Institution: Imperial College London

Unit of Assessment: 8 Chemistry

Title of case study: C5 - Impact of research on the solvent effects on East Asian lacquer by Imperial College chemistry department on the conservation of decorative art objects

1. Summary of the impact (indicative maximum 100 words)

A model of collaborative research excellence describes the work led by Imperial College on the conservation of the Mazarin Chest. Renowned as one of the finest pieces of Japanese export lacquer in the world, the Mazarin Chest is viewed by over 3 million people per year in London's V&A museum. Its preservation has allowed it to travel and culturally enrich global audiences, most recently at exhibitions in USA and Japan. The research on the solvent effects on the preservation of Asian lacquerware is universally recognized as changing the working practice of conservators and curators and is now well established in the teaching and mentoring of heritage organisations around the world.

2. Underpinning research (indicative maximum 500 words)

The original underpinning research quantified the polarity (i.e. solvent-solute interactions) of various solvents. It was carried out within the Imperial Chemistry Department in 2001-2002 by Dr (now Professor) T. Welton, Imperial PDRA P. A. Salter (EPSRC, 2000-2002) and three Imperial College students, L. Crowhurst, P. Mawdsley (both EPSRC DTA funded) and J. M. Perez-Arlandis (EPSRC DTA CASE studentship with Kodak) within the Imperial Chemistry Department. This research produced the 2003 paper '*Solvent-solute interactions in ionic liquids'* by Crowhurst et al. [1] which formed part of the citation for Prof Welton's 2007 RSC Sir Christopher Ingold Lectureship.

The paper describes solvent-solute interactions in ionic liquids and molecular solvents and how alternative methodologies give different results, demonstrating the importance of the solute in determining the observed solvent effects. This is an important consideration for understanding how solvents interact with any given material's chemical structure. This is a vital consideration when using solvents in conservation treatments.

In 2004 this paper brought Prof Welton's research to the attention of Shayne Rivers, a senior conservator in the conservation department of the Victoria and Albert Museum, London, a UK non-departmental public body funded by the Department of Culture, Media and Sport and the world's largest museum of decorative arts and design. Ms Rivers was co-managing a V&A project to conserve the Mazarin Chest, the most important example of Japanese export lacquer in the world, with an estimated value of £10-15 million. This object, the centrepiece of the V&A's Japanese collection, had been removed from display in 1999 due to its damaged and unstable condition. It had become clear that knowledge of the solvent effects on Asian lacquer was insufficient to allow the Chest to be cleaned without significant risk of permanent damage to, or loss of, the decoration, where most of the aesthetic, historic and technical value of this unique object is located. Ms Rivers contacted Prof Welton to ask him to assist her.

As a result, in 2005 Prof Welton and Ms Rivers established an AHRB funded Collaborative Doctoral Award entitled 'Conserving Tangible and Intangible Cultural Heritage: Removing Degraded Western Varnish from photo-degraded Japanese Lacquer' [G1]. This was designed to guide Ms Rivers' conservation practice by using quantitative scientific evidence of the effects of solvents on these materials to identify whether, and if so which, solvent treatments have the potential to remove degraded western varnish without damaging underlying photo-degraded Japanese Lacquer. The research was carried out from 2005-8 in the Imperial Chemistry Department with joint supervision by Chemistry Department staff (Prof. T. Welton and Dr – now Prof – M. Shaffer), V&A curatorial (Dr R. Faulkner) and conservation (S. Rivers) staff.

Key findings of this research were presented at an international conference in 2009 [2] and

published in English and Japanese in 2011 [3]. The Imperial research provided detailed information on the swelling and leaching effects of a range of solvents used by conservators when cleaning and stabilising Asian lacquer during conservation treatments. It established, for the first time, which solvents could be used without causing damage to Asian lacquer and the risks involved if less benign solvents were required. It also emphasised that due to the kinetics of the swelling process, the technique used by the conservator may be as important as solvent choice, reinforcing the inextricable inter-relationship between chemistry and individual conservation practice.

3. References to the research (* References that best indicate quality of underpinning research)

[1] *L. Crowhurst, P. R. Mawdsley, J. M. Perez-Arlandis, P. A. Salter, T. Welton, '*Solvent-solute interactions in ionic liquids'*, Phys. Chem. Chem. Phys., 5, 2790-2794 (2003). DOI, **351 citations (as of 1/7/13)**.

[2] *T. Welton, '*Solvent effects on East Asian lacquer'*, Lecture presented at 'Crossing Borders - The Conservation, Science and Material Culture of East Asian Lacquer' Conference, Victoria and Albert Museum, 30-31/10/09. [N.B. This was a (sold out) conference attended by an international audience of 150 conservators, curators and students].

