Training Report
on
Cultural Heritage Protection

Training Course for Researchers in Charge of Cultural Heritage Protection in Asia and the Pacific 2005 – Nepal –
25 October – 19 December 2005, Nara

Cultural Heritage Protection Cooperation Office,
Asia/Pacific Cultural Centre for UNESCO (ACCU)

Edited and Published by
Cultural Heritage Protection Cooperation Office,
Asia / Pacific Cultural Centre for UNESCO (ACCU)

Nara Prefectural Government "Horen" Office Ground Floor
757 Horen-cho, Nara 630-8113 Japan
Phone: +81-(0)742-20-5001
F A X: +81-(0)742-20-5701
E-mail: nara@accu.or.jp
U R L: http://www.nara.accu.or.jp

Printed by Meishinsha

Preface

The Cultural Heritage Protection Cooperation Office, Asia/Pacific Cultural Centre for UNESCO (ACCU Nara) was established in 1999 with the cooperation of the Agency for Cultural Affairs, Nara Prefectural Government and the Munucipal Government of Nara. Since its establishment, the ACCU Nara Office has worked towards the protection and investigation of cultural properties through training courses, international conferences, public symposia and database production.

Training courses on the investigation and protection of cultural heritage form an important part of our activities. These training courses are of two types: group courses of about one month for some fifteen participants and individual training on particular topics for one or two participants. The present course was the second type and was held in association with the National Research Institute for Cultural Properties. This time we welcomed one specialist from Nepal.

At the workplace of the participant, i.e., National Museum of Nepal, wooden, paper, textile and other organic materials are on the verge of deterioration due to termite attack and air polution. So far, they have been trying out some traditional methods to conserve them, but they are not exhibiting much efficacy. Therefore, we have designed this training course to encompass a series of practical conservation methods for museum materials, including conservation and restoration techniques developed and practiced in Japan, management methods of a museum, and the relationship between culural properties and air pollution, with the hope that it can contribute to the future cultural property protection in Nepal.

Finally, we wish to thank Gango-ji Institute for Research of Cultural Properties, Bijutsu-in, Laboratory for Conservation of National Treasures of Japan, Bunkazai-hozon Co. Ltd., National Museum of Ethnology, Kyoto Saga University of Arts, Nara University, Tenri Sankokan Museum, Archaeological Institute of Kashihara, Nara Prefecture and Shinto Fine Co. Ltd.for their assistance with this training course.

YAMAMOTO Tadanao
Director
Cultural Heritage Protection Cooperation Office,
Asia/Pacific Cultural Centre for UNESCO (ACCU), Nara

Contents

1. General Information

Training Course for Researchers in Charge of Cultural Heritage Protection in Asia and the Pacific 2005

(25 October－19 December 2005, Nara)

1. Organizers

Jointly organized by: *Bunkacho* (The Agency for Cultural Affairs, Japan), the Asia/Pacific Cultural Centre for UNESCO (ACCU), and the National Research Institute for Cultural Properties

2. Date and Venues

Date: 25 October to 19 December, 2005

Venues: Cultural Heritage Protection Cooperation Office, ACCU (ACCU Nara Office); National Research Institute for Cultural Properties, Nara; Nara National Museum; Gangoji Institute for Research of Cultural Property; Nara University

3. Objectives of the Training Course

The Cultural Heritage Protection Cooperation Office, Asia/Pacific Cultural Centre for UNESCO (ACCU Nara Office) was established in August, 1999. The activities of the ACCU Nara Office cover training for experts, provision of information, and networking for the protection of tangible, immovable cultural heritage.

The Training Course for Researchers in Charge of Cultural Heritage Protection in Asia and the Pacific is one of the many programmes that the ACCU Nara Office undertakes every year. Each year two or three experts from Asia and the Pacific region are invited to Nara and its vicinity to conduct training at appropriate institutions/organizations under the coordination of the ACCU Nara Office.

The National Museum of Nepal was founded in 1928 and has been open to the public since 1938. It is the oldest and the largest museum in the country, and possesses various ethnographic collections, such as Nepalese historic relics, natural history collections, portraits, and ethnologic collections.

Collections in the museum, especially those made of organic materials like wood, paper, or cloth, have suffered from serious damage by termites and other causes of deterioration (i.e. temperature/humidity changes). Moreover, additional factors including ultraviolet rays and air pollution have accelerated the deterioration of artifacts and other cultural properties. Steps have been taken towards preserving the collections, however traditional methods used to exterminate pests and bacteria causing the damage have had limited effect.

In light of the present situation, a training course consisting of a series of workshops and lectures related to the preservation of collections will be conducted. The topics will include the following: preserving and restoring works for cultural properties, museum management, and the effects of air pollution on cultural properties. All of these issues have been researched and conducted in Japan for many years, and will be implemented with the aim of contributing to the preservation of Nepalese cultural properties for the future.

4. Training Curriculum

- Conservation Science for Museum Collections.
  - The focus will be on collections made of Stone, Metal, Wood and folk arts.
- Museum Management and Curation of Collections.
- Air Pollution and the Environmental Parameters Required for Long-Term Preservation.
- Practical Training in Conservation Science.

5. Participants

Shobhakar ADHIKARI (Mr.)

- Conservator (Chemist), Archaeology Department, National Museum of Nepal

6. Certificate

- Each trainee will be awarded a certificate upon the completion of the course.

7. Language

- The working language of the course will be English.

8. Expenses

- Expenses for participants for the training course shall be borne by ACCU and comprise the following:

(1) Travel expenses:

Participants shall be provided an economy-class return air ticket between the international airport nearest to his residence and Kansai International Airport, and domestic transportation costs / to and from the airports and between the training venues in Japan.

(2) Living expenses:

Participants shall be provided a daily subsistence allowance during the training course from Monday October 24 to Tuesday 20 December, 2005. Arrangements for accommodations will be made by the ACCU Nara Office.

9. Correspondence

YAMAMOTO Tadanao (Dr.)
Director
Cultural Heritage Protection Cooperation Office,
Asia/Pacific Cultural Centre for UNESCO (ACCU Nara Office)
Nara Prefectural Government Horen Office,
757 Horen-cho, Nara City 630-8113
Tel: +81-742-20-5001
Fax: +81-742-20-5701
E-mail: nara@accu.or.jp

2. Programme Schedule

Day			Lecture	Venue
October	23	Sun.	***Arrival***	
	24	Mon.	Orientation	ACCU
	25	Tue	An Introduction to the Conservation Science for Wooden Architecture/ Dendrochronology in Japan and its Application	NRICPN
	26	Wed.	Future Tasks in the Preservation of Cultural Heritage I	ACCU
	27	Thu.	Future Tasks in the Preservation of Cultural Heritage II	ACCU
	28	Fri.	Introduction of the World Heritage in Nara: Horyu-ji Area	ACCU
	29	Sat.		
	30	Sun.		
	31	Mon.	Introduction to the Conservation Science and Gangoji Institute for Research of Cultural Property	GIRCP
November	1	Tue	Conservation Science for Folk Materials	GIRCP
	2	Wed.	Conservation Science for Folk Materials (Metal1)	GIRCP
	3	Thu.		
	4	Fri.	Self-Study	
	5	Sat.		
	6	Sun.		
	7	Mon.	Conservation Science Methods for Folk Materials (Metal 2)	GIRCP
	8	Tue	Conservation Science Methods for Folk Materials (Wood 1)	GIRCP
	9	Wed.	Conservation Science Methods for Folk Materials (Wood 2, Stone1)	GIRCP
	10	Thu.	Conservation Science Methods for Folk Materials (Stone2)	GIRCP
	11	Fri.	Observation of Storage Conditions and Explanation of Treatment Methods	NME
	12	Sat.		
	13	Sun.		
	14	Mon.	Conservation Science Methods for Organic Materials (Paper 1)	GIRCP
	15	Tue	Conservation Science Methods for Organic Materials (Paper 2)	GIRCP
	16	Wed.	Treatment of Stone Objects / Lecture on Mineral Pigments	GIRCP
	17	Thu.	Treatment of Metal Objects / Radiography	GIRCP
	18	Fri.	Observation Tour of Asuka Region	
	19	Sat.		
	20	Sun.		
	21	Mon.	Traditional Method for Preserving Artifacts (Conservation Treatment of Wooden Object 1)	NNM
	22	Tue	Traditional Method for Preserving Artifacts (Conservation Treatment of Wooden Object 2)	NNM
	23	Wed.		

November	24	Thu.	Traditional Method for Preserving Paper Artifacts (Conservation of Paper Objects 1)	NNM
	25	Fri.	Traditional Method for Preserving Paper Artifacts (Conservation of Paper Objects 2)	NNM
	26	Sat.		
	27	Sun.		
	28	Mon.	Introduction to Management of Artifacts and Filing	AHM
	29	Tue	Visit: Museum of Kyoto / National Museum of Ethnology (Talk Programme)	AHM
	30	Wed.	Organization and facility of the museum	AHM
	1	Thu.	Environment for Storage and Transportation / Practice: *takuhon*	AHM
December	2	Fri.	Conservation and Display of Ethnic Collection	TSM
	3	Sat.		
	4	Sun.		
	5	Mon.	Introduction to Techniques and Materials for Treatment of Metallic Objects	NU
	6	Tue	Conservational Treatment of Metallic Objects (1)	NU
	7	Wed.	Conservational Treatment of Metallic Objects (2)	NU
	8	Thu.	Conservation Science Methods for Wooden Artifacts	NU
	9	Fri.	Conservational Treatment of Metallic Objects (3) / Introduction to Air Pollution Affecting Cultural Heritage	NU
	10	Sat.		
	11	Sun.		
	12	Mon.	Effects of Air Pollution on Cultural Properties and the Measuring	NU
	13	Tue	Analysis and Evaluation of Air Pollution Observations (1)	NU
	14	Wed.	Analysis and Evaluation of Air Pollution Observations (2)	NU
	15	Thu.	Analysis and Evaluation of Air Pollution Observations (3)	NU
	16	Fri.	Observation of Conservation Lab./Exhibition and Storage of Excavated Artifacts	AIKNP
	17	Sat.		
	18	Sun.		
	19	Mon.	Submission of Final Report/Closing	ACCU
	20	Tue.	***Departure : Nara to Nepal***	

NRICPN National Research Institute for Cultural Properties, Nara
NNM Nara National Museum
NU Nara University
AHM Asuka Historical Museum, National Research Institute for Cultural Properties, Nara
NME National Museum of Ethnology
TSM Tenri Sankokan Museum
GIRCP Gangoji Institute for Research of Cultural Property
AIKNP Archaeological Institute of Kashihara, Nara Prefecture

Summary of Lectures

Visiting the laboratory of dendrochronology and observing the equipment for dating

October 25 (Tue.)

Lecture: An Introduction to the Conservation Science for Wooden Architecture

<Dr. KAWANOBE / NRICPN>

Lecture: Dendrochronology in Japan and Its Application

<Dr. MITSUTANI / NRICPN>

Joining the discussion on "Future tasks in the Preservation of Cultural Heritage"

October 26 (Wed.)

Lecture: Future Tasks in the Preservation of Cultural Heritage I

<Mr. NISHI Kazuhiko, ICCROM / ACCU>

October 27 (Thu.)

Lecture: Future Tasks in the Preservation of Cultural Heritage I

<Mr. NISHI Kazuhiko, ICCROM / ACCU>

Horyuji: introduction of World Heritage Sites in Nara Prefecture

October 28 (Fri.)

Visit: Horyuji Temple and Hokiji Temple

- Outline of cultural heritages and cultural properties in Nara area
- History of Horyuji Temple and explanation of the temple premise
- Discussion on tree types used in the temple
- The participant closely observed the bronze cancer on a bowl in the Treasury Hall of Horyuji Temple.

Facility tour in GIRCP, by Ms. Ueda

October 31 (Mon.)

