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Whilst preservation remains at the core of what we do, we are at the intersection of materials-based conservation and values-based approaches.

At the 2018 NZCCM Conference in Auckland, we welcome discussion on current conservation practices and the challenges we face. This is an opportunity to share and hear about treatment methodologies, advances in the use and research of materials, solutions for display and storage, and ways in which the context of an artwork or object has informed decision making.

This article is a preprint of a presentation given at the NZCCM 2018 Conference "Living Heritage: Materials, Methods and Context", held at Auckland Art Gallery Toi o Tāmaki on October 24 - 26, 2018. Preprints from the conference were welcomed from all speakers, who included both full NZCCM members and affiliated professionals. Articles were not peer-reviewed; views presented are the authors' own and do not represent NZCCM or its members. Authors are responsible for the accuracy of and permissions required for the content of their articles, and retain copyright to their written ideas and photographs.

TRADITIONAL MATERIALS AND APPROACHES IN THE REPAIR AND RESTORATION OF COLONIAL FURNITURE

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When dealing with important historic man-made objects a very good case can be made for using like with like; that is, only materials available and used by the original maker.

Our search for new approaches, the seemingly endless adoption of better technology, contextual sensitivity and interpretation, on occasion, might not align with traditional methods and original intention. This paper examines the use of time-proven materials and techniques to restore severely damaged wooden objects.

In my specialist field of interest with colonial-made furniture often I encounter pieces that have undergone years of use, misuse and abuse. Most damaging is any intentional alteration for fashion-sake or repurpose by generations of owners. Oftentimes it is more recently compounded by inept repairs and restorations for monetary benefit without any regard to historic significance. Redressing these ravages requires a three-stage approach: deconstruction and problem isolation, analysis, interpretation and information-gathering while considering the approach, and finally addressing each issue independently in the constructional process.

Piece by piece later interventions need to be undressed until only original parts that left the cabinetmaker's workshop remain. Analysis of materials, species, hardware, tool marks, surface treatment and reference to period designs are considered to create a picture of the original cabinetmaker's intentions and his customer's preferences. We look back sometimes 160 or more years into the context of early European colonial life. We read of desires for current fashion and betterment, of beautiful native timbers hand-crafted into modern furnishings as outwardly visible signals of settler success. Comparison can be made with surviving contemporary furniture patterns used most often as guides so every piece requires individual interpretation.

In the museum context restoration does seem to conflict with conservation practice but significant losses do need to be addressed for both historical accuracy and audience perspective. It means putting back the original lost components without compromise so that the viewer understands the piece as it would have appeared without the many subsequent interventions.

There is then a good argument for using identical materials for restitution as they behave in harmony to those they connect with, they age in sympathy, and they reflect the original appearance of the object. Furthermore, the identification and use of period hand tools originally employed to construct the piece again would seem appropriate. Finally this paper will discuss how this conservative and traditional approach has been successfully undertaken with a recently discovered and outstandingly important colonial-made sofa.

KEYWORDS: *furniture restoration, colonial furniture, traditional cabinetry materials*

1. GUIDING PRINCIPLES IN COLONIAL FURNITURE RESTORATION

The collision of principles between conservation and (correct) restoration is often vastly overstated. It is after all about approach, remedy and how much is appropriate. I would argue that in many cases, since the aims are similar, less is more and originality outweighs interference.

The approach is always about solving the problem with the least possible intervention. I defer to “like with like” in most cases; in other words, using the same materials to make repairs and largely treat the exercise as though the original creator is doing the repair. This is not to say that modern materials have no role, but the restorer’s default should always be for a traditional approach.

My specialist area of colonial-made furniture covers a very diverse range of objects, often with a high degree of damage. While no single approach can be universally applied, I have adopted a set of rules to focus my restoration methodology.

1. Fix the problem.
2. Like must go with like.
3. Interpret and replicate the original creator’s ability and intentions.
4. Defer to materials and tools available to the original creator and period of manufacture.

