STORIES FROM A BUILDING SITE

Spike Bucklow

ABSTRACT
The paper considers how technical art history facilitates intellectual access to cultural heritage. In the light of contemporary documentation, it examines the Westminster Retable, England's oldest easel painting, to draw technical and economic links between the Retable and Westminster Abbey. It suggests that details of construction and cost provide frames of reference in which to approach the severely damaged polychrome object.

INTRODUCTION

The conservator's interest in physical and intellectual access to cultural heritage presupposes that objects have variable accessibility. It assumes that some objects are more or less accessible than others and that conservators can influence levels of accessibility. This is readily demonstrable for physical access. Details vary for portable and for fixed heritage — some paintings can travel for exhibition and some sites can endure high visitor numbers, but others cannot. Yet paintings can be consolidated and visitor flow within sites can be managed. Intellectual access is more difficult to determine or negotiate.

Conservators increase physical accessibility by intervening with an object or its environment and it has long been recognized that such interventions require an intimate understanding of an object's material nature. Recently it has become recognized that conservators' knowledge of material objects has significance above and beyond their physical welfare. Technical art history is increasingly seen as a way of 'adding value' to large conservation projects by exploring the material nature of the object or site being conserved. The conservator provides the technical art historian (perhaps one and the same person) with data that illuminate the object or site and tells stories about it. Through technical art history, conservators can increase intellectual access to cultural heritage.

While intellectual access to cultural heritage may be difficult to define, the rise of the 'virtual museum' makes it an increasingly significant issue. (For example, in 2005 the Fitzwilliam Museum, Cambridge, had about 308000 visitors while its website had 36227619 visitors [1].) Virtual visitors have no physical access to the cultural heritage associated with the websites they navigate, so their access must presumably be con-sidered to be intellectual. Improving intellectual access is important because the conservation of objects is driven by their perceived value, a nebulous quality that is increasingly correlated with numbers of visitors (whether physical or virtual/intellectual). Cultural heritage is not self-sustaining but requires selective management so, in a manner analogous to historic patterns of collecting, current patterns of conservation will determine the future composition of cultural heritage. If our understanding of cultural heritage is broad then a wide variety may survive. Conversely, if our interests are narrow, then our stewardship is restricted to the currently-defined mainstream. Heritage that is not understood will be lost, by neglect if not by iconoclasm.

Concepts involved in preventive conservation — for example temperature, humidity, and light levels — are aspects of an object's physical environment and they have their intellectual analogues, the cultural values debated by UNESCO, ICOM, IIC, etc. Technical art history offers one avenue whereby conservators can contribute to the wider cultural debate, acting as advocates for objects and highlighting their values. This paper considers issues of intellectual accessibility with reference to an object that presents few problems of physical access to the congress delegate.

THE ABBEY

Westminster Abbey has a museum (501505 visitors and 1029871 virtual visitors respectively in 2005 [2]), which includes separate vitrines displaying two very different types of object. Their historic relationship is indicative of variable perceived values.

One vitrine houses representatives from a collection of 21 effigies. These include royal effigies from Edward III to James I, and seventeenth-century funeral effigies, as well as eighteenth- and nineteenth-century effigies (including Viscount Nelson) made for exhibition purposes. The effigies' origin was in French court mourning etiquette of the late thirteenth century, but they ceased to be an official part of royal funerals after 1625. The later waxworks were an innovation by the Abbey, capitalizing upon the earlier effigies as "valuable tourist attractions and a source of revenue for lay vicars" [3]. In 1778, effigies of King James, Queen Anne, Elizabeth I and William Pitt were specially displayed in the Abbey's Islip chantry chapel and public interest was such that the viewing fee was doubled from 3d. to 6d.[4].[1]

The effigies' presence in the museum today attests to their continued perceived value. They are readily accessible museum objects; relatively little intellectual background is required of the visitor, who can readily understand their function. The visitor's personal experience of clothes, for example, informs their understanding of historic clothes. However, this 'entry level' intellectual accessibility does not exclude the possibility of more profound interpretations, and such historic objects have informed contemporary cultural understanding [5].

