

Conservation and Restoration of Clear Coatings on Furniture and Architectural Timbers



Greg Peters

The Pratt Foundation/ISS Institute Overseas Fellowship

Fellowship supported by The Pratt Foundation

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1.1 Awarding Body – ISS Institute

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1.2 Fellowship sponsor – The Richard Pratt Foundation

I am indebted to Mr. Richard Pratt for his generous contribution of eight thousand dollars toward the funding of my Fellowship. Without the Pratt Foundation's philanthropic support this research trip would not have been possible.

1.3 Participating bodies

I would like to acknowledge the following institutions and individuals who welcomed me into their work places and who personally went out of their way to ensure my travels were organised, comfortable, smooth and enjoyable.

- *Royal Collection London, David Wheeler and Richard Thompson*
- *Victoria and Albert Museum, London, Shayne Rivers*
- *Buckinghamshire University, High Wycombe, Paul Tear*
- *Windsor Castle, Conservation-branch, Windsor, Adrian Smith*
- *Tikkurila Coatings, Industrial paint manufacturer, Vantaa, Finland Maria Tallsten-Lind*
- *Annika Bertlin, Conservator in Private Practice, Helsinki*
- *Evtek University, Conservation Department, Vantaa, Tuula Auer*
- *Smithsonian Centre for Materials Research and Education (SMCRE), Washington, Don Williams*
- *Winterthur Museum, Conservation Department, Delaware USA, Michael Podimanski, Greg Landrey, Richard Wolblers, Susan Buck, Peggy Olley*

1.4 Individuals and/or organizations involved in assisting in identifying/verifying specialised skills/knowledge gaps in developing your application

It is with much appreciation that I acknowledge and thank my referees who made considerable effort to compile very supportive reports outlining and explaining the skill and knowledge gaps in the field of treating clear coatings and furniture conservation in Australia. Clearly their individual and professional support assisted my campaign and contributed to my successful application.

- Mr. Eric Archer, President of Australian Institute for Conservators of Cultural Materials
- Mr. Phil Kuczma, Assistant Director Building Fabric Services, Department of Parliamentary Services
- Mr Ian Stephenson, Director of Historic Places, ACT

2.0 Introduction

2.1 About the International Specialised Skills (ISS)

Since 1990, ISS Institute, an independent, national, innovative organisation, has provided opportunities for Australian industry and commerce, learning institutions and public authorities to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management. ISS Institute offers a broad array of services to upgrade Australia's capabilities in areas that lead to commercial and industrial capacity and, in turn, return direct benefits to Australia's metropolitan, rural and regional businesses and communities. Our core service lines are identifying capabilities (knowledge, skills and insights) to fill skill gaps (skill deficiencies), which are not available in accredited university or TAFE courses; acquiring those capabilities from overseas (Overseas Skills Acquisition Plan - Fellowship Program); then placing those capabilities into firms, industry and commerce, learning institutions and public authorities through the ISS Research Institute.

Skill Deficiency - the key area targeted by ISS Institute

This is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas.

Overseas Skills Acquisition Plan - Fellowship Program

Importantly, fellows must pass on what they have learnt through a report and ISS Institute education and training activities and events such as workshops, lectures, seminars, forums, demonstrations, showcases and conferences. The activities place these capabilities, plus insights (attitudinal change), into the minds and hands of those that use them - trades and professional people alike - the multiplier effect.

ISS Research Institute

At ISS Institute we have significant human capital resources. We draw upon our staff, industry partners, specialists in their field and Fellows, here and around the world. Based on our experience and acute insights gained over the past fifteen years, we have demonstrated our capabilities in identifying and filling skill deficiencies and delivering practical solutions through our Skills Network Australia Think Tanks, Skills Forums, Mentoring Australia, focus Surveys, Skills Audits and consultancy services. Our holistic approach takes us to working across occupations and industry sectors and building bridges along the way:

- Filling skill deficiencies and skill shortages
- Valuing the trades as equal, but different to professional disciplines
- Using 'design' as a business tool in all aspects of work
- Working in collaboration and enhancing communication (trades and professional),
- Learning from the past and other contemporary cultures, then transposing those skills, knowledge and insights, where appropriate, into today's businesses.

The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs. We have no vested interest other than to see Australian talent flourish and, in turn, business succeed in local and global markets.

Carolynne Bourne AM, ISS Institute's CEO formula is;

"skills + knowledge + good design + innovation + collaboration = competitive edge • good business".

Individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

2.2 About the Richard Pratt Foundation

The Pratt Foundation was established in 1978 by Richard and Jeanne Pratt with the shared vision of supporting charitable enterprises and adding value to philanthropy. The Foundation is now one of the largest private sources of philanthropy in Australia. In the words of its mission statement, it aims "to enrich the lives of our community" and, in the words of Jeremiah, it works to fulfill this aim in a spirit of "kindness, justice and equity".

2.3 About the Fellow

Greg Peters has maintained an interest and a career in caring for fine furniture and related materials since 1992. His business 'Patinations' specialises in the conservation and restoration of furniture and timber interiors from all periods.

Greg has worked on Australia's most important collections and continues to preserve, conserve and restore the furniture for many local and interstate institutions as well as looking after many interesting and valuable private collections.

Awarded a Winston Churchill Fellowship in 2000, Greg further developed his expertise and technical skills by studying and working with world leading conservators in such prestigious institutions as The Victoria and Albert Museum, Buckingham Palace, The Louvre and The Rijks Museum to mention but a few.

Many of Australia's iconic buildings constructed in the 20th Century demand a different approach in conservation and maintenance. Furniture conservators are generally trained in treating traditional coatings, but when it comes to more modern coatings, there have been many expensive mistakes made. Greg has identified the importance of Australia's more recent furniture collections and architecturally designed interiors as becoming increasingly valuable as national assets; culturally, historically and financially. Greg has an ambition to educate people of this importance and to potentially help develop ideas and solutions to preserve our national collections of furniture and timber interiors for future generations.

2.4 The Australian Context – Nature and Current Situation of the Industry/Occupation

Australia, as a young nation has been built on a myriad of influences represented in our national collection of architectural works, furniture and art that all have the unique potential to be traced back to the origins of our built environment. Many objects, individual in their style and construction, reflect an uninterrupted timeline of traditions, cultures, design, fashion, economics and technological advancement. Many of these influences were introduced, others have evolved in time and some have been developed as undeniably Australian. Our furniture collections offer a unique insight into the social climate within Australia from the late 18th Century to the present day, not just in relation to Australia, but to a broader international population who have created what we call "Australian Furniture". To date, we have not been aware, nor possessed the knowledge or skilled labour to ensure the preservation of this heritage so that future generations can use these collections not just for pleasure, but as an important historical resource.

In Britain, Europe and the United States the study of furniture has been documented for well over 200 years. Large collections housing furniture from most periods, styles, cultures, designers have evolved. From these a wealth of knowledge has been compiled by museums staff, professional associations and private individuals who have studied and cared for these collections of furniture. Specialist furniture conservators are employed to maintain these collections and it is within these institutions that research is fostered and eventually disseminated through educational facilities and professional associations which offer on-going training and accreditation for furniture conservators/restorers.

This is not the case in Australia. With no major furniture collections in private or institutional hands, there is little need for in-house furniture conservators. To my knowledge there is no formally trained furniture conservators employed in Australian institutions nationally.

Australian conservators working with most other mediums have had the advantage of a world leading conservation course offered in Australia, plus research and employment options open to them in our institutional based collections. Professional organisations have developed for these mediums to promote the dissemination of information for further learning. Most people, including many in heritage and even those in other conservation fields, are unaware that most furniture restorers/conservators in Australia hold no qualification or formal training. The implication of this is that the conservation of institutional and private furniture collections within Australia are outsourced to the private sector. Even in recent times some nationally important collections of furniture have been irreversibly damaged through poor restoration/conservation practices. In the wrong hands, the well-intended but unaware, or untrained person, can cause irreversible damage in a matter of minutes.

Most fields of conservation have an education base and institutional support in regard to the core research, scientific analysis and new technologies that are applied in the treatment of objects. Contrary to this, furniture conservators normally acquire their core skills based on historical traditions from the cabinet making and furniture finishing trades. These century old tradition skills are essential to understanding the processes and materials which one is attempting to preserve, though often they contradict the accepted modern philosophy of conservation ethic which is predominantly scientific orientated. A furniture conservator must possess a sound knowledge of the traditional techniques and materials employed at the time of manufacture, plus understand how we can implement and adopt

these new technologies and scientific advancements derived from other mediums, to utilise in best preserving and protecting our nationally important collections of historic and contemporary furniture.

Even by international standards, furniture conservation is a very young profession. It was not till the 1960's or 70's that the 'ethics' of conservation became a topical issue and the realisation of historical value, (*preserving objects in their original condition*) became the expected method. This was the initial move that separated furniture restorers who repaired furniture using traditional methods, to furniture conservators who use a combination of both traditional and contemporary materials and methods to help preserve furniture so that the historical integrity is retained.

Abroad the usual career/industry path for furniture conservators has until recently been to complete a traditional apprenticeship in cabinet making, then branch into restoration and then finally study at university level to gain conservation skills and technique. The UK, Europe and US now have specialised institutions offering various levels of training from diplomas through to post graduate studies. Some of these studies can take up to six or seven years training. Research and on-going mid career training programs, including accreditation also exist to keep furniture conservators abreast of the latest developments.

Without specialised training or knowledge in Australia, furniture conservation/restoration has been left behind with many practitioners still using traditional 19th century techniques and technologies. Almost all institutional furniture conservation is contracted to the private sector, thus there is much pressure for our traditionally based furniture restorers to catch up with the demands of modern conservation practice. This proves very difficult when the knowledge and expertise furniture conservators require, is simply not available in Australia.

2.5 Peak organisations that impact on furniture conservation

Almost all furniture conservators in Australia are self employed or work in small businesses. A small number have trained abroad, though as there is no professional body which offers on-going training, a once contemporary knowledge base gained internationally, may in fact now be outdated.

Furniture conservators in Australia working on a professional level are generally aware of the contemporary issues surrounding conservation. Institutions, many of whom have their own conservation protocols dictate the parameters of work, materials and conditions. The problem in Australia is that furniture conservators may indeed possess a good command and practice of their conservation ethic, but they have never had access to the relevant training to implement their skills appropriately. Working in isolation, covering all the materials and separate trades, plus running a small business and finding the time to self educate and conduct private research is an impossible task.

The Australian Institute for Conservators of Cultural Material (AICCM) is the peak body for materials conservation practice in Australia. It acts as a platform to raise both the profile of the conservation profession and to promote the skills and professionalism of its members. Their aims include: Promoting the science and art of the conservation of cultural material and promoting co-operation and an exchange of information and ideas between those concerned with the conservation of cultural material.

In particular;

- To improve the scientific and technical knowledge of the profession and spread information through such activities as the publication of a bulletin and a quarterly national newsletter.
- To hold regular meetings of those interested in the conservation of cultural material, through such activities as an annual national conference, as well as specialized seminars and workshops.
- To inform and make recommendations to government and organisations on matters relating to the conservation of cultural material.

The AICCM is an essential organisation for the promotion of heritage conservation, though to date there has been no forum for furniture conservators within the AICCM. To their credit they have recognised this gap and I hope in the future to be personally involved in implementing a special interest group for furniture conservators.

- The Australian Institute for Conservators of Cultural Material (AICCM) identified furniture conservation in their 'Skills gap audit' of specialist conservators in 2000.
- In 2003, the AICCM National Training Audit, again revealed that specialist training for furniture conservation was not covered.
- There has been discussion from the AICCM in regard to accreditation for conservators who have not had the opportunity to pursue a formal education in their discipline, though maybe highly experienced in their speciality. The difficulty here is that often these people are leaders in their specialised field and the AICCM may not be a position to find other professions to accredited their skill level.

The Antique Dealers association of Australia have an 'Approved Service Provider' scheme in which a conservator/restorer can gain this title by means of 'qualified referee's reports'. Strictly this has no bearing on the persons credentials, though it does legally bind the practice to a professional code of ethics which protects the client and service provider alike, this in turn promotes professionalism throughout the field.

Internationally speciality organisations foster the dissemination of knowledge among furniture conservators practising in institutions and private practice alike. The United Kingdom Institute of Conservation(UKIC) has a specialist furniture division with publications, newsletters, meetings, workshops etc. The British Antique Furniture Restorers Association (BAFRA) also has an approved scheme where members have on-going accreditation and training. The Dutch, German, French, Canadians, Americans all have similar organisations which cater for the initial and on-going training for furniture conservators.