Lecture: Introduction to Gangoji Institute for Research of Cultural Property

<Ms. UEDA Naomi, Deputy Director of Research Department >

- History, organization and activities of GIRCP
- Facility tour
  - Excavated Metal Laboratory
  - Impregnation Laboratory

Lecture on Safety and Hygiene Management at GIRCP

Visit the headquarter of GIRCP, next to Gangoji Temple, another World Heritage site in Nara City

Observing wood cubes treated by different preservation methods

Making preparation slides of specimens

- Desalination Laboratory
- Excavated Wood Laboratory
- Experimental Laboratory
- Excavated Earthenware and Terracotta Laboratory
- Carry-in Entrance/Photo Studio/Fumigation Room
- Painted Cultural Property Laboratory <Mr. YAMAUCHI Akira>
- Folk Cultural Property Laboratory

- Explanation of the work process in each laboratory <Ms. UEDA>
- Lecture on Safety and Hygiene Management at GIRCP <Mr. NAKAYAMA Takeshi, General Affairs Office>
  - Importance of knowledge in work process and awareness of risks
  - Hazardous operation involving organic solvent, dust, X-ray, hoist, electricity, etc.
  - Safety gears and protective clothing
  - Prevention of backache by motion, posture and exercise

November 1 (Tue.)

Visit: Gangoji Temple, Headquarters of GIRCP

<Ms. UEDA >

- Courtesy Call on Rev. TSUJIMURA Taizen, chief priest of Gangoji Temple and Director General of Gangoji Institute for Research of Cultural Property
- Observation of temporary exhibition “Braided Cords” <Ms. KOBAYASHI Mari>
- Observation of temple premise including an air pollution monitoring equipment

Facility Tour (Con’d) <Mr. KAWAMOTO Kozo>

- Analytical Appliance Room (electron microscope, energy dispersive fluorescence X-ray spectrometer, thermal analyzer, hand-carried microscope, and tension and compression testing machine)
- Experimental Laboratory (FTIR, GPC, ion chromatograph, and gas chromatograph)

Lecture: Research on Identification of Tree Types <Ms. INOUE Michiko>

- For testing and development of new conservational treatments
- Tests on 3 cm cubes for fatty acid ester method, PEG method, higher alcohol method, sugar alcohol method, etc., for a most desirable method for each tree type.

Observing preparation slides, identifying the wood species

Practice: Identification of Tree Types <Ms. INOUE Michiko>

- Make preparation slides of specimens of cross section, radial section and tangential section from each wood block.
- Microscopic observation
- Determination of coniferous and broad-leaf trees (softwood and hardwood)
  - Coniferous trees (Softwood): More developed and complex tissue structure
  - Broad-leaf tree (Hardwood): Straight and simple tissue structure

Work process for metallic and wooden objects

November 2 (Wed.)

Lecture: Activities of Folkloric Cultural Property Laboratory <Ms. ISHII Rika>

- Observation of the works-on-progress and facility (X-ray room, hoist, desalination chambers, etc.)
- Scope of work of the laboratory
- Treatment upon acceptance
  - Fumigation with ethylene oxide gas
  - CO_2 method (user-friendly but not effective on fungi, duration of two weeks, acceleration of drying, possibility of discoloration)
  - Heat method (used only for wood and textile materials)
  - Refrigeration method (not good for leather materials)
  - Low-oxygen (0.3 % concentration) method
  - Vacuum method
- Application of pest repellent agent
- Work process for metallic and wooden objects

Observation of the works-on-progress

Removal of rust with brushes

Filling of iron nail with epoxy resin

Practice: Treatment of Metal Objects (iron nails for boat) <Ms. ISHII>

- Removal of rust with brushes
- Double brush application of Paraloid B44 (usually at one-day interval)
- Filling
- Drying

November 7 (Mon.)

There was a fire drill on Nov. 7 at GRICP and Mr. Adhikari participated in the event

Practice: Treatment of Metal Objects <Ms. ISHII>

- Filling of lost areas on iron nails (Con'd)
  1. Use epoxy resin mixed with glass microbaloon (without addition of colour).
  2. Using a grinder, grind off the excess until the resin surface is brought slightly lower than the surface of the metal.
- Colour touch up with acrylic paint
  - Use a lighter shade than the metal.
- Application of coating (Paraloid B44 with matting agent)
  - Caution is required against traces of brush stroke.
  - Acrylic lacquer spray is also applicable.
- Application of top coat
  - Greaseless lubricant is used to fill all the remaining pinholes for anti-corrosion effect.

Observation: Desalination of Fishing Gear

Cleaning the wood with brush: the first step for the treatment

November 8 (Tue.)

Practice: Treatment of Wooden Blocks (wooden objects with insect holes and cracks) <Mr. SHIMONO Hijiri>

- Workflow
  1. Cleaning/dusting with brushes
  2. Cleaning with cotton cloth immersed in deionized water and tightly squeezed (For brittle objects, use damped cotton swab.)
  3. Filling of insect holes and cracks
  - For insect holes: epoxy resin with glass microbaloon
  - For clacks and forming of corners: epoxy resin 6504 (clay type)

Filling of insect holes and cracks

- Weigh the agents (1:1 by weight) and mix the two agents together and knead with hands.
- It takes one day for the mixture to harden.

4. Joining and bonding
- Instant adhesive
- Hardening accelerator (Alteco Spray Primer)

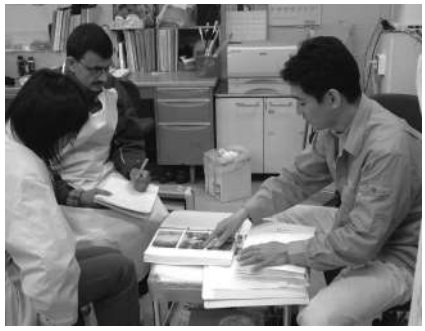
5. Overcoat with a pest repellent and fungicide agent (specially ordered for cultural properties).
- Air-dry for 2 weeks.
- Repeat the treatment every 10 years or so.

6. Grind excessive filler material away from the wooden piece.

November 9 (Wed.)

Practice: Treatment of Wooden Objects (Con'd) <Ms. ISHII>

- Color touch up of the filling material with acrylic paint
  - Shade should be lighter than that of the wood.
  - Fresh acrylic paint is removable with ethanol. Once completely dried, it is removable with acetone.


Explanation of stone treatments

Lecture: Treatment of Stone Objects <Mr. AMENOMORI Hisateru>

- Explanation of treatment examples at GRICP
  - No desalination for stone objects
  - Stone hardening resin (OH100) treatment by spray and brush application. Stop when the surface turns glittery and no more solution is absorbed.
  - For outdoor exhibition, apply waterproof treatment. (Shelter over the object is desirable.)


Tools used for cleaning up stone objects

Practice: Treatment of Stone Objects (fragments of a medieval five-ring tower from Gangoji Temple) <Mr. AMENOMORI>

- Brush away dust and dirt. Dip a brush in water, brush and wipe away the dirt with a dry cloth.
- Resin impregnation in stone hardening resin (OH100) solution.
  - Pour the solution 2-3 times every 10 minutes or so, until no more bubble comes out of the porous inner


Cleaning of stone artifacts

Joining pieces with adhesive resin

Pressing fit the powdered pigment

structure.

- Be careful handling it, while it is still moist and brittle. Especially avoid contact with water during the hardening process.
- OH100 solution gets more viscous over time, and becomes harder after penetrating into stone.

November 10 (Thu.)

Practice: Treatment of Stone Objects (fragments of a medieval five-ring tower from Gangoji Temple) (Con'd) < Mr. AMENOMORI >

- Join pieces with adhesive resin (Araldite 201)
  - Mix the two agents together, and apply the adhesive resin as thinly as possible on one mating face. Join the mating piece, remove it and apply some more on the vacant area on its surface.
  - It takes 4 hours for the adhesive to harden.
  - A grooved stainless steel bolt may be used in between the pieces, depending upon the condition.
- Mix a filling material (K Mortar. main agent : hardener = 2:1).
- Fill the gaps with K Mortar.
  - 45 minutes is the maximum time for working before it hardens.
- Colour touch up
  - Grind mineral pigment finely in a mortar.
  - Press the powdered pigment directly onto the filling material with a finger.

Practice: Treatment of Stone Objects (statue of Ksitigarbha) < Mr. AMENOMORI >

- Brush away the dirt, dust and lichen with a pig-haired brush and a stainless-steel brush.

November 11 (Fri.)

Visit: National Museum of Ethnology

Introduction to Minpaku by Dr. Minami

Lecture: Outline of National Museum of Ethnology (Minpaku) <Dr. MINAMI Makito>

- Structure and organization of the museum
- Observation of the temporary exhibition "Landscaping Model Exhibition" and permanent collection (South Asia, Japan)

Observation of Storage Conditions and Explanation of Treatment Methods <Mr. HIDAKA Shingo>

- Observation of the storages
- Explanation of fumigation chamber, various treatment methods, etc.
  - Acceptance procedure from overseas
    - Ethylene oxide treatment
    - Nitrogen treatment
  - Acceptance procedure for objects from within Japan
    - CO_2 treatment (2 weeks)
    - Heating treatment at 52℃ (8-hour-heating after the core of wooden material reaches 52℃)
    - Refrigeration treatment at –25℃ (2 weeks)
  - Termite control method
  - Photo studios

Explanation of heating treatment

Wrap-up Session <Dr. MINAMI, Dr. SONODA Naoko, Mr. HIDAKA>

- Termite control methods

<u>November 14 (Mon.)</u>

Conservation Science Methods for Organic Materials: Paper (1)

<KANAYAMA Masako, GRIFCP>

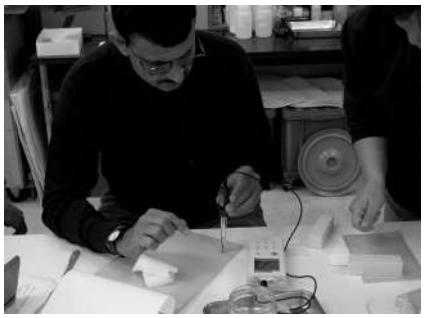
- Making of pastes
- Lining
- Leaf casting
- Hand filling

Making of paste

<u>November 15 (Tue.)</u>

Conservation Science Methods for Organic Materials: Paper (2)

- Leaf casting
- Deacidification by solution
  - Prepare solutions of calcium hydroxide (0.5 gram) in 330 ml of pure water, and calcium carbonate (0.7 gram), 330 ml of Perrier (in place of carbon dioxide).
- How to use pH meter
- Deacidification by a spray-type deacidifier
- Mounting

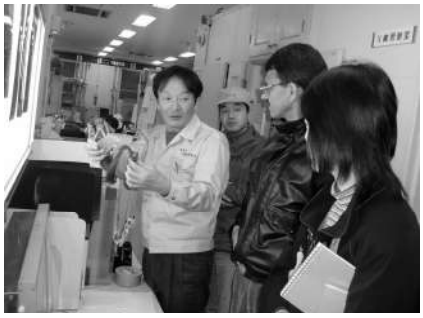


Practicing use of a pH meter

Checking the strength of the consolidated stone object

Preparation of pigments

Lecture by Ms. Nakagoshi, on treatment of metal objects



After short lecture on X-ray facility, participant examined how to judge and read the film

November 16 (Wed.)

Practice: Treatment of Stone Objects (statue of Ksitigarbha) <Ms. ISHII Rika>

- Check for the strength of the impregnated resin (OH100)
- Application of greaseless lubricant (for anti-oxidization)

Practice: Kyoto Saga University of Arts <Mr. YAMAUCHI Akira>

- Preparation of mineral pigments for Japanese painting
  - Animal glue (binder), *gofun* (powder of oyster shell), yellow arsenic, indigo, bordeaux, crimson
- Observation of copying on silk

November 17 (Thu.)

Lecture: Treatment of Metal Objects <Ms. NAKAGOSHI Masako>

- Workflow for excavated metallic materials
  1. Pre-examination
  2. Removal of rust / corrosion
  3. Desalination / benzotriazol (BTA) treatment
     - Iron: desalination treatment
     - Copper: BTA treatment
  4. (Dealkalization)
     ① Immerse in deionized water for one day over a pan of simmering water.
     ② Immerse in alcohol for 2-3 hours.
     ③ Vacuum dry.
  5. Resin impregnation in acrylic resin
  6. Coating
  7. To prevent the artefact from atmospheric impact
  8. To remove pinholes
  9. Bonding, restoration and colour touch up
  10. Observation and recording
  11. Creation of mount, platform, etc.