Another vitrine contains the 3300 × 955 mm Westminster Retable, Fig. 1. Its presence in the museum suggests that, like the effigies, it is currently valued. Yet its physical condition indicates that it has not always been valued; most of the decorative gems and cameos have been stolen and half the paintwork was deliberately removed. The Retable was made for the Abbey's high altar around 1260 but was removed in the sixteenth century. By the seventeenth century it had lost all liturgical value and it owes its survival to its robust wood construction. The Retable was reused as the lid of the case that displayed the effigies of Elizabeth I and William Pitt in the Islip chapel. The paint above Queen Elizabeth's ornate effigy was left more or less intact, but above Pitt's more sober effigy, the original paint was removed and replaced with an appropriately Neo-Classical black, white and green scheme [6].

The Retable and the effigies now have their own display cases but, for about 200 years, one formed part of the case for the other. In the eighteenth century, George Vertue recognised that the Retable had antiquarian value, but its value in protecting, and providing a foil for, the effigies was evidently greater. Their seventeenth- and eighteenth-century relationship suggests that physical access to the effigies and Retable was equal, but that intellectual access to the effigies was greater. If intellectual access to cultural heritage occurs when people recognize overlaps between their own lives and the life of the culture that

[1] In pre-decimal British currency there were 12 pence (d.) to a shilling (s.) and 20 shillings to the pound (£).

Fig. 1 The Westminster Retable. *Image: The Dean and Chapter, Westminster Abbey*.

is embodied in tangible heritage, then the Abbey visitors had more shared frames of reference with the effigies than with the Retable. However, like all tangible cultural heritage, the Retable is a multivalent object, capable of being seen within numerous frames of reference. Intellectual access is limited by failure to recognize those frames of reference.

Originally the Retable was a lavish liturgical object, but it is now in a secular context and in a condition that severely compromises its aesthetic function. The visitors' task in interpreting the object is therefore challenging. Acting as the object's advocate, the conservator and technical art historian can highlight its values by outlining appropriate frames of reference. Some of these can illuminate aspects that seem obscure [7], but the object's more prosaic frames of reference, by definition, facilitate wider intellectual access.

The effigies' enduring popularity suggests that visitors' prior knowledge of monarchs or military heroes, together with their shared experience of clothing, contribute to the perceived value of the collection. The Retable does not share these advantages, as the depiction of Christ has reduced resonance in a secular society and very few have any first hand experience of Gothic altarpieces. However, the Retable was an object made to order by skilled craftsmen, and many of us have first-hand experience of purchasing products or services and dealing with tradesmen. Technical and commercial aspects can facilitate intellectual access to the Retable.

THE BUILDING WORKS

The *c.*1260 Retable was made in Westminster, and Henry III's published accounts list payments for goods and services to individuals in Westminster between 1249 and 1272 [8]. Thirteenth-century denominations of currency were large, so payments were weekly or daily, not hourly. The length of the working week varied and the influence of hours of sunlight as well as the effect of holidays (paid and unpaid) on weekly pay in Westminster can be inferred [9, pp. 13–32]. The accounts enable us to construct frames of reference that make a late-thirteenth century product more accessible.

Some details in the accounts are specific to the Abbey. For example, in 1253 payments were made to Richard of Eastcheap for scaffolding, but in 1259 we find payments for scaffolding made to Richard of Eastcheap's widow [8, pp. 229–231, 351]. We cannot know if this change reflects the occupational hazards of scaffolding, but it suggests a human and economic side to the building with which we can all identify.

Other details in the accounts illuminate connections between building the Abbey and making the Retable. Some illustrate relationships between the use of materials in the Retable and in the Abbey while others illustrate relationships between the workers.

An example of the comparable uses of materials in the Abbey and Retable is reflected in the accounts for carriage of materials within the Abbey by Matthew of Eye (6s. for three weeks with his cart and horses), Richard of the cellar (3s.4d. for 15 days), Walter of the chamber (2s.6d. for one week, two days) and Odo (6d. for one day) [8, p. 383]. They were carrying sand and clay from Thames barges up the scaffolding to be put on oak laths before the plumbers laid lead roofing. It was standard practice to insulate lead roofing from oak, and a variety of materials, including earth and moss, were suitable isolation layers [10, pp. 265–266]. This practice follows the observation that if lead roofing was laid directly on oak laths, then a coating of basic lead carbonate (lead white) formed on the underside of the roof as the oak corroded the lead. The builder's failure to isolate lead was sometimes turned to the advantage of the painter; in 1687, John Smith advised painters that lead white pigment could be found 'under the lead of some very old buildings' [11]. In Westminster, those responsible for the Retable's polychromy evidently followed the practice of those responsible for the Abbey's roofing. On the Retable, lead was used to attach glass for the imitation enamels but the lead was isolated from the potentially corrosive oak by a thin layer of chalk.

