CARE OF PAINTINGS

Dr. V. Jeyaraj

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FOREWORD

Various art forms are the outcome of the expression of enjoyment as well as appreciation of things around an artist. The greater the artist, the finer his creation will be.. Art can be as diverse as the work of the ancient artist who left his drawings in the caves in which he lived, as magnificent as the frescos in the Ajanta Caves or the splendid architectural marvels of Angkor Vat or as incomparable as the Nataraja bronze icon of the Chola period.

The marvellous stone sculptures, the magnificent temples, the wood carvings, the soul stirring wall paintings, metal icons of celestial beings etc., made by master craftsmen with perfection have enriched social life and given a new dimension to our culture. All these have to be conserved for posterity.

The word, 'Care' means taking meticulous care of the art treasures in a museum. Taking care of paintings is very important, as paintings have a very important place in the society. Now-a-days, awareness of the need for preserving our past has considerably increased.

The Chemical Conservation and Research Laboratory of the Government Museum, Chennai is serving the cause of conservation from 1930 onwards. The publications made by Dr. S. Paramasivan, the first Curator of this Laboratory are noteworthy. His work in conserving paintings in India is known through out the world. His research and conservation activities have achieved similar renown. This Laboratory has kept up this tradition of excellent work in conservation.

This book has been written by Dr. V. Jeyaraj, Curator, Chemical Conservation and Research Laboratory of the

Government Museum, Chennai in order to help those who are interested in caring for the painting collections with them. Even though there are some books on these lines, this is a book, which tells about the care of almost all types of paintings available in museums. I hope this will be a handy books to teach about conservation enabling the user to take care of the painting collections.

CHENNAI-600 008
15-3-2002 AD

(Dr.R.Kannan, Ph.D., I.A.S.)

PREFACE

The Chemical Conservation and Research Laboratory of the Government Museum, Chennai is indebted to Dr. F. H. Gravely, the then Superintendent of the Museum for his efforts to establish the Laboratory in 1930 and the hard work evinced by the Curators who headed this Laboratory starting from Dr. S. Paramasivan.

Thiru N. Harinarayana, the then Director of Museums, who taught me the subject of conservation in the Laboratory, was instrumental for starting the refresher course on Care of Museum Objects in 1974. Slowly, this Laboratory started many courses under the patronage of successive Directors and commissioners of this museum and the courses are well received by museum personnel and others throughout India and students from various colleges and universities. It was possible for me to think that the students force can be used to take up conservation work after training them in conservation. Therefore, it was possible for this Laboratory to conduct many courses in conservation for the past 24 years and hundreds of objects have been conserved through the courses while training them.

In the recent years, the Principals of the Government College of Arts and Crafts, Chennai were very thoughtful to send their students to take up project works in this Laboratory and students have found this training meaningful and useful. A student who has got training in this Laboratory will be able to start his own Conservation studio to restore paintings. I prepared a small report on the Conservation of Paintings in 1995 and I wanted to publish it as a book. It was possible to publish it only through the encouragement of the Commissioner of Museums, Dr. R. Kannan, Ph.D., I.A.S., to publish it as a book. I should thank Thiru. K. Lakshminarayanan, Assistant Director and Dr. C. Maheshwaran, Education Officer for their help in the publication of the book. This will be a source book giving information about the types of paintings, techniques, damages, conservation measures to be taken in museums, galleries etc. This is a simple beginning in this direction. Any comments and suggestions are requested to update it in the next publication.

I take this opportunity to thank Ms.Y.A.Divya Durga Prasad, an intern as well as a volunteer of this Laboratory and a research scholar working under me, who helped me to prepare some notes on the history of paintings for an earlier report. I thank my

colleagues Thiru. J. D. Jagannathan, Laboratory Assistant, Thiru. P. Raja BalachandraMurugan, Technical Assistant, Thiru. S. Sampath, Gallery Guard, Tmt. Dally Vergheese, a Volunteer Restorer, in the Laboratory. I extend my gratitude to Thiru. K. Sekar, Curator of the Children's Museum and to all those who helped in this task. The help rendered by Thiru. M. Muthukrishnan and Thiru. M. Girija Shankar of the Photography Section and Thiru. G. Ramesh, Technical Assistant is acknowledged. I extend my thanks to my wife, Tmt. S.R. Hepzibai for sparing me to do the work, my son, J.Abraham Durairaj, who helped me in the scanning of the photographs and designing the wrapper, especially my daughter, Selvi. J. Christy Veda, who helped me in typing the matter for the book and assisting me in proof reading. I will fail in my duty, if I do not thank the printers Smart Fonts, and Mr. K. Kottai Nagarajan who did the DTP work for this book.

Chennai-600 008.
13.03.2002.

