

# CARVED JOINERY

## The conservation and repair of historic timber carvings

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**O**UR HISTORIC buildings contain an extraordinary variety of carving on joinery, from the Rochester choir stalls of 1227 and the fine wood carving of Grinling Gibbons (1648–1721), to the interiors of the Arts and Crafts movement. Carving styles and joinery components have undergone many changes but the basic techniques used in their making have generally remained remarkably consistent. The technical issues faced by conservators are therefore generally the same whatever the age of the carving, but the ethical issues can be highly contentious, particularly where the question of whether and when to replace missing carving arises.

In historic buildings that have remained in constant use, ongoing small losses to delicate carvings are almost inevitable. In this context the replacement of missing carving is a necessary step if our first priority is to stabilise ongoing aesthetic deterioration and preserve a space that we value highly for its appearance. Different priorities would apply when considering a museum piece in un-restored condition, preserved in a protected environment.

The decision to replace a missing component in a historic building should always be a considered one. The question assumes the conservator has the skill and sensitivity to produce a carving that matches the quality of the original and that there is a good reason for the intervention. In all cases the decision has to balance the competing priorities of the aesthetic, historical and physical integrity of the object in a way that is appropriate to the object's setting and use.

Aesthetic and historical considerations might include the general level of finish in the room, how much the losses detract from the original design intention, the symmetry of the object, and how closely we can reference the new carving to existing features or other evidence.

Physical considerations might include the current use of the room, the condition of its support, and the state of its environment. A diagnostic assessment or treatment plan should always look at the carving in the context of both the structure it is part of or attached to, and the fabric of the building that supports and contains that structure.

### HISTORIC CONSTRUCTION TECHNIQUES AND MATERIALS

Mortice and tenoned frames with unglued pegged joints and panels were the most fundamental component in the construction



*Scribing a template for replacement carving, New College Chapel, Oxford*

of screens, wall panelling and choir stalls in the Middle Ages. The frames could be decorated with carved or pierced panels and the jambs could be extended with other layers of timber to form arches and other carved decorative features. In 17th- and 18th-century joinery, doors, reveals, shutters, soffits and box pews were framed, while architraves, entablatures and chimneypieces were often of simple plank or box-frame construction, with elaborate carving fixed to them with nails or metal pins. Carved elements could be made up of several layers glued together, either before or during the carving process.

The species of timber commonly used in carved joinery are outlined below.

#### **European Oak** *Quercus robur*

Until the last quarter of the 17th century oak

was by far the most commonly used timber in carved joinery. Most would be English in origin but from the mid-14th century onwards high quality quarter-sawn oak boards known as wainscot were imported from Europe. These sawn boards were used for doors, window shutters and panelling.

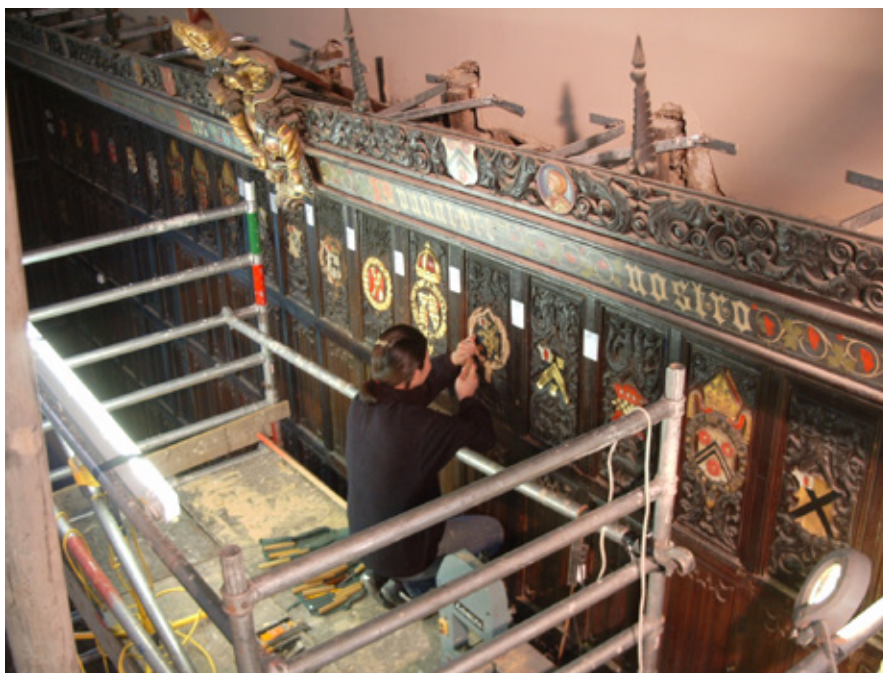
#### **Deal (Pine, spruce and fir)**

From the 16th century, the term deal was used to describe any, ready-sawn coniferous timber imported from the Baltic. Red deal or yellow deal implied European redwood, *Pinus sylvestris* (Scots pine). This is by far the most common imported species encountered in carving and joinery. Deal is light, stable, fast to carve and takes paint or gesso (a fine plaster bound with size used for gilding and paint finishes) better than oak.