The advantage of these guiding principles is that they very simply define and distil down options for remedy. I cannot recall any situation where they could not be applied.

1.1. *FIX THE PROBLEM*

Fixing the problem(s) is the fundamental task of a restorer. The original cause of damage or compromise needs to be intelligently resolved to prevent any future recurrence necessitating more intervention. Cognisant with preserving historic integrity is also an awareness of aesthetic to ensure viewer appeal and elevate the potential for that object’s preservation. That is, make the piece look so good that it will be well-cared for ever after.

It is absolutely critical that the solution to one problem does not impact on unaffected components or introduce new issues. The introduction of foreign and historically inconsistent materials is in contradiction to the task of eliminating future problems (as described in section 1.2). The overwhelming task I have is that of removing failed repairs, most often poor adhesives, numerous nails, screws and metal braces. The complex nature of any piece of furniture generally presents the restorer with multiple questions to resolve. In total they might appear insurmountable, but individually addressing each issue will seem far more achievable.

It is essential to isolate each problem and deal with its peculiarities independently. More often than not this will involve a level of disassembly or undressing. It is completely feasible to reduce any piece of furniture down to its individual parts, make repairs and reassemble it with no visible evidence of such radical interference. Traditional glues, and surface treatments make this a simple and realistic process by virtue of their reversibility. Furniture is always constructed in a progressive and logical sequence, so reversing the original cabinetmaker’s work is usually straightforward and far less invasive than might be supposed.

Screws can be backed out, sometimes with the application of moderate heat to expand the metal and contract the surrounding timber. They are labelled and taped to a simple plan of the object so that each screw is returned to its original hole. Surprisingly nails are seldom used in superior cabinetmaking but in the colonial context they do occur quite frequently. Heat will significantly reduce the frictional hold and wooden wedges can be used to prise components apart, with pincers used very sparingly. Again, nails are taped to a schematic plan. Traditional gelatine glues soften with heat to the point that tenoned joints can be hand pulled apart and

veneers can be lifted with a spatula. Wood is a poor conductor, so heat is applied gradually with a hot air gun set at approximately 50-60°C.

Deconstruction is time-consuming but time-saving in the long run. It allows plenty of time to review and understand the cabinetmaker's work habits and their personal style if reconstruction later requires missing components to be replicated. Evidence can also be gleaned from surviving glue-lines and scribe marks of lost components. I consider this time spent as an opportunity to understand why some problems have occurred, for example timber distortions, wood-worm damage, breakages through use or, even the more destructive, intentional remodelling as fashions changed. Additionally, I consider contextual interpretation, that is, analysis of when a piece was made, its design origins, what timber species were used to suggest a region of manufacture and its social meaning. A surprising amount of information can be gleaned. Adding story to an object substantially elevates its importance and chances of future care.

1.2. *LIKE MUST GO WITH LIKE*

While it might be tempting to introduce materials with perceived better properties, such as adhesives, modern lacquers, or more decorative timber species, the boundaries have already been provided by what the original cabinetmaker had initially used. On occasion this rule may be overlooked depending on the peculiarities involved but in principle I always defer to tradition.

Generally, I adhere to the "like with like" rule unless the reuse of a material with known degrading properties will only reintroduce an inadvertent problem in the original piece. For example, it may be preferable to use heartwood to replace highly worm-prone sapwood, reducing the risk of future infestation. The introduction of penetrating and hard-setting resins will prevent further infestations while strengthening compromised timber, but they are non-reversible, can discolour, and their aging properties are untested. It would have to be the last option before total replacement. To renew a large area of rotten or infested original timber, such as the entire backboards to a cabinet, could effectively remove as much as twenty percent of the entire volume of an object. While this is a compromise option, as a last resort it is far more preferable than total loss.

A severely weakened component can be internally rebuilt with new timber while retaining all the original old, information-rich exterior surfaces. For example, a turned chair leg might be drilled out and a new dowel fed up its length. Alternatively, a board might be split, edge to edge, with fresh, sound timber laminated between the two halves. One always needs to examine what history will be lost while balancing the best interests of the object and its longevity.

