

花鳥螺鈿食籠 “Kacho Raden Jikiro”



図58 「花鳥螺鈿食籠」一合 ベルリン東洋美術館所蔵 (修理後)  
“Kacho Raden Jikiro” after restoration



図59 「花鳥螺鈿食籠」一合 ベルリン東洋美術館所蔵 (修理前)  
“Kacho Raden Jikiro” before restoration

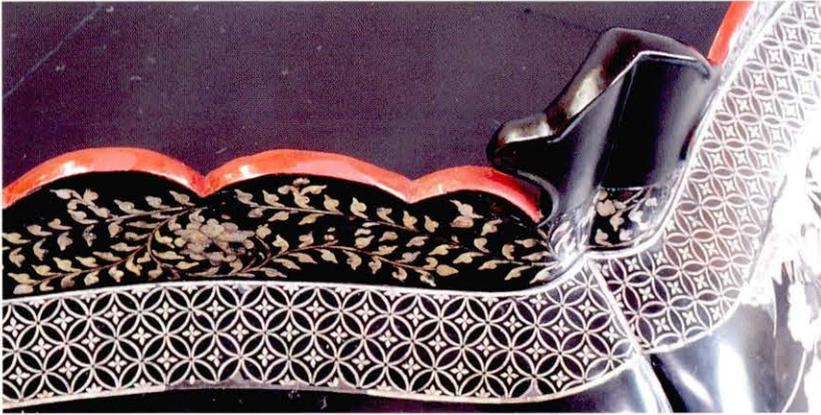


図60 高台、刎足の状態 (修理後)  
*Kodai and kuriashi after restoration*



図61 高台、刎足の状態 (修理前)  
*Kodai and kuriashi before restoration*



図62 螺鈿の剝離 (修理後)  
*Exfoliation of raden (after restoration)*

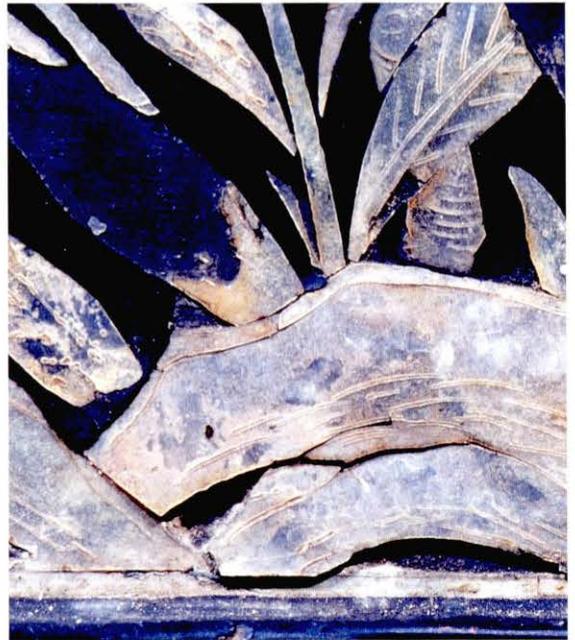


図63 螺鈿の剝離 (修理前)  
*Exfoliation of raden (before restoration)*

ベルリン東洋美術館所蔵

## 花鳥螺鈿食籠

(平成11・12年度補助事業)

山下好彦

品名：花鳥螺鈿食籠  
 所蔵：ベルリン東洋美術館 ドイツ  
 品質構造：木製、乾漆製、黒漆塗り、螺鈿、  
 所蔵番号：ID.25922-a

請負者 目白漆芸文化財研究所  
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 原稿執筆 山下 好彦

## 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、ドイツ・ベルリン東洋美術館所蔵「花鳥螺鈿食籠」一合の保存修理が、平成11年度、12年度の2ケ年に亘って独立行政法人 東京文化財研究所（平成13年4月に改名）で行われ、平成13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、「花鳥螺鈿食籠」（現資料と呼ぶ）の修理概要・品質構造・加飾技法・損傷状態・修理仕様・修理工程と内容・分析の項を設け説明、今回の修理で判明した新知見をまとめる。なお、X線透過写真撮影は東京文化財研究所の三浦定俊氏、木材分析は森林総合研究所の能城修一氏、繊維分析は高知県立紙産業技術センターの大川昭典氏、蛍光X線分析は東京文化財研究所の平尾良光氏、斉藤亜三子氏に分析を依頼した。また、クロスセクションは東京文化財研究所の早川典子氏の協力を得た。桐箱は大阪重雄氏、台制作には（有）東京修復工房の鈴木晴彦氏、油単は池富幸子氏に依頼した。

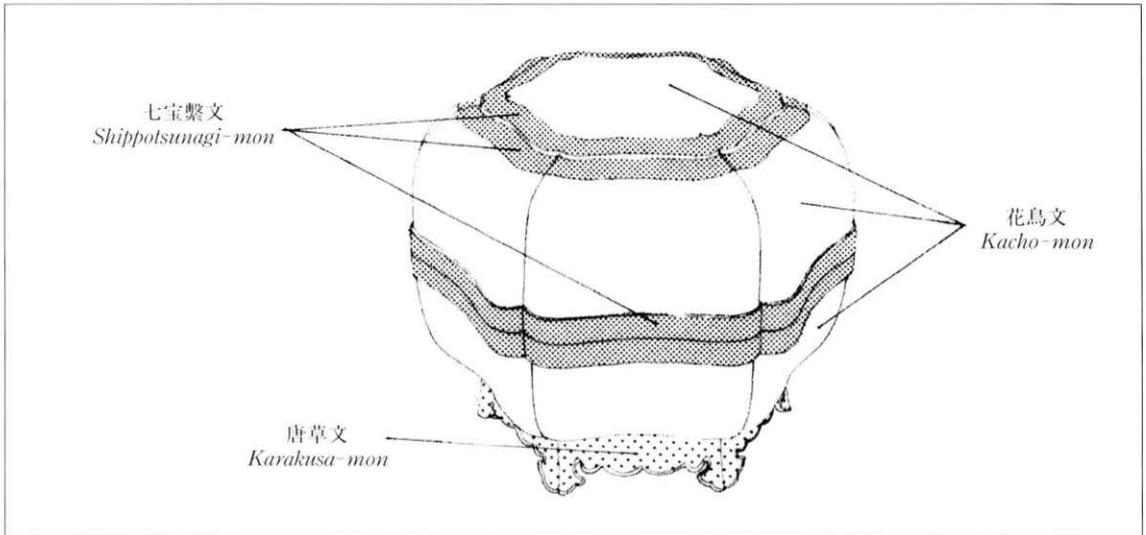
## 1. 修理概要

現資料は黒漆螺鈿の大型の食籠で、第二次世界大戦後、旧ソビエト軍によってレニングラード（現在のサンクトペテルブルグ）に持ち去られた。東西ドイツ統合以前にいったん旧東ドイツ・ライプティヒに返還、その後、ベルリン東洋美術館に所蔵されるようになった経歴がある。損傷が著しく、足が欠損し自立することが出来ない。この事は、現在の所蔵館に返還される以前の保存環境の悪さを物語っているものと考えられる。

所蔵番号 1 3 3 3 I.D.2 5 9 2 2 - a  
 時代 17世紀中期～18世紀 琉球第二尚氏時代  
 法量 (mm) 縦417 横384 高さ332

## 2. 品質構造

黒漆塗り、六弁稜花型の食籠で、高台と刳足が付く。全面に薄貝螺鈿で花鳥図を描き、甲板の周辺部や合口部分等に七宝繫ぎを繞らす。甲板の入隅には花紋を置き、高台には唐草を繞らせる。螺鈿は夜光貝、



鮑貝を併用し、毛彫を施す。素地は木製の指物と曲物、乾漆を組み合わせる。蓋と身の内部および高台縁は朱漆で塗る。

### 3. 加飾技法

#### [螺鈿]

螺鈿は薄貝を用い、各所に毛彫を入れる。螺鈿は夜光貝のへぎ貝を主に使用し、花等の部分に鮑貝の摺り貝を使う。摺り貝は貝の平坦な部分を砥石で摺りおとす技法である。一方、へぎ貝は貝を海水で約10日間煮て、真珠層に沿って剥がして薄い貝を作る技法であり、中国から琉球に伝わったとされている。薄貝は刃物や針で形状に切り、白色の下地を施した上に膠で貼り込む。その後、透き漆を全面に塗り込み、炭で研ぎ出し艶を上げた後、毛彫を刃物で入れる。夜光貝のへぎ貝は真珠層の間で剥がすため、光が強く華やかである。また文様ごとに意図的に異なる色味の貝を使用している。

### 4. 損傷状態

修理前の状態は、打損、擦り傷、劣化、亀裂、剥離、剥落など一般的に状態の良くない漆工品によく見られる症状が認められた。搬入された時点での損傷状態を下記に列記する。

- ①悪い条件下で外箱もなく保管されていたと考えられ、器胎表面の一部に水が流れた跡があった。
- ②紫外線による漆塗膜の劣化が表面塗膜にみられ、細かい断文が入っていた。
- ③劣化することで本来の漆の艶が失われていた。
- ④経年変化や木地の収縮によって各素地の接合部からの割れが著しく、蓋甲板では矧ぎ目部分に歪みが生じ、素地面にずれが生じていた。
- ⑤亀裂や断文の周辺では漆塗膜が各所で剥離し、一部で塗膜の剥落があった。蓋の内側朱漆塗膜面に剥離があり、底裏の漆塗膜剥落箇所では木地が露出していた。
- ⑥素地の収縮や打損等により螺鈿のほとんどが剥離していた。また、貝素材の劣化によって貝が崩れやすくなり、真珠層間の剥離が進行することで貝の色が白色化していた。また、多くの貝がすでに欠失

