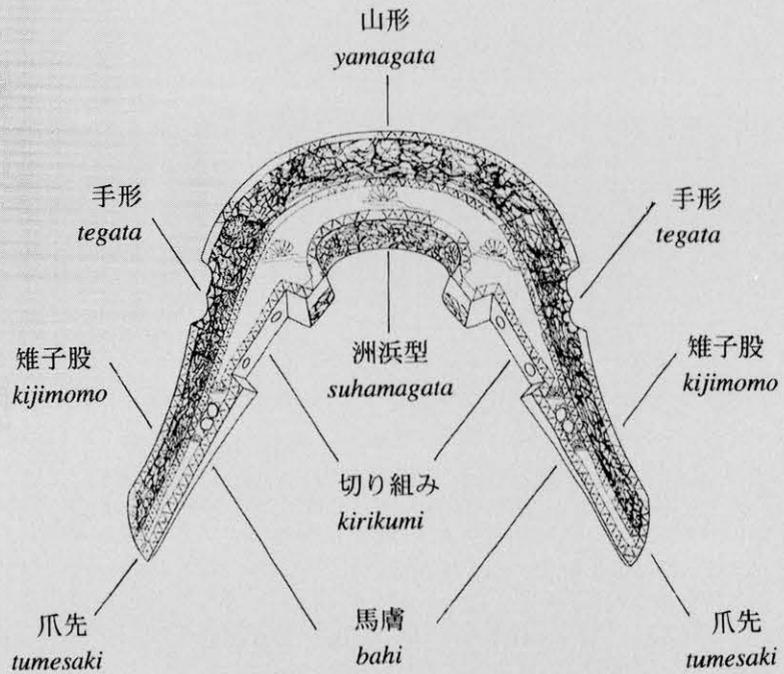


菊文螺鈿鞍

平成11年度補助事業



品名：菊文螺鈿鞍

所蔵：メトロポリタン美術館 アメリカ

品質構造：木製黒漆塗り、螺鈿

所蔵番号：36.25.83

請負者 山下 好彦

修理担当者 山下 好彦

原稿執筆 山下 好彦

菊紋螺鈿鞍



19 菊紋螺鈿鞍の前輪 (修復後)
"Kikumon Raden Saddle" (saddlebow, after restoration)



20 菊紋螺鈿鞍の居木 (修復後)
"Kikumon Raden Saddle" (seat boards, after restoration)



21 螺鈿の部分(修復後)
"Kikumon Raden Saddle" (detail of the *raden* parts, after restoration)



22 螺鈿の部分(修復前)
"Kikumon Raden Saddle" (detail of the *raden* parts, before restoration)

はじめに

文化庁の事業として平成9年度からスタートした在外日本古美術品保存修復協力事業(工芸)のうち、アメリカ・メトロポリタン美術館所蔵「菊文螺鈿鞍」一背の保存修理が、平成10、11年度の2ヶ年に亘って行われ、平成12年3月末に完成した。これはその修理記録の概要である。

以下、「菊流水文螺鈿鞍」(現資料と呼ぶ)の修理概要・形状・加飾・構造技法・保存状態・修理仕様・修理工程と内容・分析結果の項を設け説明、今回の修理で判明した新知見をまとめる。なお、X線透過写真撮影および蛍光X線分析はそれぞれ東京国立文化財研究所の野久保昌良氏、平尾良光氏、早川泰弘氏、クロスセクションは早川典子氏と東京芸術大学大学院の沓名貴彦氏の協力を得た。

1. 概要

現資料は総体が木製黒漆塗に螺鈿で加飾された鞍で、前輪・後輪の磯部分に菊流水文を配し、左右の居木中央部分には十文字文様を付ける。螺鈿は鮑などの中厚貝を割り、幾何文様に切り整え、鞍の各部分に意図的に異なる色味の貝を貼り分ける。両輪の磯部分や、居木の外面には微塵貝を蒔いて仕上げしており、特徴のある華やかな意匠となっている。

鞍校は近世鞍の特徴を示し、前輪、後輪ともに右の切組み部分に花押、左居木に対応する部分に合わせ記号(口)が墨書でかけられる。

居木裏には14.100.78という番号と英文字(DEAN)が赤い塗料で書かれ、「十四万九十五金五万円」と書かれた和紙片が付く。

両輪と左右の居木は鞍橋を解体した状態で搬入されたが、前輪の左切り組み部分に素地の割れが認められ、すでに鉄の鏝が打ち込まれていた。鞍の全面に加飾された螺鈿は剝離や剝落が著しく、非常に危険な状態であった。また、すでに剝落した螺鈿が数多く付属していた。

2. 形状

現資料の鞍橋は、前輪、後輪の外面に海と磯の区別のあるいわゆる海有形の鞍である。前輪は高さの約四分の一が山の高さで、山形の隅よりも若干下がった位置に手形を設ける。後輪は肩から爪先にかけての湾曲が浅く、横から見ても立体感のない形で、後輪の素地が前輪と比較すると素地の厚みが薄く量感がない。両輪ともに山形の形は柔らかく、爪先も丸みを帯びている。また、全体に素地が薄く華奢であり、居木幅も狭い。上記の形状は、おもに室町期以降に登場する水干鞍の流れを汲む形式であり、幕末まで続いた近世汎用鞍の特徴を示していると言える。

居木裏の花押や紀年銘の入るべき部分が大きく削られ、居木先の前後輪と組む紐穴が修正されている。このことから、素地の割れを修復した時点で調整されたものか、両輪と居木が当初の組み合わせでない可能性も考えられる。

次に、各部の寸法(mm)を記す。



図203 「菊文螺鈿鞍」前輪 (修理後)
Kikumon Raden Saddle, the saddlebow
(after restoration)

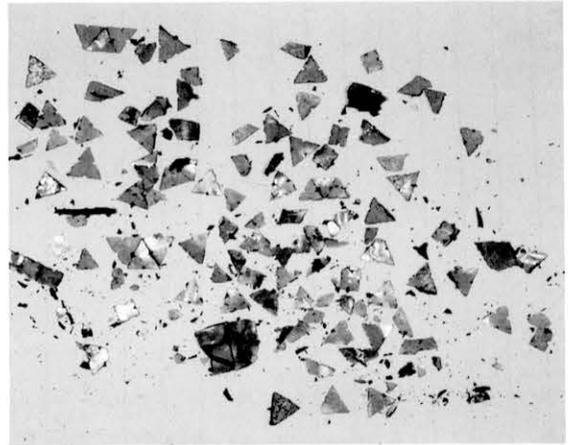


図206 付属した剥落断片
Fragments of raden and layers



図204 「菊文螺鈿鞍」後輪 (修理後)
Kikumon Raden Saddle, the hind bow
(after restoration)



図207 螺鈿剝離部分の養生 (後輪)
Protection of lifted raden by Japanese paper



図205 「菊文螺鈿鞍」居木 (修理後)
Kikumon Raden Saddle, the seat boards
(after restoration)



図208 剝離した螺鈿部分の麦漆の含浸
Impregnating mugi urushi into lifted raden

	高さ	馬挟み	中央幅	中央厚	長さ	幅	乗間
前輪	278	316	75	32			
後輪	318	377	77	33			
居木					382	101	344

法量 (mm) 縦 390
横 408
高さ 277

3, 加飾

加飾は鞍橋の馬膚、切り組み、居木裏の周囲を除く全面に施す。

文様は、前輪、後輪の磯部分に菊流水文をそれぞれ7ヶ配し、左右の居木中央に十字花を付ける。その他は幾何文様を連続させ、割り貝や微塵貝で各面を埋める。

鞍橋の周囲部分の文様には三角形の各面に切り込みを入れた貝を連続させ、両輪の海には鮑貝の斑のある部分を割り貝にして石畳状に繋ぐ。磯の菊文にも同様に斑のある鮑貝を使う。菊以外の空間には鮑の微塵貝で加飾するが、流水文だけは赤味のある貝を並べ、その他の部分には青味の貝を使用する。紐穴の周囲には花卉状の貝を貼る。

両輪外面周囲の厚み部分には同様に切り組みを入れた四角形の貝を2列繋げる。手形部分には菱形を五角形に繋ぐ。爪先面には先端のとがった花卉形と小さな正方形を繋いだ七宝繋ぎをめぐらす。また、洲浜形部分には青味のある割り貝を貼り込む。両輪の内面は海磯の区別はないが外側と同様に面を途中で分割し、外側と同様に貝を貼り分ける。