With timber loss I reintroduce not only the same species, but also consider the grade and colour of the new wood. The identical species grown in different soils and climates will exhibit quite noticeable character variations. Annular growth rings are aligned with the (original) host timber to ensure expansion and contraction occurs in harmony. In show wood the reflectivity and lustre will also respond correctly while aging (oxidation, darkening and fading), and in time will tonally drift toward the older material. Eventually even prominent inserts into highly visible surfaces will harmonise to a point of near invisibility. The objective should be to consolidate original material or recreate what was lost without historic compromise, and to make it as inoffensive as reasonable to the casual viewer.

Generally, the introduction of non-original materials while solving existing problems can unintentionally introduce new ones. A huge portion of my work as a furniture restorer is taken up with failed repairs. Not only has the original damage resurfaced but the failed repairs have created further issues. I would then argue for an approach that is sympathetic with the original

materials and further suggest that it is in keeping with the maker's intent to use only those materials that were available to them.

1.3. INTERPRET AND REPLICATE THE ORIGINAL CREATOR'S ABILITY AND INTENTIONS

It is tempting to improve an object beyond its original status but restoration simply entails putting back what was lost while making that new work as unapparent as possible.

This requires all the skills of the original craftsman with an ability to mimic their work style. If significant elements have been lost, usually those subject to changes in fashion such as carvings, hardware and ornamentation, then an understanding of historic context and style has to be interpreted within the original maker's capabilities and resources.

It may seem contentious to slightly degrade new work to blend with original material; however, the purpose is not of deception, but merely to create the appearance of a more complete object. Documentation will define areas of new work. The antique trade term 'distressing' surely does have overtones of forgery and misrepresentation for gain, but a balance between authenticity and appearance is consistent with viewer expectations. While all intervention should be documented, there is no harm in making the final appearance as seamless as possible; it makes no sense to do visible or poor work merely to highlight that it is there.

1.4. DEFER TO MATERIALS AND TOOLS ONLY AVAILABLE TO THE ORIGINAL CREATOR AND PERIOD OF MANUFACTURE

Some furniture can comprise of a surprising array of different materials: multiple timbers varieties, leather, textiles, glass, ceramics, linoleum, gutta percha, plastics, paper, metals such as iron, brass or nickel, resin varnishes, paints, pigments, and even semi-precious material such as ivory, pewter, silver, gold or tortoiseshell (actually turtle shell!). If original then they will provide an inventory of all the material available to the cabinetmaker when the piece was first manufactured and here again they limit options on what should be used for repair.

Seemingly unimportant items such as nails and screws underwent marked changes throughout the nineteenth-century and now offer extremely important clues as to dates of manufacture. For example, by 1840 completely hand-forged nails had virtually been superseded by machine-cut varieties. In the colonial context just a few furniture pieces have still been found with the forged nail type placing them amongst the earliest yet discovered pieces. To incorrectly introduce old nails of the wrong type, such as wire patterns which were only available after 1862-63, would substantially confuse possible important dates and estimates of when a piece may have been made.

Similarly, different types of powered saws were gradually introduced after the onset of planned migration, and often their distinctive kerfs or impressions remain on some (secondary) wood surfaces. Certain saws were known to be operating in specific regions, making their repetitive signature marks useful for dating purposes. Such evidence is immensely useful for research historians, while the introduction of inconsistent tool marks, particularly machine ones, would again confuse clear time frames of manufacture.

1.5. REVERSIBILITY

1.5.1. *Traditional glues, polishes and waxes*

In furniture restoration the use of traditional glues and polishes is central to the entire process. Their longevity is well tested and their reversibility make them exceptionally versatile. Gelatine or collagen-based traditional glues will bond to old glue of the same type by effectively forming single polymer chains. This welding and reversibility are also common to alcohol-based lac polishes and natural waxes; in other words, they are re-soluble in their original solvents. Oils however are not as reversible when they dry and harden they oxidise to form new compounds. Plant-based oils in any case have limited use and were not used as commonly as might be supposed.