Repaired 16th-century panelling with new panel in background, and (below) the back of the panelling showing its repair.



Carving repair on an early 16th-century dais screen



15th-century screen showing constructional layers

#### **Lime** *Tilia vulgaris*

Lime, with its ability to take detail, is the finest of all the carving woods. However, it lacks the stability needed for the structural elements of joinery and is slower to carve than pine. From the third quarter of the 17th century lime was used extensively for carved decoration on oak or deal joinery.

#### **Walnut** *Juglans regia*

Walnut was used extensively for furniture in the first quarter of the 18th century and occasionally for joinery.

#### **Mahogany** *swietenia macrophylla*

From the second half of the 18th century mahogany from Central America was occasionally used for carved joinery. It looks good, works easily and is extremely stable. It may be hard to obtain suitable varieties to match early work.

### **TIMBER PROCESSING**

Native hardwoods such as oak would be riven (split using wedges). Timber was then cut using a two-man saw with the tree trunk set on trestles or over a saw-pit with one sawyer above and one below the piece being sawn. Deal was machine sawn using water-powered sawmills before importation.

After seasoning, air-dried timber has a moisture content of about 17 per cent. The wood retains its ability to lose and regain moisture as the relative humidity in its environment varies. As it dries it shrinks or 'moves'. The greatest shrinkage takes place along the circumference of the annular growth rings of the tree. The thickness of the rings is slightly reduced and the length of the timber along the grain moves very

little. This differential shrinkage is the source of cupping and bowing in timber. The traditional way to minimise these problems is to 'quarter-saw' the timber to create even shrinkage within the plank.

### **REPAIR MATERIALS**

#### **Timber selection**

When choosing timber for a repair it is important to try to match the species of wood, the moisture content, the grain width and the grain direction. This matching will make the repair look less obvious and will ensure the minimum of differential movement between the repair and the original piece. If replacing an entire component it is best to select timber as near quarter-sawn as possible, and essential to reject any timber which has hairline cracks and compression shakes, sap wood and large or dead knots.

#### **Glue selection**

If the relative humidity in the room is within reasonable limits and good contact surfaces have been achieved, a traditional protein glue such as pearl glue will prove as strong as any modern alternative and is easily reversible. It should be considered before other options. Fresh glue should be made regularly in small batches and should be heated in a traditional glue pot. If the glue is old or if it is overheated the collagen links on which its strength depends will break down. Microballoons (a lightweight filler) can be added to improve the glue's gap-filling properties but will cause a small reduction in strength.

Epoxy resins give a strong bond and can prove useful if gap-filling properties are required. In some cases there may be a trade-off between poor reversibility and the need to avoid the loss of original material at the glued joint. A small amount of pigment can be added





*Epoxy microballoon fill and dowel, and (right) the two halves combined*



*Carving replacement after consolidating charred area with Paraloid B72*



*The use of unglued wooden biscuits to hold a two-piece spandrel panel in line while allowing movement*

to colour the glue line to match the object. Quick-setting epoxy resins can prove useful in a situation where effective clamping can only be achieved by hand.

Fish glue and liquid protein glues applied cold are reversible and convenient but are not reliable unless environmental conditions are good.

PVA is only semi-reversible in practice, has poor gap-filling properties and should not be used if a joint is under shearing pressure as the glue line may creep. An aliphatic resin (a common constituent of wood glue which is more rigid than PVA) is a better alternative.

## TYPICAL DEFECTS AND CAUSES OF DAMAGE

### Damp

The greatest enemy of carved joinery is damp due to poor building maintenance. Damp can lead to decay by wet rot, dry rot and insects such as woodworm. It can cause the warping of timber and the failure of protein glues. Damp may still be a problem in some historic buildings and should be addressed by a good building maintenance programme, before attempting other conservation work.

### Low relative humidity

In many historic buildings today, better maintenance and central heating mean that low relative humidity is a very common problem. This leads to cracking and warping, loose joints and desiccation of glue. A relative humidity of between 40 and 65 per cent is best, and ideally the temperature should be no more than seven degrees above external conditions. However, this is likely to prove unacceptably cold at times for the occupants of the building. There are several possible solutions to the problem. For further information consult English Heritage's *Environmental Management Performance Standards* (see Recommended Reading).

### Lighting

Unsuitable lighting can result in an unhelpful increase in temperature near a carving. Sunlight and strong artificial lighting can cause bleaching to timber or cause deterioration of surface finishes. Fitting a window film that provides ultraviolet protection can be an effective solution.

### People

Woodcarving is subject to depressingly regular damage and loss at the hands of cleaners or contractors working in historic buildings. People are often unaware of its vulnerability. A short induction and written guidelines for contractors stressing the historic value and fragility of the fittings will go some way to addressing the problem where access cannot be restricted.

### Insect attack

Damage by wood boring insects such as furniture beetle, house longhorn beetle or deathwatch beetle can cause considerable damage. The drier conditions found in most buildings today are less attractive to these insects but if new flight holes or the insects themselves are spotted, seek advice promptly.