居木中央の十字花とその周囲の文様は十字花文様を変形させたものと考えられ、十字と花卉の内側を斑のある貝の割り貝で加飾し、その外側を青色と赤味のある微塵貝を二重に葺く。

微塵貝の葺き分けと同様に三角や四角形に切り整えられた貝は、よく観察すると青味のある貝と赤味のある貝が交互に用いられており、意識的に色分けを行いデザインされたものであることが分かる。

菊水は菊流水文とも呼ばれ、流水の上に菊花が浮かんでいる様を描いたもの。陰暦の9月9日に重陽の節句の宴を菊水の宴とか、菊の宴といい、杯に菊花を浮かべて酒を飲んだ。菊流水文は古くから工芸の意匠としてよく用いられた。

4, 構造技法

[素地]

前輪、後輪は道管が荒く、比較的堅い桜材を使用しており、X線透過撮影写真の肩部分を観察すると、山形から左右の足先に向かって木目が二方向に流れている。このことから、現資料の素地には股木（木が二股に分かれている部分）を使用し、二股に削りだしているのが分かる。左右の居木は両輪の素地と異なる木地を使用するが、両輪との接合部分の観察から、縦木取りの素地を居木の表面が木表になるように木取りし、削りだしている。

[漆塗り]

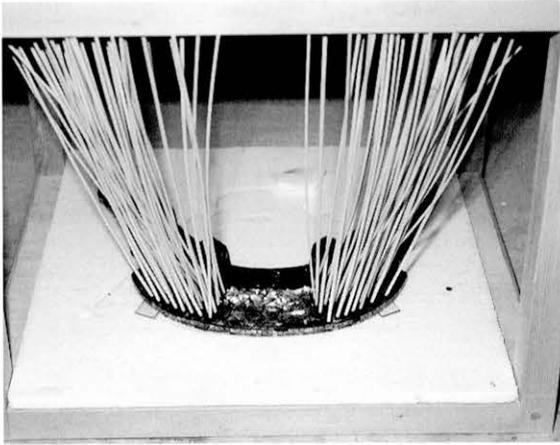


図209 しんばり台による圧着
Stabilizing by *shimbari* method

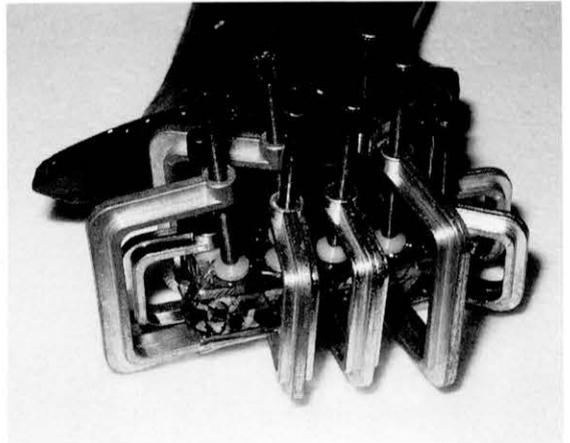


図212 螺鈿と布着せの圧着、居木先部分
Stabilizing the *raden* and cloth, the tip of seat board

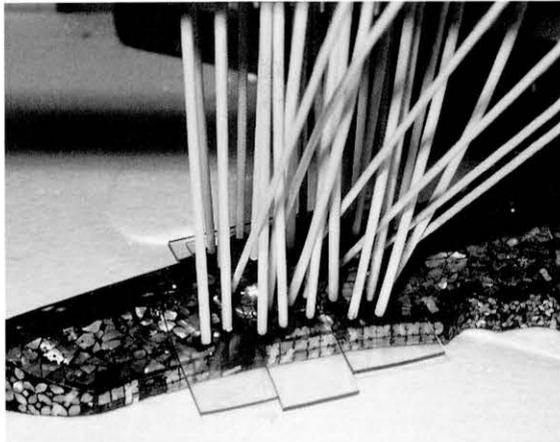


図210 螺鈿の圧着 (前輪)
Stabilizing the *raden* part of the saddlebow



図213 素地亀裂部分の麦漆の含浸
Impregnating *mugi urushi* into cracked wooden parts

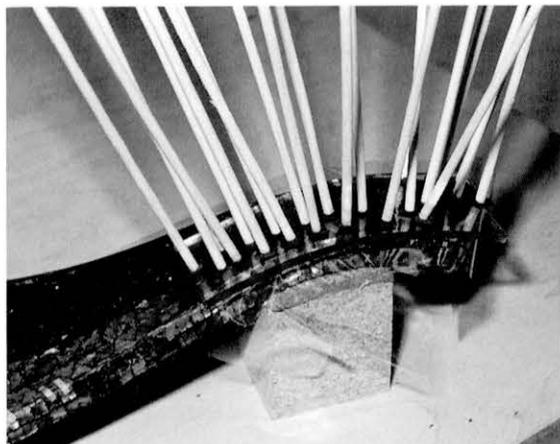


図211 受台の使用 (後輪)
Using the protection-stand (the hind bow)

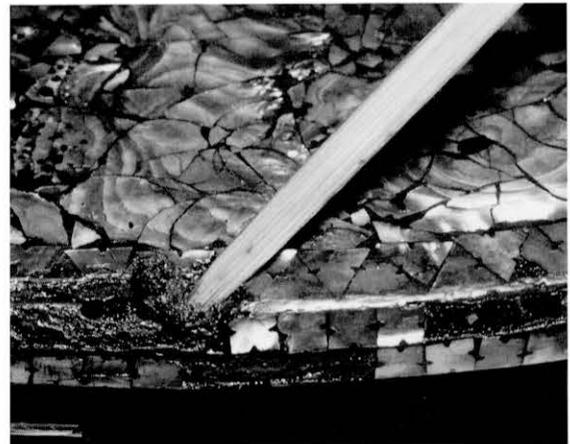


図214 虫損部分の刻苧充填 (後輪)
Filling *kokuso* into insect-damaged part

前輪、後輪ともに布着せはなく、居木裏の一部と居木先部分のみに貼られる。使用した布は藍色に染色された麻布で、1 cmに20～21本の織目がある。

前輪の右切り組み部分は鞍を使用することで居木に当たる部分が擦れ、下地構造が良く観察される。後輪の山形部分にも同様な露出箇所があり、剥落片の裏側や他の部分と総合して現資料の下地構造の特徴を列記する。

- ・素地の上に直接黒茶色の漆下地を厚く1層付ける。
- ・黒色漆を塗り込む。表面には劣化が見られ、0,1mm角の大きな段紋のなかに0,04～0,06mm程度の細い段紋が観察される。
- ・赤味の強い褐色の荒い漆下地を付ける。
- ・松煙等の黒色粒子を混ぜた透き漆で貝を接着する。
- ・貝と貝の段差に褐色の漆下地を付ける。
- ・部分的に灰色の細い下地を付ける。
- ・下地と貝を砥石で研いだ後、透漆に黒色顔料を入れた黒色漆を数回塗り込む。
- ・全体に透き漆を塗り込み、研いで貝を表面に出し、磨いて仕上げる。塗膜の劣化段紋の初期症状（0.06mm程度）が見られる。

下層の黒色漆と表面の透漆を比較すると劣化の状態が下層の漆層の方が段紋が細く入っており、塗膜の劣化がより進行していることが分かる。また、前輪左切り組み部分に打たれた鏡の数ミリ上に螺鈿の加飾が入る事から、黒漆の鞍としていったん使用し、傷んだ素地を再利用し、加飾がされた可能性が強い。居木裏に書き込まれた紀年銘と鞍橋の形状や文様とが時代的にそぐわない例があり、鞍橋の再利用は珍しくはなく慣例化されていたと考えられる。そのことから、桜の股木が貴重であったことを伺い知ることが出来る。

[螺鈿]

現資料の螺鈿は中厚貝を使用する。貝の厚みは多くが0.3mm前後で、0.2mm以下の貝は、貼り込んだ後、砥石で表面を研ぐ作業で厚みが薄くなったものと考えられる。中厚貝は、原貝を糸ノコなどを使って4 cm×4 cm程度に切り出し、荒い砥石を使って表裏から厚みを整える。