Technology in communication has increased accessibility to this knowledge. Many organisations previously unknown to those outside their region can now be within an email or telephone call. Publications and research by these professional bodies is often posted on the internet, a vital tool in my on-going education. Discussion between like-minded organisations and individuals is rapidly advancing the knowledge, education and training of restorers/conservators worldwide.

The main impact on furniture conservators comes from the need to present themselves as professionals equal to those conservators working in other mediums. When working in collaboration with conservators from other fields, furniture conservators need to be up to speed so they can discuss professional problems and expected outcomes. Due to the small number of (a handful) of furniture conservators practising at a professional level in Australia, they tend to cover much ground and are exposed to a widely varied medium from 16th – 21st century objects from diverse cultural origins. Combined with the practical skills of proficiently executing several historically based trades/arts, understanding materials both ancient and new, and also being able to identify and implement modern chemical treatments, the work loads and mental capacity are often stretched. The situation abroad is now to individually specialise in areas of period, culture, material, style, etc; this is simply not possible within Australia.

2.6 Aim of the Fellowship

The aim of my fellowship is to seek out experts specialising in the conservation and preservation of clear coatings on furniture and interior timbers. This is an area which has evolved from other fields of conservation where clear coatings have been used, i.e.: varnishes on oil paintings. Techniques have been researched and explored abroad, but as they have only recently crossed over to the conservation of furniture, these techniques are still being developed specifically for problems and materials encountered in the conservation of furniture finishes.

Clear coatings on paintings and static visual works of art normally act to enhance and protect the object, whereas finishes on furniture perform several practical functions, including the enhancement of the natural timber. Though a much higher priority is placed on protecting the surfaces from abrasion, spills and to minimise dimensional change in timbers reacting to changes in relative humidity (RH). The functional use of furniture and the exposure of finishes to physical contact creates many different parameters. The additional complications of previous maintenance regimes or restoration attempts need to be considered in devising conservation treatments for finishes on furniture or interior timbers. Not only do they have to be preserved, look aesthetically pleasing, but they also need to be sound and fit for their intended purpose if future operation is determined.

The commercial approach to clear coatings has been to strip and refinish. This naïve approach has contributed to the loss of heritage/historical/financial value of many nationally important collections. Conservators and responsible restorers attempt to preserve all original fabric, the finish being of paramount importance as it is often deposited on these surfaces, the materials which identify much about the furniture's past. This is not to say that finishes are never removed, altered or added to in the conservation process, but as a rule, minimum intervention is the generally accepted approach.

2.7 The Skills/Knowledge Gaps

There is a complete absence in Australia of any specialised apprenticeship, accreditation, diploma or degree for furniture conservators/restorers in Australia, thus the only choice left is to travel abroad to attend an institution at great expense, or to self-educate.

Our Nationally important furniture collections and timber interiors have suffered at the hands of well intentioned, but untrained or ill informed furniture restorers/conservators.

Even among professionally practicing conservators in Australia, the treatment of clear coatings or finishes for furniture and architectural timbers is a grey area with no real specialist knowledge available. Conservation science and the treatment of finishes for furniture/timber is an area of on-going research in the US, UK and Europe. Products need to be developed to meet the harsher environmental conditions in Australia.

Other fields of conservation have been fortunate to have a world leading institution at home at which to train, with both undergraduate and postgraduate studies available. In Australia, furniture conservation/restoration has, until recent times, been seen more as a trade than a serious conservation profession.

A proficient furniture conservator must not only have the trade skills of cabinet making, french polishing, marquetry and all the associated fields which were historically separate trades, but must also have an in-depth knowledge of furniture history, materials history, plus importantly be up to date with the latest scientific advancements on how to best preserve and protect our nationally important collections of historic furniture. Additionally, one must also understand how to implement new technologies and science to better care for new wooden art furniture, wooden sculpture and objects, plus all the architectural timbers in our national institutions.

The UK, Europe and US have specialised institutions offering various levels of training from diplomas through to post graduate studies. Some of these courses take up to 6 or 7 years of specialised training. Research and on-going mid career training programs also exist to keep furniture conservators abreast of the latest developments.

Our Nationally important furniture collections have suffered at the hands of well intentioned, but untrained or ill informed furniture restorers/conservators. This is not just historically correct, damage is still occurring today.

Most people, including many in heritage and even those in other conservation fields, are unaware that most furniture restorers/conservators in Australia hold no qualification or formal training. To my knowledge there are only three furniture conservators employed in Australian institutions nationally. The implication of this is that institutions in Australia outsource furniture conservation to the private sector. Even in recent times some nationally important collections of furniture have been irreversibly damaged through poor restoration/conservation practices. I believe it is of paramount importance that the potential damage that may occur through unskilled restoration/conservation should be communicated to the highest relevant level.

In the wrong hands, a well-intended but unaware or untrained person can cause irreversible damage in a matter of minutes.

Even among professionally practicing conservators in Australia (*trained abroad*), the treatment of coatings or finishes for furniture or architectural timbers is a grey area with no real specialist knowledge available. Conservation science and the treatment of finishes for furniture/timber is an area of on-going research in the US, UK and Europe. Products need to be developed to meet the harsher environmental conditions in Australia.

New materials and techniques tend to filter down through technology developed for other facets of conservation or other un-related fields. In Australia we only know about these advances that may be used in conservation or finishing treatments for furniture through papers or articles published on the internet. Conservators employed in other fields tend to work in environments which encourage and foster the cross fertilisation of knowledge and research. Most furniture conservators employed in Australia are privately employed and thus have little contact with conservators in other fields. Being privately employed, the time available for research and development is minimal.

Institutions abroad employ furniture conservators who work in conjunction with conservation scientists, and analysts to develop new or existing technology for the specialised use in furniture conservation. Much of this research is in developing ways to clean old finishes and materials without disturbing the ground. Protecting and prolonging the life of the original finish is the desired outcome on old furniture.

Much research is also being conducted on the use of new clear coatings for the use on important furniture and architectural timberwork. Commercial finishes employed in recent times (50 years) have a short life expectancy and once damaged, the option to repair is often not possible or viable. New finishes deteriorate to an extent where they cannot be saved, thus they are periodically removed and re-coated. This process is not only hugely expensive but they also leave the underlying timber very vulnerable to damage, either mechanically or chemically. Conservation grade finishes are being developed abroad for institutions where timber is a prominent architectural material and used for decorative detail. A finish which can withstand day-to-day use, can be maintained rather than replaced, protect the underlying timber from ultraviolet light, moisture and mechanical damage, plus be able to age acceptably. This is becoming increasingly important when we are already running into trouble with some of our most significant Australian Interiors that are already in need of attention 10 or 20 years after manufacture.

3.0 The Fellowship Program

3.1 Introduction – The nature of my program overseas –who, what, where, when.

During the course of my four week overseas program, I met with numerous people, all of whom are considered world leaders in their field. These specialists were selected by asking and posting enquires to the broader international furniture conservation field for their advice and input on whom would be the most valuable people to meet for my specific investigations. The responses far exceeded what I could practically complete within time and geographical restraints. Although I could not see everyone, I feel confident that this selection offered me the best resources at this moment in time.

I targeted individuals and groups for their specific knowledge. All experts chosen are in the related field of furniture conservation, though each of my visits will target a specified subject to which the individual or organisation is renowned for. My own personal intuition, plus advice from others, in anticipating my reception was also factored in when short listing these visits. Within the furniture conservation fraternity, a single degree of separation exists, some members I am already acquainted with recommended my visit to their peers. A level of support which is most encouraging. To develop and build personal relationships will be of high importance. I recognise the benefit of an international network, not only for my own professional development in solving conservation issues, but also as a referral for other conservators working in Australia who may need specialised advice for specific problems.

My program will entail personal meetings that will be purely on an interview level, others will involve visits to workshops and laboratories involving practical demonstrations.

Royal Collection Workshops, Saint James Palace, London, UK **September 26 – 27th** **2005**

- Workshop visit with joint staff meeting/discussion of relevant topics

Victoria and Albert Museum, London, UK **September 28th** **2005**

- Meeting with Senior Furniture Conservator Shayne Rivers. Discussion.

Buckinghamshire University, High Wycombe, UK **September 29th** **2005**

- Meeting with Professor Jake Kaner, president of the 20th Century Furniture Research Group.
- Workshop visit with Paul Tear, course leader at Buckinghamshire Chilterns University College (BCUC)
- Lecture and slide presentation to students and staff on the issues relating to my ISS Fellowship
- In-depth discussions with coatings specialist, Cambell Norman – Smith

- Windsor Castle, Conservation-branch, Windsor UK, September 30th 2005**
- Meeting and inspection of works Mr Adrian Smith, Chairman of the furniture division, United Kingdom Institute of Conservators.
 - Discussion and Meeting with painting conservator ...
- Tikkurila Coatings, Industrial paint manufacturer, Helsinki, Finland October 6th 2005**
- Visit to plant, coatings museum and discussion with industrial chemists
- Evtek University, Conservation Department, Vantaa, Finland October 7th 2005**
- Discussion with staff and students as to how they are conserving Finland's rich design heritage and vast amounts of interior timber. Head of the Conservation Studies, Tuula Auer
 - Presentation to Students on furniture conservation in Australia
- Private Workshop of Annika Bertlin, furniture conservator, Helsinki, Finland October 8th 2005**
- Meeting with several furniture conservators working with modern and traditional materials, particularly the problems associated with conserving finishes in the private sector
- Smithsonian Centre for Materials Research and Education (SMCRE), Washington DC, October 13-14th 2005**
- Meeting with Don Williams. Inspection of Smithsonian facilities followed by question and answer discussion.
 - Meeting other people in the materials research field, attended Don's book launch on conservation for the home.
- Winterthur Museum, Conservation Department, Delaware USA October 16-20th 2005**
- Meeting with Professors Michael Podimanski, Greg Landrey and Mark Andersen, Furniture Conservators. Discussion and displays, examples of work
 - Meeting with Professor Robert Wolbers, conservation research scientist. Primarily on selective removal systems and finish replacements.
 - Meeting with Dr. Jennifer Mass, Museum Scientist
 - Day of observation with Dr. Susan L. Buck, Paint analyst and conservator

3.2 List educational/Host organisations and give a brief outline of that enterprise and its structure

a) Royal Collection Decorative Arts Conservation Studio, Saint James Palace, London UK

The Royal Collection houses one of the world's most historically important furniture and decorative arts collections. The collection consists of objects located within the nine royal properties, and over 3000 loaned objects in other institutions. Due to its sheer size and importance as a historical resource, it is managed by a dedicated team of curators, historians, conservators and administration staff, operating from St. James Palace. The furniture conservation workshop is located across from St. James Palace at Marlborough House.

The Decorative Arts Conservation Department has three full-time furniture conservators/restorers, two object conservators, one gilder and one armourer. The Royal Collection conservation department practices a unique conservation ethic that sets it apart from most other conservation departments, unlike a museum where the objects are maintained in a stable environment, the Palaces house functional and working collections. The palaces are not environmentally controlled, and the collections are sometimes subjected to harsh conditions compared with furniture in museum environments.

Senior Decorative arts conservator Mr. David Wheeler is originally a furniture conservator. David and his team, collectively have a wealth of experience and exposure to problems associated with maintaining furniture in a functional state whilst retaining its historic integrity. Due to the functional nature of objects in The Royal Collection, throughout history many objects have been modified or made more practical, dressed up and over-coated. The decisions and techniques employed in revealing or removing later additions are very relevant (although on a different level) to furniture in Australian collections which too are commonly functional, or have been function until recent times. Much investment has been made in the documentation, history and analysis of The Royal Collection, thus they house a fantastic archival resource which encourages much collaboration with specialists from many conservation fields.

b) Victoria and Albert Museum, London UK

The collection at the Victoria and Albert Museum consists of more than 14,000 pieces from Britain, Europe and America, dating from the Middle Ages to the present day. It is predominantly furniture but also includes related objects such as architectural and decorative woodwork, musical instruments, leatherwork, treen and clocks. The collection also includes complete rooms, some of which are on display in the British Galleries.

Research is a core activity of the Victoria and Albert Museum and is carried out in all its departments. Some research concerns the identification and interpretation of individual objects. Other studies contribute to systematic research. This develops the public understanding of the art and artefacts of many of the great cultures of the world. Furniture conservators have developed specialisms within their discipline, such as modern furniture, ecclesiastical objects, architectural woodwork and models, objects from South Asia, veneered surfaces and decorative surfaces, including gilding and oriental lacquer.

Meeting with Senior Furniture Conservator Shayne Rivers

SHAYNE RIVERS' roles in practical conservation, include condition assessment, cleaning and consolidation to stabilise pieces from the Victoria and Albert Museum's collection for photography, transport and display. She also is responsible for preventive conservation - for example, checking for insect infestation - and emergency response planning. Her research and many publications look into conservation treatments and ethics. Shayne has recently co-authored the most up to date and comprehensive text manual for professional furniture conservators.