し、下地が露出していた。

- ⑦ 6本の刳足のうち4本が破損、欠失し、自立出来ない状態だった。また、刳足内側の木地が一部欠失していた。
- ⑧ 身の合口部分、立ち上がりの一部が2箇所欠損し、木地が露出していた。
- ⑨ 高台の一部が大きく崩れ、非常に危険な状態にあった。
- ⑩ 各所に打損や擦り傷が認められた。
- ⑪ 各所に後世修理がすでに施されていた。刳足の一部に合成樹脂による接着跡があった。螺鈿は広い面積が合成樹脂によって再接着され、周囲を下地で埋めていた。また、塗膜剥落部分に朱漆、透漆が塗り込まれていた。
- ⑫ 身立ち上がりの木地が露出した部分に朱色の補彩があった。
- ⑬ 一部に西洋塗料や朱漆の付着がみられた。

## 5. 修理仕様

修理方針は、文化庁の指導の元に行われている漆工品の文化財保存修理と同様に考え、現状維持修理を基本に行い、欠損した刳足部分等は形状を復元した。

剝落止め、接着、補強などに使用する修理材料は、螺鈿部分には膠、漆部分には漆を選んだ。材料は日本産の良質な物を選んで使用した。復元は欠損箇所の素地や塗膜構造を十分考慮した。特に、刳足部分は現資料の制作方法と全く同じ技法を用いて形状を復元する事とし、周辺の塗膜に表情を合わせた。後世修理の下地や塗料は可能な限り除去した。修理仕様を事前に定め、その内容の変更については、東京国立文化財研究所の加藤寛氏、所蔵館 Curator の Ms. Khanh N. Trinh, Ms. Elisabeth Campenhausen 修復担当者の山下好彦の三者で協議し、決定するものとした。

## 6. 修理工程と内容

### (1) 調査および写真撮影

現資料の素地、下地、塗り、蒔絵をそれぞれ技法の上から調査し、傷みの現状を記録にとどめた。また、修理前の写真撮影をし、修理後と比較出来るようにした。

### (2) 掃除と養生

資料全面を覆っている埃を毛棒を使って払い、綿棒や洗いざらしの綿布に水を少量含ませ、汚れを丁寧に取り除いた。一部では水とエタノールを混合した溶液を使用した。付着物は鼈甲の箆や彫刻刀で塗膜に傷を付けないように除去した。剝落の危険のある塗膜箇所に小片に切った雁皮紙を生麩糊で貼り、作業中での剝落を予防した。

### (3) 螺鈿の補強

へぎ貝の真珠層間の剝離箇所に粒膠2パーセント溶液を含浸し、貝層の剝離防止を行った。

### (4) 内部の漆固め

朱漆の塗膜を漆で補強した。透漆と生正味漆を混合した漆を石油系の溶剤で希釈し、紙片をよけて塗膜表面に塗布、リグロインで完全に拭き取った。

### (5) 素地亀裂の接着と補強

蓋甲板を除く各亀裂部分に接着性のある麦漆を含浸した。身合口部分や刳足の根元などの素地が動く部分では、クランプ、木棒やヒゴを使って安定させた。

空隙がある部分では接着力のあるある柔らかめの刻苧を詰め、補強した。

#### (6)高台破損箇所の補強と接着

高台が崩れ、折れ曲がっていた部分は麻糸数本で繋がっているにしかすぎないことから、いったんこの部分を取り外した。つぎに露出した素地や下地を補強するため、麦漆を薄く希釈し含浸した。亀裂によって変形した高台を修正するため、他の高台部分をCraftResin WR-200A・Bと錫金貝で型取りした。破損した高台は内側の麻布間での剥離を接着すると同時に亀裂部分に麦漆を含浸した後、この型を使って高台の形状を修正し、クランプを使って圧着した。折れ曲がっていた部分も他と同様に作業を進め、断面に麦漆を付け、クランプと木杵とヒゴを用いて元の形状に戻した。

#### (7)螺鈿および塗膜接着の準備

剥落止めをするための木杵と受型を作るが、食籠の形状が複雑であることから各面ごとに上に向けて作業を出来るように設計した。内部の受型は、身蓋ともに六角柱を中心に5枚の稜花型のシナ合板と木の板を組み合わせた構造物を造り、塗膜との接触点をシリコンで調整した。

#### (8)螺鈿の接着

螺鈿の剥離箇所に粒膠を含浸、木杵（しんばり台）と竹製や木製のヒゴ（しんばり棒）を用いて圧着した。膠はサンオリエント化学社製のパール膠大王20パーセント溶液を使用した。膠には表面張力があり、含浸しにくいことから、8時間超音波発生装置で分子の鎖を切り、さらに少量のエタノールを混入した。また、膠の含浸によって貝の下に薄く塗られた胡粉が流れやすく、灰色の下地が露出することで貝の表情を変化させやすいため、膠に少量の胡粉を混ぜ含浸させた。胡粉は数種類ある胡粉のうち、最も色合いがあうものを選び、さらに、彩度をおとすため表具の修復に使用する灰汁を微量に混ぜて使用した。膠は筆を使って含浸し、余分な膠を拭き取った後、剥離した部分に合わせてビニールシートやゴムを置き、細く抑えた。螺鈿の剥落止めと同時に雁皮紙の養生を除去した。

#### (9)漆固め

劣化した漆塗膜を補強するため、漆固めを行った。漆塗膜に出来た細かい断文にクリーンソル（石油系の溶剤）で希釈した漆を螺鈿部分をよけて筆で含ませ、表面に残った漆は完全に拭き取った。漆は本地呂漆と生正味漆を混合し、使用した。

#### (10)蓋甲板の亀裂の接着

蓋素地の亀裂部分に希釈した麦漆を含浸し、木杵とヒゴで圧着した。貝の部分に漆を付けないようにするため、先に細いチューブを付けたスポイトを使用した。

#### (11)外部塗膜の接着および亀裂の補強

漆塗膜の剥離箇所に接着用に調整した麦漆を希釈、含浸し、ビニールシートをあて、木杵とヒゴを用いて圧着した。このとき、漆が貝の下に流れ込まないように注意した。

#### (12)素地、下地欠失部の形状復元

欠失した部分の形状を復元した。身合口の本地欠失箇所は薄い曲物木地で形作られており、しかもちぎれてる様に損傷していた。この部分は木片で形状を合わせるのには難しいと考え、#100の麻布と刻苧で形状を復元した。欠損部分は漆下地を行い、漆を数回塗り重ね、黒部分は炭粉、朱部分は乾漆粉を蒔き、漆で艶を合わせた。身の合口部分は刻苧のみで形状を復元し、周囲に艶を合わせた。

4本の刳足を現存する2本の足と同様の技法で復元した。刳足は外側を麻布を4枚貼り重ねた乾漆で作成し、足の内側に竹（笹）と檜の薄板で補強、さらに刻苧で形を整えている。復元では、つぎの工程に沿って作業を行った。

- ・残った足をシリコンで型取りし、石膏の乾漆型（雌型）を作った。

- ・足の本型を作り、割れた部分の断面の形を刻苧で正確に写し取った。
- ・本型を石膏の雌型に置き、石膏を流し、断面の形を型に写した。
- ・乾漆の離型材として、石膏に薄めた上新粉を数回塗り重ねた。
- ・石膏雌型表面に漆下地を2回行った。
- ・#100の麻布を型に合わせて切り、少量の地の粉を混入した麦漆で貼った。
- ・麻布の目を埋めるため、漆下地で目摺りをした。
- ・#40の麻布を前述と同様の方法で3枚貼り重ねた。そのつど目摺りを行った。
- ・60度で30時間、90度で7時間、電熱器で貼り重ねた型を十分乾燥させた。
- ・水に石膏型を浸し、石膏を割り、乾漆部分を取りだした。
- ・損傷した刳足部分にあて鑪で形状を修正した。断面や修正部分に漆下地を行い整えた。
- ・外側に数回漆塗りを繰り返し、表面を整えた。
- ・麦漆で高台の断面に復元した刳足を接着した。このとき、足の高さや角度を十分注意した。
- ・刳足の内側に残った檜の薄板に合わせて補材を作り、麦漆で接着した。
- ・補材の周囲を刻苧で充填した。
- ・刳足の内側中央に残った痕跡に合わせて竹の棒を作り、麦漆で接着した。
- ・刳足内側全体に刻苧を付け形状を作った。乾燥後、漆下地を行い表面を整えた。
- ・外側と同様に漆塗りを数回繰り返した後、非常に細い炭粉を蒔いた。
- ・炭粉の上は透漆で固めを行い、最後は希釈した透漆を極く薄く塗り込んで周囲と違和感のないように艶を合わせた。
- ・朱部分は色を合わせた乾漆粉を作り、篩いにかけて粉蒔きした。艶を合わせるため、透漆で固めし、摺漆を数回行った。

### (13)際錆

剝離剝落していた塗膜の際に極く少量の細かい漆下地を施し、触指による再剝落を予防した。下地には水干した黄砥の粉に生上味漆を加えた後、変色を抑えるため、少量の松煙加えた。余分な下地はリグロインで拭き取った。

### (14)漆固め

食籠は劣化によつての各所の艶が異なっていた。そのため、艶に応じて2回から5回の漆固めを行い、全体の艶を整えた。

### (15)保存箱の作成

保存において、現資料は素地構造が複雑であり、加飾に螺鈿のへぎ貝を使用していることから湿度の影響を受けやすい。また、展示においては、刳足の形状が全体に比べ脆弱である。修復後、海外で永年に亘って保管や展示することを考え、高台下の台を制作、調湿剤を下部に納めた桐の保存箱を作成した。また、表面を保護するため、絹の外覆を作った。台は下水板に接着し、資料を乗せてそのまま展示出来るようにした。台の資料に接触する部分は資料を保護するため、内部に4～6枚の美濃の揉み紙を入れ、厚めのサテンを貼り、さらに、表面は羽二重を貼った。60%の薄型の調湿材を2箱下部に入れた。