剥落貝片の裏側から貝の裏側に付着する素材を実体顕微鏡で観察した。その結果、貝の接着には透漆に松煙等の黒色顔料を混入した漆を使用しているのが分かった。

前輪、後輪の海や洲浜型部分および居木中央は、割り貝技法を用いる。割り貝は割る以前に貼り込む場所に合わせて周囲を整え、貝の表面に和紙を糊で貼込み、貝を曲面に合わせて割る。貝を貼り込んでから乾かないうちに筆と水を使って和紙を剥がし、篋を使って文様を整える。前後輪、居木によって異なるが、32～40枚の割り貝を各面に使用し、その他の部分にも他の割り貝を貼り込む。

両輪や居木の周囲の幾何文様には斑のない部分を使い、糸ノコなどの道具を使って三角形や四角形等に切り整える。その他の部分には斑のない鮑の微塵貝を蒔く。微塵貝は貝を青味と赤味のある貝に事前に分け、鉋を使って細く割り整える。漆を全体に塗り込み、砂子筒等を使って蒔き詰める。

両輪表面の菊流水文様部分のみに毛彫りを入れ、菊の花弁を放射状に描く。毛彫りを拡大するとU字状に深く削られており、刃先が丸い道具が使われているのが分かる。



図215 螺鈿剥落断片の照合
Collation of fragments



図218 螺鈿の剥離部分後輪内側 (修理後)
The lifted part of *raden*, inside the hind bow
(after restoration)

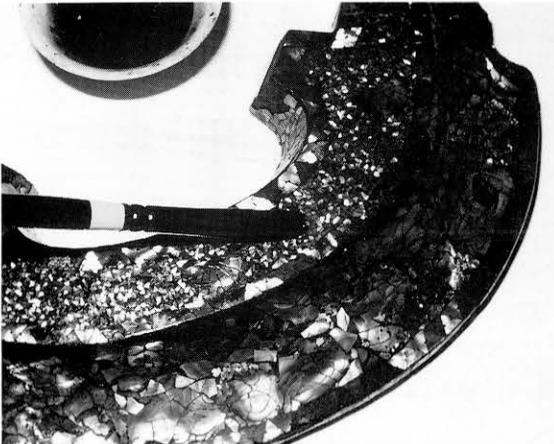


図216 劣化塗膜の強化
Consolidation of damaged film



図219 螺鈿の剥離部分後輪 (修理前)
Raden that had fallen the hind bow
(before restoration)



図217 螺鈿の剥離部分後輪内側 (修理前)
The lifted part of *raden*, inside the hind bow
(before restoration)



図220 螺鈿剥落片の接着 (修理後)
Fixing a fragment (after restoration)

現資料には鮑の原貝を摺り貝にした時の周辺に出てくる穴をそのまま使用している。この部分は文様に使わないのが通常であり、デザイン的にもそれほど効果がない事を考えると、この貝が当時相当貴重なものであったと想像できる。現資料には原貝で100個におよぶ鮑貝が使用されていると考えてよい。

現資料に使われる斑のある貝は、日本近海の鮑貝では見当たらず、アメリカ・カリフォルニア沿岸で採れる一般的に孔雀貝あるいはメキシコ鮑と呼ばれる貝が使用されていると思われる。このことから、現資料が制作された当時の材料の流通経路をも伺い知ることができる。

5, 保存状態

修理以前の破損状況を以下に列記する。

- ①資料全体に埃や汚れが被り、一部に朱漆が付着していた。
- ②紫外線や経年変化による漆塗膜の劣化が見られた。
- ③素地の収縮や打損等が原因と思われる螺鈿の剥離が鞍のほぼ全面に亘り、各所で貝が突出し、非常に危険な状態となっていた。
- ④貝と接着面との間に空隙ができ、本来の貝の色味が失なわれていた。
- ⑤螺鈿の剥離剥落部分を中心に下地と下地の間での剥離が随所に見られ、居木では布が広い面積で浮き上がり、波打っていた。
- ⑥螺鈿と漆塗膜の剥落が各所にあり、下地が露出していた。
- ⑦木地の割れが後輪山形部分と、両輪の馬膚、前輪左切組み部分に見られ、とくに前輪の切り組み部分は損傷が著しく、紐通し穴を中心に木地が数条に亘って割れ広がっていた。
- ⑧切り組み部分の素地損傷部分周辺に漆塗膜と下地の剥離が広がり、一部で剥落していた。
- ⑨居木裏の紐穴には鞍が使われたときに傷んだと思われる布の浮きがあり、藍に染色された繊維が露出していた。
- ⑩数ヶ所に虫害が認められ、後輪山形部分では内側に空隙が認められ、幅、約30mm、深さ10mmに広がっていた。
- ⑪両輪の馬膚や、居木との接合部分に擦れ等による木地や漆塗膜の傷みがあった。
- ⑫搬入時にすでに剥落した塗膜および140片に及ぶ螺鈿片が付属していた。
- ⑬数箇所に後世修理が認められた。前輪左切組み部分には内側から鉄製の鏝が打ち込まれ、その上から漆を使って布着せ（30本/1cm）され、補強されていた。また、後輪左馬膚には木地の欠損部に下地が充填されていた。

6, 修理仕様

修理は、日本国内に於て文化庁の指導の元に行われている美術工芸品の文化財修復と同様に考え、現状保存と現状維持を修理原則とし、螺鈿や表面の漆塗膜の復元は行わないこととした。虫害によって塗膜が大きく欠損した部分は螺鈿が貼り込まれる面にあわせて形状を戻し、色合いを周囲に合わせた。

前輪に施された後世修理の鉄製の鏝は、すでに錆びており、しかも表面の螺鈿のすぐ下



図221 後輪山形中央の虫損部分 (修理前)
The tip of the inner part of the hind bow
(before restoration)

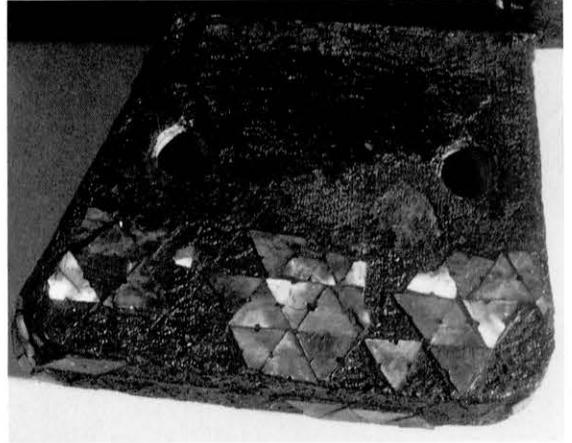


図224 螺細と布着せの剥離右居木先 (修理後)
Lifted *raden* and cloth, right seat board
(after restoration)

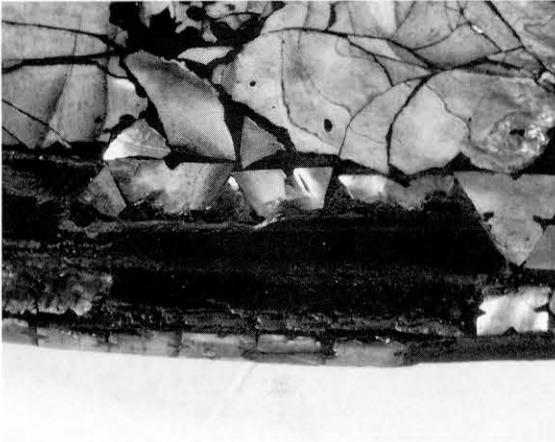


図222 後輪山形中央の虫損部分 (修理後)
The tip of the inner part of the hind bow
(after restoration)