[3] *Carolyn McSharry, Rupert Faulkner, Shayne Rivers, Milo S.P. Shaffer and Tom Welton, *'Solvent effects on East Asian lacquer (Toxicodendron vernicifluum)*', in S. Rivers, R. Faulkner and B. Pretzel (eds), 'East Asian Lacquer: Material, Culture, Science and Conservation', London, Archetype Publications, ISBN: 9781904982609 (2011). [N.B. Publication of this peer reviewed dual language publication was funded by the Getty Foundation.]

Grants:

[G1] Arts and Humanities Research Board Collaborative Doctoral Award (CDA), **'**Conserving Tangible and Intangible Cultural Heritage: Removing Degraded Western Varnish from photo-degraded Japanese Lacquer', 2005-08, PI: Prof T. Welton, award covered Imperial fees for three years, plus £14,500 per annum maintenance.

4. Details of the impact (indicative maximum 750 words)

The impact of the Imperial College Chemistry Department led research on solvent effects on east Asian lacquer has been significant and far reaching.

Impact on the V&A

It allowed accurate risk-benefit analysis that underpinned the use of solvents for cleaning, removal of degraded Western varnish and consolidation of the light-damaged surface of Mazarin Chest [A]. Treatments based on this research stabilised this object for an estimated 50-100 years and allowed it to travel to exhibitions in Japan and the USA in 2008-9, with combined attendances of more than 200,000 (Kyoto National Museum >67,000; Suntory Museum of Art, Tokyo >36,000; J. Paul Getty Museum >100,000) [B]. The promotional material for the Getty Museum visit, 3/3/09-24/5/09, described the conservation treatment as having been *"Backed by thorough scientific and art historical research*" [C, p4 of exhibition brochure]. In October 2009 the Chest was returned to permanent display in the V&A's Toshiba Gallery of Japanese Art to coincide with the staging of the international conference, 'Crossing Borders: The Conservation, Science and Material Culture of East Asian Lacquer' [2]. There were around 3,000,000 visitors to the V&A in South Kensington in both 2012/13 and 2011/12 (the V&A does not count visitor numbers to individual permanent galleries).

The V&A is home to one of the most significant collections of Japanese lacquer in any Western collection. It is also home to smaller collections of Chinese, Korean, Burmese and Thai lacquer. The knowledge and experience gained though the collaboration with Prof Welton and the Imperial Chemistry Department have been applied to all subsequent conservation treatments of East Asian lacquer at the V&A [D]. The beneficiaries of this impact were the V&A and its audiences (UK and international) through improved preservation and presentation of East Asian lacquer objects that form part of the UK national art collection.

Impact on the British Museum

The research on the solvent effects on East Asian lacquer has also had an impact on the conservation department at the British Museum. The British Museum has 3,245 objects in its collection that are catalogued as containing a variety of lacquer, many of which had been waxed or recoated prior to their donation. The museum testifies that (i) the "*research undertaken at Imperial College in collaboration with the V&A, published in East Asian Lacquer: Material Culture, Science and Conservation in 2011, has been crucially important in outlining the possible effects of a variety of solvents on these coatings and on the lacquer", (ii)* it has *"proved to be an excellent reference point*" and (iii) is always recommended as required reading before students approach the cleaning of a lacquer object [F]. In conjunction with the museum's own increased awareness of the material history of their collections, "*the work undertaken at Imperial College in collaboration with the V&A has changed the way [they] clean East Asian lacquer*" [F].

Impact on UK and international curation and conservation of East Asian lacquer

Imperial College Chemistry Department undertook a survey of conservators, curators and scientists in May-June 2013 to assess the impact of Carolyn McSharry and Prof Welton's research into the solvent effects on East Asian lacquer [E]. The survey was posted on 11 May 2013 on the *Conservation Distlist*, which includes conservators from several specialities, scientists, curators, archivists, librarians and academics from a number of disciplines; the survey was also posted on the more specialised *Lacquer Distlist*.

Reach of solvent research impact: There were more than 100 respondents of whom 80% identified themselves as curators or conservators working with East Asian lacquer. Respondents worked in 17 countries, though the UK and US predominated. 50% were based in public institutions, 25% in universities and 25% in private practice. They represented a very experienced field of experts, with 79% having at least 5 years, and 63% with more than 10 years of experience in their discipline (i.e. curation, conservation, science or teaching) [E].