Practice: Treatment of Metal Objects (excavated iron artefacts) <Ms. NAKAGOSHI Masako>

Practice: Radiography <Mr. MURATA Tadashige>

- Nails, watch, gas lamp, digital camera and coins at 60 volt, and fishing gear (wood, metal and plastic) at 40 and

60 volts.

Wrap-up <Ms. UEDA>

November 18 (Fri.)

Observation Tour of Asuka Region and Interaction with Other Participants from Asia-Pacific Countries

- Ishibutai Tomb
- Nara Prefectural Manyo Museum
- Asuka-dera Temple

Visited Asuka region with other participants from Asia-Pacific countries

November 21 (Mon.)

Traditional Method for Preserving Artifacts

Lecture: Outline and Observation of the Facility <Mr. MATSUNAGA Tadaoki, General Manager, Laboratory for Conservation of National Treasures of Japan, Bijyutsuin >

- Work flow
  1. Fumigation
  2. Cleaning
  3. Disassembly
  4. Repair
  5. Reassembly

Observing the interior of a statue of Jizo

Practice: Conservation Treatment of Wooden Object (1) <Mr. KAGEYAMA>

- Removal of mould with brush and cotton swabs dipped in ethyl alcohol
- Application of three types of acrylic resins for comparison of finish
  - 10% Paraloid B72 solution with methyl ethyl ketone
  - 2 % methyl cellulose solution
  - Aqueous ethyl alcohol solution
  - No treatment

Observing wood surface with microscope before the treatment

Application of three types of acrylic resins

November 22 (Tue.)

Practice: Conservation treatment of wooden object (1) <Mr. KAGEYAMA>

- Comparison of finish with different resins
- Preparation of resin fillers
  1. Mix butyral resin and ethyl alcohol solution (1: 4 by


Examining the characteristics of paper


Rolling up of scroll


Making paper suitable for repair

weight).

2. Grind mineral pigments and mix it with wood powder in a mortar. Mix butyral resin, acrylic paint and add cellulose powder.
3. Make cones of fillers.

- Application of resin filler

Wrap-up <Mr. MATSUNAGA>

November 24 (Thu.)

Lecture: Outline of the Workshop and Traditional Method for Preserving Paper Artefacts

<Mr. OHBAYASHI Kentaro and Ms. AOKI Keiko, Bunkazaihozon>

- Conservation of painting on silk
  - Work flow
  1. Removal of lining and starch
  2. Repair of holes with aged silk
  3. Colour touch up
  4. Lining with paper
  5. Mounting
- Types of paper

Kozo (paper mulberry), *ganpi* (*wikstoemra sikokiana*), *mitsumata* (*edgewortbia papirifer Sieb*), and bamboo

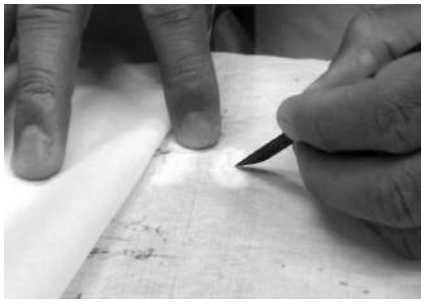
- Types of mounting
  - Hand scroll, book, hanging scroll, folding screen, sliding door, etc.

Practice: Conservation of Paper Objects < Mr. OOBAYASHI >

- Rolling up of scroll
- Measurement
  - Count of laid lines per square *sun* (3.03 cm)
  - Width between threads
  - Thickness
  - Weight
  - Relative density
- Characterization of the paper used
  1. Creation of preparation by taking a sample from the back face

2. Microscopic observation by coloring with reagent

- Making of paper for repair
  1. Select a piece of paper as close to the original document as possible, and tear it into small pieces.
  2. Add 3 mm x 3 mm square pieces of paper.
  3. Mix the paper in a mixer.
  4. Add PAM.
  5. Remove undesired chunks of fibre.
  6. Make a sheet of paper in a bath with a draining board and a reed screen.
  7. Spread the paper on unwoven paper and cover with rayon paper.
  8. Drain and dry the paper.



Repair method for paper object: hand filling

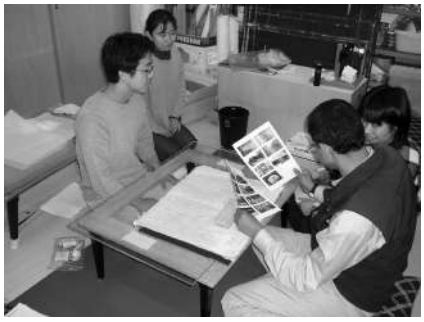
November 25 (Fri.)

Lecture: Conservation of Paper Objects <Mr. HOTTA Keigo>

- Determination of paper for repair
- Selection of repair method (lining, leaf casting, DIIPS, hand filling, etc.)

Practice: Conservation Methods of Paper Objects <Mr. HOTTA, Ms. AOKI>

- Hand filling
- Joining methods for paper
  - *Botsugi* or straight-cut overwrap joint
  - *Kuisaki-tsugi* or feathered joint



Comparing the repair methods for paper

November 28 (Mon.)

Introduction to Management of Artifacts and Filing

<Mr. SUGIYAMA Hiroshi, Chief Curator >

Lecture: Outline of National Research Institute for Cultural Properties, Nara and Asuka Historical Museum

- Organization
- Scope of work
- Temporary exhibitions
- Exhibits of the museum

Observation of the Exhibits

- How the docent tour is conducted

Lecture by Mr. Sugiyama

To see the museum activity, joined the museum tour conducted by curator

- Observation of temporary exhibition: "Garden Ponds in China"

November 29 (Tue.)

Visit: Museum of Kyoto

- Observation of the temporary exhibition: "Heritages of Silk Road"
- Observation of the permanent exhibition

Visit: National Museum of Ethnology

- Observation
- Participation in Talk Program "David Hummel and Tebbu-Tietans: An Exercise of Anthropology in Ethnographic Museum" by Mr. Hakan Wahlquist (Chief Researcher, National Museum of Ethnography, Stockholm)
- Reception

At the backyard of the museum: preparing gadgets for exhibition

November 30 (Wed.)

Lecture: Organization and Facility of the Museum

- Observation of the facility (auditorium, storages, laboratory)

Visit: The Heijo Palace Site Museum <Mr. NISHIMURA Yasushi, ACCU>

Packing methods, demonstrated by Mr. Sugiyama

An example of packing for overseas transportation

December 1 (Thu.)

Lecture: Environment for Storage and Transportation <Mr. SUGIYAMA>

- Packing Methods
  - Use Japanese tissue for wrapping, filling the space, and as ropes.
  - Workflow
  1. Make cotton cushion with Japanese tissue and cotton sheet
  2. Wrap the objects with Japanese tissue and pack it over with cushions in cross shape.
  3. Put the object into a Cardboard box (3 sizes) and label it on the surface.
- Transportation Procedure
  - Domestic: Ship in a transportation truck with air-conditioning and air-suspension. Curator accompanies the objects.

- Overseas: Prepare for the crate box (by the transportation company) in the presence of the curator(s) from the receiving museum, insert the packed objects and seal the lid. Ship the cargo with an accompaniment of a curator in the same airplane.

Practice: *Takuhon* (ink rubbing) of roof tiles and a bronze mirror <Mr. SUGIYAMA>

- Utensils: Japanese paper, *tampo* (round cotton pad wrapped with silk), solid ink, spray of water, cotton swab, scissors
- Workflow

1. Place a piece of Japanese paper on the object.
2. Wet the paper and pressing a cotton swab to attach it to the surface of the object. Remove the air from the centre towards the rims.
3. Dry it until the colour turns white.
4. Start rubbing with a *tampo* by transferring the ink from another *tampo*. Start with a light shade, gradually darken the image. Bring out the detail such as lines and patterns, and leave the other areas untapped.
5. Remove the paper from the object, sandwich it between newspapers and keep it under a press.
6. Remove the crease and mount.

Takuhon: pressing a cotton

December 2 (Fri.)

Visit: Tenri Sankokan Museum for Conservation and Display of Ethnic Collection <Mr. ODAGI Harutaro>

Visit Shinto Fine Co., Ltd.

Lecture: Extermination of Termites <Mr. AKI Seietsu>

- Identification of termite species
  - Drywood termite
  - Subterranean termite
  - Dampwood termite
- Types of termitecide for *Coptotermes spp.*, a kind of subterranean termite
  - Organiophosphorous insecticides (non-repellent, quick evaporation)
  - Pyrethroid insecticides (good repellent)
  - Neo-nicotinoide insecticides (non-repellent)
  - Termite bait: insect growth regulator (IGR)
    - Chitin synthesis inhibitor
    - Juvenile hormone mimic
- Extermination the colony is the best method.

Lecture by Mr. Aki on extermination of termites

Lecture by Prof. Nishiyama

Placing artefact for X-ray research

Checking the data of X-ray Florescent Analyzer

December 5 (Mon.)

Lecture and Observation: Introduction to Nara University <Prof. NISHIYAMA Yoichi>

Lecture: Introduction to Techniques and Materials for Treatment of Metallic Objects <Prof. NISHIYAMA>

- Workflow
  1. Pre-examination (by radiography, material analysis, etc.)
  2. Cleaning in a solution of alcohol, xylene, and ethyl acetate
  3. Desalination of iron objects

- Removal of chlorine in the soil in a alkali solution (alcohol or aqueous solution of lithium hydroxide)

- Change the solution every other day up to 4 times, while observing the condition of the object.

- It is technically impossible to remove all the chlorine. Therefore, apply top coat to seal the object from contact with air.

  4. Desalination of bronze objects

  - Application of BTA for anti-corrosion

  - Resin impregnation at 59℃ (minimum of 3 times)

  - (For corrosion-covered folk cultural objects): Physical removal of rust, bonding, and BTA application

*Depending on the condition of the object, select the ideal method among BTA application, immersion in BTA solution for 20-30 minutes, or vacuum impregnation of BTA.

Courtesy call on Dr. KAMADA Michitaka, President of Nara University

December 6 (Tue.)

Conservational Treatment of Metallic Objects: Practical Training (1) <Mr. HASHIMOTO Toshinori>

- Radiography

  - Lower voltage (~100 V): wooden, earthen, and glass objects, painting, thin ironware

  - Higher voltage (110 ~ 250 V): Metallic objects (thick ironware, bronze, etc.)

1. Pre-examination
2. Aging of irradiation devices

   - For reduction of load applied on the device by sudden change of voltage

3. Preparation of X-ray films between intensifying screens
   - 1X80 film: for metallic and glass objects
   - 1X-FR film: for composite objects
   - Work under a safety light, with the doors locked and wear gloves.


Evaluating the developed X-ray films

4. Preparation of development fluids in pans and baths
   - Developing fluid for industrial X-ray film
   - Acetic anhydride for stop solution
   - Fixing solution for industrial X-ray film
   - Tap water for stop bath
   - Solution of wash accelerator for film
   - Tap water for washing
   - Drywell solution for removal of water stain
5. Radiography with different intensity
   - Insert markers to indicate the condition (name, voltage, date, place, etc.)
   - First test with different voltage, in case of a composite object made from different materials.
6. Development
   ① Developing fluid for industrial X-ray film (5 minutes)
   ② Stop solution (30 seconds)
   ③ Fixing solution for industrial X-ray film (10 minutes)
   ④ Stop bath (30 seconds)
   ⑤ Wash accelerator for film (1 minute)
   ⑥ Tap water for washing (5 minutes)
   ⑦ Drywell for removal of water stain (30 seconds)
   ⑧ Work under a safety light t, with the doors locked. Always use thongs.
7. Drying

- X-ray Florescent Analyzer (for analysis of pieces of metallic canopy, bronze mirror and lacquered basket coffin)
  - Both quantitative and qualitative analyses of the surface of the artefact are possible.
  - It can identify elements only, so types and composition of pigment, for example, should be done by another method such as X-ray diffraction analysis.
  - Selection and changeover between chromium and molybdenum tubes is possible. (With chromium tube, detection of arsenic and lead is not possible; with molybdenum tube, detection of smaller elements is not possible.)
  - Workflow

1. Adjustment of target position

Desalination Process

Remove the objects from the solution, and drain.

Take two bottles of sample from the desalination solution.

Prepare 1 % aqueous lithium hydroxide solution and impregnate the objects into the new solution.