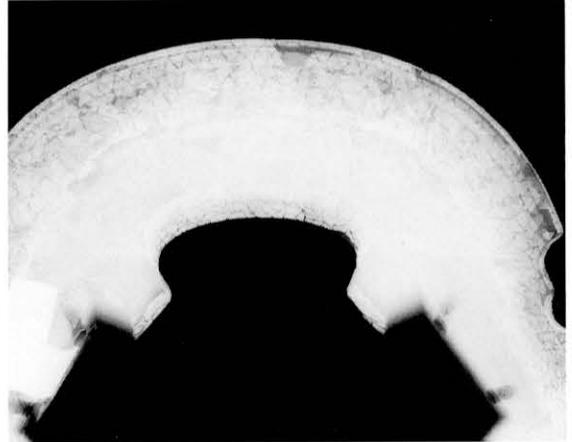


図225 前輪のX線透過写真
The saddlebow, X-ray photograph

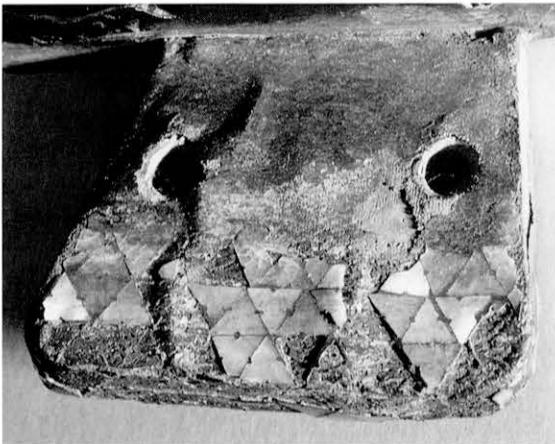


図223 螺細と布着せの剥離右居木先 (修理前)
Lifted *raden* and cloth, right seat board
(before restoration)

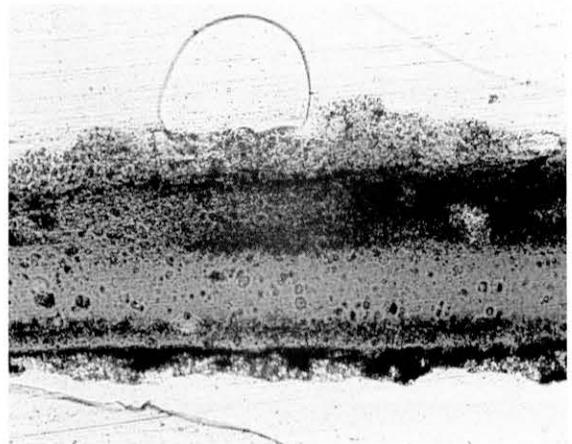


図226 塗膜のクロスセクション
The cross-section of a film

に打ち込まれていることから、取り外すことは資料を破壊することにつながると考え、素地の補強に留めた。修理材料は、事前調査を元に資料の技術的特色を十分考慮に入れ、良質の材料を選んで使用するものとした。

7、修理工程と内容

(1)調査記録

修理前に損傷の状況と原因、材料や技法的特徴等を十分に調査した。X線透過写真を撮り、素地や虫害の状況を観察した。また、修理前の写真撮影を行い、修理後と比較できるようにした。

(2)掃除

資料全面を覆っていた埃や汚れの掃除は、螺鈿の剥離が著しく非常に危険な状態にあったため、初めは毛棒を使って埃を払う程度にとどめ、螺鈿や漆塗膜が安定した後に水やアルコールを少量含ませた綿布で丁寧に取り除いた。

付着した朱漆は彫刻刀を用いて丁寧に除去した。

(3)仮止め

剥離していた漆塗膜や螺鈿のうち、剥落の危険のある箇所には仮止めを行った。仮止めには短冊状に切った雁皮紙を調整した澱粉糊を使って貼り、作業中での剥落を予防した。雁皮紙は剥落止めと同時にはずした。

(4)螺鈿の剥離止め

前輪、後輪、居木それぞれの受台をバルサ、コルク、シリコンなどを用いて製作した。剥離した螺鈿の空隙部分に接着用に調合した麦漆をリグロインで希釈、筆で含浸し、余分な漆を拭き取った。漆が乾燥しないうちに剥離箇所にビニールシートやプラスチック板を置き、木枠と竹や木製のヒゴを用いて部分ごとに抑えた。

(5)漆下地の補強と剥落止め

居木先などの布着せの剥離部分で布が素地から浮き上がり布が余っている部分は布の周囲を刀で切り、上記と同様の漆を含浸、崩れている下地とともに小さなクランプを使いプレスした。居木の剥落止めをするため受台を製作した。受台は複雑な形状に合わせるため大麦粒をフェルトに入れ、その上から絹で包んだ袋を使用した。その他の布着せの剥離した部分は木枠と竹や木製のヒゴを用いて抑えた。切り組みの塗膜剥離部分も同様に抑えた。

(6)素地の補強と欠損部の充填

前輪左切り組みやその他の木地の割れ部分に希釈した麦漆を含浸、十分に乾燥させ、補強した。割れの空隙の部分には、はじめに柔らかめの接着力のある刻苧を数回充填し安定させた。

(7)剥落螺鈿片の照合と接着

現資料は鞍のほぼ全面が螺鈿で加飾され、しかも幾何文様を連続させる表現をとっているため、螺鈿剥落部分と剥落片の照合は容易ではない。しかし、同じ文様でも良く観察すると部分によって形状や大きさが異なったり、制作するときの砥石の傷が貝の表面にはいつていることが作業を進めるうえで発見できた。そこで、搬入時に付属した螺鈿の剥落片

を以下の条件にしたがって剥落部分と照合、断片の位置を決定した。

- ・加飾文様の形状
- ・文様の大きさ
- ・青色味のある貝と赤色味のある貝
- ・貝表面の形状
- ・剥落欠損部の形状
- ・剥落欠損部の接着素材の傷
- ・貝表面の砥石傷
- ・貝の厚み

照合には木製のヒゴの先に粘着シートを貼り、1片1片方向を変え検討した。その結果、剥落片のほとんどが照合できた。剥落片は剥離止めと同様の方法で麦漆で再接着した。前輪40片、後輪44片、右居木22片、左居木28片を本来の位置にもどした。

(8)虫害素地欠損部分の補強と成形

虫害によって素地に空隙ができ脆弱化した部分には、調製した麦漆を含浸し、補強した。空隙部分には数回にわたって刻苧を充填し、剥落部分の形状に合わせ刻苧表面を整えた。その上に山科砥粉と生上味漆をあわせた錆下地を行い、本来の面より僅かに下げて素地の形状に戻した。螺鈿剥落面に表情を合わせるため、松煙を入れた黒漆を下地の上に薄く塗り込み、乾燥した後、かるく炭で研ぎ、摺り漆を数回行った。紐穴の虫損部分は刻苧を充填し乾燥させた後、べん先を使って周囲の色に合わせた。

(9)螺鈿や漆塗膜の剥落防止

触指による再剥落を予防するため、剥離剥落していた貝や漆塗膜の際に漆下地を極く少量施した。下地は目立たなくするため、水練りした山科砥粉に蠟色漆と少量の松煙を練り込んだ黒色の細かい材料を使用した。下地は椀の柔らかい筥で貝や塗膜の際に付け、乾燥しないうちにリグロインを使って拭き取った。

(10)塗膜の漆固め

経年変化等による塗膜の劣化の補強、活性化をはかるため、漆固めを行った。漆は透漆と生正味漆を混合し、石油系の溶剤で希釈、筆で全体に薄く塗布した後、すぐにリグロインを用いて完全に拭き取り十分乾燥させた。

(11)修理記録

修理工程の記録写真を撮るとともに、修理後に修理前に合わせて写真撮影を行った。また、螺鈿の図を作成し、現資料の特徴を捉えた。今回貼り戻した螺鈿の位置を図に書き込み、位置を明確した。

(12)分析

剥落した螺鈿を裏側から実体顕微鏡で観察、下地や接着素材を視認で分析した。また、剥落片のうち元の位置に戻らなかった塗膜片のクロスセクションをとり、下地構成を明確にした。

(13)報告書の作成

今回行った修理記録を作成し、分析をまとめた。

8, 分析結果

後輪の剥落片を対象とした下地、塗膜の蛍光X線分析の結果とクロスセクションの構造図を付記する。

(1) 蛍光X線分析

[調査対象]

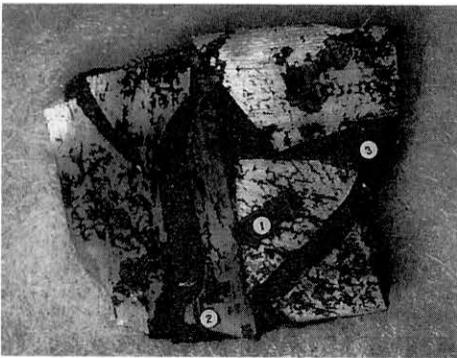
後輪洲浜型左面の剥落片

[測定条件]

