

## New Conservation education and research roles for a Cypriot pottery collection

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### Abstract

The Cypriot Collection at the University of Melbourne has traditionally been used as a reference collection in the training of archaeology students and for archaeological research. More recently the collection has been used for exhibition display and is electronically available as part of a Virtual Museum on-line database project. Now within the field of cultural materials conservation there is a new research role for the Cypriot Collection. A particular feature of many of the reconstructed vessels in the collection is that most have old repairs, which are failing, making vessels unavailable for exhibition. Since the advent of the new postgraduate course in cultural materials conservation, which commenced in 2004, the collection is being used to train conservation students using a 'Problem Based Learning' model. Teaching conservation involves facilitating a reflective practice, where students are required to explain and justify their decisions and evaluate their own conservation work and that of others. Treatments involve reversal of old repairs, desalination and re-integration using conservation grade adhesives. In addition, the Cypriot Collection has featured in an Australia Research Council Discovery Project, which has surveyed the collection to test an adhesive identification methodology, assess adhesive performance observed on the vessels and make recommendations regarding the use of adhesives on archaeological pottery. This paper will illustrate how the use of the Cypriot Collection has evolved over time, and how the conservation of objects complement research into adhesive testing methodologies, potentially altering decision

frameworks and the types of adhesives used on archaeological pottery.

## New Conservation education and research roles for a Cypriot pottery collection

The University of Melbourne has one of the most significant collections of Cypriot antiquities in Australia (Sagona and Zimmer 1988, Salter 2008). Representative of the human history of a strategically important island Cyprus in ancient times, it comprises an impressive range of Bronze Age and Iron Age artefacts dating from the late third millennium BCE to the fourth century CE. The Collection is largely the legacy of the late Professor James Stewart, Professor of Middle Eastern Archaeology at the University of Sydney, and director of the Melbourne Cyprus Expedition. Between the late 1930s and his untimely death in 1962, Professor Stewart conducted three excavation seasons in Cyprus, and, during these visits, purchased many vessels from Cypriot antiquities dealers and from the reserves of the Cyprus Museum in Nicosia (Salter 2008). Sponsors such as the eminent Melbourne businessman, Walter Beasley, who founded the Australian Institute of Archaeology (AIA) in 1946, financed the removal of artefact assemblages from Cyprus to Australian universities, museums and other institutions (Salter 2008). In 1987 the university purchased over 200 objects from the AIA, which had been excavated by Stewart, supplementing its already important collection. This purchase enhanced the Cypriot pottery collection acquired in 1972, thus forming an almost complete sequence of ceramic development from the island of Cyprus spanning some two and a half millennia (Sagona and Zimmer 1988, Salter 2008). Pottery is the dominant medium represented in the University of Melbourne's Cypriot Collection, which also includes stone, bronze and copper artefacts.

### Archaeological Context at the University of Melbourne

Closely following the 1987 purchase from the AIA, the first exhibition of this now comprehensive collection, *Images of the ancient world: archaeology at the University of Melbourne*, was shown in the Westpac Gallery of the Victorian

Arts Centre, in Melbourne from 20 October to 6 November 1988. Organised by the university's Department of Classical Studies, in collaboration with the School of Art and Design, of the Chisholm Institute of Technology, the exhibition was accompanied by a publication edited by Sagona & Zimmer (1988). A decade later, The Virtual Museum Project aimed to transform teaching, research and public education in Classics and Archaeology and related areas by opening up access to the University's valuable collections of antiquities using state-of-the-art technology. The outcomes were significant: A fully searchable on-line catalogue (created October 1999), the first comprehensive documentation of the Classics, Cypriot and Near Eastern Collections; images at three resolutions; object movies; and various publications, including a catalogue of over 100 Cypriot objects (Salter 2008). Coinciding with this initiative was the opening of the Ian Potter Museum of Art (IPMoA) building in 1998. By April 2001 the Cypriot Collection was moved to the new Classics & Archaeology on-site store in the Classics & Archaeology Gallery, which opened at the IPMoA in April 2001.