Visit to Science section with 20th Century materials polymer scientist, Brenda Keneghan.

The Science section aims to contribute to the knowledge and understanding of museum objects and their environment. It works in collaboration with the Conservation department, other museum staff and fellow professionals and concentrates on collection-centred work, meeting clearly agreed goals and balancing education, research and consultancy. The skills within the multi-disciplinary team include: chemistry, physics, materials science, conservation science, polymer science and microscopy. On-going museum initiatives that fall within the sphere include: environmental monitoring and advice; lighting and solar control policies and implementation; dust monitoring; technical examination of artefact constituents and response to environments; paint and pigment analysis; and display cases.

c) Buckinghamshire Chilterns University College, High Wycombe, UK

The Faculty of Design offer undergraduate and postgraduate studies in furniture conservation. Buckinghamshire Chilterns University College (BCUC) is one of nine specialised university run courses in the UK. Students have the option to continue their studies to Mphil Or PhD level.

The study is a workshop/studio based experience with supporting studies of material science, history of furniture and its treatment. Students negotiate the particular areas or techniques they wish to research from the wide range of historic furniture, including Twentieth Century furniture, for both their project work and thesis. The course includes studies in Conservation, Ethics, Furniture History, Restoration Theory, Material Science and Practice. The final period of the course sees the integration of theoretical and practical studies exhibited by the dissertation and the completed restored or conserved pieces.

Workshop visit with Paul Tear, course leader at Buckinghamshire Chilterns University College (BCUC)

PAUL TEAR was previously Senior Conservator at the Wallace collection in London, as well as heading the United Kingdom Institute of Conservators (furniture division). Paul has been a major player in the in modernising the field of furniture conservation, bringing innovative and creative thinking to simplify and solve problems encountered in the technical end of conservation.

Other staff include Senior Lecturer Campbell Norman –Smith and Principle Lecturer David Gillet . Campbell has an in-depth knowledge on the material use of shellac and has undertaken much of his own research on the subject.

The Twentieth Century Furniture Research Group (TCFRG) is also situated within the faculty of designs at BCUC. The central aim of the TCFRG is to promote and preserve furniture manufactured in the Chilterns throughout the twentieth century. President, Jake Kaner's thesis studies the early polymeric materials encountered in furniture, 1880-1920: 'Their Chemistry, Conservation, History and Manufacture.' Jake's focus has been on casein plastics and cellulose nitrate, though his research and knowledge of material history in the furniture trade is most contemporary and complete. He has been reviewing previous techniques and investigating new ones, which allow for the identification of early polymeric materials and standardising the analytical, chemical and macroscopic procedures

d) Windsor Castle furniture conservation branch, The Pug Yard, Windsor, UK

Windsor Castle is an official residence of The Queen and the largest occupied castle in the world. A royal home and fortress for over 900 years, the Castle remains a working palace today. Windsor Castle is the oldest and largest occupied castle in the world.

The twentieth-century history of the Castle is dominated by the major fire that started on 20 November 1992. It began in the Private Chapel, when a spotlight came into contact with a curtain and ignited the material. Nine principal rooms and over 100 other rooms covering an area of 9,000 square metres were damaged or destroyed by the fire, approximately one-fifth of the Castle area. The next five years were spent restoring Windsor Castle to its former glory. It resulted in the greatest historic building project to have been undertaken by Britain in the twentieth century, reviving many traditional crafts.

The Pug Yard at Windsor Castle is located within the Castle precinct and houses the furniture conservation department. Adrian Smith is Senior Conservator and Assistant to the Master of the Royal Household, controlling the furniture workshops including polishing, repairs, upholstery and gilding. Adrian is also president of the furniture division, United Kingdom Institute of Conservators, (Now ICON). The Institute of Conservation.

Conservation(C)-branch at Windsor are responsible for the conservation/restoration and maintenance of the furniture belonging to the Royal Household, those being objects which are lived with day-to-day by the extended Royal Family on numerous estates in the UK. Much of their work also involves the upkeep of functional furniture used for ceremonial and state occasions, which tends to take a battering due to high use. C-branch has five or six furniture restorers/conservators/polishes, two gilders, and two conservation upholsters. The department works on a semi-

commercial level, servicing outside clients from the Royal Household on a commercial basis. Much of the major interior conservation and restoration work around the palace is contracted to the private sector.

d) Tikkurila Coatings, Industrial paint manufacturer, Vantaa, Finland

Tikkurila was founded in 1862 and is not only Finland's leading paint manufacturer but also one of the largest in Europe, with customers all over the world. Alcro-Beckers and Tikkurila are part of the Kemira group. The Kemira group is a chemical industry group with production in over thirty countries. Tikkurila has had a long association with local furniture designers/manufacturers and no doubt part of their success was due to the popularity of Scandinavian furniture throughout the late 20th Century. Tikkurila have a unique archive and museum on paint and varnish production, an fantastic resource when identifying finishes from a particular period.

Scandinavian Environmental and Occupational Health and Safety (OH and S) legislation has been advanced of most western countries for several decades. Due to tighter restrictions paint and chemical companies have had to be innovative in developing their products to be compliant and thus today have an edge and are recognised as world leaders in producing safe and environmentally friendly paints and finishes.

e) Evtek University, Furniture Conservation Department, Vantaa, Finland

The Department of Conservation Studies is the only higher education programme in Finland offering studies in conservation.

Programmes in conservation are offered in;

- Conservation of easel paintings
- Paintings on wood, including polychrome sculpture
- Conservation of paper and paper materials
- Conservation of textiles
- Conservation of furniture
- Conservation of cultural historic objects, including glass, ceramics, stone, wood, leather, metal, archaeological finds and ethnographical materials
- Conservation of cultural historic interiors

Interestingly the intake of students for any one discipline is limited to every four years. The students studying their medium are the only students throughout the duration of their degree, Not only does this ensure in-depth training, it prevents a glut of conservators who might other-wise flood the market in such specialised fields. The students I met were just starting their second year and numbered around a dozen. They were all female which is a trend I have noticed internationally. By far, the majority of students in Europe and those I met in America have been female. The university does not require students to have previous woodworking experience as do most universities. The

conservation treatments come first with the traditional and practical hand skills of woodworking and polishing secondary.

f) Private Workshop of Annika Bertlin, furniture conservator, Helsinki Finland

ANNIKA BERTLIN is a conservator in private practice and works on a large variety of objects ranging from the 17th century through to the 20th century. Her business tackles objects from the museum environment, private collectors as well as the antique trade. Within Finland's' small population, Annika has developed a network of locally engaged conservators who utilise one another's skills and knowledge, plus are able to pool together to utilise the sophisticated and expensive modern analysis methods at local institutions.

Scandinavia is renowned for its 20th Century design in many disciplines. Scandinavian furniture production in this period has impacted most markets in the world, with a popularity that has not subsided. The use of new technologies and materials in producing their designs has led to many new techniques which are today practiced in workshops world wide. The conservation of this furniture has required a different approach, often dealing with early spray applied production finishes which are typically unstable, and glues used in the lamination processes, which have also created many conservation headaches for the furniture conservator. Scandinavian designers, manufacturers and industry boast a uniquely long collaboration in their commitment to develop new products to solve design problems and this collaboration has today flowed through to conserving what is now an important part of Scandinavian heritage.

Annika arranged a meeting and discussion forum with a local group of furniture conservators addressing issues concerned with the preservation and sometimes necessary subsequent replacement of 20th Century materials.

f) Smithsonian Centre for Materials Research and Education (SMCRE), Washington DC, USA

Established in 1963 to principally provide technical support to the Smithsonian museums in the analysis and conservation needs of the collections. The mission of the Smithsonian Centre for Materials Research and Education (SMCRE) is to develop independently formulated programs in research and education for conservation and scientific studies of collection materials, serving a nationwide and international professional audience.

Meeting with Don Williams

DON WILLIAMS, Senior Furniture Conservator at the SMCRE, provides care for the furniture collection and wooden objects from the Smithsonian collections: structural repair and stabilization, finish deterioration and replacement, veneer and Boulle work, carving, gilding, lacquered and inlaid papier-mache furniture, and consultation on objects as diverse as the Wright Flyer and wooden mail wagons. Previously the Director of the Furniture Conservation Training

Program 1989-1995, he then served as an adjunct lecturer in the Conservation Science Doctoral Program in the Materials Science Department of Johns Hopkins University; faculty member Parsons/Smithsonian MA Program in the History of the Decorative Arts. Engaged in studies of materials and development of treatment options and protocols, especially as related to technology and preservation of coatings materials and decorative surfaces, Don now writes and delivers numerous lectures and presentations relating to these subjects.

At the SMCRE Don has conducted much independent research, developing individual responses to complex chemical and physical problems encounter in the conservation of finishes. With a background in polymer chemistry, Don has utilised his vast knowledge of materials science, practical skills and his in-depth understanding of traditional woodworking and finishing to tackle problems which have been frustrating furniture conservators for decades.

g) Winterthur Museum, Conservation Department, Delaware USA

Winterthur is one of America's most visited house museums with over 250, 000 visitors annually. It was bequeathed by the Dupont family in 1963 as museum to reflect the agrarian way of life that existed on these country estates in colonial times.

The University of Delaware with the Winterthur Museum offer a cooperative Art Conservation Master's Degree Program designed to educate and train conservation professionals who can carry out the examination, analysis, stabilization and treatment of art and artefacts. Winterthur boasts a world leading Scientific Research and Analysis Laboratory with equipment to perform x-ray fluorescence spectroscopy (XRF), Fourier transform infra-red spectroscopy (FTIR), Raman spectroscopy, reflected and transmitted ultra-violet visible spectroscopy (UV/VIS), gas chromatography–Mass spectrometry (GC–MS), scanning electron microscopy (SEM) with energy dispersive analysis (EDS), and metallographic examination. The Museum Analysis Laboratory examines the composition of collection objects, aiding in their interpretation and research by museum curators and conservators. Conducting research into the development of new instrumental methods for the characterization of objects of art, and into early American architectural finishes.

Meeting with Professor Robert Wolbers

RICHARD WOLBERS is an Associate Professor in the Art Conservation Department at the University of Delaware, Newark, Delaware. His academic qualifications include BS Biochemistry and MFA Painting from the University of California and MS Art Conservation from the University of Delaware. His research interests lie in developing cleaning systems for fine art surfaces and in applied microscopy techniques for characterising decorative materials.

Many conservators have learned how to use Richard's methods, but perhaps the least understood aspect of the new techniques is the chemistry,. He feels his job is to be a facilitator, to teach the chemistry necessary so that any conservator who is interested can understand more about the cleaning process. Richard is quick to point out that his contribution to the field is to provide more options to the practicing conservator. As using water-based systems to

clean materials that are traditionally cleaned with solvents is counterintuitive, the difficult part is knowing when a newer, more complicated treatment is preferable to an older, simpler technique.

Meeting with Professor Michael Podmaniczky, Senior Furniture Conservator

MICHAEL S. PODMANICZKY is head of furniture conservation at Winterthur Museum and adjunct associate professor in the Winterthur/University of Delaware Program in Art Conservation. He has an extensive craft background as carver/cabinetmaker, boat builder, model maker, pattern maker, and machinist. He received his B.A. in fine arts from Kenyon College in 1970, Certificate in Furniture Conservation from the Smithsonian Institution, and congruent master's degree in decorative arts from Antioch University in 1990. He is a member of the class of 1989 of the Attingham Summer School on the English country house. He has responsibility for accessioned woodworking tool collections at Winterthur and maintains active research of related historic trade practices. He is a Professional Associate of AIC, a member of the Objects Specialty Group, and past chairman of the Wooden Artefacts Group..

Meeting with Dr. Jennifer Mass, Museum Scientist

Museum Scientist Dr. JENNIFER MASS and Assistant Scientist Catherine Matsen work with M.S. students on the sampling of objects, the use of analytical instrumentation, and the interpretation of data. They also supervise technical study research projects undertaken by all M.S.-level students. Jennifer and Catherine also conduct research into the development of new instrumental methods for the characterization of objects of art, and into early American architectural finishes.

3.3 Programme Content

a) Royal Collection Decorative Arts Conservation workshops, St. James Palace, London UK

Over the past seven years I have become well acquainted with the staff at the Royal Collection, visiting numerous times. The conservation team have been most helpful and forth-coming in sharing their wealth of experience and knowledge with me. Their international presence in the conservation world has enabled me to access other contacts throughout the world to whom they have kindly referred me.