測定装置	SEA5230
測定時間 (秒)	300
有効時間 (秒)	295
資料室雰囲気	大気
コリメーター	φ0.1 mm
励起電圧 (kv)	50
管電流 (μA)	1000

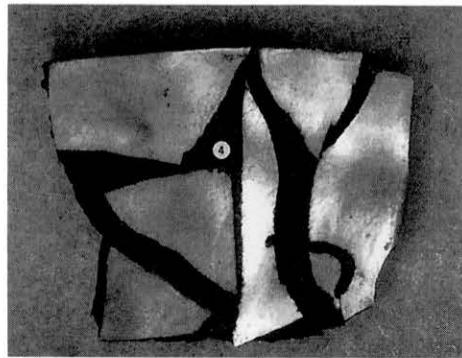
[測定箇所]

- ① 素地に直接付けられた一番下層の赤茶色の荒い下地。(一辺地)
- ② 貝の接着素材、漆の中に黒色の顔料が練り込まれる。
- ③ 貝を接着した後、貝の段差を埋めた褐色の荒い下地。(二辺地)
- ④ 表面に塗られた塗膜



後輪洲浜型左面の剥落片裏

Fallen piece next to the *suhama* of the hind bow on the left (back side)



後輪洲浜型左面の剥落片表

Fallen piece next to the *suhama* of the hind bow on the left (surface)

[測定結果]

測定箇所	①	②	③	④	
元素	A (cps)	A (cps)	A (cps)	A (cps)	R O L (kev)
Fe	7.850	0.526	15.671	14.975	6.23-6.57
Sr	4.676	4.980	2.831	2.752	13.92-14.36
Ca	1.457	30.142	0.627	1.040	3.84-3.84
Ti	0.846	0.337	0.752	0.730	4.35-4.46



図227 前輪螺鈿図 (漆原早奈恵作図協力)
Raden on the saddle bow
(with the cooperation of Urushibara Sanae)



図228 後輪螺鈿図 (同)
Raden on the hind bow (with the cooperation of Urushibara Sanae)

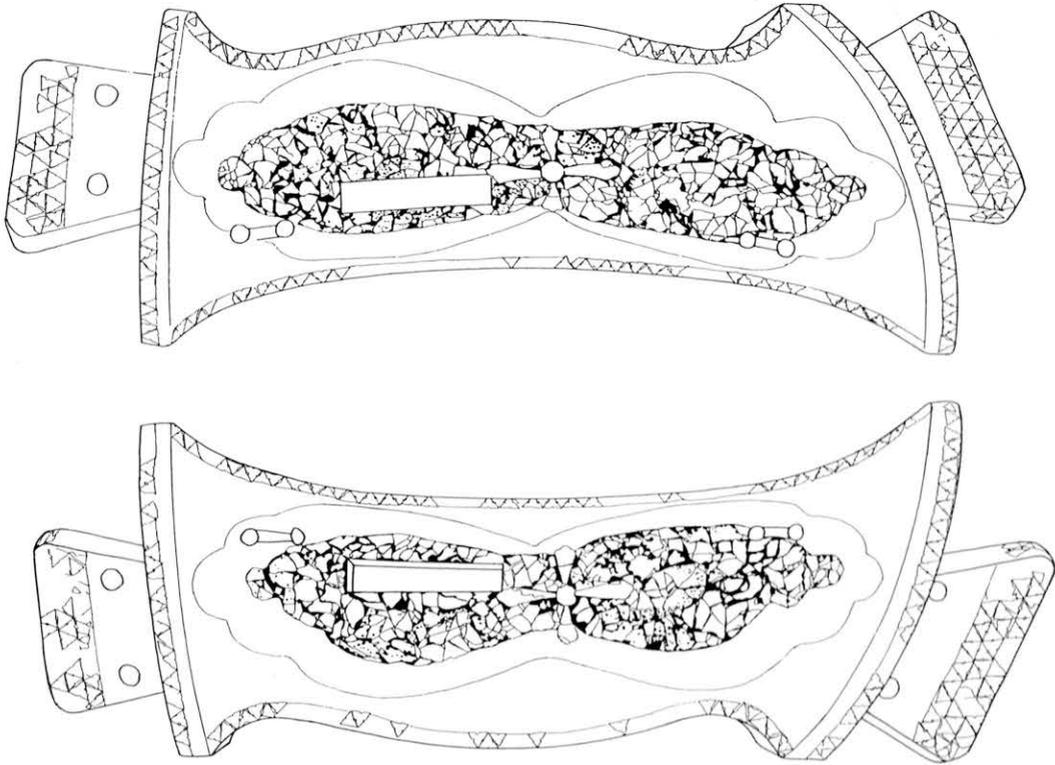


図229 居木螺鈿函 (同)
Raden on the seat board (with the cooperation of Urushibara Sanae)

(2) クロスセクション

[調査対象]

付属した剥落片のうち、修理によって位置が確認できなかった漆塗膜片。形状から、両輪の山形から爪先に向かった稜線沿いの部分で、貝の段差を埋めた下地から表面の漆塗膜までの断片。

[作業条件]

ペトロポキシ154 (米国パルース・ペトロ・プロダクツ社製品) を使用。レジンに硬化剤を混入、攪拌した後、減圧し脱泡する。断片を封入し、薄く鏡面に仕上げ光学顕微鏡で観察、写真撮影を行う。

[調査結果]

上塗り	黒色漆、透き漆に黒色顔料を混合。顔料少ない。沈殿、明るい
中塗り	黒色漆、透き漆に黒色顔料を混合。顔料多い。
中塗り	黒色漆、透き漆に黒色顔料を混合。顔料少ない。沈殿、厚い
下塗り	黒色漆、透き漆に黒色顔料を混合。顔料少ない沈殿、極く薄い
下地	褐色の荒い下地
接着	螺鈿を接着した漆。黒色漆。透き漆に黒色顔料を混合。

おわりに

修理前、鞍全体の状態は、螺鈿が剥離することで白く浮いた感じであったが、二ケ年に亘る修理作業の結果、現資料が制作された当初に近い貝の表情に戻すことが出来た。

保存修理は資料を将来にわたって保存することを目的とするが、その中にはさまざまな選択肢がある。今回の剥落止めの場合で言えば、一つには現状を維持し、傷んだ貝の色合いをも変えることなく保存する考え方であり、もう一つには制作当初と同じ材料を使って修理を行うことで貝の表情を本来の姿に戻してゆこうという考え方である。後者は漆で貝の剥落止めをするのに対し、前者では膠を選択することが必要となる。海外であるならば、合成樹脂をも選択肢の一つとして考えなくてはならないであろう。

修理方針は当然ながら関係者で協議して決定しなければならないことであり、修理者が勝手に決定できるものではない。しかし、修理材料の選択と使用方法は修理者の理念や修理経験に委ねられている部分があるということを付け加えなくてはならない。今回の修理では、資料の調査をもとに使用されていた材料とほぼ同じ素材を修理材料として選択することで、漆の接着強度を生かし、本来の貝の輝きをもどすことができた。

最後に、今回の修理にあたり御助言、御協力いただいた諸氏に感謝申し上げ修理報告とする。



花押
Kao

On the Restoration of “*Kikumon Raden Saddle*” in the Collection of
The Metropolitan Museum of Art, New York

YAMASHITA Yoshihiko, Urushiware Conservator

Preface

As a part of the Project for Conservation of Works of Japanese Art in Foreign Collections (Applied Arts), which was started in 1997 by the Agency for Cultural Affairs, the restoration of “*Kikumon Raden Saddle*” (saddle with chrysanthemum and *raden*), or, to be exact, “*Kiku-ryusui-mon Raden Saddle*” (saddle with chrysanthemum-and-stream design and *raden* decoration), in the collection of The Metropolitan Museum of Art, New York, was conducted under the author’s charge over a period of two years, from 1998 to 1999, and was completed in late March 2000. This is a summary of its restoration work.

This report deals with a general description of the “*Kikumon Raden Saddle*” (hereafter referred to as “the object”), its shape, its decorations, its structure and techniques, its existing state (condition before treatment), its restoration policy, the processes of its restoration work, and the results of analysis. It also gives a summary of what was found or learned through this restoration project.