It took more than nine years after the death of Peter Connor, curator of the Classics & Archaeology collections from 1965-1996, for a new curator, Andrew Jamieson, to be appointed to the Classics and Archaeology Collection. As the inaugural RE Ross Trust Curator, Jamieson curated, *The ancient Near East, Egypt, Greece and Rome: selected works from the Classics and Archaeology Collection*, (25 February – 27 August 2006). Its opening coincided with the re-opening of the IPMoA in February 2006. A year later the exhibition, *Cypriot antiquities*, (5 September 2007 – 16 March 2008), was dedicated to the Cypriot collection (Nel & Jamieson 2008). This exhibition presented key works covering the main historical periods of ancient Cyprus, primarily illustrated by stylistic developments in the ceramic record. This coincided with the publication of Salter (2008), *Cypriot Antiquities at the University of Melbourne*. While the collection had long been part of ongoing research interest by archaeologists from other academic institutions such as B. Hennessy, K. Eriksson, D. Frankel and J. Webb (Salter 2008), Andrew Jamieson's curatorship and with the facilitation of Holly Jones-Amin, a

conservator with an archaeological background, teaching into Masters by Coursework in Cultural Materials Conservation, a new collaborative role emerged for the collection.

### **Materials Conservation Context at the University of Melbourne**

Masters level conservation training and post-graduate research programs in cultural materials conservation were developed at the Centre for Cultural Materials Conservation at the University of Melbourne, in response to the closure of the University of Canberra Conservation of Cultural Materials undergraduate course in 2002. Established in 2004, as a joint initiative of the Faculties of Arts and Science and the Ian Potter Museum of Art, the Centre was envisaged as providing unique interdisciplinary collaborations in teaching and research. As a practice-based learning (PBL) experience subjects in the Masters by Coursework comprise both theory and practice. Students undertaking conservation treatment subjects are introduced to the philosophy, ethics, materials and techniques used in the interventive conservation of artefacts. The PBL methodology emphasizes an ability to analyse, identify, describe and explain conservation problems; propose, explain and justify appropriate intervention treatments; and review and revise methodology during treatment (Jones-Amin & Scott 2005). Objects for student treatment and research programs are drawn from the vast collections of the University of Melbourne. To date students have fully conserved / restored four pottery vessels in the Cypriot collection and initiated ongoing research into the collection. The collection is also used in the Centre's Graduate Certificate in Art Authentication.

### **Initial research conducted on the Cypriot collection**

In 2005 the Cypriot collection featured as a minor thesis research project undertaken by Dr Petronella Nel (2005) as part of the requirements of the Masters by Coursework (Cultural Materials Conservation). The project focussed on six vessels, MU nos 1972.0121, 1987.0179, 1987.0194, 1987.0259, 1987.0291, and 1987.0308 (Figure 1) and aimed to clarify their

conservation status in terms of stability for research and display purposes. Various issues were identified, and included: the presence of salts and concretions; fragile surfaces and fabrics; the possible presence of organic residues in untreated vessels, failing adhesives damaging break edges; structural weaknesses; loss areas; and past reconstructions (Nel 2005, Nel & Jamieson 2008). However more significantly, it was recognised that old repairs on the vessels, for which there were no treatment records, would provide insight into earlier archaeological conservation practices and adhesive performance. An analysis methodology, based on visual observation, ultra-violet (UV) fluorescence, solubility tests, chemical spot tests and exploratory Fourier Transform infra-red (FTIR) analysis, was used to tentatively identify adhesive samples that were removed from three of the vessels (Nel 2005, Nel 2007). Experiments involved acquiring control adhesive samples and conducting control tests on these samples. A review of conservation research literature indicated that acetone reversible adhesives, commonly recommended by the conservation profession, were likely to form the basis for adhesives found within the Cypriot Collection. These are cellulose nitrate (CN)-based, poly(vinyl acetate) (PVAc)-based and the acrylic Paraloid B72 (Sease 1994, Cronyn 1990).

The examination and identification of adhesive samples located on artefacts, allows an assessment to be made of adhesive performance. In this study CN based adhesives associated with vessels, clearly illustrated the controversy that surrounds the use of CN based adhesives. CN based adhesives are popular due to their ease of use, good working properties, rapid drying to form a strong film, solubility in acetone and high glass transition temperature (T<sub>g</sub>) of ~50°C, making these adhesives suitable for use in hot climates. However, they also yellow, dry out and become brittle with age (Buys and Oakley 1993, Horie 1987, Sease 1994). Access to in-situ aged samples, provided by the Cypriot collection enabled the documentation of these issues. This has provided invaluable illustrative case studies (Nel & Jamieson 2008, Nel 2009) for the conservation and archaeological professions (Figure 2). For example, it is now possible to show within the collection, evidence that the proposed limited

lifespan of 6-20 years which should be anticipated for this adhesive (Horie 1987) is in fact correct. Further investigation showed that one brand of CN-based adhesive Tarzan's Grip had undergone a formulation change in 1997 making it no longer appropriate for use in reconstructing pottery vessels, as the new formulation is not reversible with solvent (Nel 2005, Nel & Jamieson 2008, Nel 2009). Poly(vinyl acetate)-based and acrylic adhesives do have good ageing properties, with an anticipated lifespan of more than 100 years (Horie 1987). However due to low T<sub>g</sub>'s of ~30-40°C, these adhesives tend to soften in hot conditions (Sease 1994), causing several vessels in the collection to sag or joints to fail entirely (Nel & Jamieson 2008). As a result they are of limited use in the field, and perform best in a controlled environment. However manufacturers have attempted to compensate for this, with for instance the brand UHU-all purpose, a poly(vinyl acetate) based adhesive where CN has been added to raise the product's T<sub>g</sub> (Nel 2005, Nel & Jamieson 2008, Nel 2009).