Reversible glue, polish and waxes are invaluable as they can be used to reactivate the original ones first used. They effectively amalgamate into single compounds with vertical chemically-linked chains or bonds across new/old barriers without forming distinct layers as, for example, an oil paint does. In the case of oil paints, the age difference between successive coats with mechanical adhesion between coats creates variations in elasticity with potential for delamination. The amalgamation (welding) of traditional glues, polishes and waxes into a single layer means that delamination will not occur. It is also quite realistic to use the original (volatile) solvents alone to restore an original treatment such as glued joints with water, old polish with methyl-alcohol or wax with turpentine.

The hygroscopic nature of timber allows water-based gelatine glues to readily wick into the phloem and xylem vascular structure. This affinity or chemical attraction is in addition to the irregular mechanical links formed within wood surface interstices. Deep penetration of gelatine into the wood will achieve excellent bond formation above the gelling temperature (approx. 35°C), provided the timber is dry and warm. Rubbed and contact timber joins can effectively be made without clamp assistance by hand pressure alone until gel-set. The water-swollen gelatine finally hardens by evaporation with significant contraction pulling the wood surfaces together over several days. Gelatine-based glues set harder than timber and with intimate joint connection there is simply no better adhesive. Thereafter both wood and glue attract and release water in partial unison depending on humidity. Any error or misalignment can be corrected in situ, even years later, with the gentle application of heat and offset clamp pressure.

The versatility of traditional glue, polish and wax cannot really be overstated. Each is soluble and reversible with a solution that will not (in general) interfere with the others. They can all be thinned to alter their working properties and they can all be used as mediums for pigments and solid colours. Once the properties of each is understood there is very little in restorative terms that cannot be achieved. However they are not wonder products, and each does have weaknesses.

Hide-based gelatine glues are poor gap fillers. To offset contraction gelatine glues can be bulked out with sawdust or plaster, but both bulking agents will tend to dilute the glue's setting strength. They need to be applied hot, and the chilling time can be as little as 15-20 seconds with working surfaces ideally needing to be warmed in advance. Repeated reheating of the same glue (pot) will break down the long matrix strands into shorter chains, thereby diminishing the strands' ability to inter-tangle and form strong bonds. Gelatine glues are not weather proof and will soften even in direct and intense sunlight. They tend to discolour blonde timbers.

Shellac polishes are soft in mild heat and will melt in high domestic temperatures such as found with hot dinnerware. This is particularly so with the more refined blonde polishes. They darken in sunlight and are only moderately water resistant. To counter those issues, shellac's ability to be repaired is unrivalled when compared to modern surface treatments.

Similarly, beeswax has a melting point around 62-64°C, low enough to melt in direct sunlight on a hot day behind glass. This can be raised to nearer 80°C when (increasingly) mixed with

harder carnauba (palm) wax, however beeswax darkens brown when heated to over 80°C. Dust, dirt and soot can embed in the soft surface of the wax, and in any case waxed surfaces dull quickly even with moderate use. These surfaces are quickly repaired with the application of more wax.

1.5.2. *Modern post-colonial adhesives*

Modern non-reversible adhesives only began to be commercially available by the 1930s, with today the two most widely used ones being vinyl and poly-epoxide resin glues. Both have advantages over gelatine-based glues for specific tasks but neither should ever be considered as multi-purpose adhesives for restoration.

Polyvinyl acetates (PVA) have a comparatively long cold working life, in some cases up to 15 minutes which provides ample alignment and clamping time. They are generally colourless and are perfectly suited to irregular breaks where parts need to be carefully knitted together. PVAs have poor gap-filling properties and cannot be diluted. Drying time and final set strength can be significantly impaired by cold or damp environments. Glue penetration can sometimes be very effective in highly porous timbers or wood-worm-eaten components. They can be coloured with pigments and some water-soluble dyes. Overall they should be reserved only for specific breaks but never for cabinetmaker-formed joints.