We are grateful to the following researchers at the Tokyo National Research Institute of Cultural Properties who helped us in this project: Mr. Nokubo Masayoshi, Mr. Hirao Yoshimitsu and Mr. Hayakawa Yasuhiro for taking X-ray radiography and conducting fluorescent X-ray spectroscopy; and Ms. Hayakawa Noriko and Mr. Kutsuna Takahiko, graduate student at the Tokyo University of Fine Arts, for conducting cross-sectional investigation.

General Description

The object is a black-lacquered, wooden saddle with *raden*. There are chrysanthemum-and-stream designs on the exterior face of the *iso* section (the lower or outer section) of each of the saddlebow (or the pommel) and the hind bow (or the cantle), while the right and left seat boards have a cruciferous design at each of their central parts. The *raden* are made of *awabi* (abalone) and other shells of medium thickness that were cut into pieces in such a way that they combine to form geometric patterns. They are deliberately arranged in different colors in different parts of the object. The *raden* on the *iso* sections of the saddlebow and the hind bow and on the exterior surface of the seat boards are sprinkled with thin shell fragments as the surface finishing, thereby endowing their designs with a distinctively splendid look.

The *kurabone*, or the main body of the object, possesses the distinctive features of an early modern saddle in Japan. The saddlebow and the hind bow both have an inscription of *kao* (designed monogram of signature) written in Chinese ink at their respective joints with the right seat board and a figure “口” also written in Chinese ink at their respective joints with the left seat board. A number reading “14.100.78” and a word “DEAN” are written in red paint on the downside of the seat boards, and a slip of Japanese paper with a number and a price on it is also attached.

The object was delivered to us with its saddlebow, hind bow, and right and left seat boards disassembled. When those parts were checked at the time, the substrate of the saddlebow was found to have cracks at its left joint, and an iron clamp was already driven in there. The *raden* on the surface of the object had become lifted or had fallen and were in a critical condition. Many of the *raden* pieces that had fallen and had been kept separately were also sent to us together with the object.

Shape (See illustration on p129 for detail)

The *kurabone* of the object has two separate sections respectively on the exterior faces of the saddlebow and the hind bow. The *yamagata* on the upper part of the saddlebow is about one fourth of its total height, and a *tegata* is shaped out a little below the *yamagata* on left and right. The hind bow is gently curved from its shoulders to its left and right lower tips and consequently gives an impression of its being not so three-dimensional even when viewed from its side. It is also thinner than the saddlebow in the thickness of the substrate and does not give a sense of volume. The *yamagata* of the saddlebow and the hind bow are both gentle in shape, and their lower tips are rounded. The substrates of the main parts are thin and fragile on the whole, and the seat boards are narrow. The features as observed in respect to the shape of the object represent a type affiliated with the *suikan gura* (see report on “*Hyotan Makie Hyomon Saddle*”), which appeared in the Muromachi Period (1338-1573), and it can be said that the object, as such, is characteristic of the early modern general-purpose saddles which continued to be used up until the end of the Edo Period (1867).

Parts on the downside surface of the seat boards, where the date and *kao* are usually inscribed, had been scraped off extensively, and the cord holes on both ends of the seat boards, which had been provided for the cord that joined the seat boards with the saddlebow and the hind bow, had been repaired. These findings suggest that the seat boards were adjusted when cracks in their substrates were repaired or that the existing seat boards, saddlebow, and hind bow are different from their original combination.

The dimensions of the main parts are as follows (mm):

	Height	Contact face	Width of the central part	Thickness of the central part	Length	Width	Length between The saddle bows
Saddlebow	278	316	75	32			
Hind bow	318	377	77	33			
Seat boards					382	101	344

Total measurements (mm):

Depth 390

Width 408

Height 277

Decorations

Decorations are found on the entire surface except on the *bahi* (the undersides of the main parts), the joints, and the undersides of the seat boards.

As for the designs, there are seven chrysanthemum-and-stream designs on the *iso* of the saddlebow and the hind bow, and there is a cruciferous flower design at the center of the left and right seat boards. On the other parts are consecutive geometrical patterns with *warigai* (artificially cracked shell pieces) and *mijingai* (tiny crushed shell fragments) scattered around them.

Triangular shell pieces with small cuts on all three sides are arranged in a line on the periphery of each main part. *Warigai* made of spotted parts of abalone shell pieces are linked like a cobblestone pavement on the *umi* of the saddlebow and the hind bow. Similarly, spotted parts of abalone shell pieces are also used in the chrysanthemum design on the *iso*, while other areas of the *iso* are decorated with *mijingai*. The shell pieces used in the design of the stream are all reddish in color in contrast to the bluish ones used on the other areas. Rectangular petal-shaped shell pieces surround each cord hole.

Shell pieces with small cuts on all four sides are similarly arranged in two rows on the thick peripheral parts of the outer faces of the saddlebow and the hind bow. The *tegata* are decorated with diamond-shaped shell pieces that are arranged in a star-like pentagon. The lower tips of the saddlebow and the hind bow are decorated with petal-shaped shell pieces with pointed ends and tiny square shell pieces placed between the petals. This pattern is linked together in a *shippo-tsunagi* style. The *suhmagata*, or the lower curve of the *yamagata*, of the saddlebow and the hind bow are decorated with bluish *mijingai*. The inner side of the saddlebow and the hind bow has no separate sections called *iso* and *umi* but is divided into two parts at the center and decorated with shell pieces in different designs just as on the outer face.

The cruciferous flower and the design around it at the center of each seat board are considered to be a modified shape of the traditional cruciferous flower pattern. The cross pattern is decorated with pieces of the spotted parts of abalone shell

while the petals are decorated with *warigai* of the same shell. The flower is first surrounded by *mijingai* of reddish shells and then by *mijingai* of bluish shells. When the shell pieces that were cut into triangles and rectangles are closely observed, we see that bluish and reddish pieces are alternately arranged and are thus consciously used to distinguish colors of the designs, just like the sprinkled *mijingai* of different colors in separate areas.

Kiku-ryusui-mon, which is also simply called *kiku-sui*, is a design depicting a chrysanthemum (*kiku*) floating on a stream (*ryusui*). In old Japan, people used to hold a feast on *choyo-no sekku*, or September 9 according to the lunar calendar, to enjoy drinking sake from a cup with a chrysanthemum floating in it, and this feast was called *kikusui no en* (a floating chrysanthemum party) or *kiku no en* (a chrysanthemum party). The chrysanthemum-and-stream design, therefore, has been frequently used on applied arts from early times in our country.

Structure and Techniques

[Substrate]

The substrates of the saddlebow and the hind bow are made of comparatively hard cherry wood with rough vessels. When their shoulders are observed in an X-ray radiography, it is found that the grains flow in two directions from the *yamagata*, to the left and right lower tips, in each. This suggests that a forked tree (a part of a tree that forks into two) was used and skillfully carved into shape. The substrates of the left and right seat boards are made of a different kind of wood. Observation of their joints with the saddlebow and the hind bow shows that the wood was cut parallel to the grains and roughly carved so that the outer face of the tree would be used for the outer face of the seat boards.

[Urushi coating]

The substrates of the saddlebow and the hind bow are not covered with hemp cloth. Hemp cloth is used only on some parts of the downside of the seat boards and their ends. Hemp cloth is dyed indigo blue and has a texture of 20 to 21 threads for every centimeter.

Since the right joint of the saddlebow rubbed against the right seat board when in use, its urushi coating had worn away. As a result, it provided a good place to observe the foundation layers well. There was also a similar exposed area on the *yamagata* of the hind bow. The distinctive features of the foundation layers as found on these exposed areas and on the backside of fallen pieces may be summarized as follows.

- A thick layer of dark brown urushi foundation was applied directly on the substrate.
- Black-colored urushi was applied thereon.