Cover up the container with plastic foil to seal from the air

Shutting the lid of the cylindrical tank

2. Creation of vacuum
3. Confirmation of target position
4. Setting of irradiation condition: voltage (kV) electric current (mA), X-ray intensity (up to 1000), period of analysis (up to 200 seconds)
5. Irradiation, detection and judgment of peaks

December 7 (Wed.)

Conservational Treatment of Metallic Objects: Practical Training (2) <Mr. HASHIMOTO>

Practice: Desalination

1. Remove the objects from the solution, and drain.
2. Take two bottles of sample from the desalination solution.
3. Prepare 1 % aqueous lithium hydroxide solution.
4. Impregnate the objects into the new solution.
5. Cover up the container with plastic foil to seal from the air.

Practice: Vacuum impregnation of ironware in synthetic resin (Paraloid NAD10)

- Vacuum impregnation allows resin to penetrate into porous areas in the metal.
- Device: tank filled with naphtha solution of resin, cylindrical tank, vacuum pump, naphtha, acetone, trays, cloth, newspaper and drying facility.
- Workflow

1. Connect the devices.
2. Insert the dried metallic objects cured in silk screen into the cylindrical tank, and shut the lid airtight.
3. Create near-vacuum in the cylindrical tank, and open the valves to pour in the resin until the objects are entirely immersed. Close the resin valve, stop the vacuum pump, open the vents and leave the tank for an hour.
4. Open the lid, take out the objects, remove the silk screen, and wipe off the excessive resin from the surface of the metal. Always keep the label close to the object.

5. Dry the metallic artefacts for 2-3 days in a drying chamber with ventilator running.
6. Vacuum dry in an oven at 60℃ for 3 to 24 hours.
7. Wipe off the resin clean from the cylindrical tank and the mesh tray with naphtha or acetone.


Lecture on conservation science methods for wooden artefacts

December 8 (Thu.)

Lecture: Conservation Science Methods for Wooden Artefacts

<Prof. NISHIYAMA>

- Development of conservation methods for wooden artefacts in Japan
- Selection of PEG method, freeze-dry method, natural dry method, depending on the condition of the artefact
- Observation of PEG impregnation bath


Observation of PEG impregnation bath

Practice: Electron microscopy of wooden, lacquered, textile and glass objects

<Mr. SHIMAZU>

- Composition analysis down to electron arrangement is possible.
- Identification of tree type using X-ray micro analyzer: only one sample is sufficient to observe all three sections. Element and distribution analyses are possible.
- Lacquer ware: Observation of technique and condition of each lacquer layer is possible.
- Textile: Observation of yarns of brocade from Hang Dynasty China, and folk cultural cotton cloth.
- Glass beads: Observation of technique

Observation of wooden artefacts by Electron microscope


Observation of a wooden tablet by Infrared ray camera

December 9 (Fri.)

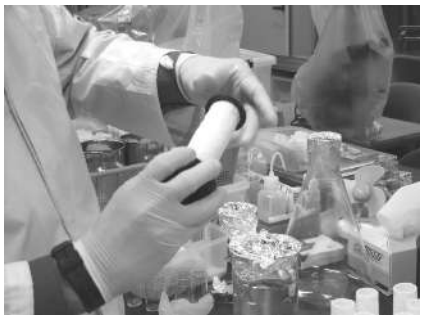
Conservational Treatment of Metallic Objects: Practical Training (4)

<Prof. NISHIYAMA>

- Desalination (Con'd): change of solution
- Benzotriazol treatment of bronze objects (brush application of alcohol solution of BTA, and spraying)

Infrared ray camera

- Observation of a wooden tablet with Sanskrit


Preparation of cylindrical filters


Lecture by Mr. Horiike, at Todaiji


Replacement of TEA cylindrical filters


Checking the temperature to adjust the hydro-thermograph measurement machine

Introduction to Air Pollution affecting Cultural Heritage: Practical Training (1)

<Mr. SAKAI Shunji>

- Explanation about TEA-CF method
  - A low-accuracy but cheap method. Accuracy can be increased by large number of samples over a long period of time. Ion chromatograph is necessary for analysis.
  - Measurement of Cl-, SO_2, and NO_2 (selected for their adverse effect on cultural properties)
  - Measurement of temperature, relative humidity, and discoloration of metallic plates is also conducted at each measurement point.
- Preparation of cylindrical filters
  - Prepare 29 filters for observation by immersing the filter in aqueous solution of nitrilotriethanol.
  - Workflow
    1. Take 500 ml of nitrilotriethanol and add ultra pure water to bring it to 1 liter.
    2. Pour the solution into a flat beaker and immerse the cylindrical filter for 15 minutes.
    3. Drain and set the cylindrical filter.
    4. Keep three cylinders in the refrigerator as non-exposure control samples.

<u>December 12 (Mon.)</u>

Lecture: "Effects of Air Pollution on Cultural Properties and the Measuring Air Pollution and the Protection of Cultural Properties in Historic City Nara, Japan"

- Adverse effect of air pollutants (Cl-, NO2, SO2) on cultural properties in the world
- Triethanolamin cylindrical filter (TEA-CF) method conducted in the last 15 years in Nara Basin and effort by the city government
- Important points for protection from air pollution
  - Reduce pollutants.
  - Afforestation is important. Use wooden boxes and buildings.
  - Remove the dust and keep the cultural properties clean.

Observation of Adverse Effect of Pollutants on Cultural Properties

- Kasuga Grand Shrine
- Todaiji Temple
- Shosoin


Transferring the data to computer

December 13 (Tue.)

Practice: Analysis and Evaluation of Air Pollution Observations: Practical Training (2)

<Prof. NISHIYAMA>

- Collection and replacement of TEA cylindrical filters and hydro-thermograph paper at Shosoin (2 samples), Hanyaji Temple (1), Kofukuji Temple (3), Gangoji Temple (1), Jurinin Temple (2), Todaiji Temple (4), Kasuga Grand Shrine (3), Ichijo High School (1), Heijo Palace Site (1), Toshodaiji Temple (2), Yakushiji Temple (1), and Nara University (3)


In the process of extraction of samples

December 14 (Wed.)

Analysis and Evaluation of Air Pollution Observations: Practical Training (3)

<Mr. SAKAI >

- Extraction of samples and preparation of vials for ion chromatography


Introducing other methods for measuring air pollution

December 15 (Thu.)

Practice: Analysis and Evaluation of Air Pollution Observations <Mr. SAKAI>

- Explanation of the use of ion chromatograph
- Calibration of data

Practice: Analysis and Evaluation of Air Pollution Observations <Prof. NISHIYAMA>

- Creation of level maps for SO_2, Cl-, NO_2, based on the ion chromatography result
- Explanation of other methods for air pollution measurement
- Wrap-up


Analysis and Evaluation of Air Pollution Observations: Creation of level map

Observing tank used for conserving wooden materials, conducted by Mr. Okumura

At the storage of Museum

December 16 (Fri.)

Lecture and Observation: Introduction and Observation of Archaeological Research Institute of Kashihara/Exhibition and Storage of Excavated Artifacts

<Mr. HASHIMOTO Hiroyuki, chief researcher>

- Offices
- Computer Room
- Library
- Workshop
- Storage

Observation of Conservation Lab

<Mr. OKUYAMA Masayoshi, researcher>

- Conservation Science Complex (metallic object laboratory and wooden object laboratory)

Visit: Museum, Archaeological Research Institute of Kashihara

<Mr. ONISHI Takao, curator>

- Observation of the museum (exhibition halls, museum shop, storages, library, curator's offices)
- How archaeological artefacts are stored in the Museum.

Mr. Adhikari, receiving the certificate

Country Report

National Museum of Nepal

Shobhakar Adhikari
Chemist (Conservator)
National Museum, Kathmandu, Nepal

Introduction /An Overview:

Nepal, a small country between, India and China, two big countries of Asia, has a long history. The northern side of Nepal has many peaks of above 8000 meters, including the highest peak of the world (8848 meter), Mt. Everest (Sagarmatha). Kathmandu Valley, the capital of Nepal has a history, culture and tradition of its own for the last three millennia. It is well-known that there are so many temples, monasteries, stupas and statues in Kathmandu valley. There are as many temples as many houses and as many gods as many temples. It is true; Nepal is among the very few countries of the world, which has seven World Heritages within 20 km radius. The whole Kathmandu Valley is like an open museum as thousands of pieces of artworks are scattered all over.

The National Museum of Nepal, known as "Nepal Rastriya Sangrahalaya," was established in 1928 A.D. as the arsenal museum, which was built in 1819 during the administration of the Prime Minister general Bhimsen Thapa (1806-1837). The initial name of this museum was "Chhauni Silkhana," which literally means the store house of arms. British East India and French East India Companies were rivalling for the rule over Indian subcontinent. During that period, the French East Company initially started to modernize the Nepalese army, and later started to provide training and war strategy in accordance with the European standards. Before then, the army barracks were not constructed. So this was the first military barrack built according to the Greco Roman style, which became the National Museum of Nepal. At the initial stage, it was open only to the guests of the ruling Rana family after the downfall of Thapa clan. It opened as a public museum in the year 1938 during the rule of the Prime Minister Juddha Shumsher Jung Bahadur Rana.

The National Museum is under the supervision of the Ministry of Culture, Civil Aviation and Tourism and the Department of Archaeology. The museum houses historical objects, natural history, portraits of the personalities, ethnology and various fields of culture and art of Nepal. Being the oldest and the largest, it is the only multipurpose museum in the country. Obviously, it has an important and leading role to play for the development of museums in Nepal, together with the role of propagating the non-formal education for the community.

There are three buildings within the museum compound. One is for exhibition, one for arsenal, and the main building for the natural history gallery.

Galleries and Sections in National Museum

A The Main Historical Building/Galleries

B Juddha Jatia Kalasala, and

C Buddhist Art Galleries

A. The Main Historical Building/Galleries

The main building from the 19th Century is of neo-classical architectural style. The historical gallery consists of natural science, arms, armories, paintings, philatelic and weapons collections. Though being the oldest, the largest and with the richest collection of art and cultural properties along with its diversities in its collections of ethnographic artefacts, the museum lacks the modern technical facilities of conservation lab, libraries and museum shops.

B. Juddha Jatia Kalasala

This building was built by Rana Priminister Juddha Shamsher J.B.R. in the year 1942, which represents the various disciplines of Nepalese art. Especially, it consists of stone art section, terracotta section, painting section, wooden craft section and the bronze section.

C. Buddhist Art Galleries:

Buddhist Art Galleries consist of northern Himalayan section, Kathmandu Valley section and the Southern Terai section. On the first floor is Mandala section displaying Buddhist statues, textiles, paintings and ritual art objects. Buddhism has two schools of thought, Mahayana and Theravada. So this religion has definite influence on the art, paintings and the structures of the area, into which the museum has tried to assimilate. This section has thousands of Buddhist sculptures with miniature paintings, painted scrolls, cast copper and bronze images, stone sculpture devoted to Chaityas and stupas for worship and veneration.

Terai Section:

This section, though small, provides the glimpse of the Buddhist art of the Terai Region of Nepal, where the excavations have recovered the artefacts.

The Kathmandu Valley Section:

The Lichhavi rulers up to the 8th Century encouraged Buddhism. They built Buddhist monasteries, stupas and consecrated land for financial support to maintain them. So the museum has lots of

collection from this era.

Northern Himalayan Section:

Buddhism, once entered Tibet from Nepal, was blended in its own way there. Such Tibetan Buddhism is divided into many schools like Ninma pa, Sakya pa, Kagyu pa and Gelug pa, and spread to the Northern Himalayan region in Nepal. It has also developed many rites and rituals, which require ritualistic objects like Phurpa, Dorje, charm against epidemics, etc., and many idols. For such activities they developed various kinds of Sputa Chortens and in this collection one can just peep in the Buddhist art of High Himalayan region of Nepal.

Vajrayana Buddhism developed many rituals, and to perform these rituals, many ritualistic objects were designed. This system continues even today. Kathmandu Valley is now one of the few places left to study and practice the Vajrayana Buddhism.

Exhibition

National museum lacks modern furniture facilities and essential equipments for making the exhibition more attractive and systematic. It does not yet have an auditorium to house temporary exhibits. There are several works to improve and enhance the museum to the internal standard. It is able to display number of extraordinary as well as informative objects.