The use of lead to secure glass on the Retable was analogous to its use in the Abbey's windows, and the plumbers and glaziers who worked together on the Retable may also have worked on the windows; the accounts have no sub-divisions for 'plumber' or 'glazier' as they have for 'mason'. There are suggestions that the plumbers who worked on the windows may have been the same individuals who also worked on the roof [9, p. 21].

As the layer isolating lead from oak illustrates, comparable technical functions could be fulfilled with a variety of materials. Another example is provided by the way the glass was sealed in the Retable and the windows. On the Retable, glass was sealed with putties of lead white in linseed oil, whereas the window glass was sealed with wax and pitch [8, pp. 419–433]. The function of the wax and pitch was to make windows water-tight and the lead cames themselves were evidently thought to require no protection. This suggests a sophisticated understanding of rates of corrosion in different environments — lead is stable in the open air, but vulnerable when adjacent to oak.

The discovery of 31 iron dowels joining the oak boards of the Retable was therefore a surprise. X-radiographs of the structure showed that the iron and oak had reacted and that the resultant metals salts had diffused into the wood grain, Fig. 2. The use of iron dowels appears unusual in easel painting, yet it has its equivalent in building construction and extensive use of iron in

Fig. 2 X-radiograph of ironwork in the oak panels of the Retable. *Image: The Dean and Chapter, Westminster Abbey.*

Fig. 3 Detail of tinned metalwork on the Retable. *Image: The Dean and Chapter, Westminster Abbey.*

the Abbey is documented [12, p. 139]. It was widely recognized that iron was the most easily corroded of all metals [13], and several strategies were employed to retard its corrosion. For example, in building, pitch was used for 'blackening hinges' and tin was used for 'whitening hinges' [10, p. 295].

The whitening of iron (and copper alloys) with tin was also employed on the Retable. The possibility of oil paint discolouring as a result of corroding iron nail heads and copper trays was evidently foreseen, as the metalwork was tinned before painting, Fig. 3. The context-specific treatment of lead — protected near oak but unprotected in windows — suggests that the treatment of iron nails may also have been context-specific. Iron (nail heads) required whitening with tin when exposed to paint media, but iron (dowels) may have been seen as 'self-blackening' when exposed to oak. Craftsmen's knowledge of lead's oak-induced 'self-whitening' potential has already been shown, and whether such reactions were encouraged or discouraged depended upon the desirability or otherwise of the resultant coating.

Carpenters would have experienced the self-blackening of iron in conjunction with oak as they worked; their hands would be stained when carving as their sweat facilitated oak's reaction with iron tools. This did not occur with low-tannin woods. The blackening of iron was exploited by reacting oak galls, the part of the tree with the highest tannin content, with iron to make black ink. Making black ink for the Abbey's scriptorium or for Henry III's accountants would have demonstrated that, unlike its red rust, iron's black rust was not autocatalytic. The self-blackening iron may therefore have been seen as slowly 'sealing' the dowel or 'bonding' it to the Retable's oak. Such a bond between iron and oak would have been acknowledged in the Abbey's Infirmary. An influential herbal of *c.*1250 indicated that toothache could be cured by engraving an iron nail, using it to carve the patient's name on an oak tree, and then hammering it into the tree; as long as it remained there, the pain would not return [14].

THE CRAFTSMEN

Plumbers were aware of lead's different behaviours on roofs and in windows. Glaziers varied their seals for glass in windows and in the Retable. Blacksmiths retarded one of iron's rusts with tin or pitch, scribes accelerated another of its rusts with oak galls and when any of them got toothache, their treatment might involve the interaction of materials they knew and understood. The details suggest a web of connections between disciplines. This does not necessarily imply innovation at Westminster, yet as a large-scale multi-media enterprise it constitutes a 'site of experimental practice'. Henry III's accounts outline the conditions under which technology transfer might occur in what has been called a 'laboratory' [15].