### Poor original design

Damage can also be caused by a failure of short grain (where the cut ends of the grain are exposed) on pieces of timber under stress, or fixings that do not allow for movement in the timber.

## TREATMENT OPTIONS

### Cleaning

The surface finishes on carved joinery vary widely and it is unwise to assume the piece retains its original finish. Early carving that was originally painted and gilded may have been stripped and treated with wax,

linseed oil, French polish or oil varnish. Test cleaning and inspection under ultraviolet light for variations in fluorescence can help to identify varnish layers and components such as natural resins and drying oils. Once the identification of the surface to be cleaned has been made and the remains of any earlier schemes noted, it should be possible to formulate a suitable cleaning method. If a piece retains its original finish this should be preserved with great care.

### Consolidation

If the timber has suffered extensive insect or fungal attack the careful injection of a consolidant may re-establish the structural integrity of the carving or impart enough strength to allow the piece to be re-backed with timber. Two-part low viscosity epoxy will impart considerably more strength to the object than solvent-based consolidants and will be easier to apply effectively. The risk of spillage onto the surface of the piece can be reduced by filling any insect flight holes with wax of an appropriate colour before consolidation. Paraloid B72 can be useful for surface consolidation. Conservators should be realistic about the practical reversibility of anything other than surface consolidation whichever consolidant is chosen.

### Fillers

Wax can be a useful filler for small cracks and gaps in situations with unpredictable relative humidity, where there may be the potential for excess movement. In more stable situations a narrow crack or joint injected with glue then filled with wax may sometimes be less visually obtrusive than a colour-matched wooden fillet. Wax is an ideal filler for insect flight holes. Good results can be obtained using microcrystalline wax, which is less sticky than beeswax and gives a harder finish. The wax should be melted and tinted with good quality oil colours to match the colour of the surface to be filled. It can be scored into thin strips and these can be worked with the fingers until soft enough to apply. It then can be levelled to the surface of the work with a plastic scraper.

Epoxy filled with microballoons can be used in a situation where the surface of a badly decayed carving is intact and re-backing the piece with new timber is deemed impractical. This will not be reversible but it may strengthen the piece sufficiently to save it.



### Re-backing

When a fragile carved object is structural it may be possible to reinforce it by replacing a badly decayed area on the back with new timber leaving the appearance on the front relatively unchanged. It may be necessary to consolidate the piece before this is possible.

### REPLACEMENT CARVING

#### Carving

The most common type of intervention will involve replacing carved leafs and other small ornamental details. If the piece is part of a symmetrical scheme, a pattern can be taken from its mirror image. A small piece of clear plastic such as a CD case can be held over the surviving carving and the outline established with a fine marker pen. This can be instantly reversed and marked out on the new timber. A small band saw with a fine blade will prove invaluable for this sort of work. The outline can be cut on the band saw and then fixed to a small board with a hot glue gun or a paper joint. The board can then be clamped to the workbench and carving commenced. It is useful to have a photograph of the work being copied on the bench as an instant reference during the carving process. Once the carving of the front is complete, the carving can be removed from the board to allow the reverse to be carved back and any undercutting to be added. The final touches will take place after the piece is glued in position, taking great care to cut away from the original at all times. In some situations a carver may be working from photographs of the carving taken before the losses occurred. In these cases a working drawing will prove essential.

#### Fixing

The area where the new carving meets the old should be left slightly oversize and any extra wood needed to achieve the joint taken into account. A clean flat surface needs to be created on the piece being repaired. Often the carving will have broken off along the grain. If the timber is straight grained and of good quality the break may well have a nearly flat surface. If this is the case, a paring chisel can be used to create a good surface with virtually no loss of original wood. If more wood has to be removed it is better to fit the repair to the shape of the break. Carbon paper can be used to mark high points which are removed in stages until the piece fits. In some cases it will prove very difficult to get a perfect match in which case the use of a gap-filling glue such as an epoxy will create a better fix than a more reversible alternative.

In some cases a mechanical fixing such as a small dowel or wooden biscuit will create a much more secure joint and will allow the repair to be removed and replaced during the carving process. For small repairs wooden kebab sticks are excellent for this purpose. Made of split cane with long fibres they are strong for their diameter. To mark the centres to be drilled, a pin can be taped across one of the pieces to be joined, with the pinhead where the dowel will centre. Pressing the two pieces together firmly will cause the sides of



Carving replacement New College Chapel, Oxford



Replacement 14th-century stiff-leaf at New College Chapel

the pinhead to indent both pieces. The adhesive can be applied and the new carving clamped in position using spring clamps or masking tape.

#### Recommended Reading

V Dorge and F Carey Howlett, *Painted Wood: History and Conservation*, Getty Conservation Institute, Los Angeles, 1998  
*Environmental Management Performance Standards: Guidelines for Historic Buildings*, English Heritage, Swindon, 2009

S Rivers and N Umney, *Conservation of Furniture*, Butterworth-Heinemann, Oxford, 2003

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