The furniture and objects in the Royal Collection are of another league compared to most work I am engaged with whilst working in Australia. The age, historical importance, embellishment and price tag cannot be compared to the type of furniture common to Australia. This difference aside, the desired outcomes are often very similar. Most furniture collections in Australia are functional, as is The Royal Collection, thus both require special consideration to ensure objects are retained in working order, whilst still following modern conservation ethics and principles.



Senior Decorative Arts Conservator, David Wheeler

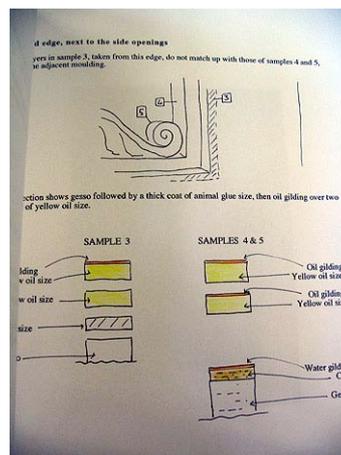
One of the targeted areas I pursued at The Royal Collection was selective varnish removal techniques. Throughout time and up until two or three decades ago, many objects in the Royal Collection had been treated with overcoats of inappropriate clear coatings and materials to update them or revive a deteriorating surface. Sometimes a modern finish was used to make the object less susceptible to damage and thus more user and maintenance friendly. Functional furniture often receives such treatment no matter where it is. Dozens of examples exist in Australian State and National collections.

Where there has been an expectation that objects are to be used whilst retaining a rich, exuberant aesthetic, there has been excuse to intervene with objects with a heavy hand. The previous techniques and materials used in these processes normally involved stripping and replacing original coatings with estapol or spray finishes, adhesives such as epoxy and polyvinyl acetates (PVA) were also used extensively. Not only do these additional modern materials change the objects aesthetics and degrade its integrity, but it very difficult to reverse and undo the damage caused as a result of these. In my private practice, I would estimate that up to 70% of work involves undoing the work of others.

The other subject most relevant to my investigations is the decision process that occurs after these objects have had their inappropriate materials selectively removed. The dilemma of choosing a new clear coating for an object intended for functional use is complex. Importantly our choice is made by selecting a finish with the correct historical aesthetic for the object, (same refraction, look and feel). A functional object must also be resilient to day-to-day wear and tear, but must still retain the ability to be reversed and repaired with ease and without affecting the objects integrity.



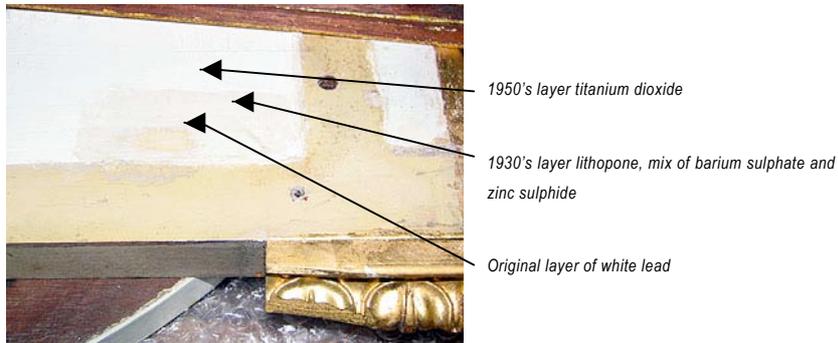
*Pedestal from Brighton Pavilion.
Over painted at least once.
Originally painted in lead white
with applied decoration and gilding*



*Diagram after analysis by Scanning Electron
Microscope (SEM). Discovered the pedestal has
been overpainted at least twice. Once between
the world war, again in the 1950's with house
paint*



*Removing over paints both
mechanically and with solvents to
expose original layers*



I have been lucky to observe several major varnish removal processes at the Royal Collection Workshops. A painted and gilded pedestal from the Brighton pavilion which has had three major re-decorations and re-paints, the last being in the 1950's.

An important decorated Commode which has a painted finish using layers of medium over a silver leaf ground to create a remarkable depth. The detail and colour were heavily clouded and soiled by degraded layers of oil-varnish and shellac. The selective removal process was a most complex procedure.

Mahogany furniture made, by the Royal appointed cabinet maker William Vile were stripped of historically incorrect finishes and replaced with coatings more sensitive to the objects intended aesthetic.

The decisions surrounding coating replacement are made on an individual basis depending on the historical significance, interpretation, function and aesthetic which is to accurately emulate the historical look of the piece. Both shellac and wax treatments are extensively used on timber whilst paraloids and synthetic resins have been used on other materials. Shellac and wax are both historically correct and can be manipulated to create a whole range of 'looks' which can emulate most aesthetics. Shellac and wax coatings are both reversible and can be removed, repaired or replenished at any time making them a favourite choice for conservators.



Commode made by William Gates for George IV's apartments at Buckingham House in 1781



Veneer repair to cover large split in door. Veneer selection was poor. Finish had been removed to facilitate previous repair. Again, this was removed to allow for current replacement.



Richard Thompson carefully replaces previous patches which were poorly executed and mis-matched. The finish was replaced with a thin layer of shellac applied as French polish, then waxed

b) Victoria and Albert Museum, London UK

The Victoria and Albert Museum is typical of many large museums throughout the world in that they have their own furniture conservation department consisting of five to six personnel along with interns who work on project and research basis, contributing to their academic qualification.

Shayne Rivers is one of the most recognised academic minds in furniture conservation today. Recently she co-authored the first comprehensive reference book on furniture conservation, taking 10 years to complete. Shayne has come from a practical background of woodworking and restoration before finally moving into the world of conservation and research, specialising in the conservation of oriental lacquer.

I was to also meet with material scientist Brenda Keneghan, who unfortunately was unavailable. Accompanying Shayne was an Intern from Delaware university. Dana Melchar is one of two students undertaking her PhD in furniture conservation which involves an internship. (*more information on this under Winterthur*)

Shayne, Dana and I had a question and answer discussion which lasted many hours. It's interesting to discuss with Shayne newer technology and techniques which have been developed in the museum sector that may have implications for private practice. It is difficult to designate the time for unpaid research in private practice, which is why the institutions and museums are vital for the development of research and technologies in conservation.

Some of the issues discussed were;

- Stabilisation of shellac by replacing natural resins with synthetics
- Use of shellac as a commercially viable resin on functional furniture and interiors
- Philosophies surrounding the conservation of clear coatings on modern furniture, should it be replaced? What with?
- Use of Ultra-violet light absorbers and deflectors, Tinuvin in coatings
- Sunburn cream? How does this work for us and can it be used in coatings
- Shellac on reproductions, floating Vandyke between layers of shellac
- The adoption of synthetic resins from painting conservators, which ones are applicable to furniture
- Making cleaning agents, gelling solvents
- The conservation of nitro-cellulose finishes
- Removal systems for polyurethane

The problems associated with some modern replacement materials which have become common and accepted practice in conservation was a topical issue. Techniques that are developed in institutions might take several years, even a decade to become accepted and common in private practice, by which time these techniques and materials may have been superseded or even determined un-safe or detrimental to the object. *i.e.;* (*the use of epoxy adhesives throughout the 1960's in the restoration of Boulle work, marquetry and other furniture repairs. And museum recipes which advocate the use of linseed oil and vinegar as a cleaner for furniture*). Clearly as time

passes and further research is completed, it becomes apparent that some treatments may indeed inflict long term damage to the very object we are trying to conserve. Institutions only have a relatively short time frame in which to observe or discover any negative impacts of modern materials and methods used in the conservation treatment, some implications may not become apparent for decades. The argument for the use of traditional materials such as animal glues and shellac coatings has been observed and studied over centuries and thus their positive and negative characteristics determined. I noticed that the attitude of, "Better the devil you know", has surfaced as a strong argument for the use traditional materials over their modern counterparts.

Shayne specialises in oriental lacquer and western japanning, she has developed technics for over-varnish removal on these surfaces. Access to scientists, specialists and equipment to analysis the surface coating materials in-house, gives museum conservators opportunity to design specific materials and techniques for individual objects. It is in institutions that have these resources that progress is made and techniques like those used at The Royal Collection (who don't have the scientists or equipment) are implemented. Eventually filtering through to private practice.

Shayne's knowledge on conservation materials and synthetic coatings is comprehensive. In compiling her recent book she has had contact with many researchers and gained an awareness of previous publications on almost every relevant topic. Personally she has explored the use of selective removal techniques and synthetic resins as a coating to re-saturate an oriental lacquer on the prized 'Badminton bed' with good results. For museum application where the objects remain static these resins are suitable, however for practical and functional furniture more resilient resins are required. We discussed the use of other resins such as Irapols 80 and 120. To her knowledge no one has trialled these.

c) Buckinghamshire Chilterns University College(BCUC), High Wycombe, UK

High Wycombe has traditionally been renowned for furniture making in Britain for several centuries. The furniture industry was a large employer of locals and thus the infrastructure for education and training has been well established. The resources at BCUC are amongst the best I have seen, particularly the workshops. The University took over what was a TAFE and thus the workshops have much plant machinery, which although not compulsory for conservation, woodworking skills are the back bone of our profession.

Having met Paul Tear on numerous occasions and briefing him via correspondence on my research trip I knew the time at Buckinghamshire would be interesting. Unfortunately, I did not get to meet Jake Kaner from the 20th century furniture research group, though discussions throughout the day on related issues were intense.

Senior lecturer Campbell Norman-Smith has conducted much research on shellac and its characteristics. He was particularly interested in my problems associated with Parliament House and was most helpful in recommending associates he had worked with at companies still producing specialist traditional materials for the furniture industry. Campbell is an advocate for the use of shellac and posed valid arguments for using a traditional shellac to replace

our modern finishes in scenarios like those at Parliament House. (*see later in Document, Parliament House Scenario*). Although not directly related, Campbell's research has been to find an alternative to the widespread use of modern synthetic compounds used to repair Boulle work, simulating tortoise shell. Campbell reasoned that very little is known about what possible detrimental effect solvents used in modern coatings, and the other materials employed in these compounds, may have on pieces in the future.

The students were very interested in the state of furniture conservation in Australia and I was asked give an impromptu presentation to students from all years. Talking on the subject of furniture conservation in Australia, though concentrating on the content and intent of my ISS fellowship. It became evident that even though the 20th Century furniture research group is a part of the same department, the students do not specialise until perhaps post graduate level. The teaching of furniture conservation throughout the UK and Europe still focuses primarily on historic furniture and associated materials.



Upstairs at Buckinghamshire, the final year students working on their projects



Course Leader Paul Tear

Paul Tear's previous experience at the London Museum and Wallace Collection involved him in important new technologies and materials accepted widely today in furniture conservation. Paul was involved in developing several new techniques and adopting other pre-existing methods, particularly in the repair and consolidation of marquetry where the underlying glue is vulnerable to conservation treatments. We talked a length about the issues of removing modern coatings with solvents and their impact on glues as this is indeed one of the scenarios I often face. Paul has a scientific approach to problem solving and his suggestion to run a series of tests on mock panels is one I will definitely pursue. Though first I need access in Australia to those with the knowledge, equipment and expertise to measure and quantify the results.

d) Windsor Castle furniture conservation branch, The Pug Yard, Windsor, UK

Of all the institutions, the conservation workshops at Windsor perform the type of work most closely aligned to the work I do in Australia. The principles and philosophies associated with the conservation of antique furniture for functional use differ from ethics for static objects. Working on historically important furniture which is to be utilised, calls for a unique, though strict code of ethics. Retaining furniture in a functional state often conflicts with the strict ethics of pure preservation, thus the decision process becomes more complicated. Much deliberation is had in the choice of materials and deciding the extent of repair work in order to keep an object functional.

Adrian Smith (Senior Conservator) has a long association with furniture, both on a commercial and institutional level. Adrian has been extremely supportive and understanding of the furniture conservation/restoration sector and as president of the The Institute of Conservation (ICOM) furniture division, is well aware of related issues in institutions, private practice and also in industry/trade.

Adrian had very sound advice on the problems I raised with him in relation to modern coatings, He told me he didn't have much new material for me, though he could show me "What not to do."