A section of the 2005 minor thesis research included conducting chemical spot tests on a control set of adhesives. A surprising discovery was made from this simple investigation. It appeared that the HMG brand of the acrylic conservation grade adhesive Paraloid B72, possibly contained an additional resin (Nel 2005). In order to clarify this finding, CSIRO supported further investigations by the student in 2006 and the University of Melbourne commenced supporting the research in 2007, the results of which will be discussed a little later. A successful ARC Discovery Grant application (Sloggett, Sagona and Lau, with Nel as Research Associate) resulted in significant funding (2008-2010) to develop analysis and assessment protocols for adhesives used on archaeological pottery. The rationale for this grant was to enable conservators to better identify adhesives used on pottery, assess performance, and identify formulation changes when they occur. A case study demonstrated how a survey of the collection provided important outcomes for the conservation profession.

### **Conservation research into adhesives used on archaeological pottery**

An important aspect of conservation training is linking scientific analysis with conservation questions. Numerous analytical techniques were used to definitively identify that the additional resin present in the HMG brand of the acrylic conservation grade adhesive, Paraloid B72 is CN. Although the formulation change occurred in 1995, it was not reported until recently by Nel & Lau (2009) once the assessment had been completed on adhesives in the Cypriot Collection. This finding highlights the need for conservators to be vigilant about monitoring formulation change in commercial products. Paraloid B72 is commonly used due to its thermoplastic properties, clear white appearance, good long-term ageing properties and solubility in acetone (Horie 1987, Buys and Oakley 1993). The introduction of CN into the formulation by the manufacturer (HMG), reflects the ongoing search to improve working properties and to elevate glass transition temperature ( $T_g$ ) of  $-40^\circ\text{C}$  to reduce the risk of softening and slumping at high temperatures. However this may have compromised the conservation related performance of the adhesive. Further investigation is underway to assess this possibility.

From a comparison of different FTIR instruments and methods of sample preparation (Derrick, Stulik & Landry 1999; Nel et al. 2007) a methodology was devised for removing micro samples of adhesive and to measure infrared spectra using a small portable FTIR unit (rented for a week), which enabled analysis of the vessels in their museum storage space where the collection is housed. A survey in early 2009, of 164 adhesive samples used on 146 vessels in the Cypriot pottery collection, identified the use of the following polymers (Nel, Lonetti, Lau, Tam, Sagona, & Sloggett 2010): CN (67%), PVAc (23%), and acrylic (3%). In addition, protein based glues (1%) and polystyrene (PS) (3%) an unexpected result, were identified. It was also demonstrated that visual based identification of adhesives is unlikely to be consistently accurate. Analysis of a Kylix vessel (MU no. 1987.0181) for which the 2006 treatment is discussed below (Figure 3) was of interest, as adhesive samples removed, were not retained for analysis purposes. Despite this, a small residue of the old adhesive was found on the vessel and identified to be CN. In addition,

although applied very neatly, a sample of the new adhesive used by the student to re-assemble the vessel was found, and the exact brand of Paraloid B72 used, identified.

### Conservation treatments by students

Apart from research, the collection forms the basis for other challenging student conservation projects undertaken as part of the Conservation Assessment and Treatment subject in the Masters by Coursework (Cultural Materials Conservation). In 2006, a Kylix vessel (MU no. 1987.0181) (Figure 3a) was selected for conservation treatment by Kate Shepherson because the surface was being disrupted by salt formations, the result of soluble salts migrating to the surface, crystallising and lifting surface decoration and ceramic material from the main body. These salts were removed, in order to prevent further damage to the ceramic and to allow the decorative elements of the vessel to be viewed clearly. Exterior water-soluble salts were removed by immersing the vessel in a water tank over a period of nine weeks, with fresh changes of water two to three times per week. Interior water insoluble accretions were physically removed. Joins were pulled apart, with the aid of acetone and old yellowed brittle adhesive film residues were physically removed from the surface and join edges. The desalinated vessel was re-adhered with Paraloid B72 (Figure 3b) (Shepherdson 2006, Nel and Jamieson 2008).