From one accounting period to the next, the sequence of taking on and laying off workers indicates the order and duration of, as well as resources required for, subtasks within the building programme. In some accounts all workers are listed and in other accounts only a few workers are mentioned. In all accounts however, the relative order is the same; whitecutters, marblers, layers (all types of mason), carpenters, carvers, painters, plasterers, polishers, smiths, glaziers, plumbers and scaffolders. Then, on separate lists, come accountants, labourers and the hire of carts. The order represents relative status; workers who occur infrequently, like gilders and bell founders, do not feature in order, although their relative status was well established [16].

While the average pay for high status workers was greater than that of lower status workers, levels of pay within many categories overlapped and the overall differentials were not great. (Pay rates between crafts can be compared over the same period, thus avoiding the complexities of the variable lengths of working days and weeks. Special conditions of employment applied to some workers, so the accounts do not reflect all remuneration.) The accounts also show payments for particular tasks, and task work enables the comparison of labour and material costs.

A plumber would typically be paid 5s. per char, for founding, casting and laying lead [8, p. 339]. A char of lead (2184 pounds or 990 kg) cost just over £2.5s. [8, p. 273] and would cover 160 square feet (nearly 15 m^2) of roof [10, p. 263]. When laying roofs, the materials cost more than nine times the labour. However, the costs of most tasks were more complex. For example, coloured glass cost 12s. per seam whilst white glass was 6s. per seam [8, pp. 263, 287]. One seam, or 24 wey, of glass was 120 pounds (54 kg), and half a wey (2½ pounds or 1.1 kg) was sufficient for one square foot (0.093 m^2) of window. Early-fourteenth-century accounts mention manufacture of white glass windows at a task rate of 4d. per square foot [10, p. 181]. The task rate suggests that one square foot of white glass cost 1½d. for the material and 2½d. for the glazier's labour [10, p. 175]. Coloured glass windows were between 6d. and 8d. per square foot, approximately reflecting the fact that coloured glass cost twice as much as white glass. When making windows, the material costs were greater than labour

costs when using coloured glass, but were less than labour for white glass.

The carpenter's and painter's tasks were too varied to be susceptible to similar breakdown of costs and the construction of a Retable was too small a task to feature in detail in the accounts. However, it required the coordinated services of carpenters, carvers, blacksmiths, plumbers, glaziers, plasterers, gilders and painters. From costing the materials (approximately 20s.) and labour (between 70s. and 112s.), it is estimated that the total cost of the Retable was between £4.10s. and £6.12s. [6]. Considering its lavish appearance and prestigious position, the Retable was surprisingly cheap. Its visible area was about 3 m^2 and its production corresponded to the cost of between 12 and 24 m^2 of coloured window or 27 to 39 m^2 of lead roofing.

THE COST

Artists' materials, methods and interactions provide frames of reference that facilitate intellectual access for those interested in the technical aspects of cultural objects. However — due to liquidity — financial aspects provide a more widely appreciated frame of reference. But what does the Retable's cost of between £4.10s and £6.12s. actually mean?

At the time of construction, oxen cost between 8s. and 11s., so the Retable cost the same as between eight and 16 oxen [17]. Today, according to data provided by the UK Meat and Livestock Commission, cattle cost around £120 per head [18], but this is not comparable to thirteenth-century oxen as our economy is not agrarian and oxen were primarily beasts of burden. A pair of thirteenth-century oxen might be more comparable to a modern tractor, costing around £57000 (the UK's 2007 best-selling MF6480) [19]. The Retable — as an isolated object — could therefore be considered as costing the thirteenth-century equivalent of between four and eight tractors, or £228000 to £456000.

However, the accounts also allow us to treat the creation of the Retable as a part of a larger venture; building the Abbey. In the thirteenth century, the construction of Westminster Abbey was London's largest building project; injunctions prevented stone being quarried in Kent, except for use at Westminster [12, p. 151]. Today, London's largest building project is the 2012 Olympics. As such, the costs of these two enterprises might be considered broadly comparable. According to Henry III's accounts, the Abbey's average annual building cost was about £1500 [20]. According to data supplied to the National Audit Office by the Department of Culture, Media and Sport, current estimates of cost for the Olympics are £9.35 billion over six years, which corresponds to an average annual expenditure of over £1.5 billion [21]. The estimated cost of the Retable corresponded to about 0.3% of the average annual cost of building the Abbey. The same proportion of the projected annual cost of the Olympics would be £5 million. The Retable, as a component of the capital's biggest building project, could therefore be considered as costing the thirteenth-century equivalent of £5 million.