### (16)記録および写真撮影

修理記録をまとめるとともに修理後の写真撮影を行い、修復を終了した。

## 7. 分析

所蔵館の了承のもと、現資料の材料と技法の分析を行った。各分析名称と対象目的、その結果を下記に記す。

### (1) X線透過写真撮影—素地構造

X線透過写真をから、次のことが分かった。蓋甲板と身底板は、針葉樹の柾目板二枚を剥ぎあわせ、素地が狂わないように中央に垂直方向に同種の板を抜けないように差し込む。側板は六弁各面ごとに乾漆で作り、六枚を寄せて接着する。蓋身とも口縁部は柾目針葉樹の曲物作りで、内外両側から薄い板を寄せ、木釘で止める。高台と刳足は乾漆造り、刳足内側から三本の薄板で補強する。

### (2) 樹種分析—刳足裏補強材の樹種

光学顕微鏡による観察およびプレパラートによって木質の断面を観察した。その結果、刳足中央の素地は竹あるいは笹、左右二本の素地は檜の柾目材とわかった。

### (3) 繊維分析—高台内側乾漆表面の紙繊維および高台乾漆の布繊維

繊維片の光学顕微鏡観察から、乾漆表面の紙繊維はほとんどが雁皮でみつまたが僅かに混ざる事がわかった。また、雁皮の回りに白土の粒子が付着しており、この白土を分析した結果、間似合い紙や箔打ち紙と同様の紙であると判明した。この和紙は兵庫県の名塩辺りで現在でも作られている。布繊維は光学顕微鏡観察から大麻の繊維であると分かった。大麻は南アジア中央アジア原産の一年生草本で、日本にも古代に伝えられ、一般に畑で栽培されていた。

### (4) 蛍光X線分析—螺鈿下の白色顔料、後世修理の修復材料

東京文化財研究所に依頼し、剥落した螺鈿の下に残っていた白色顔料を分析した。その結果、螺鈿下の白色顔料はCaの検出があり、総合的な検討から胡粉であると可能性が高い。また、後世修理に使われた白色顔料はPbの検出があることから、鉛白であることが判明した。

### (5) クロスセクションによる分析—下地および塗膜構造

剥落片を対象にエポキシ系の樹脂で封入し、耐水ペーパーで薄くした後、光学顕微鏡で下地構造を観察した。漆塗膜は2層で、黒色の顔料を混入した漆で下塗りし、透き漆で上塗りしている。下地は漆下地で、濃茶色の荒い下地を3層、濃い灰色の細かい下地を1層施す。高台の玉縁部分は、茶色の下地を型で引き、こい灰色の荒い下地と細かい下地を2層付けて表面を整えている。刻苧は木粉と漆、さらに少量の下地を混入したものと判明した。

## おわりに

西洋における漆工品の修復は合成樹脂材料を中心に使用するのに比べ、日本においては、漆や日本絵画の伝統材料を使用して修復を行っている。漆にはもともと修復に必要なさまざまな素材としての特徴がある。漆は天然素材であるため、合成樹脂と比較して劣化が自然であり、漆工品の環境に変化がなく、無理がかからない。現時点では、修復材料は天然素材を選択すべきであると考えられる。しかし、修復は画一的なものではなく、対象の状態と目的によっては合成材料を選択しなくてはならない。私は伝統的な修復材料の研究や修復技術の開発を今後もさらに継続するとともに、合成樹脂の使用も比較して研究してゆかなくてはいけないと考えている。また、在外日本文化財保存修復事業の機に海外の修復技術者と日本の修復技術者との交流が進み、素材の研究が発展することを願っている。

今回の修復にあたり御支援、御教授いただいた方々に深く御礼申し上げ修復報告とする。

## JEOL JED-2110

定量分析 vers. 1.0

試料名 : ベルリン東洋美術館紙片  
 測定日時 : 2001年9月26日 17時35分37秒

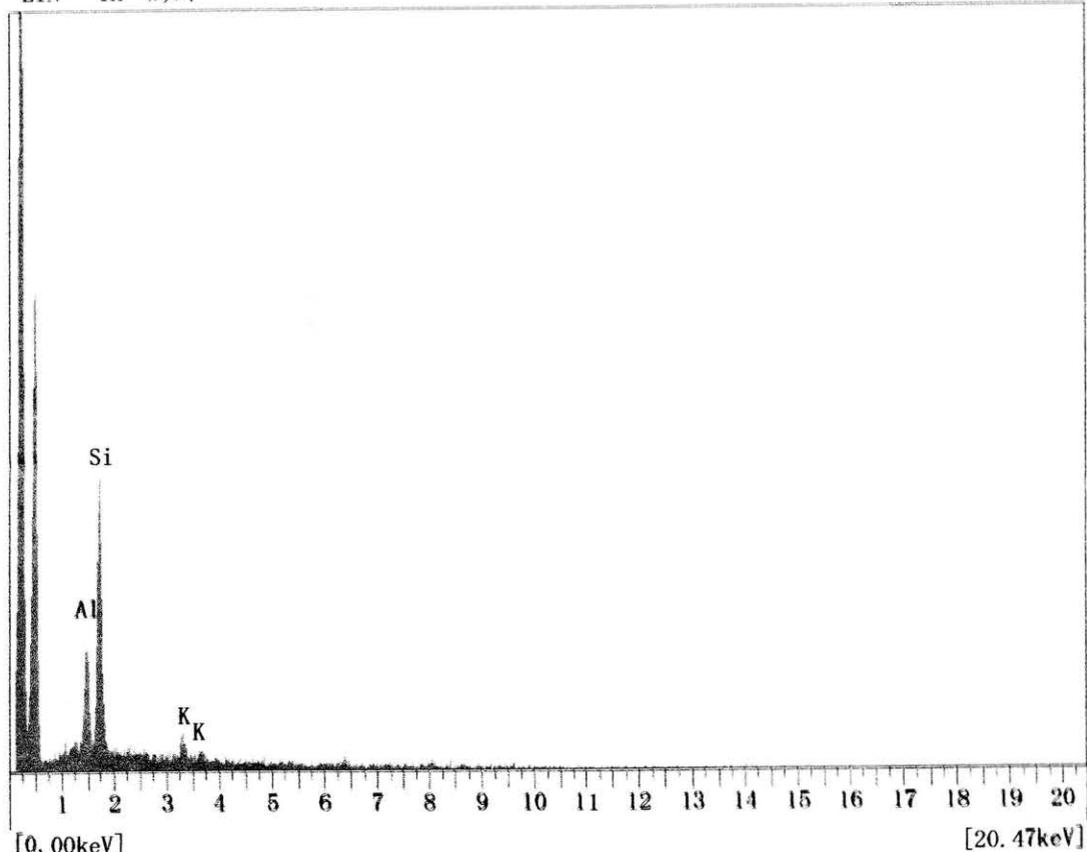
—— 測定—ジオメトリ パラメータ ——

加速電圧 : 20.0kV 取り出し角度 : 30.00°  
 経過時間 : 312.87秒 有効時間 : 300.00秒

—— 分析 結果 (ノーマライズ) ——

元素	(keV)	重量%	誤差%	原子量%	化合物	重量%	Kレシオ酸化物
0		49.4		63.30			
Al_K	1.49	18.5	0.9	14.02	Al <sub>2</sub> O <sub>3</sub>	34.9	0.0006
Si_K	1.74	28.2	0.9	20.62	SiO <sub>2</sub>	60.4	0.0010
K_K	3.31	3.9	0.4	2.05	K <sub>2</sub> O	4.7	0.0002
合計		100.0		100.00		100.0	

LIN 1K カウント



[0.00keV]

[20.47keV]