In 2009 two incomplete Red Polished Ware Cypriot vessels: a milk bowl (Figure 4a-b) and an amphora (Figure 5a-c), were conserved by Zoran Kilpa and Carmela Lonetti respectively. A comparison of photographic evidence taken at the time of excavation with photographs produced recently indicate that several pieces of the milk bowl are either lost or have been misplaced (Figure 4a). Due to the low-fired amphora (Figure 5c) having a fragile slip and being powdery in nature, no aqueous based interventions could be introduced to the vessel. The above-mentioned survey of the collection (Nel et al. 2010) determined that CN and PVAc have been used to repair the milk bowl and CN has been used on the amphora. Acetone was used to disassemble and remove old adhesive repairs from the milk bowl. In relation to the amphora, highly visible stains

due to the application of adhesive tape that was never removed after the joins had set (Figure 5a) were reduced, dramatically improving the appearance of the interior (Lonetti 2009). In addition adhesive residues were removed using acetone (introduced via a vapour chamber and later direct application) and mechanical methods and an insoluble carbonate based salt was mechanically removed. Both vessels were reconstructed using Paraloid B72 (Rohm & Haas): 10% w/v to consolidate edges and 40% w/v for adhesion (Figures 4b & 5c). In view of the adhesive research being conducted by the Centre for Cultural Materials Conservation (CCMC), both students retained samples of the adhesives removed, for future analysis.

In 2010, an almost complete Bichrome Ware jug (Figure 6a), was selected for conservation treatment by Lauren Stragalas. Although the adhesive was in excellent condition, care was required when removing aged adhesive residues due to the presence of surface paint decoration. In order to obtain intact adhesive samples from the vessel for analysis and research purposes and to assist the decision framework process, new methods of adhesive removal, and a forensic grid methodology were proposed (Figure 6b). The 2009 survey of the collection (Nel et al. 2010), identified poly(vinyl acetate) on the vessel. However, when investigated in more detail, it was thought that an additional adhesive was present that had not been identified when the collection was surveyed in early 2009. During adhesive removal, using acetone (vapour chamber and later direct application), it was found that one join could not be released. This was, later found to be a aged protein based glue, which is soluble in warm water, and it was removed with the application of hot steam (Figure 6c). Samples were retained for future analysis, as building up an adhesive identification database will assist substantially with future identification. The vessel was reassembled using Paraloid B72 (Rohm & Haas): 5% w/v to consolidate edges and 20/40% w/v for adhesion.

### **Future conservation research and training**

A portable FTIR unit was recently purchased by CCMC. This new piece of analytical equipment

will provide students with more reliable data to aid treatment decisions and further research into old adhesive repairs associated with archaeological pottery collections. In addition preliminary work has commenced at the Australian Synchrotron Beamline Infrared microscope facility, to analyse adhesive films removed from vessels in order to characterise deterioration processes. This research is of ongoing value to University of Melbourne collections, the conservation profession, and for the future study and treatment of ceramic antiquities.

### **Conclusion**

The use of the Cypriot pottery collection has evolved from its initial use as a reference collection for archaeological research and training. With the opening of the Classics and Archaeology Gallery access is being provided to the public through exhibitions and the online electronic database and to students and researchers in the Centre for Cultural Materials Conservation for research and treatment. As part of their training, students have conserved four vessels that can now be displayed for exhibition and interpreted more clearly. In addition, a sustained research program analysing old adhesives repairs has provided new information for the conservation profession into the use of adhesives on archaeological pottery. This interdisciplinary collaboration between archaeology and conservation has proved to be of ongoing value for the University of Melbourne collection, the conservation profession, and more importantly for the study and treatment of ceramic antiquities into the future.

**This paper has been independently peer-reviewed.**

### **Acknowledgements**

The authors wish to thank the following: Deborah Lau from CSIRO for providing access to scientific analysis support; Jay Miller and Robyn Hovey from the Ian Potter Museum of Art, for providing access to the Cypriot pottery collection; the Centre for Cultural Materials Conservation for providing access to the CCMC adhesive reference collection; Koman Tam from Biolab (Aust) Pty. Ltd. for providing access to the Bruker Alpha-P

diamond FTIR spectrometer and for providing support with the operation of the instrument; and Kate Shepherdson, Alex Kilpa, Carmela Lonetti and Lauren Stragalas, students of the Masters by Coursework (Cultural Materials Conservation) program at CCMC, for contributing photos of their treatments. We thank the University of Melbourne Arts Faculty and the Australian Research Council (ARC) for financial support of this work.

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