(V. Jeyaraj)

CONTENTS

HISTORY OF PAINTINGS

The representation of objects in accordance with their individual nature, movable and immovable, found in the three worlds, is called painting (*chitra*). The art of painting occupies the eighth place in the 64 types of Indian traditional arts. Early man used his home - the cave to express his feelings in the form of paintings. Painting has always been a mean of self-expression of man from days immemorial. Over the centuries paintings along with man have grown from its primitive to the present state. The art of painting can be broadly categorised as follows, according to the period:

a) Prehistoric Art
b) Ancient Art
c) Medieval Art
d) Renaissance Art
e) Modern Art

Prehistoric Art

The art of mural painting is very old, its origin goes far back in the dim, prehistoric past. With its primitive beginnings in the form of hand prints made with liquid colouring matter (such as red earth) on cave walls during the Auringnacian Period at the beginning of the Upper Palaeolithic (about 30,000 B.C), prehistoric painting is seen in its fully developed form as early as the Magdalenian Period (15,000 B.C) in a well-known cave painting of Altamira in Spain and Lascaux in the south of France, depicting animal life and hunting scenes with remarkable liveliness and vigour. The same is found in Indian context.

Ancient Art

The art of painting later developed under various civilisations like Egyptian, Greek, Roman, Early Christian etc.

The Egyptian art of painting on walls and the relief work was prevalent from 3500 BC onwards and were popular during the 16th Century B.C. Egyptian art was a funerary art. The Egyptians painted the outer sides of sarcophagi, representing the deceased with particular effectiveness. The earthenware and pottery were always painted in Greece during the 5th Century B.C. The Greek art extending from

1000 BC to 30 BC included earthenware and pottery painting of high quality as well as wall paintings. Even as early as 6th Century BC, Romans contributed significantly to art, which continued up to 4th Century BC. Their wall paintings were famous and they achieved three-dimensional effect by shading.

In the early Christian era (1st Century A.D), mural paintings were seen on the walls of the communal sepulchres. Wall paintings developed simultaneously with mosaics. This Byzantine art was popular during the 14th Century A.D. in Europe. In the Gothic period (from 10th Century to 14th Century A.D.) miniature paintings and illumination of books and manuscripts were popular in Europe.

Medieval Art

The thousand-year period from the 4th to 14th Century A.D. is known as Medieval Ages. During Byzantine period (6th to 14th Centuries) the art of mosaic painting and iconic painting on wood was popular. In the Gothic period from 10th to 14th Centuries AD, miniature paintings, illuminated manuscripts and beautiful stained glass paintings were done with excellence in Europe.

Renaissance Period

Renaissance period is famous for the flourishing art of painting in different media like fresco, tempera on wood and oil painting which developed under many geniuses like Leonardo, Michael Angelo, Raphael and Titian.

Modern Art

The modern movement of art began in and around Paris during 19th and 20th Centuries A.D. It was a declaration of independence against the strong hold of official academic art. Art movements like Neo Classicism, Romanticism, Realism, Impressionism and Post-impressionism were present in 19th Century. Famous painters during the initial period were Monet, Manet, Lezanne, Vangogh and Gauguin. 20th Century reflected the freedom of the artists to work in a manner consonant with their feelings about a subject. Thus 20th Century saw movements like Fauvism, Cubism, Expressionism, Abstraction, Surrealism and Pop art. Picasso, Braque, Kandinsky and Salvador Dari were some of the leading artists.

History of Paintings in India

In India, a large number of sandstone cave shelters in Central India comprising the States of Madhya Pradesh and parts of Uttar Pradesh and Rajasthan, and a few granite rock shelters in South India especially in Tamilnadu containing prehistoric paintings, have been explored and studied. These paintings also deal with animal life, including the rhinoceros, as well as hunting scenes. The earliest historic paintings with sufficient remains were found at the Ajantha Caves; they were executed over a period of 700 years from 2nd to 7th Centuries AD. Famous murals are also found in the Bagh Caves in Madhya Pradesh, Badami Caves in the Deccan, Ellora in Maharastra, Panamalai, Tiruparuthikunram, Sittannavasal, Thiruvannamalai, etc., in Tamil Nadu. Most of the frescos in India are based on Buddhism and Jainism. The murals at Ellora, Thanjavur, Lepakshi, etc., are based on Hinduism.

From the literary sources, we come to know that other forms of paintings also existed in India. Since, easily degradable materials such as cloth, wood, palm-leaf, bark were used for paintings, the paintings did not survive. Illustrated palm-leaf manuscripts came to being only from 10th Century A.D.

Moghul emperors, inspired by the Persian art, introduced the concept of miniature painting. Even though, this art was in existence since 13th Century A.D, it developed and became popular only in the 15th Century A.D. under the patronage of Akbar. Later, this form of art spread to other parts of India. Rajput School of Art, Rajasthani School of Art, Kangara School of Art etc., were evolved out of it. These miniatures unlike the Moghul art used Hinduism as their main subject, though in the miniature form. The Thanjavur School of Art was patronised by Serfoji, the Maratha ruler. It dealt with not only Hindu themes but also with portraiture.

At the close of the 19th Century A.D., the miniature schools all over India lost their prominence. In the late 19th and early 20th Centuries A. D., there was renaissance through the British Artists and Indian Artists like Raja Ravi Varma who introduced oil painting in

India. The freedom movement led to the rejection of European style and revivalism of Indian Art pioneered by Bengal School. Soon the modern movements took over the Indian Art scene. The modern art in India believed in portraying the common man in a realistic atmosphere. Some of the famous Indian painters are Jaimini Roy, Nandalal Bose, M.F. Hussain, K.C.S. Panikkar.