In 1992 after Windsor castle suffered the disastrous fire which destroyed a fifth of the Castle, a committee, headed by the Duke of Edinburgh and Prince Charles, was set-up to oversee the restoration work. They decided that certain principle rooms destroyed by the fire - the Grand Reception Room, the State Dining Room, and two Drawing Rooms - should be restored to their former state. Specialists were brought from all over the world to rebuild and to train others to help reproduce the traditional timber work and fine arts from centuries before. The restoration process was long and painstaking, it took five years to complete with over 1500 people involved at a cost of £37 million. Near the end of the restoration the committee made a decision, probably on environmental grounds, that the windblown oak timbers which had been especially selected from old estates for their grain structure, then delicately hand carved and shaped to match the gothic architectural detail, were to be spray finished in a modern water-borne polyurethane lacquer? From the day it was finished, the choice of finishing coating has been problematic. To start with it does not have the aesthetic of an old world finish. Water-borne finishes tend to be milky and cold. Within years of being complete, the water-borne polyurethane started to cloud, bleach and degrade where exposed to sun light and fluctuations in environmental conditions. Contracted furniture restorers/conservators were called in to rectify the situation. Well intentioned, though ill-informed, these conservators used nineteenth technology to fix 21st century problems. In an attempt to disguise the milky cold appearance, they applied tinted shellac coats to the water based finish. This may have rectified the problem short term, though today these areas look terrible. The coloured dyes or pigments used were not light fast and the red has faded and are now grey. This complicates matters further as the oak panelling in Saint Georges hall has the names and heraldic crests of the order of the garter under the finish, which are now illegible under this grey wash.

To rectify the situation will cost millions of dollars. The water-borne polyurethane will have to be removed which will be a very challenging task. Firstly the area will have to be closed for an extensive time. The vaulted ceilings are very high, the carvings are deep and to my knowledge no barrier layer was used to separate the coating from the timber. Much hand scrapping will have to be performed, even if only to remove the solvent strippers which are likely to be used. The text and heraldry will have to be entirely re-done. The decision will almost certainly be to re-finish

with the traditional coating of shellac and wax. In the adjacent rooms which were untouched by fire, the shellac and wax finish was last restored in the 1920's and is in good condition. The water-borne route turned out to be an expensive and embarrassing mistake. Adrian is quite right in that we can learn much from other peoples errors.

Whilst at Windsor Adrian suggested we visit the Painting Conservation Studios at Stable Cottage to meet the Paintings Conservator, Al Brewer who had treated paintings at Windsor on wooden panels. Al suggested and discussed the typical synthetic resins used in picture conservation on panel paintings, though he had reservation about their application to functional furniture mainly due to low melting temperatures and softness. Al talked us through the conservation of a Caravaggio which was newly conserved. Paintings in the Royal Collection, like the furniture, have to contend with conditions less than perfect. The Royal residences are seldom environmentally controlled to museum standards.



Adrian Smith and Al Brewer, paintings conservation lab

d) Tikkurila Coatings, Industrial paint manufacturer, Vantaa, Finland

A site visit to Tikkurila's research and development department was arranged by Annika Bertlin on my behalf. Several other furniture conservators attended as did the Senior furniture conservation lecturer from Evtex University. Tikkurila provided us with a guide for the day and were very hospitable, allocating as much time as required and refreshments all day. We visited the testing labs where new products are trialled. An out-door long term testing field was interesting, with samples dating back several decades. The lab scientists were very keen to demonstrate their finishing efforts using clear coatings in water-borne and solvent based finishes. Longevity, ease of application and speed were the focus for these chemists. When asked about conservation and reversibility they didn't seem to understand the relevance to their products. Maintenance issues were discussed instead which were accepted as keying the surface and applying an additional coat every twelve months. Not an acceptable treatment for historically important furniture.

Language did not seem to be the issue as my colleagues were also surprised at the lack of understanding and insight the chemists and scientists had in relation to conservation issues for clear coatings. Manager of Research and Development of interior products, Maria Tallsten-Lind was more understanding of questions and seemed to suggest that no one had approached Tikkurilia identifying these issues before. She understood the relevance and place for a clear coating to be developed for furniture conservators, though thought it probably commercially unviable for Tikkurilia.



Research and development Lab



Dr. Maria Tallsten-Lind



Outside testing panels

We were all very grateful for the warm reception and generosity shown by the firm though I got they impression Tikkurila misinterpreted our visit as a commercial opportunity to sell their current products to a new market.

The Tikkurila museum of finishes and finishing materials was interesting. I had not seen a museum or collection based on the finishing industry before. The development of application techniques has come a long way these past 50 years. I was interested to learn that the paint roller was developed in Finland, as recently as 1917. An interesting observation was that the new floor in the museum was a plastic laminate imitating timber. Apparently with the ice and snow, timber floor finishes are too difficult to maintain!



Coating application technology

technology



Material

Evttek University, Conservation Department, Vantaa, Finland

A visit to any institution involved with educating furniture conservators is of interest to me. I have visited most schools in Europe and have a real interest in the comparison of education offered to furniture conservators internationally.

My visit coincided with the first week of the academic year, thus there were few projects underway carrying on from the previous year. The University offers conservation treatments for historic collections and were treating several 17th century polychrome carvings from a local church. The cold climate of Scandinavia must have a preservation effect on timbers as although exposed to the elements, these objects were in very good condition except for the damage caused by humans in times of religious conflict and the heavy coating of bird faeces. The treatment of decorative surfaces seem to make up a large component of the course. The traditional use of pine, birch and beech timbers as a building medium, not as a show timber, means historically most surfaces were decorated with paints or applied materials. Even furniture from the arts and crafts inspired period was veneered in better cuts of decorative birch.



Furniture workshop and classroom



Analytical and chemical treatment lab



2nd year students, 100% female enrolment

Paintings lecturer Tannar Ruuben gave me a tour of the paintings laboratories with examples of the student's research on analytical work. The labs are well set up with up to date equipment and technology.

The furniture students were keen to hear about the type of work I do and the purpose of my visit. Thus I repeated a similar presentation to that delivered at Buckinghamshire University.

Among the international furniture conservation fraternity there is much criticism of courses where students concentrate heavily on surface treatments rather than learning about practical and structural cabinet work. Commonly most educational facilities require a working knowledge and demonstrated practical ability of wood-working prior to studying conservation. To learn both conservation and practical cabinet making in four years would be impossible. Conservators graduating from an institution such as Evték will have to perform more specialised roles from the perceived furniture conservator/restorer. It is debatable which skill set should come first, though either way a combination of both traditional woodworking and scientifically based surface treatments are desirable and from my experience, those with passion and drive for their subject do invest and do become quite adequate in both areas of furniture conservation. The one positive side to learning the treatment side first is that the treatments for decorative surfaces are more transferable to objects or even paintings, giving the conservator broader scope rather than just sticking with furniture. It also encourages people who may not be confident with plant machinery or power tools to still explore the possibility of furniture conservation, thus creating specialisms within the furniture conservation field itself. In a museum environment it is already true that specialism occurs. As surface treatments become more scientific and complex, they become intangible for the more traditionally trained conservator/restorer, thus perhaps the best outcome is that we do have specialist furniture conservators who can work together for ultimate outcomes.

e) Private Workshop of Annika Bertlin, furniture conservator, Helsinki Finland

Annika was my main contact in Helsinki. She was instrumental in organising my itinerary, visit to Tikkurila and the Evték University. She also acted as my translator when required. Discussion with Annika on all conservation issues was mutually beneficial as our businesses and professional circumstances are in very similar predicaments. Like Australia, the Finnish institutions don't employ furniture conservators. Out of necessity Annika, like myself, operates

a private practice. This is her 5th year in the private sector, the same age as my business. The problems associated with running a commercially viable business in conservation are many, namely the treatments are generally lengthy and thus expensive. Our over-heads tend to be large and our output low. In order to maintain a professional presence at an institutional level we have to provide the services to museum standards. Some equipment and resources to perform these outcomes are impossible to afford and thus inhibit our professional progress.

The topic of conserving nitro-cellulose lacquers specifically in private practice is one Annika and I pursued in-depth. Scandinavian designed furniture, post second world war, has recently become internationally important. It is a difficult decision whether to interfere with the original finish on an object as it will normally lead to replacement. Each object is treated individually and decisions made accordingly. We were both very happy to realise that we thought very similarly on conservation issues and had independently made many of the same assumptions. The typical scenario of 20th Century furniture in Scandinavia is as in Australia; most furniture from this era is in private functional collections where the owner is aware of its stringent value in terms of design history. It is coated in nitro-cellulose lacquer, or sometimes later polyurethanes. In either case once deteriorating these finishes do not develop a pleasant aesthetic or patina, to the contrary they deteriorate physically to become powdery and clouded, ultimately requiring replacement. Annika and I both agreed that the finish of choice to do replace these coatings on furniture of this genera is shellac which can be applied to emulate the same aesthetic. It can be applied by hand, environmentally sound and safe to use. Importantly it can be treated in the future without removal, or if required, can be removed and replaced without the use of harsh chemicals. If the same object was bound for a glass display case in a museum, then our treatment process may well be very different.



Annika's workshop



Two Gustavian Desks



Discussing the finer points of conservation

Working a business within a small market does create a problem when your colleagues are also your competitors. Both Annika and myself are on friendly and co-operative terms with our professional peers, though it is hard to discuss certain elements of business with them. Although our businesses are a world apart, Annika and I have continued discussions relating to business and commonly consult one another for ideas and even pricing on difficult jobs. The advantages of modern technology when images and illustrations can be sent immediately for inspection half way round the world has definitely improved my knowledge and professional capabilities.

Smithsonian Centre for Materials Research and Education (SMCRE), Washington DC, USA

Senior Conservator Don Williams is well respected in the international conservation world for advancing the field of conservation on many levels. He has a very practical and human approach to conservation which is an important characteristic and lead for conservators to follow. I have always enjoyed reading Don's published articles on conservation as he includes a human presence throughout his writings which makes him very easy to follow, despite the complex chemistry and science which might be prescribed. Conservators often forget that we are only preserving an object because of the social and emotional importance people place on it. Don is an important flagship for Conservation at an international level.

My visit was timely in context to the above. I attended a book launch which Don had just completed in conjunction with freelance writer Louisa Jaggar. The Book Titled, "Saving Stuff", is aimed at the average person who wants to ensure their valuable possessions are properly cared for, ensuring they are preserved for the future. In this instance the word value does not necessarily refer to financial value, rather sentimental. Don and Louisa refer to the fire scenario, if your house was burning down, what would be the first things you grab? Most people would first collect photographs and personal effects that have emotional and sentimental value – not a dollar value. Although not directly linked to my fellowship, I think Don's human approach to conservation is worth promoting.



Don Williams and Louisa Jaggar's book launch, "Saving Stuff" at the Archives of American Art

On a professional level Don was able to provide an example of a parallel scenario that I am faced with at Parliament House. Don's colleague David Smith runs a refinishing business and was recently involved in a large scale removal and replacement of a degraded modern finish from large timber panels in the lobby of large salubrious hotel and conference centre, The Lilly in Indianapolis. Unfortunately, I did not have the time to travel to Indianapolis to meet David, though we have since corresponded and discussed issues. David conducted thorough research and designed a removal system and recoating system that could be implemented without closing the hotel. Although he divulged his findings and results with me, he pointed out areas which he would improve. He has asked that I not publish details of his treatment process for commercial reasons. David chemically removed a degraded nitrocellulose lacquer which had discoloured over several decades. Once removed the panels were spray coated using an airless delivery system, applying a modified shellac with stabilisers added. I hope to converse more with David Smith and to possibly discuss matters further to improve systems for large scale re-finishing.

The conservation labs at SMCRE were impressive. A large materials research lab where Don has conducted much research has recently been made redundant due to funding cuts and job losses. I was fortunate to see and discuss with the paper conservator, the recent research conducted on pigments from a lipstick kiss on a love letter from Carla Frieda. The pigments had fluoresced to an almost iridescent pink colour which would not have been fashionable or available in that time. Due to the current colour, people have mistakenly made the assumption that this colour was fashionable in the 20's. This type of research helps us understand the social context of objects and materials in past times.



Material testing labs with samples set up for exposure/accelerated aging. See paint samples on far right

On coating technology Don and I had another question and answer discussion. Don is also an advocate of shellac and suggested a shellac based product would be his preference to refinish in most re-finishing situations. On the subject of furniture waxes Don was able to provide me with the formula for a wax newly researched and developed for furniture by fellow SMCRE conservator, Mitch Kohanek.

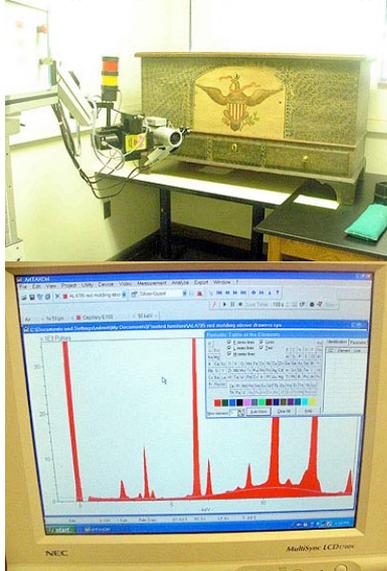
Winterthur Museum, Conservation Department, Delaware USA

The Winterthur Museum and Delaware University run conservation degree program is the most comprehensive, well resourced and complete education for furniture conservators that I have experienced. Although the program offers conservation of all disciplines, The Museum is furniture focussed and thus is set apart from any other institution that comes to mind. A post graduate PhD can now be obtained in Furniture Conservation.