A Brief Introduction to Classical Nepalese Art

Nepalese art can be said to reflect the Nepalese way of life, their wisdom and aesthetic sense refined over successive generations since immemorial time. These works of art speak to us about the beauty of the land with words that are noble, friendly and full of life. In them the spirit of the people, their traditions and their creative impulse can be felt. Nepalese art has a long history. The terracotta toys, the bronze peacock and some figurines at Tilaurakot (Ancient Kapilvastu) in Western Nepal, as well as some bronze figures at Lumbini (the birthplace of Shakyamuni Buddha) are some of the best examples of Nepalese art before the Christian era.

The history of Nepalese art of the Kathmandu Valley goes back at least two thousand years. Nepalese art, which is predominantly religious in character, has great symbolical meanings. During the medieval period Nepalese art flourished, reaching its zenith. It penetrated into Tibet, China and other countries of the Far East as well with the opening of the Tibetan trade route. Figures of deities were the vehicles for the expression of art executed in diverse materials and forms. Nepalese art flourished throughout the centuries under the benevolent patronization of the Lichchhavi, Malla and Shah Dynasties. Nepalese art can be broadly categorized into the following periods:

1. The Lichchhavi Period from the 2nd Century to the 9th Century
2. The Post-Lichchhavi Period from the 10th Century to the 14th Century

3. The Malla Period from 15th Century to 18th Century, and
4. The Shah Period from 18th Century onwards

National Museum is one of the most beautiful examples of stone art. Ornate and elaborate hair styles, proportionate limbs, plastic and mobile bodies, slenderness of the waist with moderately exaggerated hips and bust, restrained ornaments, and decorated and diaphanous drapery; these are some of the typical characteristics of the Lichchhavi stone figures. During the Malla Period, the stone figures become stocky and short, and ornateness predominates, but they also continue many of the Lichchhavi traditions. The stone image of the Shah Period is but a pale echo of the magnificent earlier examples. The exhibited stone relief of Uma-Mahesvara (dated 8th Century) has been one of the most popular themes throughout the centuries. The other three exhibited sculptures reflect different iconographic themes and time period themes.

The Objectives of National Museum of Nepal

1. Collection, conservation, documentation, preservation, Educational Dissemination for the posterity
2. To develop it as a non-formal educational centre
3. To promote tourism through museum
4. To develop it as a research lab for scholars
5. To protect the artefacts from natural and man-made bio deterioration
6. To give information on Nepalese cultural heritage to foreign and local visitors
7. To develop as a recreational place for younger people as well as an information centre for both tangible and intangible cultural properties

The Present Condition of the National Museum

1. The arrangement of the displays is not systematic and scientific, because of lack of skilled manpower and scientific instruments.
2. The displays are not based on methodical conservation.
3. There is no temporary exhibition hall, auditorium, testing lab, proper moulding and casting system.
4. Due to the lack of proper equipments and manpower, the gardens are neglected.
5. The establishment of a conservational and scientific research laboratory in the premises of the National Museum is the most essential feature urgently needed.
6. Termites, silverfish and wood borer and even uncontrolled environment are rapidly destroying the art objects along with the building materials, so all the deteriorated agent should be controlled by a proper way.

7. At present the provisions for storage are not adequate and suitable. Due to lack of storage spaces in the museum, the exhibition areas of the galleries are presently being used for storage.
8. A lack of investment in preservation, conservation, restoration and museum research is also a big problem in my country.
9. A grave problem in Nepal is a lack of awareness concerning the importance of cultural properties for the public.
10. Preservation of objects is one of the main tasks of this museum as well as a chief problem. In a developing country like ours, this problem is becoming more and more acute because of various reasons such as paucity of resources.
11. There are several works for improvement and enhancement of the attractive display of rare artefacts in the museum.
12. Lack of knowledge on museum at the policy-making level
13. Lack of motivation
14. There is no museum shop and restaurant in the museum area, which may be income sources of the museum.
15. The use of traditional technique and obsolete recording system

In summary, many problems still exist in Nepal in the field of museum. The National Museum of Nepal is trying to overcome these problems with the support of different institutions around the world.

Since the National museum of Nepal contains various types of cultural materials, they are facing serious danger of deterioration and decay, caused mainly by the relative humidity, light (UV), pollution and pests. The gallery-buildings themselves are suffering from termites. Many wooden, paper and textile materials are also being affected by termites. In the long run, their number may grow considerably and they may eat away the organic materials. This in turn would result in the complete destruction of the organic materials collected in the museum. The damage is continuously done round the year, irrespective of seasonal change. Similarly, all the wooden sculptures and boxes are also affected by termites. Thus, termites are likely to seriously damage the cultural property displayed in the galleries.

On the other hand, most of the metallic objects are suffering from corrosion because of uncontrolled pollution, dust, and high level of humidity. All the textile objects are exposed to fungi and stone objects are affected by biological growth.

Quality of most of the light-sensitive objects such as costumes, water colour, miniatures, manuscripts, wall papers, dyed leather, most of the natural history and ethnographic specimens containing fur and feathers are being deteriorated day by day due to uncontrolled UV light.

Measures Taken to Control the Problem:

Various measures were taken to control the problem. To control the termites, I sprayed insecticides such as Dursban (3-4 times) and Chlorophosphyrine, but the result was not positive. Besides the termites, wood borer and silver fish are causing great damage to the displayed objects like sculpture, manuscripts, Thanka paintings, etc. So, most of the organic materials are going to deteriorate day by day even after using different chemicals like Dursban, PDCB, etc. Most of the stone sculptures are deteriorated due to biological growth caused by humid climate. Some of them are cracking, flaking and being abraded. To avoid such problems, I used another chemical "Blue Vitriol" times and again, but the problem is not solved. Leather and skin objects are also deteriorated because of humidity fluctuation.

Most bronze and iron objects are facing corrosion due to polluted environment and uncontrolled humidity. Some of the bronze objects may suffer from "bronze cancer". This problem can be solved only after the 'chloride test' followed by zinc oxide with mechanical work. But for this purpose, I do not have even a mini lab and any other modern techniques. For the control of this problem, I put forward the proposal concerning laboratory, equipment, chemicals, etc., which are a must for curative and preventative conservation. Unfortunately, we could not attain the goal.

Most of the light-sensitive objects like textile, costumes, water colour, miniatures, manuscripts, wall paper, dyed leather, natural history and ethnological specimens containing fur and feathers are going to be deteriorated day by day due to uncontrolled UV light. However, we do not have any UV filter media.

Besides all the above-mentioned objects in display, we have very beautiful sculptures and paintings in storage. Because of the lack of proper technical ideas about storage, these objects, too, are in deteriorating condition.

It is said that Nepal has as many temples as houses, especially in Kathmandu Valley. So this city is also called "city of the temples." All these temples, monuments, outdoor sculptures, wall paintings, etc., are also being deteriorated day by day due to the lack of knowledge of the cultural property. Since our country has so many world heritage sites (such as Swoyambhu Nath, Pashupati Nath, Bhaktapur, Patan Durbar Square and Lumbini, we must have new techniques and trained manpower for the protection of all these cultural properties, so that they can be saved for our future generation.

Finally, we have come to the conclusion that until and unless we can control humidity, UV, IR and temperature, and also develop new techniques and skilled manpower, we will never be successful in protecting our cultural properties. On the one hand, use of chemicals is harmful for environment and health, on the other hand, it is not so effective. At least to minimize the burning problems, we have been applying some traditional preventive techniques.

Traditional Preservation Techniques

Since the materials, in particular textiles, basketry, fibres, & leather, are organic in nature, all these materials are affected by light as well as biological agencies. Un-filtrated sunlight, insects and microorganism are the main causes of deterioration for such organic materials.

Some of the traditional preservation techniques applied from ancient period are as follows. For those materials, which are suffering from insects and fungi, most of the people use insects repellents such as

- Neem, margosa tree (Azadirachta indica): seed, leaves, stem and root
- Timur, Pickly ash (Xanthoxylum armantum): seed
- Kapur, Camphor Camphor cinnamonum, leaves, bark and flower
- Tulsi, Holybasil (Occimum sentum): leaf, stem, root, flower etc.
- Teetapati, Mug wort (Artemisia Volgaris): root, stem and roots
- Asuro, Malabar nut (Adhatuoda vasica): leaves
- Karela, Bitter cucumber, Momordica charantia: fruit, leaves and stem
- Chutro, Barberry, Barberis aristata: bark, leaves and seed
- Amala, Emblic myrobalan, Phyllanthus embilica: fruits and seeds
- Salifa, Custar apple, Annona squamosa: fruits and leaves
- Pudina, Peppermint, mentha arvesis All parts of the plants.

By the use of shadow dry leaves, stem, root and seed of Neem trees, Tulsi, Mint and Teetapati, we can easily remove every type of insect. Similarly, different parts of Teemur, Chutro, Karela Peoer, Asuro, etc., also play a vital role in removing insects. Neem leaves, seed of Timur, leaves of Tulsi and camphor are also used as insect repellent as well as fumigant. For leather objects, application of natural oil is very effective. If leather objects are going to be deteriorated by fungi, it needs to be kept dry by using indirect sunlight. Humid climate plays a very important role in the germination of most of the fungal spores. Controlled humidity is the most important thing for fungal growth. To maintain suitable humidity, we can use indirect sunlight or dehumidifier (especially water spray).

Because of all above-mentioned procedure and techniques for the development of museum, I would like to put forward following future strategies.

Future Strategies

1. Adopt new technology with the support of international institutes like ICCROM, ICOM, and ACCU.
2. Open training institutes under the control of Department of Archaeology.

3. Use new methods for preservation, conservation and restoration on artefacts.
4. Prepare museum conservation and research manuals.
5. Museum artefacts analysis from various sites.
6. Request international universities, institutes and laboratory to provide training to the museum staff.
7. Provide training to the local people describing the importance of museum and cultural properties.
8. Involve a detailed museum course at the Tribhuvan University syllabus.
9. Organize awareness programs at various levels about the historical, cultural and regional importance of museums.
10. Construct a scientific building for permanent and temporary display as well as for storage.

Thanks

Leaf Casting

Practical Training at Gangoji Institute for Research of Cultural Properties

Leaf Casting

Lining is the traditional method of repairing and consolidating the areas of paper products such as archives (on Japanese paper) infested with insect damage or missing areas, and damaged areas around the edges. On the other hand, leaf casting is a method to fill the missing or damaged areas with Japanese paper fibre, and to repair and consolidate the said areas simply by hydrogen bond of filled fibre and original paper. No adhesive including paste is added to the filling material. It is also an efficient and cost-effective method in that it can provide an even repair with one process, even when there are a few to large number of missing areas on a sheet of paper. In addition, since no paste is used, its finish is softer than that by lining.

However, the filled areas can be partially thicker than the original paper, and the paper size is made larger. Plus, since the entire document needs to be immersed in water, the method is not applicable to documents with pigments. Fold and texture are also inevitably lost.

Materials Used for Leaf Casting

- Pure water
- *Fukuronori* or gloiopeltis furcata (Postels et Ruprecht) J. Agardh, a kind of sea moss
- Japanese paper made from paper mulberry: for filling.
  Select a paper made of the identical material to the original document.
- Polyacrylamide (PAM): thickener
  Note: Polyacrylamide
  A high polymer of acrylamide ($C_2H_3CONH_2$ / melting point: 84.5℃). It is an odorless white crystal, which dissolves in an aqueous or alcohol solution. Though commonly used for paints and adhesives, it is highly toxic as well as carcinogenic, and gives adverse effect on nervous system and liver. Handling must be done with utmost care, as it is dermally absorbed.
- Small pot
- Electric stove
- Glass rod
- Brush: flat and long ones
- Unwoven cloth
- rayon lining paper
- Square stainless steel bars wrapped with sponge
- Felt
- Plywood sheets
- Press
- Suction table
- plastic sheets

Procedure of Leaf Casting

As the work involves immersing the paper with aqueous solution, first temporarily fix the areas that can be separated from the paper by buoyancy, hen line the entire paper from the back. In case there are vermilion scriptures, fix the vermilion letters with animal hide glue to avoid blur. The liner can be machine-made Japanese paper that contains wood pulp.