Significance of solvent research impact:

72% of respondents overall were aware of the Imperial Chemistry Department's collaborative research on the solvent effects on lacquer. Within this group:

- 93% of respondents rated solvent effects on lacquer research as very important or important to them (68% very important; 25% important).
- 92% indicated that the research on solvent effects had changed their understanding of lacquer a lot (47%) or some (45%). None said their understanding had not changed at all.
- 75% said that it had changed their practice a lot (13%) or some (62%)
- 74% said they use or refer to this research a lot (32%) or some (42%) when teaching or mentoring
- 80% recommend the 2011 paper [3] to others (39% a lot; 41% some).
- Of the 50% of respondents who worked in public institutions/museums, 100% of the UK respondents and 89% of the international respondents rated the solvent research as very important or important. Impact on UK and international public institutions was substantial for a change in knowledge (92%); 50% used the research for teaching and mentoring and 88% recommended the research to others. This impact was reflected in the conservation of objects held in public institutions – 89% of UK institutional respondents involved in the treatment of lacquer objects said all of their conservation treatments had been influenced by the solvent effects research, the remaining 11% said up to 2/3 of their treatments had been influenced. 29% of international institutional respondents reported that all of their treatments had been influenced and 41% said that up to 1/3 of their treatments had been influenced.

Respondents were invited to comment on the solvent effects on lacquer research. The following is a sample of the comments received:

(i) '*The results were eye-opening. Extremely important research which will change the way we approach degraded lacquer treatments*' and '*It has done so much to influence our thinking about the treatment of lacquer. It brought together the different approaches in a discussion which we can all benefit from*' (National Maritime Museum).

(ii) '*This is very important and curators need to understand this process and effect as well*' (British Museum).

(iii) '*Should be required reading*'

Comments such as (i), (ii), and (iii) touch on the legacy impact of the research. Although experienced specialist lacquer conservators may have understood many of the findings already (reflected in the 25% who said their practice had not changed very much), they had gained this knowledge through (unpublished) trial and error tests. As many solvents cause permanent damage to lacquer, the publication of the article [3] allows all conservators, regardless of their relative experience, the opportunity to make informed judgements without the necessity of damaging valuable objects in the process of gaining empirical knowledge.

Respondents were also invited to comment on the Mazarin Chest project more generally and the following is a sample of the comments received:

(i) '*The project has been very influential in our lacquer research at the Getty. The Crossing Borders symposium was exceptional in its breadth and quality of presentations. The book is an excellent summary of the symposium, standing as an important resource for those not fortunate enough to attend, and is a ready reference for us in our work. I commend all of you for having the courage to inquire about the impact that the project has had on the field, because few institutions dare to take that type of risk. In conclusion, I consider the Mazarin chest project to be a smashing success that sets the bar for other collaborative projects very high indeed. I applaud all who have been involved!'* and *'I believe the Mazarin chest conservation project is one of the best and most influential project in the lacquer conservation field' (Getty Museum, USA)*

(ii) '*As noted previously, the project gave validity (in my eyes) to the use of urushi-based treatments where appropriate (and with appropriate training) - no other major museum has published urushi-based treatments (or possibly undertaken them) so this was a significant moment in the history of lacquer conservation in the West*' (National Gallery of Victoria, Australia).

(iii) '*Japanese conservators have been using methods without thinking very much. Mazarin Chest project made us to re-think about these good-old methods are suitable or not for particular purposes'* (Kogei Sozai Kenkyujo, Japan)

Many of the survey comments also referred very positively to the effort made by the Imperial/V&A team to publicise and disseminate the research, including the widely heralded dual language English/Japanese website for the project [A, B].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[A] The Conservation of the Mazarin Chest website at the V&A, http://www.vam.ac.uk/page/c/conservation-of-the-mazarin-chest/(archived at https://www.imperial.ac.uk/ref/webarchive/1nf on 16/7/13)

[B] The Mazarin Chest project website at the V&A, http://www.vam.ac.uk/content/articles/t/mazarin-chest-conservation-project/ (archived at https://www.imperial.ac.uk/ref/webarchive/znf on 12/7/13)

[C] J. Paul Getty Museum 'Tales in Sprinkled Gold: Japanese Lacquer for European Collectors', March 3–May 24 2009, exhibition website:http://www.getty.edu/art/exhibitions/japanese_lacquer/ (archived at https://www.imperial.ac.uk/ref/webarchive/2nf on 16/7/13) and exhibition brochure, http://www.getty.edu/art/exhibitions/japanese_lacquer/lacquer_brochure.pdf (archived here)

[D] Senior Conservator, Victoria & Albert Museum, South Kensington

[E] Impact of the Mazarin Chest Survey, Imperial College 2013 (survey results available on request).

[F] Letter from the Keeper of Conservation and Scientific Research, The British Museum, 14/10/13 (letter available from Imperial on request)