紙片白土の定量分析 (高知県立紙産業技術センター 大川昭典)  
 Quantitative analysis for *hakudo*

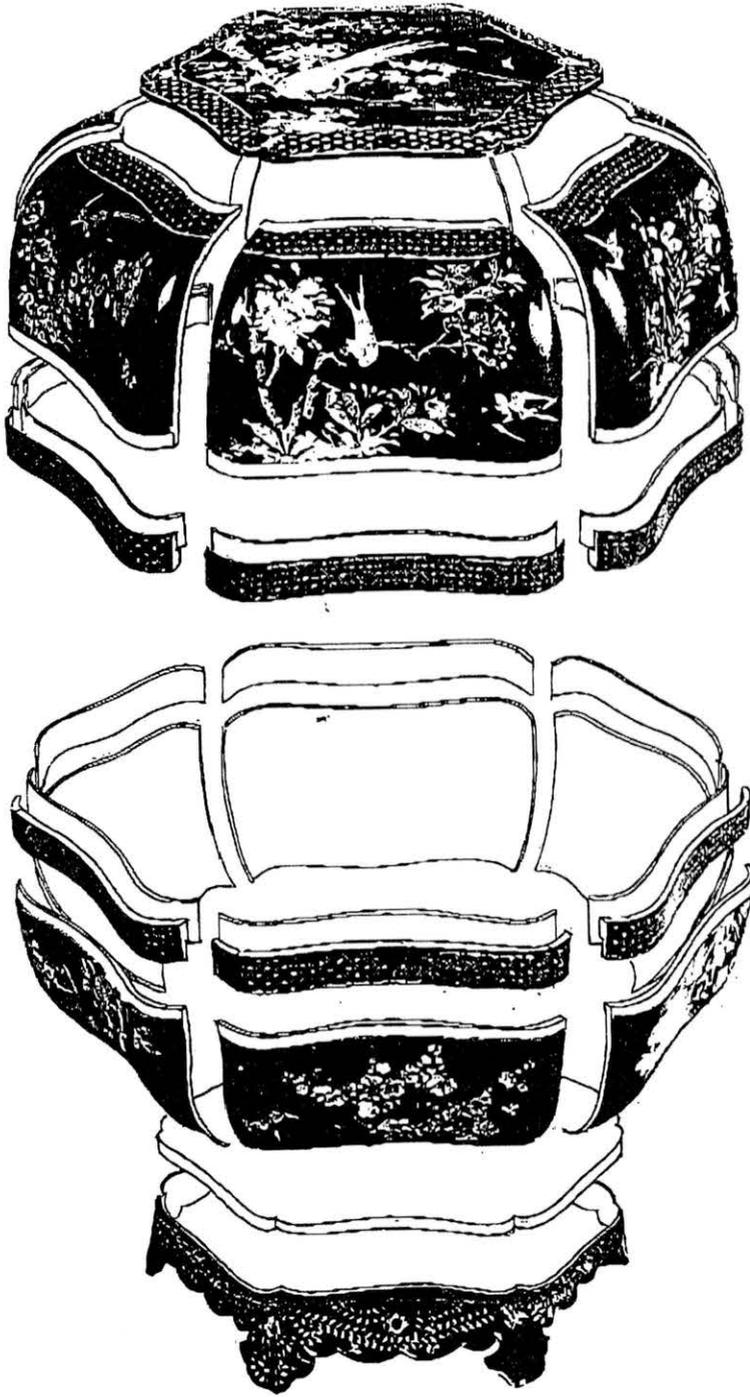


図68 加飾構造図  
Drawing of the decoration

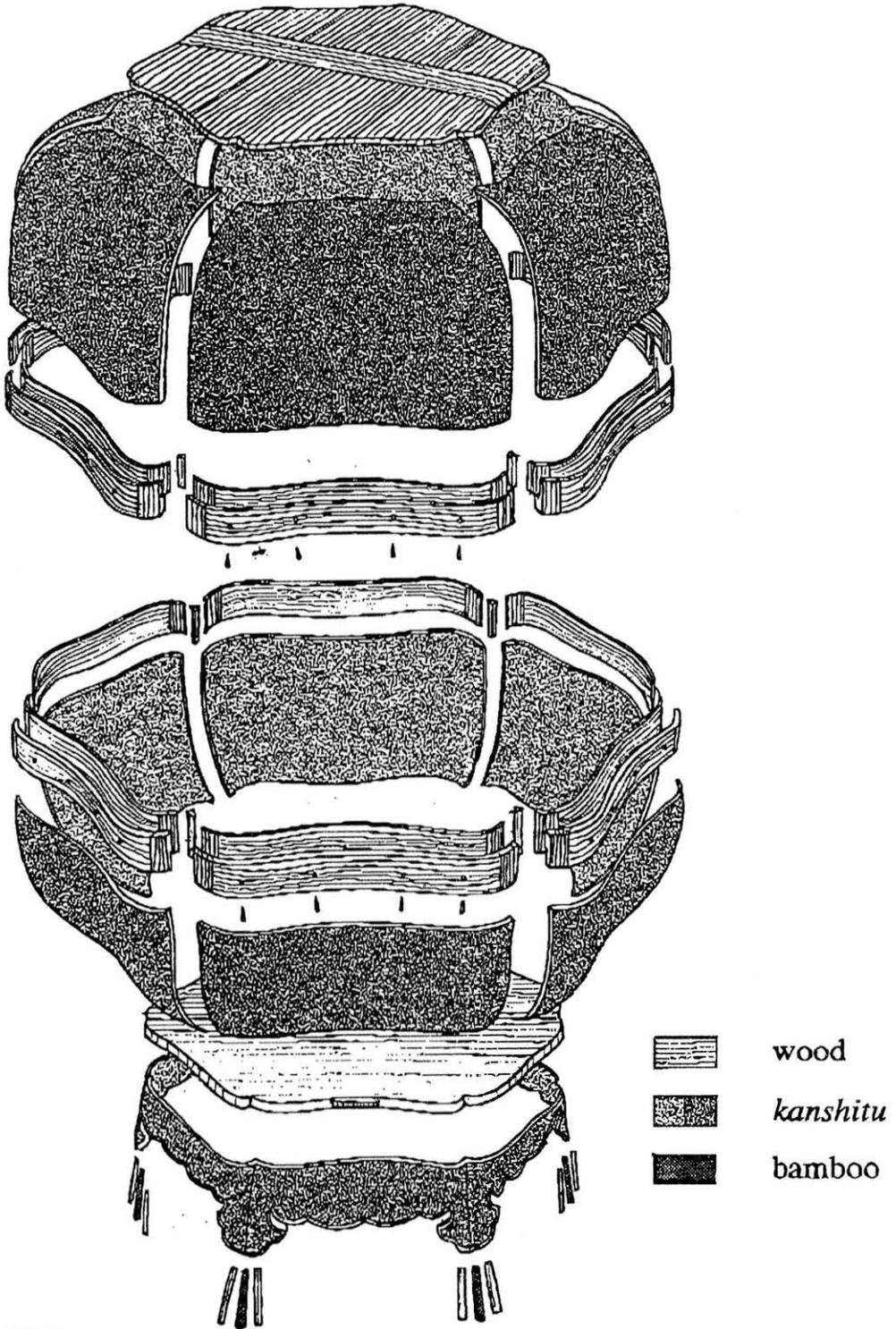


图69 素地構造図  
Drawing of the structure of the substrate

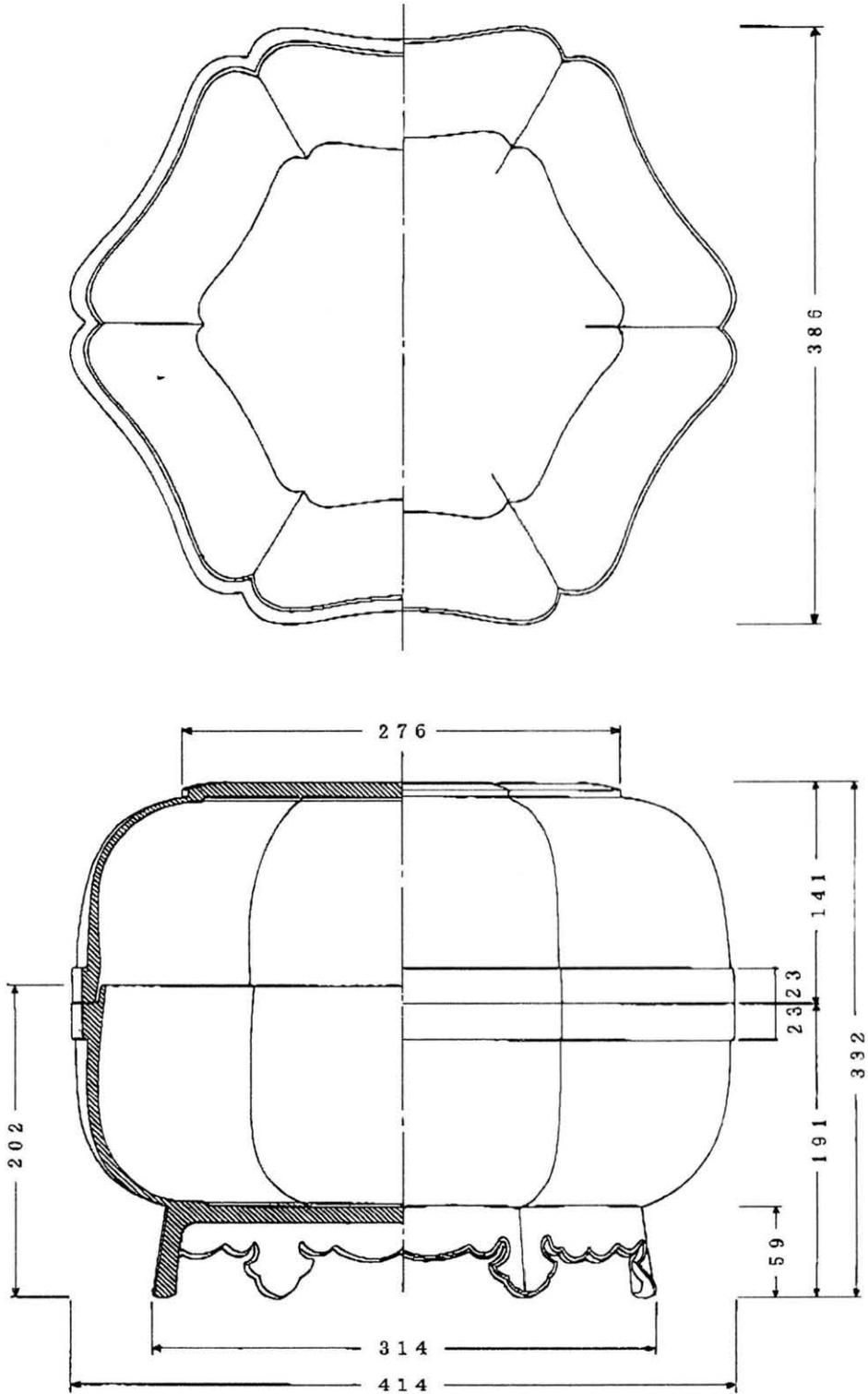


图70 平面图  
Plan and elevation of jikiro

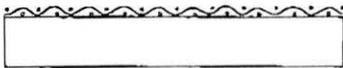
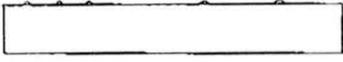
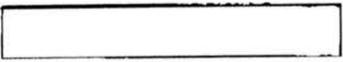
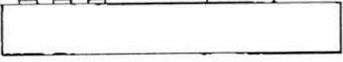
	木地 Substrate	Put together 2~3 pieces of straight wood and insert another wood at right angles
	布着せ Glued hemp cloth	Apply hemp cloth with adhesive urushi
	下地 (荒 3 回) Foundation layer (coarse three times)	Apply reddish brown coarse urushi foundation 3 times
	下地 (細 1 回) Foundation layer (fine, once)	Apply dark gray fine urushi foundation once
	描き置目 Under drawing	Draw the patten with Chinese ink
	胡粉下地 Gofun foundation	Apply a thin coat of <i>gofun</i> (calcium carbonate) which is diluted with animal glue, entirely
	螺鈿 Raden decoration	Paste thin shell piece from luminous and abalone shells with animal glue
	塗り (1 回) Urushi coating (once)	Apply a coating of black-urushi with black pigments mixed
	研ぎ Polishing	Polish with ash to let surface of shell piece appear
	塗り (1 回) Urushi coating (once)	Coat entirely with <i>suki-urushi</i>
	研ぎ出し、磨き Polishing	Polish entirely with ash; <i>suki-urushi</i>
	剥が出し Lifting and peeling	Remove by lifting and peeling any <i>suki-urushi</i> left on the shell piece with a needle or bamboo spatula
	毛彫 Engraving	Engrave one part of the shell piece with a knife