History of Paintings in Tamil Nadu

The earliest reference of paintings in India belongs to 2nd Century B.C. in Jogimara caves in Madhya Pradesh. How ever, the earliest evidence of mural paintings in Tamil Nadu is found in the caves at Panamalai (7th Century A.D.), Kanchipuram (Late 7th Century A.D.), Sittannavasal (9th Century A.D.), Thanjavur (11th Century A.D.), Tiruparuthikunram (12th Century A.D.), etc., are some of the other important places where wall paintings / murals are seen. The murals at Sittannavasal, Tiruparuthikunram etc., are based on Jain themes where as those at Thanjavur, Kancheepuram etc., are based on Hindu themes.

Painting was not a popular form of art in Tamil Nadu. The Pallavas, the Cholas, the Pandhyas preferred sculptures; The sculptural reliefs were painted. There is an instance of the Chola painting at Thanjavur being covered by a layer of painting by the Nayaks. The Maratha rulers during the 17th Century A.D. introduced Thanjavur panel painting. This is infact, a renaissance for the art of painting in Tamil Nadu. S. Dhanapal, K. Srinivasalu, R. Krishna Rao, C.J. Antony Doss, A. Alphonso, R.B. Bhaskaran are a few artists from Tamil Nadu to mention here.

ANCIENT LITERATURE ON PAINTING

There is a beautiful ancient story, which is given in the '*Chitra Lakshana'* of Nagnajit, that tellls about the origin of the art of painting. *Chitrasutra* in the *Vishnudharmottara* is the earliest and standard text in India. *Ashtadhyavi*, *Natya Shashtra*, *Meghdoot* and *Raghuvansha*, *Kamasutra*, *Kadambari*, *Daskumar Charit*, *Tilak Manjari*, *Katha Saritsagar*, *Naishadh Charit* are some of the literary works on the art of paintings. *Shilpa Ratna* by Shri Kumar of Travancore is a 16th Century treatise. The *Shiva Tattava Tatnakara* is scripted in *Kannada* language. Some other important south Indian art texts are *Abhilashitarthachintamani (1129 AD)*, *Sivatatvaratnakara*, *Silparatna*, *Naradasilpa*, *Sarasvatisilpa* and *Prajapatisilpa*. Most valuable materials on the classifications of paintings, painting materials, merits and demerits in painting as well as practical hints, which are very useful to painters, are dealt with in the *Chitrasutra* of the *Vishnudharmottara*.

The colours, either of vegetable or mineral origin, were *gairika* (red), *nili* (blue), *sudha* (white), *kajjala* (black), *haritala* (yellow). *Vajralepa* and *riryasakalka* were animal and vegetable binding media respectively for the colours. Indigo has been used extensively for blue. It is obtained from the leaves of Indigo plant (indigofera tinctoria). Indigo is an unreliable pigment but a very permanent dye. The methods of preparation of various natural pigments and dyes are mentioned in ancient literature.

HISTORY OF CONSERVATION

Man's feelings were expressed in the form of drawings, paintings, symbols, etc., before he learnt to speak and read. He started drawing with coal, minerals and natural materials like leaves and parts of plants. Finally, paints were made and used in the execution of paintings. Various forms of art developed and they were exhibited on temple walls etc. Most of them were destroyed by the ravages of time and some are in existence. The Archaeological Survey of India, State Departments of Archaeology and similar institutions such as the National Research Laboratory for Conservation, Lucknow, INTACH try their best to preserve the existing wall paintings. Nowadays, large museums are equipped with conservation laboratories, which take care of the paintings under their control. Government Museum, Chennai, a multidisciplinary museum comprising sections like archaeology, anthropology, botany, chemical conservation, children's, contemporary art, education, geology, numismatics and zoology takes care of various types of paintings.

The Chemical Conservation and Research Laboratory of the Chennai Museum caters to the needs of conservation of mainly art objects. It has involved in the conservation of paintings right from its inception. Recently, this Laboratory has widened its scope by taking up projects. The painting collection comprising of about 1200 paintings in the art section, of which 300 are in need of conservation. Though, expertise and facilities for the conservation of paintings are available, the conservation of all the paintings could not be taken due to lack of manpower. With the help of art students from the College of Arts and Crafts, Chennai, some of the works have been undertaken and are being completed since the past three years.

Historical Development of Conservation in India

The first museum conservation laboratory was established in Berlin in 1880 by the State Museum. In the beginning of 20th Century the British Museum Laboratory was established. The conservation branch of the Archaeological Survey of India was established in 1917 in Dehradun for the conservation and preservation of archaeological antiquities and mural paintings. S.Paramasivan was the first

archaeological chemist to be appointed in the Government Museum, Chennai in 1930. He was involved in the treatment of bronze icons. Subsequently, at the request of the Archaeological Survey of India, he engaged himself in the conservation of wall paintings at various places in Tamil Nadu.