1 Temporary fix

Fig.1

①Making of *funori* (Fig.1)
Cook 8 gram of *fukuronori* (see Photo) in 640 ml of water until the sea moss dissolves. Filter out the remaining core.
Note: Refrigerate the unused paste, since it degrades easily.

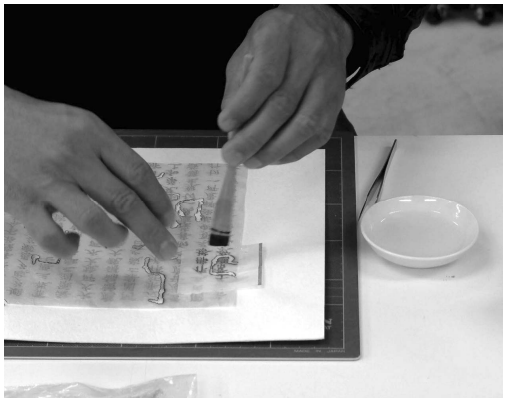


Fig.2

②Temporary fix (Fig.2)
Temporarily fix the areas that can come off by buoyancy with small pieces of rayon lining paper and *funori*. It is convenient to mark the rayon lining paper with non-aqueous pens for ease of locating at removal.

③Air-dry the paper.

2 Preparation of Filling Material and Thickener

Fig.3

①Take one gram of paper, cut a half into 1× 3 cm pieces, and the other half into 5 × 5 cm pieces. Crumple the pieces with hands, so that the pieces separate more easily in water, before putting them into one litre of pure water. Mix for 10 seconds in a mixer. This is used as filling material. Prepare 0.02 % Polyacrylamide (PAM) solution as thickener. (Fig.3)

Fig.4

②Filter PAM into the filling material and mix it with a glass rod. Mix in a cutting motion. Circular motion will get the paper fibre tangled around the glass rod. (Fig.4)

Fig.5

③Spread a piece of unwoven cloth on the suction table. Stick it firmly to the table by spray of water. (Fig.5)

Fig.6

④Seal the unused area of the suction table with plastic sheets for maximum suction effect. (Fig.6)

Fig.7

Fig.8

⑤ Place the dried document with temporary linings face down on the unwoven cloth. Float the two pieces together on a vat (square tray) filled with water, and spray water from above. (Fig.7, 8)

Fig.9

Fig.10

⑥Wet them completely, smooth out creases with a flat brush, and pull the unwoven cloth out of the water together with the document on top. (Fig.9, 10)

Fig.11

Fig.12

⑦Place them on the designated area of the suction table from the far edge line towards the body with as little air intrusion as possible. Brush away the captured air with a dry flat brush. (Fig.11, 12)

Fig.13a

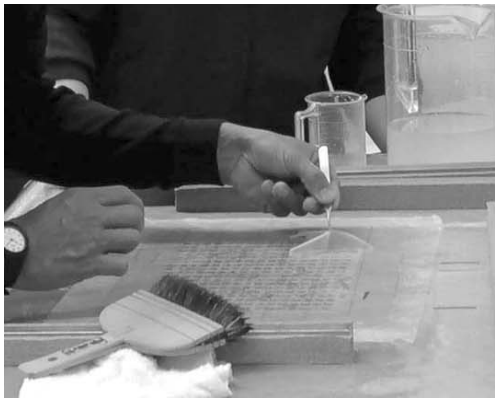


Fig.13b

⑧Smooth out the surface completely. (Fig.13)

Fig.14

⑨ Remove all the temporary liners using tweezers. (Fig.14)

Fig.15

⑩Surround the document with four square stainless steel bars, taking a slight distance away from the edges of the document. (Fig.15)

Fig.16

⑪Pour the filling material over the document. (Fig.16)

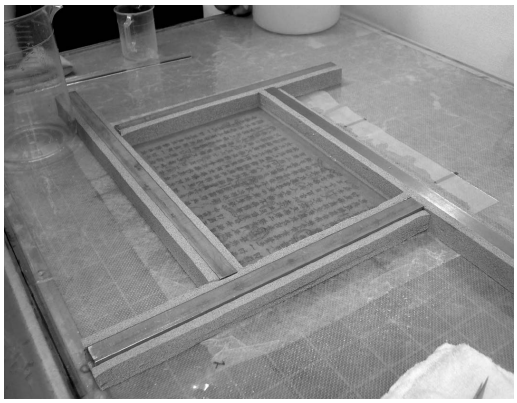


Fig.17

⑫Start the suction. (Fig.17)

Fig.18

Fig.19

⑬After the suction, place another sheet of unwoven cloth over it and stick the papers firmly with a dry flat brush.(fig.18,19)

Fig.20

Fig.21

Fig.22

⑭ Sandwich the unwoven-covered document with sheets of felt. Sandwich it further with plywood and press dry. Replace the felt about every hour. (Fig.20-22)

(at Gangoji Institute for Research of Cultural Properties)

When dissolves in water, chlorine turns to hydrochloric acid, nitrogen oxides to nitric acid, and sulphide ion o sulphuric acid.

Triethanol Cylindrical Filter Method

Overview of air pollution study

Simple concentration measurement of NO2, SO2 and CL by triethanol cylindrical filter method (hereinafter referred to as "TEA-CF method"). After exposing a cylindrical cellulose filter impregnated with 29.6% triethanol aqueous solution (hereinafter referred to as "TEA aqueous solution") to the atmosphere for a period of one month, quantitative analysis is conducted by ion-exchange chromatography to cumulatively determine per month average concentration. Quantitative values are converted to per day weight (μg/day/100cm2: relative concentration), and are converted to absolute concentration (ppb) for NO2 and SO2. A 31-day continuous roll autographic recorder is provided at main measurement points to perform temperature offset for NO2.
The measurement range for NO2 is 1.9μg of NO2/day/100cm2 and the range for SO2 is 2.6μg of SO3/day/100cm2.

Conversion formula in the TEA-CF method

Formula for conversion to relative concentration

CL-＝ 257.15 * (CCL- – B) ／ n unit: μgCL-/day/100cm2
NO2＝ 257.15 * (CNO2 – B) ／ n unit: μgNO2/day/100cm2
NO3＝ 257.15 * (CNO3 – B) ／ n unit: μgNO3/day/100cm2
SO3＝ (CSO3 – B) * 214.39 ／ n unit: μgSO3/day/100cm2

-CCL- , CNO2, CNO3, CSO3: Concentration of analysis results (□g/ml)
B: Concentration of blank
n: Number of days of exposure

Temperature offset

The concentration of NO2 varies according to temperature. Temperature offset is executed using 20・C as the standard.
The difference in reaction is that whereas CL- and SO3 react with alkalis, NO2 reacts chemically with the TEA impregnated in the sample.

C'TN ＝ CTN ／ TCOR
＝ CTN ／ (NRT ／ NR20)
＝ CTN * NR20 ／ NRT
＝ CTN * (0.12 * 20 + 4.5)／(0.12 * T + 4.5)　　unit: μgNO2/day/100cm2

TCOR : Offset coefficient using 20□C as the standard
C'TN : NO2 concentration by TEA-CF method of temperature offset
CTN : NO2 concentration by TEA-CF method
NR : NO2 adsorption of TEA-CF 100 cm2 per day
T : Temperature at each point

Formula for conversion to absolute concentration

NO2； CAS ＝ 0.118 * C'TN + 3.3（ppb, 1 ppm ＝ 1000ppb）

CAS : NO2 concentration (ppb) by automatic measurement instrument
C'TN : NO2 concentration by TEA-CF method of temperature offset

SO2； CAS ＝ 0.043 * C'TS + 2.8

CAS : SO2 concentration (ppb) by automatic measurement instrument
C'TS : SO3 concentration by TEA-CF method

Features of TEA

- Colorless liquid with minimal ammonia odor.
- Slightly viscous.
- Dissolves in water or ethanol.
- Heavier than water.
- Adsorbs to acidic gas.
- Comparatively low toxicity towards the human body.

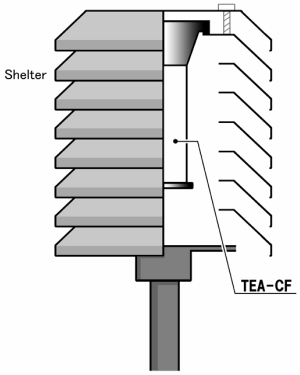
1. Sample Preparation

Required items

- 2, 2', 2" nitro triethanol N (CH2 CH2 OH2) = 149.19 (Fig.1)
- Cylindrical filter (φ3.3 mm × 100 mm, 103.7 cm^2 surface area, neutral) (Fig.2)
- Ultra pure water
- Polyethylene cylinder (made by Kimoto Electric Co., Ltd., Japan)
- Beaker
- Tweezers
- Flat-bottom flask (1000ml)
- - Acid-free filter paper

Fig.1 2, 2', 2" nitro triethanol (TEA)

Fig.2 Cylindrical filter



1. The filters must not be touched with the bare hands. Ion exists in various places such as in the air, in people's bodies (surface of the skin, breath) and surface of apparatus. You must therefore be careful not to allow ion components to get mixed in when creating, extracting and preparing samples. (Fig.3)

Fig. 3

Fig. 4

2. Dilute the nitro triethanol (TEA) 3 times. 300ml of TEA + 600 ml of ultra pure water = 900 ml of TEA solution (Fig.4)

Fig. 5

3. Shake well, and mix TEA and ultra pure water. (Fig.5)

Fig. 6

Fig. 7

4. Immerse the cylindrical filter in the TEA solution for about 30 minutes. (Fig.6, 7)

Fig. 8

5. Remove the cylindrical filter from the TEA solution, stand it on the spread out acid-free filter paper and remove the excess water. In addition to the samples for exposure, blanks for comparison or offset are also needed. (Fig.8)

Fig. 9

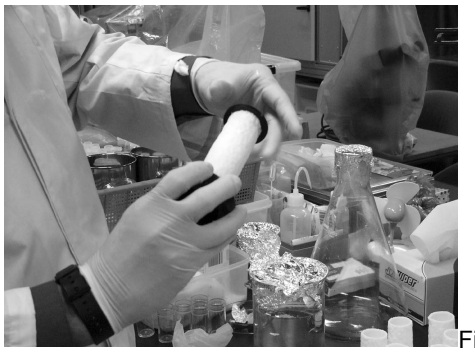


Fig. 10

Fig. 11

Fig. 12

6. Mount the filter on the cylinder. (Fig.9-12)

2. Exchange and Expose the Cylindrical Filter

Required Items

- Portable thermograph
- Precision Hygro-Termograph
- Datalogger
- Notebook PC

Fig.13

Fig.14

Fig.15

Fig.16

1. The filters must not be touched with the bare hands or shelter at setting and collection. Filters are exposed in the shelter placed 1.8m high from the ground, which is calibrated to retain 20% aeration. (Fig.13-16)

Fig.17

Fig.18

2. Retrieve data from the thermograph.

Since TEA-CF method requires compensated temperature to attain the concentration of NOx, the

averaged temperature data derived in this step is used as the compensated temperature data. It also plays an important role as data for maintenance and control, as it gives a long-term observation of the cultural properties in the given area from the hygrothermal data in their surrounding.

When using a precision hygro-termograph as shown in the photograph, replace the indicator paper and check for the remaining ink and battery. (Fig.17, 18)

Note: Since the needle of this type of device is very sensitive to vibration, place it where there is least vibration.

Fig.19

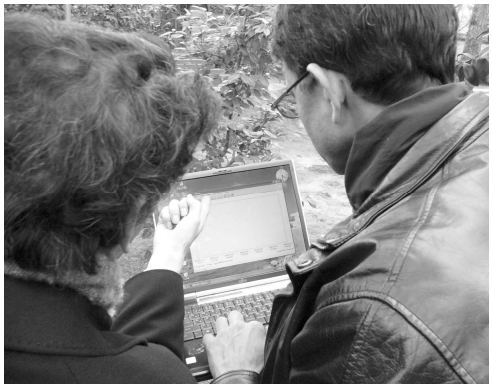


Fig.20

When using a datalogger, retrieve the digital data. Check for the remaining battery as well. (Fig.19, 20)

Note: Datalogger here refers to a device with the function of accumulating, analyzing and indicating the data from various sensors such as voltage and electric current. It can also be integral with sensor, or a simplified measurement device. It is usually the case in the cultural property field, that datalogger refers to the type of devices with measurement and memory functions.