図71 加飾工程図  
Drawings of the process of decoration



図72 底板の状態  
Condition of the bottom board

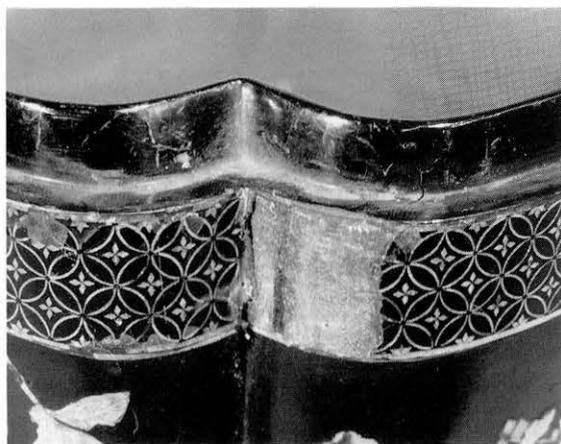


図73 身口縁部の剥落  
Lifting of the coating film on the rim of the body



図74 剝足破損部の状態  
Condition of damage of the *kuriashi*



図75 螺鈿の剝離と剥落、後補の毛彫  
Lifted and fallen off *raden*, later engraving



図76 螺鈿の毛彫りとマイクロクラック  
Engravings on the *raden* and minute cracks



図77 クリーニング 蓋甲板  
Cleaning the lid top

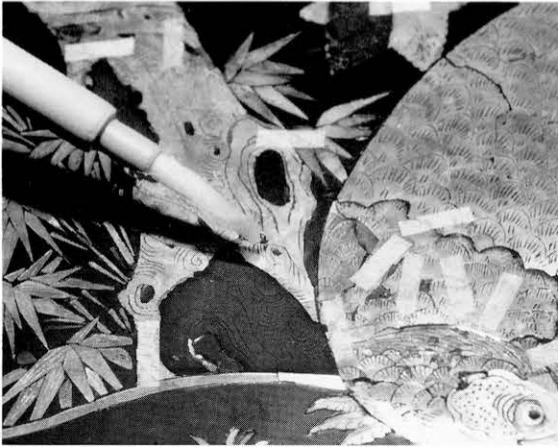


図78 螺鈿の養生 蓋甲板  
Curing the *raden* on the lid top

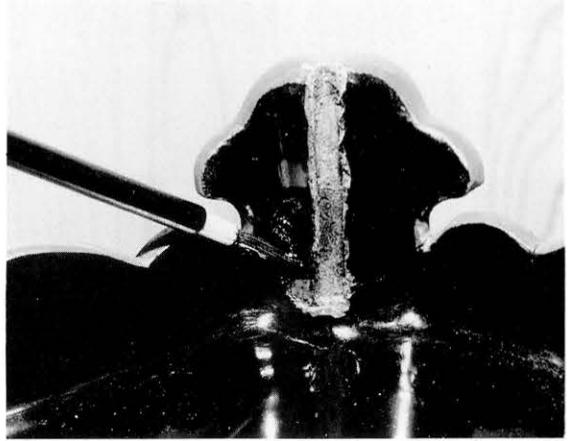


図79 麦漆の含浸 刳足亀裂部分  
Impregnating *mugi urushi* to the cracks of *kuriashi*

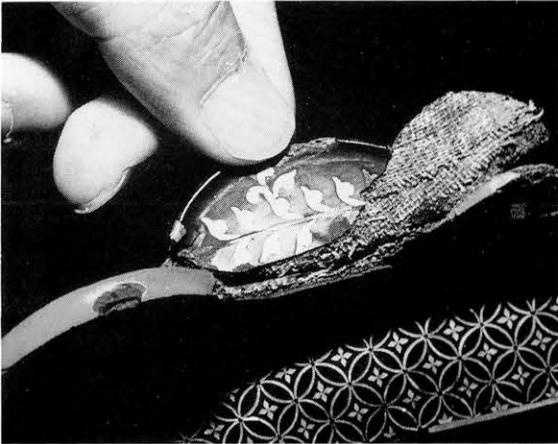


図80 高台破損箇所の取りはずし  
Removing the damaged part of the *kodai*

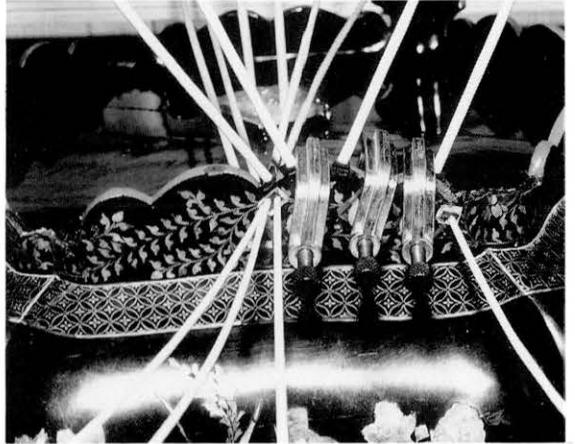


図81 高台破損箇所の接着  
Attaching the damaged part of the *kodai*



図82 受型の製作  
Making a receptacle



図83 超音波発生装置による膠の調整  
Adjusting animal glue in an ultrasonic apparatus



図84 膠の含浸 蓋甲板  
Impregnating animal glue to lid top

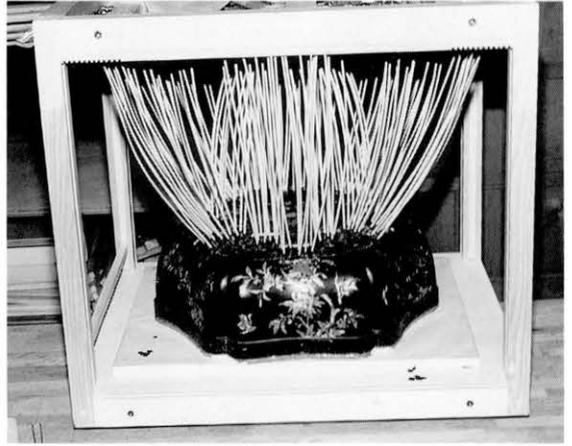


図85 螺鈿の圧着 蓋甲板  
Applying pressure to the *raden* of the lid top

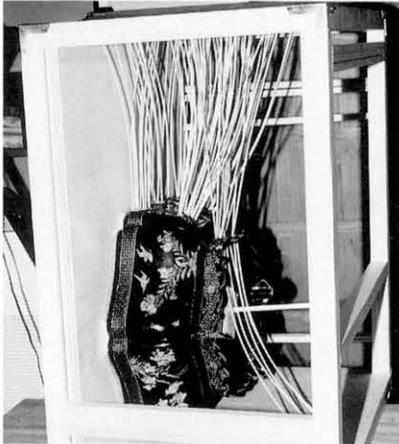


図86 螺鈿の圧着 身側板、高台  
Applying pressure to the *raden* on the sides of the body and *kodai*