National Museum, New Delhi, established its conservation laboratory in 1950. Indian Museum, Calcutta and Salar Jung Museum, Hyderabad, concurrently started their respective conservation laboratories in 1960. It is needless to state that in recent years there has been a rapid growth in conservation awareness in India. National Research Laboratory for the Conservation of Cultural Property (NRLC) was established in 1979 at Delhi and was later shifted to Lucknow and it caters the national conservation requirements and carries out research programmes in the conservation of cultural property. Its branch, the Regional Conservation Laboratory was established at Mysore in 1987. Recently, INTACH (Indian National Trust for Art and Cultural Heritage) has started conservation laboratories in Bangalore, Bhubaneswar, New Delhi, Jodhpur, Lucknow, Rampur, Trissur etc.

Today, there are over 50 conservation laboratories in India. Very few galleries have conservation studios exclusively for the conservation of paintings. They are the National Gallery of Modern Art, New Delhi and Victoria Memorial Hall, Kolkata; National Museum, New Delhi; Government Museum and Picture Gallery, Baroda; Indian Museum, Calcutta; Salar Jung Museum, Hyderabad; Government Museum, Chennai are some of the museums, which have conservation laboratories for the treatment of paintings. All the conservation laboratories of the Archaeological Survey of India, National Museum, New Delhi, National Research Laboratory for Conservation of Cultural Property, Lucknow and INTACH are actively involved in the conservation of mural paintings.

Some of the State Departments of Archaeology, notably those of Andhra Pradesh, Karnataka, Tamil Nadu, Madhya Pradesh, Rajasthan and Sikkim have monuments with mural paintings under their control.

The Birla Archaeological and Cultural Research Institute, Hyderabad has a laboratory, which is also doing conservation work in collaboration with government agencies.

The INTACH Conservation Centre, which was opened in Lucknow few years ago, has been now redesignated as the Indian Conservation Institute. It has senior conservation experts retired from government service. At present it is training young people in conservation of paintings and other antiquities. There are regional centres in New Delhi, Bhubaneshwarar, Rampur, Bangalore, Trissur etc.

Government Museum, Chennai is at present involved in all types of conservation activities. This Laboratory has been involved by the Hindu Religious and Charitable Endowments Board of Tamil Nadu to examine wall paintings at temples in Tamil Nadu under its jurisdiction. The Laboratory started internships for those interested in conservation for one year. Two research scholars, who have registered for the award of Ph.D. Degree under the University of Madras, at present working on conservation of paintings.

CHEMICAL CONSERVATION AND RESEARCH LABORATORY OF THE GOVERNMENT MUSEUM, CHENNAI

Dr. F.H. Gravely, who was the Superintendent of the Chennai Government Museum from 1920 to 1940, was to a great extent responsible for establishing and developing the research activities of this great institution, and giving it a place among the great museums of the world. The Chemical Conservation and Research Laboratory of the Government Museum, Chennai owes its inception to his scientific vision and forethought.

With the invaluable collection of bronzes at the Government Museum, Chennai, a need was felt to treat the bronze icons disfigured by corrosive crusts. This was done in order to expose the decorative details and to eliminate bronze disease, which led to further deterioration. It was by then decided to set up an electrolytic reduction equipment. In 1930, Dr. S. Paramasivan was appointed as the first Curator of the Chemical Conservation Section of the Museum.

The Chennai Museum was also of help to the Archaeological Survey of India. In 1935, Mr. J.R. Blakiston, who was then Director General of Archaeology in India, requested Dr.F.H. Gravely, the Superintendent of the Government Museum, Madras, to spare the services of the Museum Chemist to examine and report on the condition of the Ajantha like paintings in the Brihadisvara Temple at Thanjavur and to preserve the paintings at Sittannavasal.

Though the subject did not come within the purview of the museum, he realised the peculiar circumstances and co-operated fully with the efforts of Mr. J.F. Blakiston.

This was the starting point for a general scientific survey of mural paintings. This Laboratory was the first to conduct a scientific survey and publish the results in leading scientific journals. In 1943, and at the request of the Archaeological Survey of India, another fresh survey of the condition of some of the important wall paintings was made by Dr.S. Paramasivan. It may be of interest to know that the

preliminary work done in the Chennai Museum as early as 1935, was the basis for the systematic treatment of Thanjavur paintings, which was undertaken by the Department of Archaeology in 1946. Many succeeded him and continued the work in this laboratory.

Then, Mr. N. Harinarayana was appointed as Curator. He went to France on a French Government Fellowship for training in restoration of paintings at the Laboratory of the Louvre Museum, Paris.

The new building of the Laboratory of the Government Museum, Chennai was updated in all respects and opened formally in September 1963 by His Excellency Shri Bishnuram Medhi, the Governor of Tamil Nadu. New equipment for conservation of all types of antiquities and conservation research were acquired.

During the seventies, the Chemical Conservation and Research Laboratory of the museum came to be increasingly associated with the task of helping with the conservation of important art treasures outside its collections while continuing to look after the regular work of conservation of its in house objects in the Museum. The earliest of such tasks on preservation of paintings was the treatment of 14th Century Hoysala paintings in the Venugopala Shrine of the Srirangam Temple. This was carried out in 1972 and Thiru. N. Harinarayana not only treated those paintings but also studied the paintings in other parts of the same temple and prepared a detailed report on the action to be taken to preserve them. Other conservation activities included the conservation of the badly affected paintings on the walls around the Golden Lily Tank in Madurai Meenakshi Amman Temple, treatment of 68 discoloured prints in the Raj Bhavan, Chennai, the restoration of 12 oil paintings of the British Governors of Chennai previously kept in the Rajaji Hall, were some important pieces of work. Thiru. S. Thangavelu succeeded Thiru. N. Harinarayana as Curator of the Laboratory and continued conservation work.