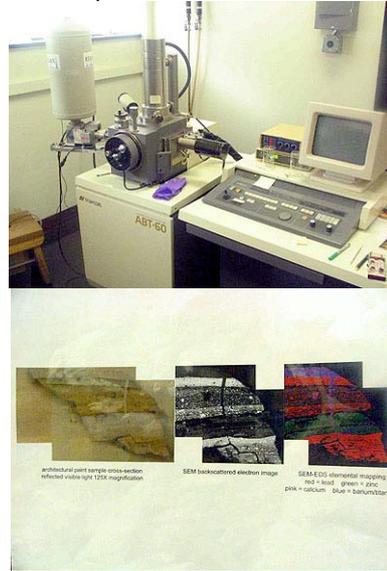
Placements at Winterthur are funded by the Dupont Foundation and are thus very competitive. Students for furniture conservation must demonstrate a practical capability for working with wood before applying. Currently there are only two PhD Students, though a new intake of students had just occurred on my arrival. Students complete a common foundation year introducing them to all mediums and covering areas of conservation such as analysis, microscopy and conservation chemistry. Staff at Winterthur are involved in lecturing and tutoring students in various disciplines as well as running research programs, both with the students and on a commercial level for other institutions or heritage bodies.

My time at Winterthur was divided up to spend time with specialists from relevant departments. Exposure to the analytical equipment was an in-depth process, my time restraint of a few days was hardly adequate. Conservation scientists Catherine Matsen and Dr. Jennifer Mass gave me demonstrations of the Laboratory equipment including x-ray fluorescence spectroscopy (XRF), Fourier transform infra-red spectroscopy (FTIR), Raman spectroscopy, reflected and transmitted ultra-violet visible spectroscopy (UV/VIS), gas chromatography–Mass spectrometry (GC–MS), scanning electron microscopy (SEM) with energy dispersive analysis (EDS), and metallographic examination. Working in private practice one would never have access to such equipment and in Australia it is difficult to access even on an institutional level. To use the equipment efficiently and expertly is a profession in itself and requires much time working with it to acquire practical knowledge and experience of the software programs and an ability to

decipher or read/recognise results. The applications for such technology in Australia would be most helpful to solving complex problems, though in commercial practice it would have to be on a contracted basis.



x-ray fluorescence spectroscopy (XRF)



scanning electron microscopy (SEM) with energy dispersive analysis (EDS)



gas chromatography–Mass spectrometry (GC–MS)

Professor Richard Wolbers, Dr Susan Buck and Peggy Olley of the Art Conservation Department offered much assistance throughout my visit. Susan is an expert on pigment identification and microscopy. Much analysis and identification can be completed under optical magnification and via transmission of light through various filters. All materials fluoresce light differently and a trained eye can identify a given material from the fluorescing colour. Susan operates a private practice as well as lecturing and has developed a niche market travelling internationally to conduct sample tests on pigments and materials from heritage sites. Currently she is involved with the analysis of materials from the Forbidden Temple in Beijing China, which is a very interesting project. Susan expressed much interest in the conservation I was undertaking and has offered her assistance in any analysis that is required.

My time with Richard Wolbers went somewhat over my head even though he was trying hard to simplify matters for me. Richard and I started out on discussing the practicality of varnish removal from furniture by adopting techniques which he has developed for use on paintings. Richard uses selective techniques to swell and dissolve coatings whilst not disturbing the original ground. To remove these additional inappropriate or degraded layers of finish without disturbing the original ground layers(s) on furniture has been relatively impossible as most over coating materials on furniture are less soluble than the underlying original surfaces we are trying to preserve. In picture varnish removal this is not the case, the varnish layers are more soluble than the underlying oil paints. Unfortunately this implies that much of the technological and scientific advancement in painting conservation cannot be directly crossed over into furniture without heavy manipulation. Richard has developed techniques directly associated to these problems which have revolutionized removal, however they do not apply in all circumstances.

We followed on the topic of clear coatings and Richard explained new methods he has developed in recent times for the conservation and cleaning of marble, this process has huge implications for large object and sculpture conservators who have to clean marble and stone fountains of rust etc. I would recommend anyone working in this field to pursue Richards techniques for this application. Ultra-violet light stabilisers were also discussed at length

with Richard again demonstrating a new product he has developed for Ultra-violet Light filters(UV) on glass and also in paints, a filter which can be brushed or sprayed on any surface. Is clear unless purposely coloured and can be reversed with a PH change. It was difficult to keep up with Richard or to slow him down to my pace. He offered his assistance in developing solutions to my research in Australia and in developing alternative coatings for specialised areas of timber conservation



PhD Student Kat making full-scale drawings



Duncan Phyfe Klismos Chairs



Overall workshop

Interestingly the furniture conservation department was where I spent the least time. Greg Landrey, Senior Conservator across all disciplines has been at Winterthur for over 20 years. Greg organised my time whilst at Winterthur, arranging inter departmental exchanges etc. In our discussion, issues pertaining to preservation and treatments for modern coatings, Greg suggested that objects conservators working at collection of modern art were probably better versed in this specialisation and that my time would be better served learning the technologies and material science that is used at Winterthur. Several specialised tours of the collection and individual treatments were observed and discussed by Mike Podmaniski and Mark Anderson. Most of my time in the furniture labs was discussing problems pertaining to more traditional work, particularly the techniques used to dull or simulate age on newly french polished work with the aid of alcohol soluble enzymes, matting agents and blotting techniques..

The library at Winterthur is renowned to be the most comprehensive library for furniture related subjects in the world. The mecca for furniture historians, curators and conservators alike. I was given 24 hour access to the library which I used extensively to research journals and view material not readily available by other means.

Winterthur prides itself on the research and scientific analysis of materials and has contributed greatly to the development of furniture conservation over the past decades. Analysis is an essential tool for conservators performing delicate treatments, a tool which is quickly improving with technology. Using world leading technology and equipment conservators can examine the finish on a much more detailed level than ever before possible, so much so as to break down the elements present in the finish. This information is useful in deciding processes and treatments that will be most effective. Without analysis only assumptions can be made about the materials present. Over the course of several hundred years it's hard to determine what may have been added to the surface coatings, deliberately or accidentally. Even on objects ten or twenty years old we cannot just assume that the specified recommendations or guidelines were followed.

Selective varnish removal first involves a high degree of analysis to define exactly what materials are present, what materials are to be removed and those to stay. Removal systems can be specifically designed to remove certain elements whilst leaving others untouched. Without high end analysis this would not be possible.

The solutions for treatment systems at Winterthur are developed in collaboration with the analytical team, the material chemists and the actual conservation department. This specialisation which is all internal and accessible to everyone including the students, creates systems and products to enable better outcomes. Winterthur is an extremely vibrant and exciting place to be in conservation and I am sure the work at Winterthur will continue to aid furniture conservation on an international level more and more. Unfortunately, much of this work has little commercial application, though it was generally accepted that the development of products for clear coating conservation, removal systems and finish replacement, will have commercial viability that might be advantageous in speeding up the research and development stages, particularly where industry is involved.

3.4 Outcomes of the Fellowship program

Gauging my level of professional competency in the international arena and building a network of professionals for future consultancy and assistance

Most importantly my fellowship granted me an opportunity to talk with, work with and discuss furniture conservation and the conservation of clear coatings specifically with people who understand the problems I face on a technical and professional level. Without an institution training, or employing professional furniture conservators in Australia, it is difficult to determine my professional competency and development as I work, study and research in isolation. Having my skills and knowledge recognised and respected by my international peers gives me the self confidence and credibility to continue my endeavours, increasing the awareness of the issues surrounding conservation, specifically the removal and subsequent replacement of modern coatings.

My itinerary was based on networking a core group of well connected conservators. Even before applying for my fellowship I was aware that someone in the world might have a solution to the issues surrounding the treatment of contemporary clear coatings. Certainly I did not set out to re-invent the wheel. I deliberately targeted individuals who are professionally aware of programs and research, thus casting the widest net possible to draw on networks of people who may be relevant to my investigations. Building relationships through personal contact is a vital step in developing long term professional bonds, particularly when tapping into resources that don't exist in Australia such as; conservation scientists, peers to consult and work with, specialised analytical tools and equipment, funding to invest in research and development. Obviously with limited time it was impossible to meet with everyone, though as my research continues there is little doubt these contacts will play a very important role in assisting with developments and implementing conservation treatments in Australia.

Lack of specialisation, a global skill gap

Despite literally drag-netting the international conservation community for people specialising in the conservation of clear finishes, specifically modern coatings on furniture and interior timbers, it became apparent there is a global skills gap in this specialisation. Typically the education for furniture conservators abroad focuses on the preservation, conservation and restoration of older traditional materials. Countries with older or ancient histories have enough older objects to treat, and tend to prioritize those from older times. Specialisation occurs within

materials and periods for furniture throughout the ages including the first decades of the 20th century, though little is being done on more contemporary furniture and materials.

Australia's position on conservation in context

Australia has a very short history since European settlement and even shorter since we first claimed a national identity through Federation. Obviously, our built heritage reflects our youth as a nation, whether this be buildings, memorials, furniture, objects, art, etc. We differ from most countries in that many of our iconic structures and objects date from the 20th century instead of the 18th, or 16th centuries, or even more ancient times. Internationally most conservation has focussed on older materials and problems associated with preserving these. Comparatively Australians place a much higher emphasis on the cultural and historic significance of 20th century heritage. Consequently, as a nation we push the conservation boundaries forward to ensure our Australian treasures are preserved for the future. This is a most significant observation when we stop to think that some of our most iconic and nationally defining structures have been created in very recent history.

First hand experience and inspections of treatment processes, learning from other people's failures/successes

The rapid deterioration of modern materials and their ultimate treatment has become a prominent topic in conservation, particularly in the contemporary art specialisation. The maintenance of clear coatings on furniture and interior timbers have historically been maintained by unskilled labour, often deteriorated surfaces were 'spruced up' by over-coating with whatever clear coating was popular at the time. In the 20th century this often resulted in a french polish/shellac coating being top-coated in nitro-cellulose lacquer; which then itself might be over-coated in polyurethane. Between coats all types of furniture oils and waxes may have contaminated the surface further. Ultimately the result being that the finishes all degrade, typically delaminating with adhesion problems, plus clouding, crazing and discolouring.

When a problem occurs with a clear coating on furniture or interior timbers in an iconic or historically important building, a furniture conservator will generally be consulted. In many instances a furniture conservator will be able to assist, however it must be stated that most furniture conservators do not understand the treatment processes for clear coatings once shellac was superseded by nitro-cellulose lacquer in the 1920's. This is true even internationally as the vast majority of conservators still train with a focus on historic materials and conservation techniques most relevant to these. Treatment of deteriorated nitro-cellulose lacquer and later clear finishes, demand a very different approach from shellac. Furniture conservators commonly make the mistake of employing traditional knowledge in a treatment attempt to preserve, repair and restore modern coatings. I was able to observe (but not photograph for security reasons) examples where modern finishes have been treated with techniques most suitable for shellacs. In some cases these treatments ultimately have caused more harm than good.

Accepting the fact – some materials cannot be conserved.

Despite on-going research which has taken place over the last twenty years, the conservation processes for nitro-cellulose and later polyurethanes has not been highly successful. The Getty Institute compiled a large document on

the conservation of cellulose, and other research has been completed in several other institutions. In all studies the results are not permanent. Other areas of conservation accept that cellulose deteriorates beyond repair. Polyurethane is much the same and as furniture conservators heading into this 21st century, we need to look at the bigger picture. There will be objects we encounter that have special importance and needs that will determine our treatment process. Sometimes the condition of finish is so bad that it cannot be viably conserved, or perhaps by leaving the piece in original condition may in fact do more long term damage than good.

A highly regarded furniture conservator made the analogy (in context) that most of the world's important paintings have a layer of varnish to enhance and protect the actual paints comprising the picture. This clear coating is viewed as a sacrificial layer and when dirty or deteriorated can be removed and then replenished with a fresh clear varnish. Furniture conservators generally find this hard to fathom as we spend a large part of our life's protecting, preserving and repairing old degraded shellac finishes. Modern coatings on furniture may require another conservation philosophy more similar to the ethics and philosophies employed by painting conservators.