図87 漆固め 蓋甲板  
Urushi consolidation of the lid top



図88 剝離塗膜の補強と圧着  
Reinforcing and pressurizing the lifted coating



図89 素地亀裂の補強と接着  
Re-fixing and reinforcing cracks on the substrate

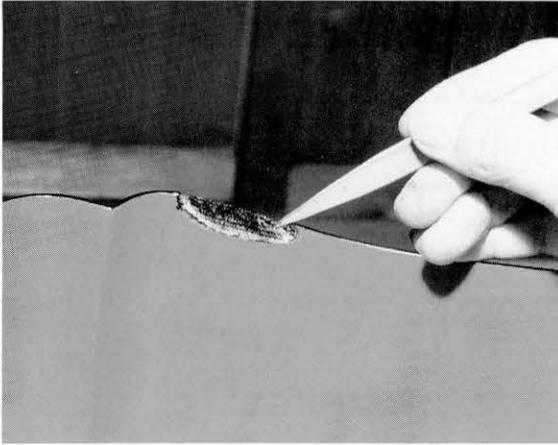


図90 素地欠失部の成形  
Shape-forming the missing parts of the substrate

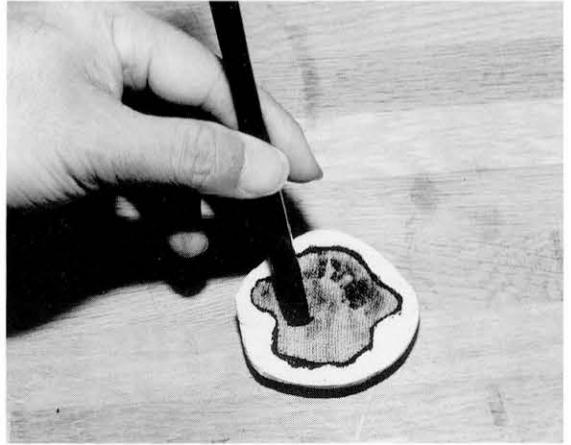


図91 乾漆による欠損刳足部分の製作  
Making the missing part of the *kuriashi* with *kanshitsu*

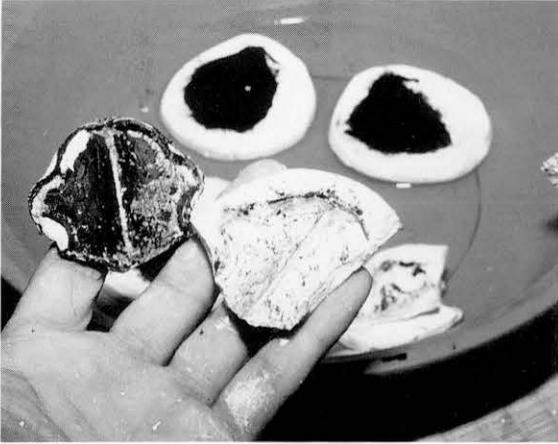


図92 乾漆の割り出し  
Removing the *kuriashi* with *kanshitsu* from the mold



図93 刳足の接着  
Attaching the reproduced *kuriashi*

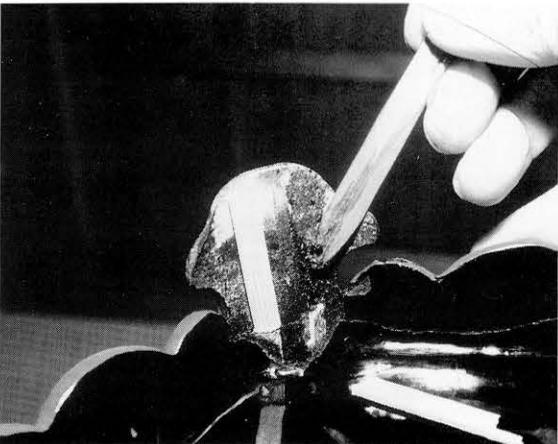


図94 刳足内側の補強  
Reinforcing the inner side of *kuriashi*

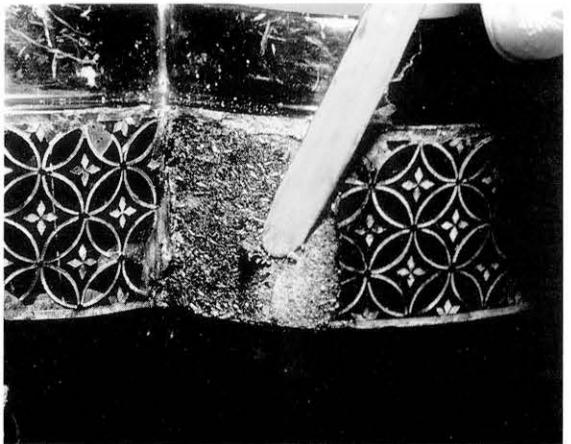


図95 下地欠損部の刻字付け  
Applying *kokuso* to the missing parts of the foundation



図96 素地欠損部分の炭粉蒔き  
Sprinkling charcoal powder over missing parts of the substrate



図97 朱乾漆粉の製作  
Making *shu-kanshitsu* powder



図98 朱乾漆粉蒔き  
Sprinkling *shu-kanshitsu* powder

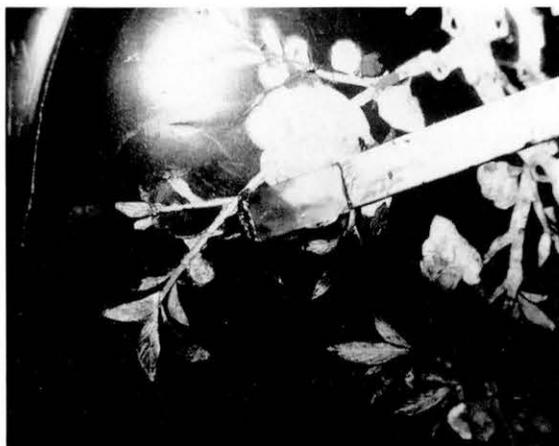


図99 際錆  
*Kiyasabi*

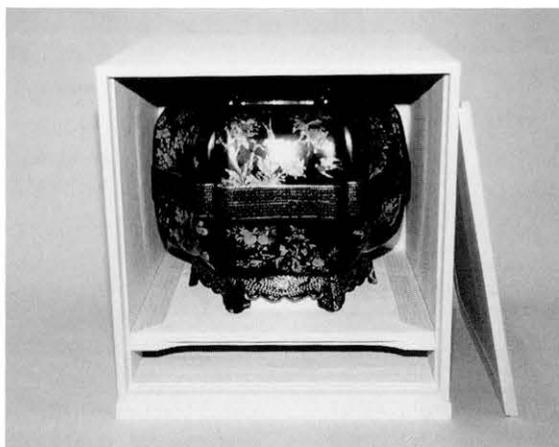


図100 保存箱の製作  
Making a preservation box

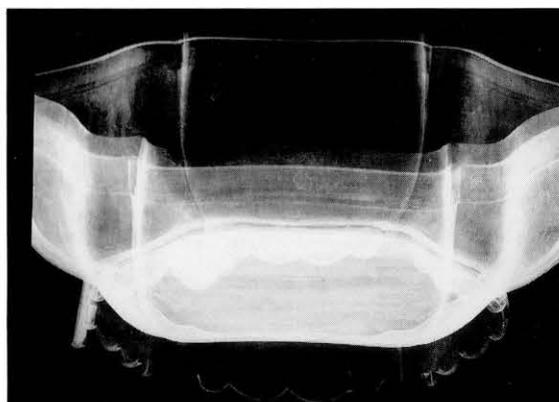


図101 X線透過写真  
X-ray radiography



図102 刎足裏側補強材のクロスセクション—竹または笹  
Cross section of the reinforcing material on the inner side of the *kuroshitsu* - bamboo or wild bamboo



図103 刻苧のクロスセクション  
Cross section of *kokuso*

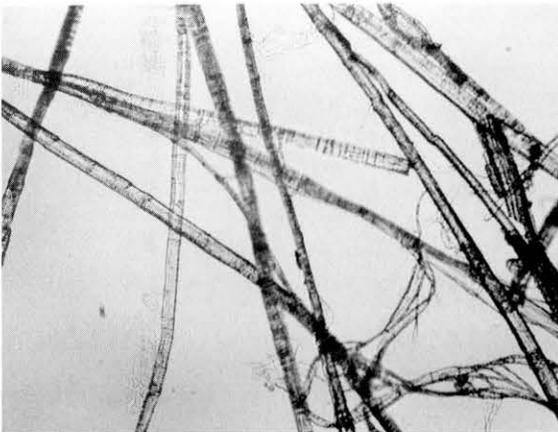


図104 乾漆布繊維—大麻 (大川昭典氏撮影)  
Fiber of *kanshitsu* cloth - Indian hemp  
(photo by Okawa Akinori)

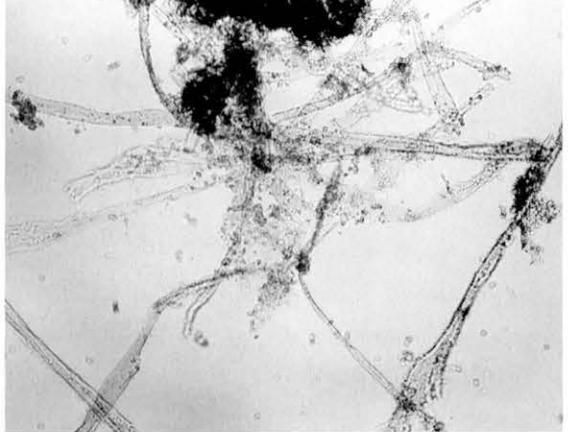


図105 乾漆の紙繊維—間似合紙または笥打ち紙 (大川昭典氏撮影)  
Fiber of paper used for *kanshitsu* - *maniai* paper or *haku'uchi* paper (photo by Okawa Akinori)

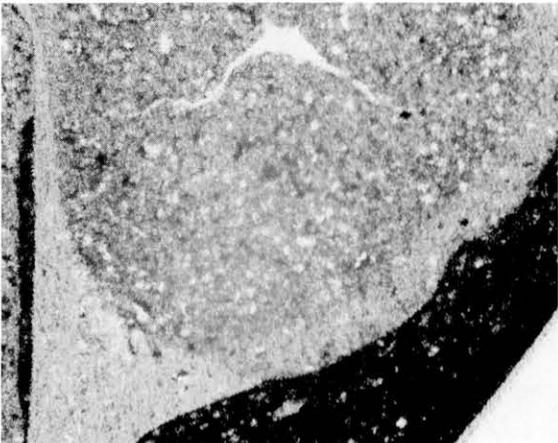


図106 身高台玉縁のクロスセクション  
Cross section of the edge of the *kodai*

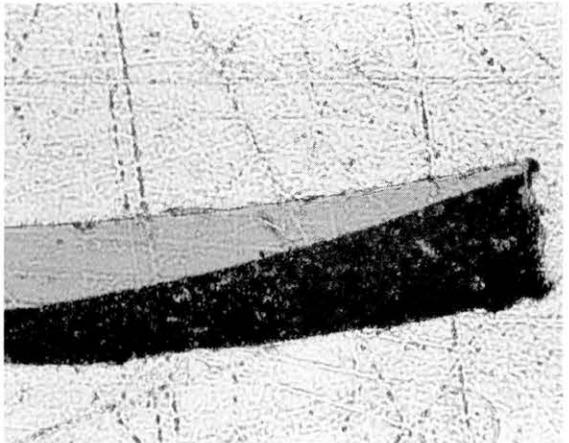


図107 中塗・上塗漆のクロスセクション  
Cross section of the middle coating and final coating

Report on the Restoration of “*Kacho Raden Jikiro*”  
in the Collection of the Museum of East Asian Art, Berlin

YAMASHITA Yoshihiko

### Introduction

The restoration of “*Kacho Raden Jikiro*” was carried out by the Independent Administrative Institution, National Research Institute for Cultural Properties, Tokyo (renamed in April 2001) as part of the Project for the Conservation of Works of Japanese Art in Foreign Collections (Applied Arts), a project of the Agency for Cultural Affairs which started in fiscal year 1997. Restoration work was conducted for two years, during fiscal years 1999 and 2000, and was completed in March 2001.