3. Extraction of Pollutants

Required items

- Ultra pure water
- Tweezers
- Measuring cylinder
- Beaker (100ml)
- Tall beaker
- Hot plate
- Glass rod
- Suction filter apparatus
- Pipette (15 ml)
- Flat-bottom flask (200 ml)
- Measuring pipette (1 ml)
- Test tube (25 ml)
- Hydrogen peroxide (highest quality) (H_2O_2 = 34.01)
- Filter paper

Fig.21

Fig.22

1． Divide the recovered TEA-CF into the proper size (about 8 – 16 divisions), place into a tall beaker. The TEA-CF must not be touched with bare hands. (Fig.21, 22)

Fig.23

Fig.24

2. Measure 100 ml ultra pure water in a measuring cylinder. (Fig.23)

3. Put the cylindrical filters in the tall beakers and pour the solution into them. (Fig. 24)

Fig.25

Fig.26

4． Cover up the tall beakers with cellophane wrap or aluminum foil against intrusion of dust. Place the tall beaker on a hot plate heated to approximately 120°C and heat for about an hour. (Fig.25)

5. After heating, crush the filter paper finely with a glass rod.

6. Place a flat-bottom flask (200ml) in a suction filter apparatus (hydraulic type in this case). (Fig.26-28)

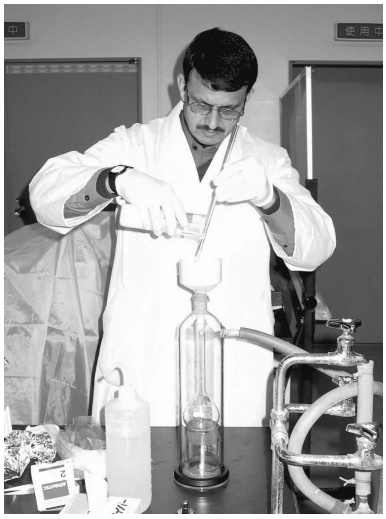


Fig.27

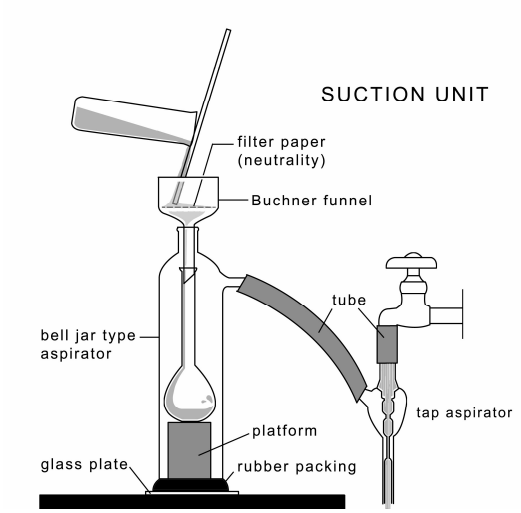


Fig.28

7. When the extraction process is completed, bring the volume of the filtered liquid to 200 ml by adding the required amount of ultra pure water and agitate well.→*This serves as the test solution.*

Note: Extraction of eluted substances could be made without such a device, but it would take considerable time under the atmospheric pressure.

3. Pre-treatment for Analysis

Before the extracted fluid is measured in ion-exchange chromatograph, a pre-treatment is necessary.

Fig.29

1. Put a stopper in the flask, turn it upside-down and shake. This serves as the test solution. (Fig.29)

Note: This is done for even dispersion of eluted substances in the solution.

Fig.30

2. Take a 15ml-sample from each. (Fig.30)

Fig.31

3. Inject the samples in test tubes. (Fig.31)

Fig.32

4. Add 0.3 ml of highest quality hydrogen peroxide. Put a stopper in the flask, turn it upside-down and shake. (Fig.32)

Fig.33

Fig.34

5. Bring the volume of the solution to 20 ml by adding the required amount of ultra pure water and agitate well (put a stopper in the flask, turn it upside-down and shake). This serves as the sample solution for analysis.

Reference)

Wait until the reagent is stabilized, and start measuring after 24 hours. The analysis of the said four substances takes about 13 minutes per sample.

Fig.35

Fig.36

6. Set the vials in the ion-exchange chromatograph with an automatic sampler. (Fig.35, 36)

Fig.37

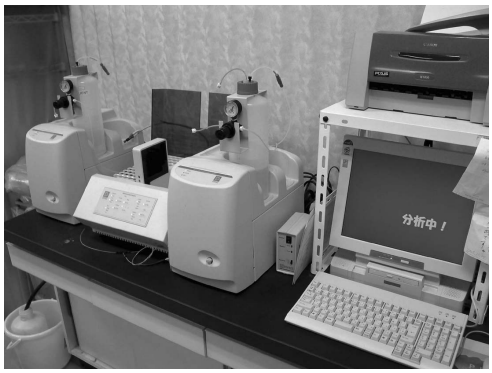


Fig.38

Now Loading…

Process steps provided by Conservation Science Laboratory, Department of Cultural Properties, Faculty of Letters, Nara University

Final Report

Study Report on Cultural Heritage Protection in Nara, Japan, 2005

Shobhakar, ADHIKARI

Introduction

The 'Training Course on Preservation and Restoration of Cultural Heritage in Asia-Pacific Region 2005,' Individual Training Course, was organized by the Asia/Pacific Cultural Centre for UNESCO, ACCU in Nara, Japan, from October 24th to December 19th , 2005. This course was specially organized only for me, so I am much grateful to the government of Japan and ACCU, Nara, for giving me the chance to attend this training course.

I am Mr. Shobhakar Adhikari, working for National Museum of Nepal as chemist (Conservator) since 1997. I have received a master's degree in Organic Chemistry from Tribhuvan University, Kathmandu, Nepal and diploma in Conservation from National Research Laboratory for Conservation of Cultural Property (NRLC), Lucknow, India. Although I have had a chance to train abroad like Norway, Malaysia and different parts of India regarding conservation science, I could not reach such height in the field of conservation ACCU, Nara has provided. During the two-month study, I learned the theories of conservation science and conservation techniques. My training was both in academic and practical fields. I sincerely appreciate ACCU for providing me with such a valuable opportunity to study under the supervision of Japanese experts and professors. I am very grateful for their professionalism and kind cooperation.

The training course was very well organized by ACCU, Nara. My study in Japan over 57 days basically focused on the following aspects:

1. Conservation Science for Museum Collections
2. Museum Management and Curation of Collections
3. Air Pollution and Environmental Parameters Required for Long-term Preservation, and
4. Practical Training in Conservation Science.

The training course took place at various venues with different instructors under the supervision of ACCU:

1. National Research Institute for Cultural Properties, Nara (NRICPN)
2. Gangoji Institute for Research of Cultural Property (GIRCP)

3. Asuka Historical Museum, National Research Institute for Cultural Properties, Nara (AHM)
5. Archaeological Institute of Kashihara, Nara Prefecture (AIKNP)
6. Nara National Museum, (NNM)
7. Nara University (NU)

About the Training Course

The following pages present a summary and my impression after completing the two-month training course organized by ACCU Nara. The course was very interesting and informative, and threw light on many conservation science and archaeology field. If I make a comparison with Nepal, that has one of the richest cultures, huge collection of museum artefacts and with more than ten world cultural heritage sites even though it is a very small country, but unfortunately there is neither modern equipment, nor a such technical knowledge and resources like Japan. In Nepal, The ancient monuments, museum artefacts and sites have suffered from a variety of problems. The burning problems, which are the causes of deterioration, are pollution, heavy rain, vandalism, large range of fluctuation of temperature and humidity, insect and fungus effect on objects including the whole building, untrained manpower, lack of equipments and new technique, lack of awareness and so on. I am very happy to see the modern techniques of Japanese conservators, scientists and archaeologists in the field of conservation, restoration exploration and excavation. We cannot yet develop the type of scientific methods that Japan has currently developed.

The course began with a series of lectures in the ACCU office and the National Research Institute for Cultural Properties, Nara (NRICPN). All lectures were very beneficial and interesting. The lecture on future task in preservation of cultural heritage by Mr. NISHI Kazuhiko from ICCROM was very useful and informative for me. This lecture consisted of an outline of variety of laws and guidelines that govern the funding management, conservation and protection of cultural heritage from international and national perspectives. This lecture not only provided a global perspective, but also examples of cultural heritage protection practices from various countries around the world. Similarly, the lecture on the Conservation Master Plan and Dendrochronology (dating of timber by study of the annual growth rings) were very interesting and applicable from the conservation point of view.


Observing Desalination Process on Gangoji Research Institute

During the two months period, most of the time was spent in Gangoji Institute for Research of Cultural Property under the supervision of experts from 31st October to 17th November, 2005. This conservation

laboratory introduced many new technological advances in terms of machinery and solution treatment, to items of wood, metal, paper and painting. I have learned the photography technique, wood identification technique, insect and water repellent technique, non-destructive fumigation technique, desalination technique, PEG (polyethylene glycol) method, resin impregnation process, BTA (benzotriazole) treatment, colour touch up, cleaning process (physically and chemically), joining techniques, handling of fire extinguisher and X-ray diffraction method for the analysis of actual condition of artefacts. Moreover, this institute also introduced new technique for paper conservation. During the paper conservation, I learned about identification of paper, types of deterioration, preparation of wheat paste, lining, leaf casting, gap filling, deacidification process, measurement of pH, mounting process, etc.

Tree Type Analysis on Electronic Microscope in Gangoji

Conservation Work on Archaeological Relic in Gangoji

Nara National Museum was another important spot, in order to upgrade my conservation science knowledge in Japan. During the one week period, I learned in this museum especially about wooden and paper artefacts. There are different techniques at different institutes within Japan. The conservation technique in this museum is a little bit different from Gangoji Institute. I learned cleaning process, removal of fungi, fumigation technique, gap filling, colour matching technique, etc. Conservation work on paper artefacts, such as paper cutting technique, rolling system, and measurement of thickness of paper, was also an interesting part of this training. Besides the conservation process, DIIPS (Digital Image Infill Paper System) and paper making system were also a part of paper conservation technique, so these processes were also memorable during the training.

Similarly, Asuka Historical Museum was another part of the training course. In this museum, I learned slightly different techniques from other institutes. Asuka is especially famous for archaeological sites, so this museum is also related to the excavated objects. A temporary exhibition was in exhibit through December, 2005. In this site, I got the opportunity to experience in packing of museum as well as archaeological relics for both national and international export, material handling technique, and operation of auditorium. The most interesting part of this site was *Takuhon* process, in which I prepared a number of *Takuhon* objects.

I was able to learn about storage methods after restoring cultural properties, and methods for monitoring the environment of cultural properties inside and outside, under the instruction of

Conservation Treatment on Wooden Relics in Nara National Museum

Conservation Work on Painting in Nara National Museum

Paper Rolling Technique on Nara National Museum

Prof. NISHIYAMA Yoichi at Nara University. Environmental conditions for preservation differ according to the materials that make up cultural properties. Accordingly, the risk of further deterioration of cultural properties is high, if storage conditions after treatment are neglected.

Recently, detection methods are developed rapidly. Concerning the non-destructive check, X-ray fluorescence analyzer, X-ray diffraction analyzer, UV-ray analyzer, IR-ray analyzer, ion-exchange chromatograph are used for the main process used at this laboratory. Besides these, desalination process and PEG 4000 impregnation methods are also involved.

In the case of cultural properties that are outside, the impact of temperature, humidity and pollutant sources for cultural properties can be observed by monitoring and measuring the air environment, and thus solution can be determined. I think this approach would be very beneficial for protection activities in the context of Nepal, especially for National Museum of Nepal.

Now I am away from the conservation site but must urgently protect cultural properties. Since Nepal is a very humid country, there is a large fluctuation of temperature and relative humidity, so most of the cultural heritages including building suffer from termites. For the eradication of termite, I put forward a program for my museum regarding termite control, to which ACCU organized a visit to a termite eradication company in Osaka.