Conservation Consultancy Services

When the author took charge of the Laboratory in 1978, he assisted Thiru N. Harinarayana in the restoration of 68 paper prints from Raj Bhavan, Chennai. Subsequently, in 1979 the British oil

paintings at Madras Medical College, Chennai, and British oil paintings at Government Museum, Pudukkottai were suitably restored and displayed at the respective places. Up to the 90s, this Laboratory was extending conservation services free of charges with the materials supplied by the institutions or individuals who sought the help of the laboratory on restoration of paintings etc. From 1995 on wards, consultancy services on charge basis have been undertaken.

In 1994, the author received the Nehru U.K. Visiting Fellowship and studied at U.K. the Current Policies and Practices in UK Museums, including the treatment of paintings. In 1996, the Hindu Religious and Charitable Endowments Administration requested the services of the Laboratory to study the mural paintings at Chitra Sabha and give a report and accordingly a conservation report was sent to the department for execution. In the later part of 1996, similarly at the request of the same administration Arulmigu Nachiar Koil, Srivilliputhur wall paintings were examined and conservation report was prepared.

In the meantime, conservation services were extended to the Prince of Arcot, Thiru. Mohammed Abdul Ali; M/s Hotel Connemara, Chennai; Thiru. Chellapillai, Chennai; Thiru. S.Raghavendra Rao, Chennai; Thiru. D. Thamani, Chennai; Prof. Krishna Rao; Selvi. P.S. Lakshmi Ratton; Tmt. Srimathi Mahesh of Values Art Foundation; Presidency College, Chennai and many more in this line. There is a great demand for the services of conservation and the Laboratory strives to extend facilities to all.

Reports Prepared on Conservation of Paintings

The Curator of the Chemical Conservation and Research Laboratory inspected many sites and organisations and prepared conservation reports on specific issues. Some of them are:

1. Conservation of the Paintings of the Chitra Sabha, Courtalum.
2. Preliminary Report on the Conservation of a Thanjavur Painting.
3. Report on the Suggested Conservation of Wall Paintings at the Andal Temple at Srivilliputthur.

4. Report on the Conservation of Oil Paintings of the Madras Christian College, Tambaram, Chennai-600 059.
5. Report on the Restoration of Railway Map Showing Madras Presidency, Southern Railway, Chennai.
6. Report on the Restoration of an Oil Painting from Government Ophthalmic Hospital, Chennai.
7. Report on the Restoration of an Oil Painting, Dr. Pandalai.
8. Report on Suggested Restoration of an Oil Painting of Mr. R. Viswanathan, Chennai.
9. Report on the Restoration of two Thanjavur Panel Paintings at the Madurai Meenashi Temple.
10. Report on a Thanka Belonging to Mr. Damani.
11. A Preliminary Report on the Restoration of Wall Paintings in the Athmanathasamy Temple, Avudaiyar Koil.
12. Restoration of Paintings in the Government Museum, Pudukkottai.
13. Restoration of Two Photographic Paintings of Thiru. Srikandeswaran, Shenkottai, Tirunelveli District.
14. A Report on the Paintings in the Possession of the Regional Centre of the Lalit Kala Akademi, Chennai.
15. Report on the Conservation Treatment of Paper Prints of Mr. C.D.Gopinath, Chennai.
16. Recently the Curator along with the students of the College of Arts and Crafts, Chennai went to Arulmigu Devarajasamy Temple, Kanchipuram and examined the wall paintings and report was sent.

PREVENTIVE CONSERVATION OF PAINTINGS

Introduction

Safeguarding cultural objects, especially paintings are very important and it is not only the duty of the government, but also of individuals. There are various categories of paintings. They may be classified material wise, region wise etc. Paintings behave differently in different environments and an individual who is interested in their preservation should know all the factors relevant to their preservation. Every one must have awareness about the cultural heritage and their preservation measures. There are different terms of preservation. I shall try to explain the different terms to you so that the terms can be understood. These tips will be helpful to those who are interested in the preservation of paintings for the posterity.

Museum

Museum is a non-profit making permanent institution in the services of the society and of its development, open to the public, which acquires, conserves, researches, communicate and exhibits for purposes study, education and enjoyment of material evidence of man and his environment (ICOM). But nowadays, it makes profit for its sustainability.

The sources of the paintings in a museum or gallery are varied. The objects may come to the museum through purchase, gifts, transfer, loan, bequest, confiscation, transfer etc. Once the objects were taken care of by their own environment / owners; when they are brought to the museums, a very few members of staff manage a large number of objects.

Preservation

Preservation is a common term, which is quite often used by every body who are interested in art and cultural objects. The main duty of a museum is preserving the past materials used by the man. Preserving the past is the slogan of every museum personnel starting from a Curator to a watch and ward. The museum profession is there fore different from any other profession as every body contributes equally to the preservation of cultural property. Museums preserve

the cultural heritage by providing them protection from the damaging environmental factors both of nature and man, making duplicates like models, photographs-black and white, colour, slides, digital records, holograms etc., conserving them, restoring them etc.