- Coarse, reddish brown urushi foundation was then applied.
- Shell pieces were glued with *suki urushi* mixed with black particles which may be *shoen* (black pigment obtained by burning pine).
- Brown urushi foundation was applied between the glued shell pieces to fill the difference in surface level.
- Fine, gray foundation was applied on some parts.
- After polishing the foundation layer and shell pieces with a whetstone, a thin layer of black-colored urushi was applied.
- *Suki urushi* was applied on the entire surface, and then the shell pieces were polished out to the surface and shined

Deterioration differed in the two layers of urushi coating film. In the lower black-colored urushi layer, there were very small cracks of about 0.04 to 0.06mm as well as deeper cracks of about 0.1mm. In the *suki urushi* coating, only cracks of about 0.06mm could be seen. These were in the initial stage of cracking, while the former was in an advanced stage. In addition, since there is *raden* decoration a few millimeters above a clamp driven in the left joint of the saddlebow, there is a strong possibility that the object was originally finished as a black-lacquered saddle and that its damaged substrates were reused with additional coating and decorations applied on the surface. There are, in fact, cases in which the inscriptions of the date on the downside of seat boards do not match the style of the main parts of a saddle or the designs on the surface. Such cases of re-using the main parts of old saddles do not seem to have been uncommon and suggest that finding good forked cherry trees was really difficult.

[*Raden*]

The *raden* of this object is made of shell pieces of medium thickness—about 0.3mm. To make shell pieces of medium thickness, shells are cut with a jig saw or some other tool into about 4cm-square pieces and are then thinned from both sides to equal thickness by using a rough whetstone. Those that are less than 0.2mm in thickness are considered to have become that much thin when the entire surface was polished with a whetstone.

Materials found on the back of some shell pieces that had fallen were observed with a stereomicroscope. As a result, it was found that the shell pieces had been fixed with *suki urushi* mixed with a black pigment such as *shoen*.

A *raden* technique called *warigai* is used on the *umi* and *suhomagata* of the *yamagata* of the saddlebow and the hind bow as well as on the central parts of the seat boards. In this technique, shells are first cut according to the shape of the intended place where it will be fixed on the object. Next, Japanese paper is attached on the surface with starch and then the shell pieces are cracked so that they will fit onto the curved surface. After the shell pieces have been fixed and cracked, the

paper is removed by using a brush and water, and the design is adjusted with a spatula. A total of 32 to 40 *warigai* are used on the saddlebow, hind bow and seat boards each, although the exact number varies depending on parts. Other shell pieces are used to fill places between rows of *warigai*.

Unspotted shell pieces are used in the geometric patterns on the periphery of the saddlebow, hind bow and seat boards. They are cut into triangles, rectangles and other shapes with a jig saw or some other tool. The other areas are finished by sprinkling unspotted *mijingai* of abalone shells. To make *mijingai*, shell pieces are first separated into bluish and reddish ones and then crushed with a mallet. These pieces are sprinkled on urushi that have been applied earlier on the entire area by using a sifter.

Fine line carvings are made only on the chrysanthemum-and-stream patterns on the outer face of the saddlebow and the hind bow. When these lines are observed with a magnifying lens, it is found that they were carved deeply in a U-shape by using a round-edged tool.

Holes appear on shell pieces when *surigai* is made from abalone. Although such shell pieces are usually not used in designs, pieces with these holes are found on this object. The fact that they are used in this object even though they do not have appreciable aesthetic effect suggests that the shells were considerably valuable in those days. It is estimated that as many as 100 abalone shells were required to make this object.

Such spotted shells as were used for this object are not found among abalone shells caught in Japanese waters. Therefore, it is considered that what are called *kujaku-gai* or *mekishiko-awabi* (Mexican abalones) in Japan, which are usually caught off the coast of California, were used for this object. Consequently, these spotted shells tell us much about the distribution route of such materials available at the time of the making of the object.

Condition before Treatment

The condition of damage to the object as observed before treatment was as follows.

1. The overall surface of the object was dusty and dirty; spots of *shu urushi* were observed.
2. Deterioration of the urushi coating due to ultraviolet rays and time change was observed. Small cracks of about 0.04-0.06mm were found in larger, deep cracks of 0.1mm.
3. *Raden* had become lifted from the foundation over the entire surface of the saddle due to the shrinkage of the substrates or physical damage. Some were in an extremely critical condition.
4. Spaces had appeared between the shell pieces and their underlying adhesive

- layer at various places. As a result, the shell pieces had lost their original color.
5. Foundation layers had become separated at various places around the *raden* that had lifted or fallen. Hemp cloth that covered the substrates of the seat boards had become lifted over a large area and had become wavy.
 6. *Raden* and the urushi coating film had fallen at various places, and the foundation was exposed.
 7. Substrates had cracked on the *yamagata* of the hind bow, the *bahi* of the saddlebow and the hind bow, and the left joint of the saddlebow. Especially the joint of the saddlebow was severely damaged with several cracks extending around the cord holes.
 8. The urushi coating film had become separated from the foundation in areas surrounding the damaged joints of the substrates and had fallen at some places.
 9. The cord holes on the downside of the seat boards seemed to have been damaged when the saddle was actually used. As a result, the underlying hemp cloth had become lifted in part, and its indigo blue dyed fibers were exposed.
 10. There was insect damage at several places. A space, which was about 30 mm wide and about 10 mm deep, was observed on the inner side of the *yamagata* of the hind bow.
 11. The substrates and urushi coating film of the *bahi* of the saddlebow and hind bow and their joints with the seat boards had become damaged by friction.
 12. The separately-kept pieces of the urushi coating film and *raden* that had fallen were sent to us together with the object. There were as many as 140 pieces of the latter.
 13. Traces of past treatments were observed at several places. A clamp had been driven at the left joint of the saddlebow from its downside, which was then reinforced by applying hemp cloth with a texture of 30 threads for every centimeter with *nori urushi*. The damaged and lost part of the substrate at the left *bahi* of the hind bow had been filled with foundation material.

Restoration Policy

In accordance with the general guidelines for the conservation and restoration of urushi cultural properties that have been carried out under the guidance of the Agency for Cultural Affairs, we decided to make it the basic principle of restoration to conserve and maintain the existing state of the object. We, therefore, refrained from using new shells or urushi to restore the *raden* and urushi coating film that had become lifted. Areas of the urushi coating which had been severely damaged by insects were repaired to become level with the layer immediately below the *raden* and color was adjusted to match neighboring areas.

In a past treatment iron clamps had been used on the saddlebow directly below the *raden* pieces, so that iron rust had caused the *raden* to become lifted. For this

reason, we thought that removing the clamps would result in destructive damage to the object; so we restricted ourselves to reinforcing the substrate only.

Furthermore, we also decided to select good-quality materials for treatment, fully taking the characteristics of the object, both its materials and techniques, into consideration on the basis of our investigation before restoration.

Processes of Restoration Work

1. Recording and investigation the object

Before starting the actual restoration work, we thoroughly investigated the conditions and causes of damage to the object and the characteristics of its materials and techniques. We examined the conditions of the substrates and insect damage by X-ray radiography. We also took photographs of the object before restoration so that we might be able to compare the object after restoration with its earlier state or appearance.

2. Cleaning

Dust and dirt on the entire surface of the object were cleaned first by using a brush only, because the *raden* was in a very critical condition with much exfoliation. After the *raden* and the urushi coating film were stabilized, they were cleaned carefully with cotton cloth moistened with a small amount of water or alcohol. Spots of *shu urushi* were removed carefully with a carving knife.

3. Temporary fixing

Of the lifted or separated portions of the *raden* and the urushi coating film, those which were at risk of falling were temporarily fixed. To do this, strips of *gampi* paper were attached with starch glue that had been properly adjusted. These strips of paper were removed when the *raden* and the urushi coating film had been stabilized.

4. Fixing the *raden*

Receptacles were made of balsa wood, cork, silicone and other materials for the saddlebow, hind bow and seat boards to support them during treatment. Spaces under the lifted or separated portions of the *raden* were impregnated with *mugi urushi* that was prepared as an adhesive and diluted with ligroin. A brush was used for this, and excess *mugi urushi* was wiped off. Before the *mugi urushi* hardened, the areas in question were covered with a vinyl sheet and a plastic board and then press-stabilized one by one by using wooden frames and *shimbari* sticks.

5. Reinforcing and stabilizing the urushi foundation

Hemp cloth had become lifted from the substrates at the ends of the seat boards and at other places. After the periphery of such loose parts was cut with a knife, these spaces were impregnated with the same kind of *mugi urushi* as described above. Then they were pressed together with the damaged urushi foundation by using a small clamp. To support the downside of the seat boards, a receptacle was

made by putting small barley grain in a felt bag, which was then wrapped with silk cloth. The lifted parts of the hemp cloth were press-stabilized by using a wooden frame and *shimbari* sticks. The lifted portions of the urushi coating film at the joints were press-stabilized in the same way.