The typical 'two-pot' (poly-epoxide) epoxy resin has specific advantages but also severe limitations. Once mixed it has a limited working life which reduces dramatically in warmer temperatures. Curing may take several days to achieve maximum hardness but since it is far in excess of any timber consideration must be given to the surrounding material to allow for natural movement. Its inelasticity has severe limitations and in general such adhesives should only be considered where extreme hardness is a virtue. It is perfect where gap-filling is a necessity, such as with a complex fracture where fragments have been lost, and excellent at the junction of metal to wood, for example where a screw hole has become worn. Additionally, it can be diluted (somewhat) with methyl alcohol or methyl ethyl ketone, and some glues will dilute in acetone to size or stiffen damaged surfaces without causing cell-collapse. As with the vinyl/aliphatic-style glues it must be used only for repairs where its particular properties, that of extreme strength, are advantageous.

The mixing of traditional and modern products, for example the application of vinyl glue on a joint with gelatine glue residue or a plastic polymer over a shellac polish, is markedly counter-beneficial. The advantage of one is far outweighed by the weakest properties of the other. For example, a relatively heat sensitive and soft shellac polish over a synthetic lacquered surface reduces the lacquer's durability to that of shellac, but retains its embrittlement and discolouration weaknesses. Both materials lose their advantages.

2. RESTORATION CASE STUDY: RIMU AND KAURI NEO-GRECIAN SOFA

An extremely rare and important rimu and kauri neo-Grecian sofa made in Auckland (ca. 1840-45) came with multiple issues. The sofa is seen in figure 1 with the turned legs, the backrest and all upholstery removed. Ultimately the damage was so extensive that the entire sofa was dismantled down to individual component parts. The original design was taken from Thomas King's *Cabinet Maker's Sketch Book* (1835), so in the colonial context it formed a very significant part of our earliest known furniture history (fig. 2).



FIG. 1 Rimu and kauri neo-Grecian sofa, with turned legs, backrest and upholstery removed. Note the traditional glue pot on the far right.

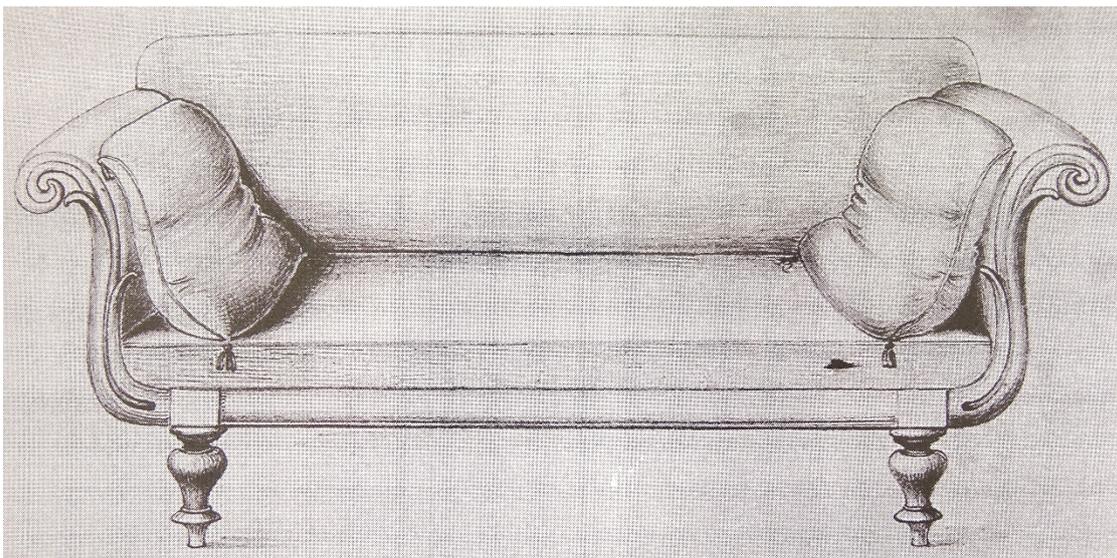


FIG. 2 Original sofa design from Thomas King's *Cabinet Maker's Sketch Book* (King, 1835).