Modern finishes don't respond so well to the current conservation treatments, though perhaps there will be future developments that will enable more success. There will be objects where it is important to retain the original coating and to slow deterioration in the hope that future research will enable a treatment process. I suspect these treatments will only be suitable for furniture in static museum environments. For functional furniture it must be accepted that at a point in time, the finish will require removal and replaced with a new coating layer to protect the object, just as it is accepted in painting conservation. If the original surface and patina is retained then the finish will again acquire a patina in the finish, which poses the two most relevant questions.

- 1. With what, and how should one remove contemporary deteriorated finishes?**
- 2. With what clear coating should one re-finish modern furniture?**

These are the core questions I set out to discover answers for. There are many different scenarios which need to be considered, treatments are normally determined on an individual object basis which makes prescribing individual treatment processes for each item impossible. To set some challenging, but realistic parameters I used an example of the scenario I am faced with at New Parliament House, Canberra. Completed in 1988 to be perhaps our most nationally important building and comparative to the Houses of Parliament in London, The Reichstag in Berlin and The Capital Building in Washington.

The Parliament House Scenario

New Parliament House was created to be an iconic landmark for Australia. A show case of Australian materials, design, craftsmanship and art. It is the largest building in the southern hemisphere and displays acres of native timbers. The architectural brief was to design a building to last two hundred years. Now less than twenty years since completion there is a major issue with the clear coatings applied to enhance and protect these timbers. The finishes were specified as nitro-cellulose and polyurethane lacquer which were, and still are, industry standards used in up to ninety percent of timber finishing processes. Both finishes are resilient to wear and are easy to maintain (whilst in good condition.)

The problems arise when these finishes start to break down and deteriorate. Not only do they look bad aesthetically but they stop performing their protective function, sometimes maybe even damaging the timber as secondary by-products are produced. To date neither nitro-cellulose nor polyurethanes can be successfully conserved long term, especially when performing a protective role during functional use. The only viable solution is to carefully remove the deteriorated finish, a complex problem in itself.



Polyurethane finish over jarrah which has reacted with over stain to form a two part hydrogen peroxide bleach. Note the top horizontal has been treated with a stain initially intended to darken it, the vertical was not treated. See mitre where joints has been taped off

Many of the timber surfaces in Parliament House are veneer applied to medium density fibre board (MDF). The adhesive is urea formaldehyde. Some of the panels have decorative inlay/marquetry which are considered an integral part of the art collection throughout the building. The veneers started life as 0.9 – 0.6mm and could be as thin as 0.4mm after they were initially sanded, thus the timber we are trying to protect is paper thin. This immediately rules out further sanding or scrapping. Another consideration is the adhesive holding the veneer to the MDF board and the adhesive used in the construction of the board itself. If we use a solvent based system to remove the deteriorated finish, it will be impossible to prevent it penetrating the thin veneer, thus it needs to dissolve the finish without affecting the urea formaldehyde adhesive.



Marquetry panel in Marble Foyer designed by Michael Retter

Finally the choice of solvents and chemicals also need to comply with the strict Occupational Health and Safety (OH and S) regulations and environmental restrictions placed on working within Parliament House. As a building which operates 24hrs a day, 365 days of the year it makes for difficult maintenance access.

The removal process will also need to account for the scale of Parliament House. All coated timber surfaces will eventually require their deteriorated coatings removed. Once the finishes have been removed successfully the dilemma then starts with the second question; 'With what and how should the timber be re-coated?' If we use the same or modern equivalent coatings products then in another ten/twenty years we will encounter a similar problem. Even if we get away with one removal, each successive future removal may cause exponential damage due to the deterioration of the adhesive. Much of the timber panelling was coated prior to installation, finished horizontally with spray equipment. Other timbers were coated in situ prior to the building being opened, thus the strict environmental guidelines and OH and S issues were reduced.

Ideally a finish should be employed with the following characteristics;

1. *Environmentally friendly to both the person applying and the general public*
2. *Easy to apply, either by hand or airless delivery*
3. *Can be repaired and maintained with ease*
4. *Is durable and resilient to wear and tear including moisture, cleaning chemicals etc*

5. *Has longevity, though once deteriorated can be removed easily and safely without damage to underlying veneer, MDF*
6. *Does not discolour timbers or contaminate timber preventing use of alternative finishes in future*

Despite explaining this above scenario to many conservators, conservation scientists and paint chemists, a solution was not forth-coming. The coating removal process was tackled by some with the confidence they could in time develop a removal solution and process within the set parameters, the difficulty lies in creating an economically viable system for large scale operations, potentially by non-conservators. The second question was more contentious, choosing a product and technique with which to then re-finish.

These questions were out of field for many conservators used to older materials. The common response was that shellac has all the desired properties bar that it is not resilient to moisture and is particularly vulnerable to cleaning chemicals. I agree that shellac may indeed be one solution, but one would hope that with today's technology a modern material could be made to emulate the characteristics of shellac with the advantage of being more resilient, more stable with no discolouration. The modification and adaptation of shellac has been toyed with on various levels however, further work is required to prove that these processes do in fact enhance and improve the properties of shellac.

Synthetic resins

The use of natural resins in painting conservation has been superseded over the last decades by the use of synthetic coatings such as methacrylate resins, Paraloids B72 and B67, ketone resins MS2A and Laropal K resins. These synthetic resins have been implemented to overcome the discolouration and insolubility problems of natural resins. Once polymerised, natural resins and oils can be difficult to remove, endangering the painting itself. The developments of varnish removal techniques and the use of re-coating with synthetic resin have slowly crossed over and have had positive implications for furniture conservation, though these resins do not offer an absolute solution as they are too soft, brittle and do not withstand wear and tear. Paintings differ from furniture in that the majority of furniture remains functional and requires protection not just against environmental factors but from mechanical abrasion and accidental damage.

Paint companies and material scientists researching coatings are the most likely people to find solutions to these problems which are too complex and too large for most conservators to tackle alone. Even conservation scientists may be years behind the game when it comes to working with the latest materials and techniques in the area of manufacturing coatings. Certainly paint companies at this moment focus on producing products for longevity and resilience, often designed to out last the object itself. Conservation friendly coatings with trialled removal systems, repair ability and maintenance ease with coatings that can be top-coated, have not been given much thought. To develop coating system with such characteristics may have not been previously viable, but in today's climate where the awareness of conservation is growing, and when the economics of removing and replacing finishes every ten to twenty years is cost restrictive or environmentally unacceptable, perhaps there could be room for a commercial product.

4.0 Recommendations

Presently my findings are inconclusive, though I am confident solutions will be found that are conservation minded and economically viable. Until these can be implemented, the best approach we can take is to learn from the mistakes and misfortunes of others. It is highly important to communicate to and to educate people of relevance so they better understand issues surrounding the use of clear coatings for furniture and interior timbers in places of cultural significance.

4.1 Government –Federal, state and local government

Governments, whether federal or local invest heavily in local building infrastructure. The Federal Government particularly have been responsible for constructing Australia's most iconic structures. These buildings represent the Australian people on both a national and international level. Design and function of these 'show' buildings are highly considered and budgets for such structures reflect their national importance. These structures and interiors have been designed and constructed to become Australia's lasting iconic buildings. Federal Parliament House was built around a brief to last 200 years.

When governments decide to build such structures they need to look further ahead for longevity, cultural investment and economic management. Parliament House may last 200 years as a concrete shell, however the materials employed in the construction and manufacturing of the interior are in serious trouble less than 20 years after completion. The economic cost on maintaining and conserving materials doomed to fail from the outset is a huge financial burden. And for the objects which were destined to become iconic art works of national significance, these may in fact not survive long enough to become significant at all. The budgets that are cut and money saved now often indicate that money will need to be spent later, often at a greater cost and in some instances at the loss of what may have been a lasting memorial to our young nation.

The economics of treating objects that will eventually fail is one that requires consideration, and is an easy point to demonstrate. Choosing the correct materials at the design stage is fundamental to the longevity of the object or building. Governments, architects, artists and manufacturers should be conscious of the potential long term issues when choosing materials. Examples of material failure are commonly accessible, and are a powerful demonstration tool. If objects are designed with correct material choices, then these problems will be minimised.

Governments must be presented with the economic argument for good conservation policy. By choosing the correct materials in the design and building processes, (which may well be more expensive initially), maintenance and on going conservation costs will be minimised. A good example of this was the decision not to use Ultra-Violet (UV) filters in the glass at New Parliament House. For an added 10% to the glass budget, inbuilt UV filters may have prevented UV damage to thousands of square meters of timber floors, to furniture, to carpets and textiles. Without figures on hand, I am sure the repair and replacement of these materials has exceeded the additional 10% many times over. And this is only in the first 20 years of the buildings life. At a large expense, UV films have now started to be installed throughout Parliament House.

4.2 Industry

Conservation even on an international level is such a small entity that in most cases materials and practises used to forward conservation technology are borrowed from other industries. Paint and chemical companies are the largest Industry contributor in furniture conservation.

The paint manufactures that produce clear coatings for use on furniture and interior timbers are the most likely partner to help with solutions for many of the outlined conservation issues. The specialist knowledge of paint and material chemists is second to none in understanding the degradation, removal and replacement processes of finishes. Paint companies must perceive a commercial application for products to be economically viable, hence I believe the research and eventual products and technologies to be used in the application of clear coating conservation need to be further reaching than just the small conservation market.

Paint companies have become very proficient at marketing their products to architects, building industries, and to the broader public with 'environmentally friendly' and 'sustainability' almost becoming marketing slogans. The environmental and sustainable approach in paints and clear coatings has much in common with preservation and conservation ethos in that in context to conservation, the product would be environmentally and user friendly. That it would be long lasting and maintenance friendly, and that when it did reach its expiry date, it could be removed without the need for toxic and damaging chemicals.

Paint and chemical companies currently invest huge amounts of money into developing products which are environmentally friendly, Government legislation is being implemented globally calling an end to the VOC (volatile Organic Compound) solvents found in most paints and coatings. Although water based finishes have been developed and produced for several decades, as clear coatings these currently present many similar problems to the nitro-cellulose and solvent based polyurethane, in that they are hard to remove and actually deteriorate faster than solvent based coatings. Thus their need for replacement will occur faster and more frequently than solvent based coatings. If environmental factors are taken seriously by paint companies (with millions of dollars already being invested to create healthy and sustainable products), then the principles of conservation should be taken into consideration, as no architect, designer, builder, owner or manager will want the problems and associated expense of upkeep, maintenance, removal and eventual replacement of the finishes used to protect and enhance substrate materials.

Shared objectives for environmental and conservation friendly clear coatings

- *Reduction of Volatile Organic Compounds (VOC). This is the main push behind government legislation and the reason coating technology has shifted to water bourn development*
- *Sustainability, would be advantageous to have coatings which could be repaired and top coated*
- *Economically viable as coatings can be repaired rather than removed or replaced without the need to close buildings due to contamination risk*

- *Both products aim for a removal system which does not involve the use of dangerous chemicals*
- *Products that have no long term health affects for the person applying, treating or removing the coating*
- *No off gassing issues for the safety of public exposed to surfaces*
- *A conservation friendly coating will ultimately prolong the life of the timber substrate, reducing the need for new construction timber, resulting in less timber usage*

The commercial market for conservation friendly products may not be lucrative for industry on a small scale, though on a wider scale based more on economic and environmental factors, a conservation friendly product would be very attractive to any large scale development employing timber because this will deliver the desired outcomes for sustainable and environmentally friendly products. Ultimately the solution will be to encourage those who have the knowledge, equipment and expertises to seek the benefits of research in this area more thoroughly, particularly if a complementary removal system was included that removed existing finishes without the use of powerful solvents, maybe then the market would expand even further into the DIY market as people become more aware of the adverse effects of solvents in painting materials.

4.3 Professional Associations

Most important buildings and furniture collections within institutions are governed by basic conservation principles as set out in the Burra Charter. These principles are the internationally accepted guidelines for conservation, preservation and restoration of objects and places of cultural significance. The Australian Institute for Conservators of Cultural Materials (AICCM) also has its own code of ethics which are well respected and adhered to in most Australian Institutions. Most professionals working for Institutions in curatorial or conservation roles would be aware of the role the AICCM play in protecting our heritage.

Due to the fact that furniture conservators/restorers generally do not work within institutions and that there has never been a formal education for them in Australia, the role of the furniture conservator is often misinterpreted. Although furniture conservators/restorers are in a good position to monitor problems associated with modern clear coatings, and may well be able to foresee problem areas, furniture conservators/restorers need to acknowledge that generally their understanding of the science and chemistry pertaining to treating modern coatings probably does not encompass the highly complex issues surrounding modern finishes and their deterioration.