Conservation

All forms of direct and indirect actions aimed at increasing the life expectancy of (an) undamaged and or damaged element(s) of cultural property are termed as *conservation*. All forms of direct action aimed at enhancing the message(s) carried out by (an) damaged element(s) of cultural property is termed as *restoration*.

There are three types of preservation work in a museum. They are:

1. Preventive Conservation
2. Curative Conservation and
3. Restoration

1. Preventive Conservation

The collection in a museum can be divided into three categories sound, stable and some are damaged. What ever may be the condition of the objects, preventive conservation is essential. A team of people in a museum / gallery may do this. Preventive conservation is all forms of indirect action taken to increase the life expectancy of any painting.

2. Curative Conservation

In a museum or gallery about 2% of the collection may be in a bad state of preservation and therefore they are in need of curative conservation. When a unique piece is actively damaged, it needs curative conservation. It is an urgent and vital process to be carried out by a trained conservator / restorer. If the curative conservation of certain objects is not carried out, then the objects may completely deteriorate beyond restoration. Curative conservation is all forms ofdirect action taken to increase the life expectancy of a painting.

3. Restoration

About 10% of the objects in the collection of a museum are in a damaged condition. There may be some loss in the object. How ever, even though the objects are found damaged, they may not

deteriorate the objects. The priority of the treatment is secondary. A trained conservator-restorer may do the restoration when he finds time for the restoration. Some objects are in need of only conservation. Some objects are in need of restoration. There are objects, which are in need of both conservation and restoration.

The message from an object should be communicated to the onlookers and also the objects should be protected. The Curators of the collections in a museum are not much aware of the damaging factors of the objects / artefacts. There are very few cases, where objects are miraculously protected without the help of any direct or indirect action. If the Curators discuss the problems with the Conservators, a majority of the objects will be better preserved.

Life Expectancy of an Object

Every object has a life span. This is called the life expectancy of an object. The physical integrity of the object is 100% at the time of its creation. The time taken to completely disappear is also called the life expectancy. For example an iron object at the time of its making has 100% physical integrity. When it completely corrodes, there is no metal core but the form of the object is maintained. Even though there is deterioration, the life expectancy is maintained further.

Adopting any method, which can increase the life expectancy of an object, is the job of a Conservator or any body who is involved in the preservation of our cultural heritage. In order to increase the life of an object, one must know the life history of the object. Before an object comes to the museum, it has experienced various environments. An individual or a group of people would have used the object before it reaches the museum. There are a lot of differences in the type of attention given to the object at these places. There fore proper care should be taken to increase the life of the object in the museum.

Any painting, which comes to the museum or gallery, is quite often found in a deteriorated condition. The aggression due to nature and human beings is high. In order to control the deterioration of a painting,

1. We must be aware of the factors of deterioration or dangers.
2. The museum personnel should be competent to handle the problems and
3. The Conservators-Restorers and the museum staff should be good communicators.

By the application of the above three acts, the life expectancy of an object can be extended, reduced or will reduce at the rate at which it originally deteriorates.

Aggressions to a Painting

The aggressions, enemies or the deteriorating factors of a painting can be natural or man made. They may be by the environment, building, visitors and or staff. The natural aggressions may lead to immediate destruction or progressive destruction.

Immediate Destruction

Immediate destruction to a painting may be brought about overnight by insects, flood, fire, earthquake, theft etc. In certain cases nothing will be left out and in others only traces will remain.

Progressive Destruction

Progressive destruction is also natural one. This is brought about by environmental pollution due to air, dust, moisture, heat, light, micro organisms, wind, salt and intrinsic factors like chemical changes within the material, physical changes etc. This is slow and invisible till the object is almost completely damaged. Light levels should be controlled by modern lighting. (See Colour Plate No. 1 and 2 on page 119).

The man made aggressions are classified as public aggressions and professional aggressions.

Public Aggressions

The public aggression is due to unawareness of the custodians as well as the visitors. They are such as vandalism (See Colour Plate No. 3 on page 120), theft, war, bomb blast, religious fanaticism, terrorism etc.

Professional Aggressions

The aggression due to the professional mishandling of the paintings is called professional aggression. This is due to the lack of awareness, planning, training, security, control and improper execution of curative conservation, restoration or transport, storage, exhibition, support, lighting, handling, maintenance etc.

Strategy for Preventive Conservation

For better conservation of the cultural property such as paintings, a systematic strategy is to be adopted. There are seven steps for preventive conservation. They are:

1. *Know* the collection of paintings
2. *Categorise* and *identify* the aggressors
3. *Avoid* the aggressors
4. *Block* the aggressors
5. *Check* or *monitor* the aggressors
6. *React* against the aggressors
7. *Communicate.*

Even after taking the above preventive measures, if the cultural objects deteriorates, conservation experts may be consulted. Training for preservation of cultural heritage is being conducted by museums. Adequate training may be given to those who are in charge of the collections.