This report presents information about the object—its description, materials and structure, measurements, decoration technique, condition of damage, restoration specifications, restoration process and content, and analysis. Comments will also be made on some new findings that were made during this restoration work. It is to be noted that X-ray radiography was done by Mr. Miura Sadatoshi of the National Research Institute for Cultural Properties, Tokyo; analysis of types of wood was done by Mr. Noshiro Shu'ichi of the Forestry and Forest Products Research Institute in Ibaragi Prefecture; fiber analysis was done by Mr. Okawa Akinori of Kochi Prefectural Paper Technology Center; fluorescent X-ray spectroscopy was done by Mr. Hirao Yoshimitsu and Ms. Saito Amiko of the National Research Institute for Cultural Properties, Tokyo; and cross sectional analysis was done by Ms. Hayakawa Noriko of the National Research Institute for Cultural Properties, Tokyo. The paulownia box was manufactured by Mr. Osaka Shigeo; the frame was made by Mr. Suzuki Haruhiko of Tokyo Shufuku Kobo, Co.; and the silk cover for the object was made by Ms. Iketomi Yukiko.

### Description

The object is a large black lacquered *jikiro* (food container) with *raden* decorations. It was taken away to Leningrad (today's St. Petersburg) by the former Soviet army after the Second World War. It was then returned to Leipzig in the former East Germany before the unification of East and West Germany. Later, it was taken to the Museum of East Asian Art in Berlin where it has been stored. There was significant damage and the legs of the object were missing so that it could not stand on its own. It is thought that this fact shows the poor preservation environment in which the object was kept before it was returned to the present museum.

Inventory number	1333 I.D.25922-a
Period of manufacture	Mid-17 <sup>th</sup> -18 <sup>th</sup> century Ryuku Kingdom

## Measurements (mm)

Length 417

Width 384

Height 332

**Materials and Structure**

The object is a black lacquered *jikiro* in a *rokuben ryoka* style (a hexagonal flower shape) with a *kodai* (foot) and *kuriashi* (decorated legs). A design of flowers and birds is depicted over the entire surface with thin shell *raden*, and a *shippo tsunagi* pattern is found around the top board of the lid and on the brim of the lid and the body. Flower pattern is found on the inverted corners of the top board of the lid and an arabesque pattern is found on the *kodai*. *Yakogai* and abalone are used for the *raden*, and fine line carvings are applied on the *raden* shell pieces. The substrate consists of a combination of wooden *sashimono* and *magemono* as well as *kanshitsu*. *Shu urushi* is coated on the lid and the inner side of the body of the container as well as on the edge of the *kodai*.

**Decoration Technique**[*Raden*]

Thin shell is used for the *raden*, and fine line carvings are found in various places. *Hegigai* of *yakogai* is used mainly for the *raden* while *surigai* of abalone is used for parts of the flowers. *Surigai* is a method by which flat portions of a shell are ground to a thin piece with a whetstone. *Hegigai* is made by boiling a shell in seawater for about 10 days and then peeling the layers thinly along the pearly layer. The technique of making *hegigai* is said to have been introduced into the Ryuku Islands from China. The thin shell pieces are cut into desired shapes with a knife or a needle and fixed onto a white foundation with animal glue. Then, translucent urushi is coated onto the entire surface and polished out with charcoal to bring out the gloss of urushi. Finally, fine line carvings are made with a knife. Since *hegigai* of *yakogai* is made by peeling between the pearly layers, the result is very brilliant and gorgeous. Moreover, shells of different colors are used intentionally, depending on the design.

**Condition of Damage**

Before restoration, the usual symptoms found on urushi objects that have not been taken care of very well were recognized, including dents, scuff marks, deterioration, cracks, lifting and falling off of pieces and so on. Below are some of the damage observed at the time the object was brought to Japan.

- (1) There were traces of water having flowed on the surface of the object, indicating that the object had been stored under poor conditions without even a storage box.
- (2) Deterioration due to ultraviolet rays was seen on the urushi coating film, resulting in minute cracks.

- (3) Gloss particular to urushi had been lost due to deterioration.
- (4) There were significant cracks extending from places where different types of substrates were joined due to the passage of years and contraction of the wooden substrate. The top board of the lid had become distorted around the joints, and there were gaps and slips of the substrate.
- (5) The urushi coating film had lifted at various places around the cracks and a part of the coating film had fallen off. There was also lifting of the coating film of *shu urushi* on the inner side of the lid, and the wooden substrate had become exposed at places on the underside of the object where the urushi coating film had fallen.
- (6) Almost all of the *raden* had become lifted due to contraction and damage of the substrate. Also, the shell pieces had become brittle due to deterioration, and the color of the shell pieces had become whiter due to progressing lifting of the pearly layers. Moreover, many of the shell pieces had already been lost and the foundation was exposed.
- (7) Four of the six *kuriashi* had been damaged and lost so that the object could not stand on its own. Also, a part of the inner side of one of the remaining *kuriashi* was missing.
- (8) The part of the body that fits with the lid was missing at two places and the wooden substrate was exposed.
- (9) A part of the *kodai* that was missing was crushed seriously, so that it was in a very critical condition.
- (10) There were dents and scuffmarks at various places
- (11) Traces of past repairs were found at various places. There was a trace of synthetic resin having been used on a part of the *kuriashi*. A large area of the *raden* had been re-fixed with synthetic resin, and the surrounding foundation was filled with it. Also, *shu urushi* and translucent urushi had been coated into those parts where the coating film had fallen.
- (12) There was a later application of vermilion on the inner side of the part of the body that fits with the lid where the substrate had become exposed.
- (13) Western coating material and *shu urushi* were found on some parts of the object.

### **Restoration Specifications**

It was decided to follow the same restoration policy used for the conservation of cultural property (urushi objects) as advised by the Agency for Cultural Affairs. Basically, the present condition would be maintained and the shape of the missing *kuriashi* was reproduced.

Material used to prevent falling of pieces, to adhere parts and to reinforce them were selected carefully. Animal glue was used for the *raden* parts, and urushi was chosen for the urushi portions. Good quality material produced in Japan was selected for use. Careful consideration was made of the substrate of the missing portions and the structure of the coating film in making reproductions. In particular, the shape of the *kuriashi* was re-

produced, using the exact same method used originally to manufacture the object, and the appearance of the coating film was matched with that of the surroundings. Foundation and coating material of later repairs were removed as much as possible. Restoration specifications were determined before restoration work was begun and any change to its content was to be made upon consultation among Mr. Kato Hiroshi of the National Research Institute for Cultural Properties, Tokyo, Ms. Khanh N. Trinh and Ms. Elisabeth Campenhausen, conservators of the Museum, and Mr. Yamashita Yoshihiko, conservator in charge.

### Restoration Process

#### (1) Survey and photographs

The materials, foundation, urushi coating and *makie* as well as their techniques were investigated and the present condition of damage was recorded. Photographs of the object before restoration were also taken so that they might be compared with those after restoration.

#### (2) Cleaning and curing

The entire surface was dusted with a brush and carefully cleaned with a swab and cotton cloth moistened with a small amount of water. In some areas a mixture of water and ethanol was used. Extraneous matter that had adhered to the surface was removed carefully with a spatula or a carving knife so as not to scratch the urushi coating. For parts where the coating film was at risk of falling, small strips of *gampi* paper were attached with starch glue to prevent them from further falling during restoration.

#### (3) Reinforcing the *raden*

To prevent further detaching of the shell pieces, a solvent of 2% granular animal glue was impregnated between the shell layers.

#### (4) Consolidating urushi on the inside

Urushi was applied to reinforce the coating film of *shu urushi*. A mixture of *suki urushi* and *kijomi urushi* that was diluted with an oil-based solvent was used. It was applied on the surface of the coating film in such a way as to avoid the paper strips and then wiped off completely with ligroin.

#### (5) Re-fixing and reinforcing the cracks on the substrate

Adhesive *mugi urushi* was impregnated to all the cracks except those on the top of the lid. Clamps, wooden frames and *shimbari* sticks were used to press parts of the substrate that move, such as that part of the rim of the body where the lid fits in and the base of *kuriashi*. Gaps in the cracks were filled with soft adhesive *kokuso* for reinforcement.

#### (6) Re-fixing and reinforcing the damaged part of the *kodai*

Since the part of the *kodai* that had been broken was joined only by a few hemp strings, it was temporarily removed. Next, slightly diluted *mugi urushi* was impregnated to the exposed substrate and foundation for reinforcement. To repair the *kodai*, which had been crushed because of cracks, Craft Resin WR-200A/B and a thin tin foil were used to make

a mold. The damaged *kodai* was repaired by re-fixing the layers of hemp cloth inside, which had become lifted, and impregnating *mugi urushi* into the cracks. While repairing the shape of the *kodai* by using this mold, clamps were used to press stabilize the body. The part of the *kodai* that had been crushed was also repaired in a similar way by applying *mugi urushi* on the broken faces of the cracks and using clamps, a wooden frame and *shimbari* sticks to bring back its original shape.

(7) Preparing to re-fix the *raden* and urushi coating

Wooden frames and receptacles were made in order to stop *raden* and urushi coating from falling. But since the shape of the object is rather complex, they were designed so that each side of the object could be turned up. For the mold to be placed inside the object, 5 pieces of plywood and magnolia board were combined to make a structure that would be fitted into the hexagon. Silicon was used to make adjustments.

(8) Re-fixing the *raden*

Lifted portions of *raden* were impregnated with animal glue, and wooden frames and *shimabari* sticks were used to apply pressure. A solvent of 20% diluted Pearl Nikawa was used. Since animal glue has surface tension and is difficult to impregnate, it was put into an ultrasonic apparatus for 8 hours to cut the molecular chain. In addition, a small amount of ethanol was added. Moreover, since *gofun* (calcium carbonate), which is applied thinly under the shell pieces, does not remain stable because of the impregnation of animal glue and since it may change the expression of the shell pieces by exposing the gray foundation, a very small amount of *gofun* was used. Out of the many types of *gofun*, one most suited in color was selected and a small amount of ash gel was added to tone down the color. A brush was used to impregnate animal glue and, after wiping off excess animal glue, vinyl or rubber sheets the size of the lifted parts were placed over the *raden* and carefully pressed. Upon stopping exfoliation, curing *gampi* paper was removed.