Those charged with the responsibility of caring for these objects/buildings, and those who contract consultants and contractors should be informed of the lack of expertise presently available in Australia. Curators, maintenance personal, architects, furniture makers, conservators of other mediums, material scientists and paint chemists all need to better understand that the treatment of modern coatings is a rather new discipline and requires a different approach than has been taken with older shellac and resin coatings that most furniture conservators normally deal with.

At this time solutions to many issues pertaining to the treatment of many modern clear coatings are not yet readily available. Further research needs to be compiled and in order to complete this, there needs to be co-operation and collaboration on several levels. The departments who manage building and collection maintenance need to open up to new ideas on the long-term treatment of their timber interiors and furniture. Conservators can often identify problem areas and potential solutions to on going problems, though co-operation from management to view long-term treatment processes as good investment is a difficult negotiation point, especially when most financial decisions are made with a short term economical approach.

4.4 Action Plan

I hope be instrumental in encouraging industry and conservation associations to work together to tackle the issues surrounding clear coating technology and its subsequent conservation/maintenance/removal and replacement. Informing industry of conservation requirements and involving the surface coating industry in research and problem solving for clear coatings has not been a priority in conservation previously as most of the surface coatings have been older technology than what industry has been producing. Today this is not the case, the coatings in question today are less than 20 years old and are still commonly used in the coating of interior timbers. The scientists and chemists employed by industry today will be very familiar with these products and associated problems. Compromise will have to come from all sides, but I am confident that if the ambitions of the conservation field can be manipulated into an economic gain for both industry selling conservation grade products, and for institutional/building management to save on maintenance, then the chances and speed of achieving an outcome in the not too distant future will be increased

Educating and informing people of the issues at hand, particularly of the limited resources available right now to deal with modern clear coatings may help put the situation in perspective. The relevant and target audiences are those from different fields who all share a common goal of caring for our important furniture collections and timber interiors. Curators, architects, maintenance personal, conservators in other mediums, paint chemists, material scientists, woodworkers and artists. The larger the pool of people the more cross-fertilisation of knowledge and experience. This year I am presenting lectures to explain and contextualise the situation of conserving clear coatings with professional bodies and organisations such as;

- The Australian Institute for the Conservation of Cultural Materials (AICCM)
- The Furniture History Society of Australasia (FHSA)
- The Surface Coatings Association of Australia (SCAA)
- Historic Houses Trust (HHT) of NSW
- Antique Dealers Association of Australia (ADAA)

Since my return I have already lectured to the following audiences:

- The Australiana Fund (responsible for furnishing the four official residences, Government House, The Lodge, Kirribilli and Admiralty House) on the importance and treatment of Australia's 20th century furniture collections.
- I have run two modules for the University of Tasmania's Faculty of Design, teaching students from the Australian School of Fine Furniture the issues surrounding material choices in their design stages for later maintenance and conservation, plus the practical application and manipulation of finishes and colours.
- The Australian National University (ANU) also have invited me on several occasions to lecture to the students in the Furniture and Wood Design School. Once again I try to promote the idea of material choice from the outset. If an artist or craftsman is creating an object to last 200 years and invests the time necessary to deliver the quality and workmanship in order for this object to remain intact, it must also be taken into consideration that in time this object will require maintenance and maybe repair, thus the object needs to be created with materials and designed in a manner which can accommodate future conservation.
- The Surface Coatings Association Of Australia (SCAA) asked me to deliver a presentation on conservation issues relevant to the paint industry. This lecture in Sydney proved to be very valuable in explaining to the conservation ethos to an industry which to date is mainly interested in manufacturing products that contradict most conservation policy. That is to last for as long as possible and to be hard to remove. The contacts made through this organisation will hopefully be very valuable.
- Historic Houses Trust NSW have instigated an investigation into the 20th century surface coatings at Rose Seidler House in Wahroonga, Sydney. I hope to be involved in the conservation treatment process.
- A lecture in to The Furniture History Society on the 'dilemma of conserving 20th Century finishes'. This was to a target audience of professionals. A panel discussion followed with fellow furniture conservators and curators.
- Art Services at New Parliament House have employed my business to consult and report on the condition of some of their furniture and fittings and to perform conservation treatments.
- Building fabric services have also engaged my services for initial consultation with the aim of developing training and maintenance regimes for the development of an in house maintenance crew.
- I am a key organiser of what will be the first and inaugural furniture history symposium held in Australia in early 2007. Run in conjunction with the National Museum of Australia and the Furniture History Society, I will be delivering an paper on the relevance, importance and conservation of 20th Century furniture and interiors. This symposium will be aimed at professional and museum personnel with the aim to raise the profile of our furniture heritage so often neglected by institutions in Australia.

- Directly influenced by my research, and the work my business undertakes, are the staff my firm employs. As training for furniture conservators is non-existent in Australia, I attempt to install in my staff a grounded understanding of furniture conservation, knowledge of related materials, practical hand skills and the associated principles and ethics. I would hope to inspire them to travel widely and to learn additionally from a broader base which will help them recognise their level of competency and to question and to think independently, increasing their lateral thinking and problem solving capability which is most important to furniture conservation/restoration. This is particularly the case in Australia where we do not have the support of fellow professionals to bounce ideas off.

4.5 Further skill gaps

Due to the fact that there has never ever has been any form of education for furniture conservators in Australia, combined with the fact that none are employed by institutions with Australia, there has been little chance for a forum to exist where furniture conservators can pool together to discuss issues and deficiencies in the furniture conservation fields. Institutions normally harbour an environment where academic knowledge can be increased, where research and experimentation can occur. Without these facilities in Australia furniture conservators are forced to work in the private sector which is not conducive to un-paid research, experimentation or the academic advancement of the field.

Furniture conservators working in private practise have little time to invest in research or the furthering of academic material. Most furniture conservators I know personally work far in excess of 60 hours a week. To gain knowledge or to advance ones skills requires self education and the necessary time and investment. Access to information from abroad has become easier with the use of electronic media, though as in many instances literature alone cannot digress all knowledge. Personally I estimate that I spend between 80 – 90 hours per week working in my business combined with self education. Travelling is a necessity to ensure skills and knowledge are updated. This is a massive financial burden on a small business.

Conservation science and material chemistry in Australia is also an area which has much room for improvement. Abroad conservators can work in conjunction with specialist conservation scientists who can perform the analysis and material research in order to determine the best treatment for the individual object. This skill gap exists in all mediums of conservation in Australia, though as furniture conservators are generally outside the institutional loop, access is even more difficult.

The cross over of the conservation and surface coating industry is also non existent. Several specialised paint companies in Australia produce coatings sympathetic with traditional receipts and do aim for heritage markets. These companies are genuinely interested in conservation issues and the potential use of products for conservation, though they still don't have the resources of large chemical manufacturers to invest in independent research.

Other conservation fields and institutions are generally unaware of the lack of expertise in Australia for furniture conservators. Often this will result in furniture conservators taking on work that they are not trained for.

Training and funding for education

It is unlikely that any specialised education will be established in Australia for furniture conservators. Conservation training in Australia has already been drastically cut due to the perceived expense of practical training. This raises several key issues; importantly the lack of concern for the preservation of our national heritage, the cost when we are required to bring in specialist labour from abroad and the brain drain associated with this mentality, and finally the ultimate long term implications of risking objects of national heritage significance.

With no training available at any level for furniture conservators it not only makes it very difficult to further ones education, but it is very difficult to obtain proficient staff. Internationally specialised schools exist which offer under and post graduate degrees which normally involve a training process which lasts up to 7 years.

The back bone of furniture conservation are an ensemble of traditional skill sets encompassing what were historically separate vocations requiring 3-4 years training for each. Cabinet making, marquetry, carving, turning, upholstery, french polishing are but the key components. Combined with a working knowledge of the history of all these disciplines over the last 400 years or so, plus the more recent technologies and already the training is extensive. This is without the conservation side of material science and principles.

Staffing issues affect my capability to run a successful business. The core income of my business comes from my practical skills and ability which require me to work on the bench. As my business is booked out for months on end this leaves little room for furthering my academic knowledge or for experimentation and research. Training staff has been my last resort. With no assistance or help provided from outside organisations it places a massive responsibility on my business in time, money and with no guaranteed outcome. The vocational training available for apprenticeships in woodworking, upholstery or French polishing are aimed at contemporary techniques and materials which have little bearing on the majority of work undertaken in the furniture conservation field. Training staff from scratch is a very time consuming activity. Once their practical skills become somewhat proficient (4-5 years), then they will have to go abroad to further their conservation skills and to gauge amongst other their professional capabilities. There are several specialised schools abroad which take on student to complete a conservation diploma in 2 years if prior practical ability can be demonstrated.

For the past 6 years the Australian Institute for Conservators of Cultural Materials (AICCM) have recognised the skill gap deficiency in the field of furniture conservation. The AICCM have for the first time to my knowledge organised a four day work shop concentrating on the cleaning of furniture surfaces. This workshop is to occur in September 2006 at the National Gallery of Victoria and it may be an opportunity to discuss and develop ways to raise the issues of education and training in the furniture conservation field.

How the ISS can help

Most of the advances in furniture conservation have traditionally come from large institutions and museums. These too are in decline as budgets and personnel are cut. It is within the privately funded International institutions like the Getty and Winterthur which seem to have taken up the research arm of conservation, even granting money to other institutions for research projects.

The issues of conserving modern coatings has not been heavily explored at any other level other than individuals like myself and overseas institutions who, out of necessity, have had to find solutions to new problems. Getting together with these people and communicating our ideas would be of huge benefit. The ISS may be able to aid this process by helping organise a visiting professional to run and attract enough people for an international forum.

The ISS has the necessary contacts and lobbying power required to attract international conservators to Australia. These workshops could unfortunately only be aimed at the furthering the knowledge of already practising furniture conservators.

The ISS may in the future like to consider scholarships to international academic institutions where specialised training is offered that is not available within Australia. The ISS currently sponsor people who already demonstrate proven ability in their field. Could it be possible to arrange the possibility of a 'HECS' like scheme to students who wish to study an academic or trade qualification not available within Australia? When I researched the possibility of training abroad I found that financially it was impossible. No government support was accessible and the costs of course fee's along with living expenses would have been prohibitive for most. Maybe the ISS can either lobby government to set up a system catering for students specialising in education not available under the Australian education system, or perhaps the ISS can implement themselves a student loan service similar to 'HECS' where a student can in effect borrow the necessary funds to gain experience and skills not accessible within Australia?

5. References

- Buck, Susan. L, Three case studies in the treatment of painted furniture, Wooden Artefacts Group (WAG) postprints, 1993
- Conservation Unit of Museums and Galleries Commission, Science for Conservators volumes 1,2 and 3, Crafts council 1983
- Deller, Craig, Some ideas for a better coating, conservation news 72, 1998
- E. Rene de la Rie, Degradation and stabilization of varnishes for paintings, Conference on advances in the stabilisation and degradation of polymers
- Feller, Robert and Stolow, Nathan and Jones, Elizabeth, On Picture varnishes and their solvents, second edition, Cleveland, 1971
- Heginbotham, Arlen. What's Old is New: B-72 and the treatment of degraded furniture finishes, Wooden Artefacts Group (WAG) postprints, 2001
- Horie, Charles Velson, Materials for Conservation, Second series, Butterworth-Heinemann, Oxford UK, 1987
- Jocelyn Evans, The fine art of stripping: a chemistry problem in conservation, Chemistry in Australia, March 2005
- Marquis-Kyle, Peter and Walker, Meridith, The illustrated Burra Charter, First Edition, ICOMOS, 1992
- Rivers, Shayne and Umney, Nick, Conservation of Furniture, First edition, Butterworth-Heinemann, Oxford UK, October 2003.
- Stradroudis, Chris and Blank, Sharon. Solvents and Sensibility, Western Association of Art Conservation, Volume 11, Number 2, May 1989 pp2-10
- Surface Coatings Association of Australia, Surface Coatings- Volume 1, Raw Materials and their usage, third edition, NSW University press 1993
Surface Coatings Association of Australia, Surface Coatings –Volume two, Paints and their applications, third edition, Toorak, 2002
- UKIC Furniture Section, Postprints from Conference, Modern Materials – Modern Problems, Liverpool, 1999.
- Williams, Don and Jaggar, Louisa, Saving Stuff: How to Care for and Preserve Your Collectibles, Heirlooms, and Other Prized Possessions, Fireside Books, May 2005
- Wolbers, Richard, Theoretical and practical workshop on the cleaning of paintings, S.N, 1988
- Wollbrink, Thomas, The composition of proprietary paint strippers, Journal of the American Institute for Conservation, 1993, Volume 32, Number 1, Article 5, pp43 to 57