Preventive conservation is a must for any object on display, transit or storage. Preventive conservation does not require any specialisation in the subject to handle. Anybody can handle preventive conservation. There fore, it is imperative to know the basic principles of preventive conservation by those who are interested in the preservation of paintings and other antiquities for the posterity. This is the duty of all those who are connected with the preservation of cultural, natural and art heritage.

ROCK ART OR ROCK PAINTINGS

India is rich in natural, cultural, art, archaeological and architectural treasures. The art of rock painting dates back to the Mesolithic Period (10000-3000 B.C.). India is considered one of the richest centres of rock art in the world. India has over 1500 sites with nearly 2500 painted rock shelters located in different parts of India. Tamil Nadu has many sites of rock art and there are more than 500 rock arts. Many new sites have been discovered by scholars in various places in The Nilgiris, Vellore, Villupuram districts in Tamil Nadu. The first discovery of rock art in India by John Cockburn and Archibald Carlyle goes back to 1887 AD. This rock art of India has posed complicated problems of preservation. In order to elucidate the causes of deterioration of this rock art, the techniques and materials used have been studied by carrying out a detailed examination of several typical sites and intensive laboratory investigations of representative samples of rocks and pigments.

Rock Art

Technique

Rock arts are located in those regions of the Indian sub-continent, which abound in sandstone, quartzite and granite. Rock paintings on limestone have not come to the notice. The paintings are painted on vertical or near vertical rock faces or on the under surface of projecting or over hanging rocks. The painting technique is often the wet colour technique. The colours used for rock drawings were white with yellow, hematite red in various tones or black. The paintings do not have any base other than the rock. In fact no attempt was made to dress the rock, which was neither plastered nor primed before painting. The pigments have gone straight on the rock surface.

The in-organic natural pigments (earth colours) have been used in liquid form. The earth colours were the residual products of

weathering of the rock. They are either red ochre or hematite. The examination of the white pigment has not proved lime or gypsum. But it is found to be white clay. Due to the long period of the paintings' survival it can be presumed that water was the medium used for the pigments and it is probable that the slow action of water on the siliceous rock resulted in the formation of colloidal silica and the latter produced an imperceptible layer on the pigments, thereby fixing them firmly to the rock, and rendering them immune to the solvent action of water.

Damages

Because of geographical location and easy accessibility, quite a large number of rock art sites in India are under constant danger of being wiped out for ever, due to increasing human activity and changing environmental conditions. At such sites, one may see people attempting to scribble over the rock surface and thereby defacing the rock art. The most important causes of deterioration, which have determined by the study of the three elements of the paintings are the following:

1. Weathering of rocks resulting in splitting, flaking or spalling.
2. Formation of salt on the painted surfaces.
3. Due to the seepage of water formation of microbiological growth such as moss and lichen (See Colour Plate No.4 on page 120). and thereby the damage.
4. Formation of mud-nests and thereby the degradation.
5. Erosion by flowing of water and sand blasting by winds.
6. Fading of pigments due to insolation and loss of colours due to leaching by rainwater.
7. Accretion of dust, dirt, cobwebs and soot.

Conservation

The following steps may be taken to preserve rock art:

1. General cleaning and removal of dust and dirt.
2. Removal of microbial growths.
3. Consolidation and application of surface coating.

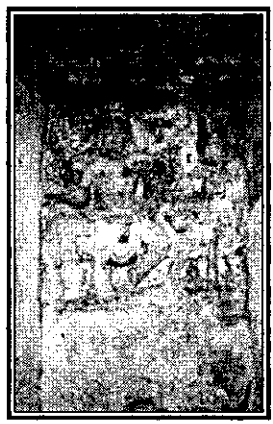
Whenever any conservation work is to be under taken it is advisable to document the paintings properly. Photography of different types, videography, line drawing etc., may be done to document the rock art. Cleaning may be done with solvents such as toluene, methanol, acetone, ethoxy ethanol, diethyl ether, ethyl methyl ketone, petroleum spirit, ethylene glycol. The sooty accretions may be eliminated by using triethanolalmine-ethyl alcohol mixture in the ratio 1:20. Microbiological growth such as algae, lichen etc., may be eliminated by using aqueous or alcoholic ammonia. If there are any stains, they may be removed with the help of hydrogen peroxide. The weakened painting may be consolidated with the help of 5% solution of poly vinyl acetate in acetone or toluene. Many are working on Rock Art. There is a Society called, Rock Art Society of India, in Agra, which is devoting a journal for Rock Art.

WALL PAINTINGS

Wall paintings, as the name cannotes, are executed on the wall. They are also called *Murals* in short. The paintings are executed on 'muir' i.e. wall. The wall can be that of a cave, a cliff, any stone structure or the wall of a building.

Types of Wall Paintings

There are three types of wall paintings. When wet plaster is used to create a painting and the nature of lime wash is used to create a natural colour with out an organic binder the painting is said to be *fresco buono*. The pigments are fixed to the ground by the carbonation of the slaked or hydrated lime and forms insoluble carbonate.If it is drawn on a dry wall, it is called *Fresco Secco.*



A Damaged Wall Painting

Preparation of the Ground

The wall must be plastered with lime mortar. The conch-shell lime ash is mixed with some kidney bean and molasses in the ratio 4:1. Then sprinkling little molasses diluted with water and sand is added to this in the ratio 4:1 with lime. This is mixed with banana and *Kalagni* pulp in the ratio 4:1 with the lime. The lime preparation is put into a tub and thoroughly pounded. After three months, this should be placed in a stone vessel and ground into a paste as soft as butter by adding a little molasses. Molasses should be applied on the wall 12 hours prior to the application of lime plaster. Then the lime paste is applied on the wall with the help of a trowel and evenness is achieved.