(9) Urushi consolidation

To strengthen the urushi coating film that had deteriorated, *urushi gatame*, a kind of urushi consolidation treatment, was carried out. Using a brush, urushi diluted with an oil-based cleaning solvent was applied to the small cracks on the urushi coating film, being careful to avoid the *raden* parts. Excess urushi was completely wiped off. The urushi used was a mixture of *kijiro urushi* and *kijomi urushi*.

(10) Re-fixing the cracks on the top of the lid

Diluted *mugi urushi* was impregnated into the cracks on the substrate of the lid and pressed down with a wooden frame and *shimbari* sticks. A dropper with a narrow tube at the tip was used so as not to get urushi on the shell pieces.

(11) Re-fixing the urushi coating on the outside and reinforcing the cracks

Lifted portions of the urushi coating film were impregnated with *mugi urushi* that had been prepared as an adhesive and diluted. A vinyl sheet was placed over them and wooden frames and *shimbari* sticks were used to apply pressure. Care was taken not to

let the urushi flow under the shell pieces.

(12) Restoring the shape of the missing parts of the substrate and the foundation

Parts of the object that were missing were restored. The missing substrate of the *aikuchi* of the object was made of a thin *magemono*. Moreover, because the substrate was torn apart, it was considered too difficult to join the pieces of wood to their original shape. So hemp cloth #100 and *kokuso* were used to restore the shape. Urushi foundation was applied to the missing parts and urushi was applied several times. Charcoal powder was sprinkled on the black part while *kanshitsu* powder was sprinkled on the vermilion part. Urushi was used to adjust the gloss. The shape of the *aikuchi* was repaired with *kokuso* only, and its gloss was adjusted to that of the surroundings.

The four *kuriashi* were repaired using the same technique as that used for the existing two. Four layers of hemp cloth were used to make the legs (*kanshitsu* technique). The inner sides of the legs were reinforced with bamboo and thin cypress boards. The shape was further adjusted with *kokuso*.

Following steps were taken to reproduce the legs.

- \* A silicon mold was taken of a remaining leg and a drag mold was made of plaster for *kanshitsu*.
- \* A wooden mold was made of the leg, accurately copying the shape of the surface of the cracks with *kokuso*.
- \* The wooden mold was placed on the plaster drag mold. Then plaster was poured in to copy the shape of the cracked surface.
- \* Diluted starch was applied several times over the plaster to make it easy to remove the *kanshitsu*.
- \* Urushi foundation was applied twice to the surface of the plaster mold.
- \* Pieces of #100 hemp cloth were cut to the shape of the plaster mold and pasted with *mugi urushi* to which a small amount of *jinoko* had been mixed.
- \* Urushi foundation was applied to fill the texture of the hemp cloth (*mezuri*).
- \* Three layers of #40 hemp cloth were applied to the mold as in the above. *Mezuri* was done for each layer.
- \* The layered mold was sufficiently dried with an electric heater for 30 hours at 60°C and for 7 hours at 90°C.
- \* The plaster mold was soaked in water and broken to take out the *kanshitsu* portion.
- \* The shape of the *kodai* was repaired with a file, and urushi foundation was applied to the broken surface of the cracks and fixed areas to make adjustments.
- \* Urushi coating was applied several times to the outside to adjust the surface.
- \* Repaired *kuriashi* was joined to the *kodai*, being very careful to adjust the height and angle of the legs.
- \* A reinforcement bar for the inner side of the *kuriashi* was made with a thin

cypress board, and *mugi urushi* was used as an adhesive.

- \* The surroundings of the reinforcement bar were filled with *kokuso*.
- \* A bamboo stick was made to match the trace that was found at the center of the inner side of the *kuriashi*, and *mugi urushi* was used as an adhesive.
- \* *Kokuso* was applied to the entire inner side of the *kuriashi* to make the shape. After drying, the surface was adjusted by applying urushi foundation.
- \* After applying urushi coating several times, as it was done on the outside, very fine charcoal powder was sprinkled.
- \* *Suki urushi* was used to consolidate the charcoal powder. Diluted *suki urushi* was applied very thinly and inconspicuously to match the gloss.
- \* *Kanshitsu* powder was adjusted to match the color of the vermilion part and sprinkled with a sifter. To match the gloss, *suki urushi* was used to consolidate the vermilion part and *suri urushi* was done several times

(13) *Kiwasabi*

To prevent further falling due to contact, a very small amount of fine urushi foundation was applied to the borderline of the urushi coating film that had become lifted or fallen. *Sabi shitaji* which was prepared by adding *kijomi urushi* and *suki urushi* to yellow *tonoko* was used. However, a small amount of pine soot was also mixed to control discoloration. To adjust the color of the *shu urushi* portion, pigment of reddish vermilion was added to the above-mentioned urushi. Excess foundation was wiped off with ligroin.

(14) Urushi consolidation

Gloss of the object differed from place to place because of the degree of deterioration. Therefore, depending on the gloss, urushi consolidation was done 2 to 5 times to adjust the overall appearance.

(15) Box for storage

It is very difficult to preserve this object because the structure of the substrate is very complex and because *hegigai* is used in the *raden* decoration. For these reasons, the object is easily affected by humidity. Moreover, the shape of the *kuriashi* is fragile compared to the whole body. Taking into consideration the fact that the object would be stored or exhibited overseas for years to come, and to protect its surface, a paulownia storage box was made. A space was provided under the object so that a box of moisture controlling agent (Artsorb) could be placed. A silk wrapping was also prepared to protect the surface. A board was placed on top of the earlier-mentioned space and an inner stand was designed to protect the *kuriashi*. The object can then be exhibited without removing it from the board. To protect the object from the board, 4 to 6 sheets of Mino paper were laid inside the silk wrapping; thick satin was placed over the paper and silk was also used. Two thin boxes of moisture controlling agents kept at 60% RH were placed in the bottom space.

## (16) Records and photographs

Records of this restoration work were made and photographs were taken after restoration.

**Analysis**

With the consent of the museum, the existing materials and the techniques used for the object were analyzed. Below are the results of these analyses.

## (1) X-ray radiography — structure of the substrate

Results of X-ray radiography revealed the following. Two pieces of straight-grained coniferous board had been joined together to make the top of the lid and the bottom of the body. In order to prevent the substrate from becoming distorted, a similar board had been inserted vertically into the middle of the two boards. Each of the 6 sides had been made by *kanshitsu* and then put together. The lid and the rim of the body and the lid were *magemono* made from straight-grained coniferous tree. Thin boards had been attached from the inside and the outside and nailed with a wooden nail. The *kodai* and *kuriashi* had been made of *kanshitsu* and reinforced with 3 thin boards from the inside.

(2) Analysis of types of trees — types of wood used for *kuriashi*

Prepared specimen of the cross section of wood was observed with an optical microscope. As a result, it was found that the material at the center of the *kuriashi* is bamboo or wild bamboo and that the substrate to the left and right are straight-grained cypress.

(3) Analysis of fiber — fibers of paper and cloth for the *kodai*

Through optical microscopic analysis it was discovered that paper fiber from the surface of the *kanshitsu* was mainly *gampi* with some *mitsumata* mixed. *Hakudo* was seen around the fiber and it was found that *maniai* paper or *haku'uchi* paper, which are still produced at Najio in Hyogo Prefecture, had been used. Fiber from the cloth was identified to be Indian hemp, which is an annual herbaceous plant that grows in South and Central Asia that was introduced to Japan from ancient times and grown in fields.

(4) X-ray fluorescence spectroscopy — original white pigment underneath the *raden* and restoration material used in repairs

White pigment found on a fallen *raden* shell piece was analyzed at the Tokyo National Research Institute of Cultural Properties. Calcium (Ca) was detected from the white pigment underneath the *raden*. So the possibility of *gofun* having been used on the substrate is very high. Lead (Pb) was detected from the white pigment used in a previous restoration, indicating it to be white lead.

## (5) Cross section analysis — structure of the foundation and urushi coating film

Some of the fallen pieces were sealed in epoxy resin and flattened with water-resistant paper in order to observe the structure of the foundation with an optical microscope. The urushi coating film consisted of two layers: the lower layer consisted of urushi to which black pigment had been mixed and the upper layer was *suki urushi*. Urushi foundation

was used. There were three layers of rough, dark brown foundation and one layer of fine, dark gray foundation. The round edge of the *kodai* was made with brown foundation by using a type of mold. The surface was adjusted by applying a layer of rough, dark gray foundation and fine foundation. It was found that wood powder added to urushi with a small amount of foundation had been used as *kokuso*.

### Conclusion

In contrast to the restoration of urushi objects in the West where synthetic resin is used mainly, restoration in Japan of urushi and Japanese paintings is done by using traditional materials. Urushi, by nature, has many characteristics that are essential for restoration. Because urushi is a natural material, deterioration is more natural when compared with synthetic resins. Thus, it does not cause changes in the environment of urushi objects and does not put pressure on the object. At this point, I believe that natural materials should be chosen for restoration. However, because restoration is not something that can be standardized, synthetic resins may have to be selected depending on the condition and purpose of an object. I believe that we must continue research on traditional restoration materials and develop restoration techniques. But I also think that we must compare and study the use of synthetic resins. Furthermore, I hope that the Project for the Conservation of Works of Japanese Art in Foreign Collections may serve as an opportunity for overseas conservators and Japanese conservators to exchange knowledge and experiences and lead to a development of materials study.

I wish to end this restoration report by expressing my deepest gratitude to all those people who offered support and guidance in this restoration work.