Comparisons between retables, farm vehicles and the infrastructure of sporting events may or may not be considered valid. Nonetheless, a question commonly asked about cultural objects is 'what's it worth?', so considering costs of production goes some way towards answering that question for objects that are not on the free market and cannot be given a replacement value. Historic cost of production, converted into modern frames of reference, can therefore provide 'entry level' intellectual access to cultural heritage. Limitations in the process of conversion, and in the validity of cost comparisons, provide evidence of differing culture-specific values. Identifying such differences can encourage intellectual access to more complex issues about the differences between historic and modern cultures.

ACKNOWLEDGEMENTS

The conservation of the Westminster Retable was supported by the Heritage Lottery Fund and Getty Grant Program.

REFERENCES

1 *The Fitzwilliam Museum Review 2004–2006*, Fitzwilliam Museum, Cambridge (2007) 72.

2 Mortimer, R., Westminster Abbey, personal communication, 11 September 2007.

3 Litten, J., 'The funeral effigy: its function and purpose', in *The funeral effigies of Westminster Abbey*, ed. A. Harvey and R. Mortimer, Boydell, Woodbridge (1994) 19.

4 Lindley, P., 'William Pitt', in *The funeral effigies of Westminster Abbey*, ed. A. Harvey and R. Mortimer, Boydell, Woodbridge (1994) 166.

5 Parker, R., *The Subversive Stitch: Embroidery and the Making of Femininity*, Women's Press, London (1996).

6 Binski, P., and Massing, A., (ed.), *The Westminster Retable* (forthcoming).

7 Bucklow, S., 'New Age Old Masters', in *The Object in Context: Crossing Conservation Boundaries*, ed. D. Saunders, J.H. Townsend and S. Woodcock, International Institute for Conservation, London (2006) 267–272.

8 Colvin, H.M., *Building Accounts of Henry III,* Clarendon, Oxford (1971).

9 Jones, A.R., 'Gleanings from the 1253 Building Accounts of Westminster Abbey', *AVISTA Forum Journal* **11**(2) (1998/9).

10 Salzman, L.F., *Building in England*, Clarendon, Oxford (1997).

11 Bristow, I.C., *Interior House Painting Colours and Technology 1615–1840*, Yale/Paul Mellon Centre for Studies in British Art, New Haven (1996) 10.

12 Lethaby, W.R., *Westminster Abbey and the King's Craftsmen*, Duckworth, London (1906).

13 Pliny (translated H. Rackham), *Natural History*, Vol. 9, Heinemann, London (1968) xxxiv 230–231.

14 *Physicians of Myddfai* (translated J. Pughe), Llanerch, Felinfach (1993) 454.

15 Turnbull, D., 'The ad hoc collective work of building Gothic cathedrals', *Science, Technology and Human Values* **18**(3) (1993) 321–324.

16 Bucklow, S., 'The use of metals in the Thornham Parva Retable', in *New Offerings Ancient Treasures,* ed. P. Binski and W. Noel, Sutton, Stroud (2001) 451.

17 Farmer, D.L., 'Some Livestock price movements in thirteenth century England', *Economic History Review* **22**(1) (1969) 2–3.

18 Farmers Weekly Interactive, www.fwi.co.uk (accessed 15 February 2008).

19 Gregson, J., Massey Fergurson, personal communication, 7 September 2007.

20 Colvin, H.M., *History of the King's works*, HMSO, London (1963) 157.

21 National Audit Office, www.nao.org.uk/publications/nao_reports/06-07/0607612es.htm (accessed 15 February 2008).

AUTHOR

Spike Bucklow has a BSc in chemistry (Southampton), MSc in artificial intelligence (South Bank Polytechnic) and PhD in art history (Cambridge). He also has a postgraduate diploma in the conservation of easel paintings (Hamilton Kerr Institute). He is currently senior research scientist and teacher of theory at the Hamilton Kerr Institute, Fitzwilliam Museum, University of Cambridge. Address: Hamilton Kerr Institute, Mill Lane, Whittlesford, CB2 4NE, UK. Email: sb10029@cam.ac.uk