms: (a) single entries listing artifacts, their description, numbers, and markings; the owner; the student assigned to complete the work; and dates of intervention; and (b) records of treatment that include day-by-day descriptions of interventive activities.

A survey of the Petrie collections at the IoA was undertaken to determine the condition of conservation treatments made between 1880 and 1930, to observe the range of conservation materials used, and to relate the material identification to possible re-treatment conservation reports made since the 1950s. The following case examples illustrate common observations and demonstrate that the conservators undertaking a re-treatment were generally unaware of the materials likely used in the original treatments.

Object Case Examples

Each object is presented with a chronological summary and interpretation of available archaeological and conservation data, as well as our observations made during a series of inspections. Observations are discussed within the context of the object's complete history, as well as the conservation practices discussed above.



Fig. 6. Ceramic strainer jug, EVII.28/2, Tell Fara Tomb 625 (Photo: authors; courtesy of UCL Institute of Archaeology).

1928-30 Field Record: EVII.28/2, Tell Fara Tomb 625, ceramic strainer jug (figure 6)

2015 First Examination: Vessel is complete with localized surface darkening associated with applied surface paint, sherd repair to rim.

Treatment Documentation: None.

2015 Second Examination: Under ultraviolet (UV) light, the surface absorptions suggest possible use of wax as consolidant.

Discussion: Petrie advocated the use of wax in the field to stabilize delicate/painted surfaces. Examples examined in the Petrie Museum of Egyptian Archaeology collections at UCL have applied surface wax. The use of this material to consolidate paint is consistent with a field treatment from 1928-30 and is probably a repair from that time.

1930-1934 Field Record: EXII.6/6, Tell el-'Ajjul Tomb 1406, ceramic piriform juglet (figure 7)

2015 First Examination: Vessel appears is nearly whole and reconstructed with complete toned loss compensation fills.



Fig. 7. Ceramic piriform juglet, EXII.6/6, ceramic piriform juglet, Tell el-'Ajjul Tomb 1406 (Photo: authors; courtesy of UCL Institute of Archaeology).

1976 Treatment Documentation: Old joins reversed with acetone; washed with warm water and Lissapol; form reconstructed and sherds adhered with HMG cellulose nitrate adhesive; gaps filled with plaster and toned with water-soluble colours.

2015 Second Examination: Under UV light, the surface and joins have no fluorescence.

Discussion: The smoothed edges of the sherds are consistent with many repairs made in the 1880-1930 period and the dark staining suggests a previous adhesive. The reversal of 'old joins' using acetone suggests a solvent soluble adhesive, while the use of warm water indicates a water soluble adhesive was present. Cellulose nitrate was known and used in 1930-1934, but Petrie generally employed natural products for conservation. It seems likely that if cellulose nitrate was used in 1930-1934, some fluorescence would



Fig. 8. Ceramic double handled juglet, EXIV.4/5A, Tell el-'Ajjul Tomb 1074 (Photo: authors; courtesy of UCL Institute of Archaeology).

be visible with UV light. The use of both warm water and a detergent for cleaning in 1976 suggests that a water-soluble adhesive such as hide glue had been used in 1930.

1930-1934 Field Record: EXIV.4/5A, Tell el-'Ajjul Tomb 1074, ceramic double handled juglet (figure 8)

2015 First Examination: Vessel is incomplete with sherds adhered, loss compensation, a recessed and toned fill, and a locked-out associated piece is stored with it. There is an extraordinary amount of surface damage suggesting that cleaning techniques were very aggressive.

1979-1980 Treatment Documentation: Old adhesive reversed with acetone; during desalination, a white surface coating swelled with suggestion that soluble nylon may have been used in previous treatment. The film was removed successfully with industrial methylated spirit and cotton wool; reconstructed with HMG¹ cellulose nitrate; gaps filled with AJK dough² toned with Cryla colours.

2015 Second Examination: Under UV light, the surface and joins have no fluorescence.

Discussion: The smoothed edges of the sherds are consistent with many repairs made in the 1880-1930 period.

The need to reverse the old adhesive in acetone suggests a solvent soluble adhesive had been present, however the use of warm water suggests a water soluble adhesive was present and more likely, especially since the detached sherd edge did not fluoresce. The appearance of the swelling white surface coating during desalination suggest a wax was present because it was soluble in methylated sprit and would be consistent with a Petrie treatment. It is not clear why there is the suggestion that Soluble Nylon had been used previously. There is an extraordinary amount of surface damage to the vessel suggesting that cleaning was very aggressive.

Conclusion

The materials and techniques of earlier repairs and restorations can provide conservators with important insights regarding accepted techniques and materials used in conservation practice in the early 20th centuries to a contextual time and place. As the conservation discipline has professionalized, many conservators have argued that previous repairs are part of the objects' history. We suggest that knowledge of earlier conservation methods and materials is important in documenting object history and agree that documenting the previous restoration history is necessary background for new conservation treatments.

Although the materials used in conservation treatments have changed considerably since the 1930s, a careful study of early publications from the late 19th and early 20th centuries provides evidence that the majority of techniques that were developed for the preservation of archaeological artifacts during this early period remain in use today. These publications illustrate a burgeoning sense of responsibility for the long-term preservation of artifacts, and demonstrate significant initiative and invention on the part of the authors to meet these aims.

Our discussion and tables provide further understanding of the beginnings of the conservation of ceramics in archaeology. We advise that the residues of all post-archaeological treatment be interpreted and documented by conservators as part of any re-treatment process. Many early treatments found on archaeological ceramics excavated at the time of Petrie and his contemporaries represent an important legacy in both conservation and archaeology.

Notes

1. HMG is the proprietary name used by H. Marcel Guest, England to produce cellulose nitrate (Selwitz 1988, pp. 57).
2. AJK Dough refers to a fill material comprised of Alvar (polyvinyl acetal), jute flock and kaolin powder mixed with solvents developed in the 1960s by Ione Gedye at the Institute of Archaeology, University College London (Fulcher 2014, pp. 32).

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