6. Reinforcing the substrates and filling the lost portions

The cracks on the left joint of the saddlebow and on other parts of the substrates were impregnated with diluted *mugi urushi* and thoroughly hardened for reinforcement. Spaces in the cracks were filled with soft adhesive *kokuso* in several steps to stabilize the damaged parts.

7. Checking up and re-fixing the fallen *raden* pieces

The object is almost entirely decorated with *raden*. Moreover, because there are designs of consecutive geometric patterns, it was not easy to check and match the *raden* pieces that had fallen with their original positions. When they were closely observed, however, they were found to be slightly different in shape or size, even if same in design, according to their positions, or to have scratches on the surface that had been made by whetstone at the time of manufacture. The separately-kept, fallen pieces that came with the object, therefore, were checked by the following criteria to determine their original positions.

- Shape of the design
- Size of the design
- Color of the shell pieces - bluish or reddish
- Shape of the surface of the shell pieces
- Shape of the missing portions
- Scratches on the adhesive material on the missing portions
- Scratches caused by a whetstone on the surface of the shell pieces
- Thickness of the shell pieces

To check the pieces that had fallen, a wooden stick, to the end of which a small adhesive sheet was stuck, was used. Each piece was turned in various directions to examine it well. As a result, the original positions of almost all the pieces could successfully be found. These pieces were fixed again with *mugi urushi* in the same way as the pieces that had become lifted had been stabilized. The number of pieces that could be returned to their original positions was 40 on the saddlebow, 44 on the hind bow, 22 on the right seat board, and 28 on the left seat board.

8. Reinforcing and reshaping the substrates lost by insect damage

First, spaces made in the substrates by insect damage were impregnated with specially-adjusted *mugi urushi* to reinforce the substrates that had become fragile. After the *mugi urushi* had hardened thoroughly, they were filled with *kokuso* in several steps. Then the surface of the *kokuso* was adjusted to fit the shape of each lost part. Next, a layer of *sabi urushi*, a mixture of Yamashina *tonoko* and *kijomi urushi*, was applied so that the layer would be a little below the original surface

level. Next, *roiro urushi* mixed with *shoen* was applied thinly on the foundation layer to make those parts match the original color of the areas where the *raden* had fallen. After the urushi had hardened, the surface was lightly polished with charcoal and then *suri urushi* was performed several times. The parts of the cord holes damaged by insects were filled with *kokuso*, and after the *kokuso* had hardened, the surface was smoothed level with a pen point and the color was adjusted to match the surrounding areas.

9. Preventing the *raden* and the urushi coating film from falling

To prevent the restored parts from becoming separated from the foundation or falling again due to contact with hands and other objects, a very small amount of urushi foundation was applied along the borderlines of the *raden* and urushi coating film that had been treated. To make the newly added foundation inconspicuous, fine black material was prepared by mixing *roiro urushi* with Yamashina *tonoko* that was kneaded with water and then kneading a small amount of *shoen* into this mixture. First, a small amount of this foundation material was applied with a soft spatula along the borderlines of the shell pieces and urushi coating film in question. Then, before the applied foundation material hardened, excess foundation was wiped off with ligroin.

10. Consolidating the urushi coating

To activate and strengthen the urushi coating that had deteriorated over the years, *urushi gatame*, a kind of urushi consolidation treatment, was carried out. The urushi used was a mixture of *suki urushi* and *kijomi urushi* that was diluted with an oil-based solvent. It was applied thinly on the entire surface with a brush. After this urushi had penetrated into the deteriorated surface, it was immediately wiped off completely with ligroin and hardened thoroughly.

11. Recording the restoration work

Documentary photographs of the processes of restoration work were taken. Photographs of the object after restoration were compared with those taken before restoration. In addition, drawings of the *raden* decorations were made to see what distinguishing features the object has, and the *raden* pieces that were fixed again this time were marked on the drawings to show their definite positions.

12. Analysis

Some of the *raden* pieces that had fallen were observed from their back with a stereomicroscope, and the materials of the foundation and adhesives were analyzed visually. Cross-sectional analysis of some of the fallen pieces that could not be repositioned was also made to find the composition of the layer.

13. Preparation of a report

A record of this restoration work and the results of analysis were compiled into a report.

Results of Analysis

Pieces of the foundation and urushi coating film of the hind bow that had fallen were analyzed by fluorescent X-ray spectroscopy, and their results are shown below. The composition of the foundation and urushi coating film as found by analyzing their cross-sections is also presented.

(1) Fluorescent X-ray spectroscopy

Specimens: Pieces that fell from the part next to the *suhama* on the left

Conditions of measurement:

Measuring equipment	SEA5230E
Measuring time (seconds)	300
Effective time (seconds)	295
Ambience	Atmosphere
Collimator	$\phi 0.1\text{mm}$
X-ray tube voltage (kV)	50
X-ray tube current (μA)	1000

Specific parts measured:

- ① The lowest, coarse, reddish-brown foundation layer that was applied directly on the substrate (*ippenji*)
- ② The adhesive used to fix the shell pieces—black pigment had been kneaded into the urushi
- ③ The coarse, brownish foundation layer that was applied to fill the difference in surface level after the shell pieces had been fixed (*nihenji*)
- ④ The surface coating layer

Results of measurements:

Parts measured	①	②	③	④	
Elements	A(cps)	A(cps)	A(cps)	A(cps)	ROL(kev)
Fe	7.850	0.526	15.671	14.975	6.23- 6.57
Sr	4.676	4.980	2.831	2.752	13.92-14.36
Ca	1.457	30.142	0.627	1.040	3.84- 3.84
Ti	0.846	0.337	0.752	0.730	4.35- 4.46

(2) Cross-sectional analysis

Specimens: Some of the urushi coating pieces that had fallen and been separately kept but whose original positions could not be determined

From their shapes, it was supposed that they were originally positioned somewhere along the ridgeline from the *yamagata* to the tips of the saddlebow and the hind bow, and also somewhere from the foundation between the shell pieces to the surface urushi coating film.

Working conditions:

Petropoxy 154 (Palouse Petro Products, USA) was used. A hardener was mixed

into epoxy resin, and after having been stirred the mixture was defoamed by reducing pressure. The specimens were sealed in the mixture to make a thin mirror surface. They were then observed and photographed with an optical microscope. Results of the investigation:

Finish coating	Black-colored urushi (black pigment mixed into <i>suki urushi</i>) Not much pigment; pigment has subsided <i>Suki urushi</i> appears more translucent
Middle coating 2	Black-colored urushi (black pigment mixed into <i>suki urushi</i>) Much pigment
Middle coating 1	Black-colored urushi (black pigment mixed into <i>suki urushi</i>) Not much pigment; pigment has subsided; thickly applied
Undercoating	Black-colored urushi (black pigment mixed into <i>suki urushi</i>) Not much pigment; pigment has subsided; very thinly applied
Foundation	Rough brownish foundation
Adhesive	Urushi used to fix <i>raden</i> Black-colored urushi (black pigment mixed into <i>suki urushi</i>)

Concluding Remarks

At first, the *raden* that had separated from the foundation gave a whitish color to the entire surface of the object. As a result of over two years of restoration work, however, the object has been successfully restored and the shells have regained their original condition.

The purpose of conservation is to conserve objects for the future, as the words signify, but there are various choices in the methods of conservation. As for ways of preventing *raden* pieces from falling, one would be to maintain the existing state of an object without changing even the color of the damaged shell pieces. Another choice would be to restore those damaged shell pieces to their original condition by using the same materials as used at the time of manufacture. For the former, animal glue would be selected, while for the latter urushi would be selected to prevent the shell pieces from falling. In foreign countries, synthetic resins might also have to be considered a choice.

Restoration policy, needless to say, should be determined by consultation among the parties concerned, and the conservator in charge is not allowed to make the decision at his or her own discretion alone. It should be added, however, that the selection of materials to be used for restoration and the methods or ways of using them are frequently left in large part to the restoration concept and experience of the conservator. In this restoration project, materials that are virtually identical with the original ones were used on the basis of investigation made before restoration. By doing so, it was also possible to obtain adhesiveness.

Before closing, the author would like to express his sincere gratitude to all the people who gave us advice or cooperated with us in carrying out this restoration project.