The classical S-scroll arm rests had been severely compromised through repeated tacking and shoddy repairs (fig. 3 & 4). As the sofa's strength and (hidden) structural integrity relied on a few frame components it was imperative that future failure was to be prevented. The skeletal nature of upholstered furniture requires an approach a little separate from cabinetmaking with large areas of exposed show wood. Once completely reupholstered it is extremely difficult to undertake sensitive yet adequate repairs meaning that the default preference should be to anticipate future problems.

Epoxy resin was used on badly fractured kauri framing substrates for its gap-filling properties and extreme hardness (fig. 5). New kauri was added where poor repairs had previously been undertaken (fig. 6).



FIG. 3 (left) & FIG. 4 (right): S-scroll arm rests were severely damaged from repeated tacking and shoddy repairs.



FIG. 5 (left): Epoxy resin was used to support fractured kauri framing substrates.

FIG. 6 (right): New kauri was added where poor repairs had previously been undertaken.

From a research perspective such a radical deconstruction does allow for information gathering not normally available. This particular sofa appears to be by the same maker as one (now) in the Southland Museum and Art Gallery (see fig. 7). Saw marks were consistent with a mill operating in the Waitakere Ranges at that period and the varieties of screws and cut nails also agree with that date. Overall the sofa's clear Regency styling would put it towards the end of its period of popularity.



FIG. 7: Similar sofa in the Southland Museum and Art Gallery.

The original screw with tapered gimlet-point had only just become commercially available by the 1840s, while the wrought iron cut nails had largely replaced hand-forged hammered nails that were also found in the framework, suggesting a similar cross-over date (fig. 8 & 9). It was important to identify original hardware from later repairs and upholstery. Obviously many layers of upholstery and thousands of later tacks, nails and most recently staples had largely destroyed much of the wood surface.



FIG 8 (left): Original screw with tapered gimlet-point.



FIG 9 (right): Wrought iron cut nails.

Following individual repairs, the entire sofa was reassembled with gelatine glue to reactivate old residue glue in all cabinetmaker-formed joints (fig. 10). Original nails and screws were returned to their holes, and as a precaution shaped glue blocks in kauri were affixed at high-

stress junctions. The reversibility of gelatine glue meant they could, if needed, be removed. Lost timber was replaced, particularly to the back rest with joinery mimicking that found on other parts (fig. 11). All areas of heavy tacking were sized with slightly diluted gelatine glue several times to stiffen the wood fibre and finally thin strips of glue-soaked cotton rag were laid over to bind areas of heavy tacking.



FIG 10: Sofa clamped after reassembly with gelatine glue.



FIG 11: Sofa with all wood repairs finished. While the new rimu can be seen in the backrest replacing a makeshift repair particle board panel, there is little other evidence to suggest such invasive work had ever been undertaken.

The final polishing was achieved with several thin coats of unrefined shellac and two coats of beeswax, hardened with carnauba and coloured with lamp black pigment (fig. 12 & 13). When finally upholstered there would be little evidence of new work or the degree of restoration. With the exception of the modern adhesives, all recent work is of course reversible.



FIG 12: Finished sofa with polish and wax coatings.



FIG 13: Detail of finished sofa with polish and wax coatings.

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William Cottrell is an art historian specialising in colonial furniture. He gave up his profession as a television editor to pursue a love of woodworking, design and history. Many pieces are now in

museums around the country through his efforts to preserve our largely unrecognised but fascinating furniture cabinetmaking history.

William wrote *Furniture of the New Zealand Colonial Era 1830-1900* in 2006 for which he won the Montana Best Reference & Anthology and Best First Non-Fiction Awards. He is currently writing a second book outlining the travel of designs across the world to nineteenth-century New Zealand and our earliest colonial-printed trade catalogues. He has a Doctorate in Art History and is constantly poking around junk shops.

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