According to the information I received there, the most common termite species, which are found in Nepal are

1. Dry wood termite
2. Subterranean termite and
3. Damp wood termite

Out of these three types of termite, subterranean termite Coptotermes formosanus is the most dangerous. So for the eradication of this termite Bistrifluron (common name) chemical in

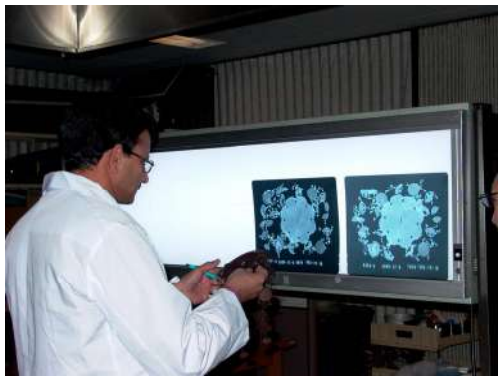
paper has been recently in use in Japan and is also a most effective one. We will also apply this method for the eradication of termite in our museum. This is another interesting and the most important achievement from my stay in Japan.

Observing Packing Process in Asuka, Nara

Study Trip to Museums, Shrines, Temples and Archaeological Sites

Besides the lectures in the classroom and conservation and restoration work in different institutes, I visited many museums, temples, shrines and archaeological sites. The maintenance of museum, temples, shrines and sites was excellent. The credit should go to the government of Japan and its people, who care for their cultural heritage with great respect. I visited some museums during my stay in Japan, such as National Museum of Ethnology in Osaka, Museum of Kyoto in Kyoto, Nara National Museum in Nara, Tenri Sankokan Museum in Tenri, Tokyo National Museum in Tokyo and Nara Prefectural Manyo Culture Museum and the Archaeological Research Institute of Kashihara, in Nara Prefecture. I was really happy to see the modern techniques used to handle artefacts. The storage system, display methods, treatment of artefacts, photography and mapping of artefacts, analysis of relics, publication of reports, conservation science, proper documentation, regarding of artefacts and the restoration and preservation were ideal. I appreciate the conservation laboratory of National Museum of Ethnology, which was built using really new and high technique. Likewise, temporary exhibitions of Tokyo National Museum and Museum of Kyoto were unique, well-organized and memorable for my life.

Extracurricular Activity: *Takuhon* process in Osaka



Observing X-Ray Analysis on Metallic Relics in Nara University

Since Nara was the oldest capital of Japan (710-794) and was the cradle of Japanese culture, arts and crafts, I also visited some temples, parks and shrines during the training course. Horyuji Temple is a very famous temple in Nara, which is the Japan's first World Cultural Heritage, announced by UNESCO. Similarly, Hokiji Temple, Todaiji Temple, Nara Park, Asuka-dera Temple,

stone chamber, etc., are most important and memorable parts of this training.

Similarly, I visited some archaeological sites. The site visits were truly informative and enjoyable. To see how archaeological sites are preserved and presented in various ways for public appreciation was really interesting. Visits to Heijo Palace Site and Asuka archaeological sites were most memorable ones among my field trip of sites. Heijo Palace Site Museum, located inside the Heijo Palace Site, tells the actual value of the archaeological site and the excavated relies. With an expanded perspective and knowledge gained from the training course, I now realize that the archaeological sites and excavated relics are much more precious than previously I thought.

During the two-month study, field trips to various museums, temples, shrines, archaeological sites as well as different conservation laboratories were conducted. These field trips provided a valuable opportunity to the participant to network with experts within this field; this has promoted mutual understanding and cooperation in our work. Looking back at what I have learned and what I have seen, I could hardly believe that I was able to achieve so much practical experience and professional liaisons in just two months. These will be very useful for my work and I wish to share my newly gained knowledge and skill with my staff. The subjects covered in this training program were broad and detailed; this report could only serve as a summary of some of the main topics that I learned in this training course.

My Responsibility after Returning to Nepal

The training programme was very important and relevant to me, because it supplied me with much information related to conservation, restoration and more new techniques for cultural heritage. Japan leads the world in the field of technology. Before I came to Japan, I heard that Japan has extremely advanced facilities. I was surprised that national institutes of Japan for cultural properties stress not only the importance of applying the latest scientific technology to the protection of cultural properties, but also of traditional techniques. I was quite impressed that they are also paying attention to storage methods after conservational treatment.

During my stay in Japan, I was able to gain a systematic understanding of the advanced conservation and restoration of cultural properties. In other words, I am now fully aware of the need to implement a preliminary analysis before restoring and conserving cultural properties. I am now aware that there are various measures and materials applicable to the protection of cultural properties in Japan. Conservation materials and method applied differ according to the type of cultural property. The degree and rate of deterioration are also diverse, depending on the materials and their buried environment. If no appropriate material is selected, no sufficient effect can be expected. This means that the historical significance and other aesthetic value of the cultural property cannot be sufficiently protected.

Through the lectures I attended, I was made aware of the serious impact that air pollution has on our cultural properties. I learned the process of how different elements in the air damage

Pollution Measurement by TEA-CF method at Nara Univ.

During Pollution Analysis by Ion chromatography in Nara University

cultural properties made of wood, stone, metal and textile, and realized the importance of measuring the environment. From now on, we will actively measure the environment surrounding our cultural heritage to provide scientific evidence to the government authorities for determining strategies.

As a result of this training, I was able to gain appreciation of the world's latest scientific techniques and measures for protecting cultural properties. I also became aware of the philosophy of the scientific approach to and the research system for protection of cultural properties in Japan. I also found a glimmer of hope in solving the problems I face in my daily work.

From the overall training, I understand that we are doctors, and cultural properties are patients. In other words, our work is the same as that of a doctor. We interpret the causes based on the symptom of a cultural property, and provide remedy according to its specific symptom. Accordingly, it is necessary to make a comparative diagnosis for careful prescription of medication after identifying the value and nature of the cultural property, material, type of disease, structure of disease, cause of disease and surrounding environment and of the conservation materials and applicable methods. When I return, I plan to put my efforts applying this philosophy to my future work, promoting technical cooperation among Japanese experts and the staff of National Museum of Nepal.

Conclusion:

Overall, the training course was quite interesting and inspiring. My experience can be summarized as having provided me with an opportunity to gain a massive injection of new knowledge and concepts. These will help me in my career in the protection of cultural properties. I also gained the opportunity to meet numerous specialists in the protection of cultural properties in Japan. When I return, I would like to step up exchanges and joint conservation science programme between the people who are involved in cultural properties in my country and the specialists I have met here. I hope we can work together for the protection of cultural heritages.

Although Nepal is very famous for ancient artefacts as well as various cultural heritage

sites, most of our artefacts and cultural relics are being deteriorated day by day due to lack of experts in this field. In view of this, this type of training is very fruitful for our country. I also hope that this prestigious institute will provide such a training course to other untrained staff at my museum in future. If they get such opportunity to attend the course, it will provide a great benefit not only to the Nepalese museum but also to world's cultural properties.

Acknowledgements

I feel that the two-month training course at ACCU in Nara, Japan, reached a successful conclusion. I would like to extend my thanks once again to the Asia/Pacific Cultural Centre for UNESCO (ACCU), Nara, Director General of ACCU, Dr. YAMAMOTO Tadanao. My special thanks go to the Programme Director, Mr. NISHIMURA Yasushi and Programme Chief, Ms. ISHII Kayoko, who took care of me throughout the training period. I would like to thank Deputy Director KOMEDA Muneo, Interpreters Ms. KUROSAWA Ayako and Ms. HATA Chiyako, ACCU Staff TACHIBANA Ruriko, NAKAMURA Yuri, and all other office staff members, and instructors that spent time teaching me. In the same way, I would like to thank Prof. NISHIYAMA, Nara University. I am also pleased to give thoughtful regards to my government of Nepal and Mr. Jal Krishna Shrestha, Director of National Museum of Nepal for nominating me to participate in this beneficial training course.

The End

1. List of Lecturers, Tutors and Interpreters

KAWANOBE Wataru
Section Head,
Restoration Material Science Section, Department of Restoration Techniques
National Research Institute for Cultural Properties, Tokyo
13-43 Ueno-koen, Taito-ku, Tokyo 110-8713
Office Phone: (+81) 3-3823-4922 Office Fax: (+81) 3-3823-4835
E-mail: kawanobe@tobunken.go.jp

MITSUTANI Takumi
Section Head
Palaeonvironment Section, Centre for Archaeological Operations
National Research Institute for Cultural Properties, Nara
2-9-1 Nijo-cho, Nara 630-8577
Office Phone: (+81) 742-30-6845 Office Fax: (+81) 742-30-6856
takumi@nabunken.go.jp

NISHI Kazuhiko
Project Manager
International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM)
Via di San Michele 13, I-00153 Rome, Italy
Office Phone: (+39) 0658553388 Office Fax: (+39) 0658553349
E-mail:kn@iccrom.org

SUGIYAMA Hiroshi
Chief Curator
Asuka Historical Museum, National Research Institute for Cultural Properties, Nara
601 Okuyama, Asuka Village, Nara 634-0102
Phone: +81 744-54-3561 Fax: +81 744-54-3563
http://www.asukanet.gr.jp/asukahome/index.html

AKI Seietsu
Director, Environmental Chemical Technical Group
Shinto Fine Co.Ltd.
15-52 Komatsu, Higashi-Yodogawa, Osaka 533-0004

ODAGI Harutaro
Curator, Department of Archaeological Art, Tenri University Sankokan Museum
250 Morimedo-cho, Tenri, Nara 632-8540

- **Gangoji Institute for Research of Cultural Property**

2-14-8 Motomachi, Ikoma, Nara 630-0257
Phone: +81 742 74-6419 Fax: +81 742 73-0125
http://www.gangoji.or.jp/

UEDA Naomi
Deputy Director, Research Department

YAMAUCHI Akira
Section Head, Research Department

NAKAYAMA Takeshi
General Affairs Office

KOBAYASHI Mari
Researcher, Research Department

KAWAMOTO Kozo
Deputy Section Head, Research Department

INOUE Michiko
Researcher, Research Department

ISHII Rika
*Section Head,*Research Department

SHIMONO Hijiri
Researcher, Research Department

AMENOMORI Hisateru
Researcher, Research Department

KANAYAMA Masako
Section Head, Research Department

NAKAGOSHI Masako
Researcher, Research Department

MURATA Tadashige
Researcher, Research Department

- **National Museum of Ethnology**

10-1 Senri Expo Park, Suita, Osaka 565-8511
http://www.minpaku.ac.jp/english/

MINAMI Makio
Associate Professor

SONODA Naoko
Associate Professor

HIDAKA Shingo
Research Fellow

- **Bijyutsu-in**

50 Nobori-Oji-Cho, Nara 630-8213
Conservation Centre for Cultural Properties in Nara National Museum

MATSUNAGA Tadaoki
General Manager, Laboratory for Conservation of National Treasures of Japan

KAGEYAMA

- **Bunkazaihozon**

50 Nobori-Oji-Cho, Nara 630-8213
Conservation Centre for Cultural Properties in Nara National Museum

TAGURO Tokuichi
President

OHBAYASHI Kentaro
Executive managing director

HOTTA Keigo
Chief

AOKI Keiko

- **Nara University**

1500 Misasagi-cho, Nara 631-8502
Phone: +81 742 44-1251 Fax: +81 742 41-0650
http://www.nara-u.ac.jp/

NISHIYAMA Yoichi
Professor, Department of Study of Cultural Properties

HASHIMOTO Toshinori
SHIMAZU Isao
SAKAI Shunji

- **Archaeological Research Institute of Kashihara and Museum**

  1 Unebi, Kashhara, Nara 634-0065
  Phone: +81 744 24-1101 Fax: +81 744-24-6747
  http://www.kashikoken.jp/

HASHIMOTO,
Chief Researcher

OKUYAMA Masayoshi
Chief Researcher

ONISHI Takao
Chief Curator, Museum

- **Interpreters**

KUROSAWA Ayako
HATA Chiyako

2. Staff Members, ACCU Nara

YAMAMOTO Tadanao, Director
KOMEDA Muneo, Deputy Director
NISHIMURA Yasushi, Director of Programme Operation Department
ISHII Kayoko, Chief, International Cooperation Section

Cultural Heritage Protection Cooperation Office,
Asia/Pacific Cultural Centre for UNESCO (ACCU)
757 Horen-cho, Nara 630-8113

Office Phone: +81-(0)742-20-5001 Office Fax: +81-(0)742-20-5701
URL: http://www.nara.accu.or.jp
E-mail: nara@accu.or.jp