The lime-plastered wall should be primed with a paste prepared of conch-shell or white clay, the urine of elephants and *nimba* (azadirachta indica). The ground is made smooth by the repeated application of the bark essence of *Sakhotaka* (trophis aspera) or that of the leaves of *Ketaki* (pandunus odoratissimus). The lime powder is made as a paste with tender coconut water and mixed with hot water and applied on the ground to achieve the smoothness.

The wall was prepared as above. In most of the cases, wall paintings were executed on the mud walls, strengthened with mud plaster mixed with husks, grass etc. The artist painted only after the mud plaster and the lime were dried. The technique of painting on a dry surface is called *fresco secco*.

Technique

The mural painting is composed of various layers as follows:

1. Carrier
2. Ground and
3. Pigment

Carrier

The surface on which the painting was executed i.e. the inner surface of walls, ceilings of caves and buildings etc., was chiselled and rough tooled to have a coarse and uneven finish.

Ground

In wall paintings, the ground is usually a thick layer of uneven surface of mud (or lime plaster) usually of organic matter like vegetable fibres, husks, rock grit and sand ground with water. This was mixed together and applied as the first layer. The second layer comprised of a thin layer of mud plaster, ferruginous earth etc. This formed a smooth surface, which was used for paintings.

Pigments

Different pigments (earth colours) were used. They were yellow, red, black, green etc. They were primarily of mineral origin. They were also from plants and animals.

Deterioration and Their Causes

Cracking, flaking of paint layer, cleavage of the paint layer, abrasion, physical damage by mishandling and vandalism are some of the deteriorations on the wall paintings. There are variations in the humidity and temperature, deposition of particulate matter such as dust, soot, smoke, tarry and greasy matter due to burning of lamps, camphor etc., atmospheric pollutants such as oxides of carbon, sulphur and nitrogen, biological growth and droppings of birds and bats, insect

nests, seepage and leakage of water, salt action, cracks, in the building etc. Disintegration of the binding medium, pigments, chemical changes in them, expansion and contraction in all the layers etc., are the causes of deterioration within the painted layers.

Cleaning of Wall Paintings

The accumulated dust should be brushed off using a soft brush like squirrel hairbrush. The accretions, if any, may be removed by gentle abrasion; the salts formed on the painting may be removed by scraping or using a moist blotting paper. Mechanical means as well as mild acids should remove the patches of white washings. The biological growth should be removed mechanically and then gently brushed with a soft brush. Grease, oil etc., are removed by using 10-20% aqueous ammonia or 10-20% N-butylamine in water. Any wax coatings or splashes can be removed with the help of tri-chloro-ethylene or carbon-tetra-chloride. For the removal of soot, tri-ethanolamine is first applied on the affected surface and allowed to stay for 15 to 20 minutes to react, at the end of which the area is cleaned with cotton swabs soaked in toluene. The excess of tri-ethanolamine is removed with toluene. For the removal of varnish, solvents like acetone, amyl acetate, cellosolve, diacetone alcohol, N-butyl and iso butyl alcohol, ethylene dichloride etc., have been found to be useful; mixtures of these solvents in suitable proportions often have proved much more effective than single solvents.

The solvent / solvent mixture is first applied over a small area with a brush and after allowing a few minutes for reaction, the dissolved varnish is removed by gently swirling cotton swabs, soaked in a solvent, over the area. The swabs have to be rolled in a way that the dissolved varnish is lifted out and not rubbed into the pores of the paint layer. If there is any indication that the solvent action has proceeds too far i.e. if there are signs or traces of pigment coming on to the swabs, the action has to be arrested by immediately flooding the area with a restrainer such as turpentine.

In some cases the overlying plaster layers have been separated by conservators revealing the layer of painting beneath carefully. (See Colour Plate No. 5 on page 121).

PAINTINGS ON CANVAS

Fabrics such as silk have been used in the Orient since ancient times as supports for a painting in ink and watercolour. Many fabrics have been used as painting supports, which are grouped under the traditional description of 'canvas'; linen, in a variety of different weaves (which may have a distinct effect on the appearance of a picture) had been most widely used, but cotton, hemp and even silk are sometimes found. Today artists chiefly use cotton, linen and a few of the synthetic fabrics. The suitability of a fabric for use as a painting canvas depends on its ability to be stretched taut and to maintain tension. If tension is lost, the stability of the more brittle paint and ground layers is threatened. The wooden strainer or stretcher upon which the fabric is mounted maintains tension. A strainer has rigidly jointed corners and cannot be expanded, whereas a stretcher has a tongue-grooved corner, which can be tapped-out or in by means of wooden keys or wedges. Other mechanisms for expansion can involve turn-bolts or springs.

Rigid strainers should be replaced, since retensioning of a canvas painting may be necessary, due to fluctuation in relative humidity (R.H). The response of fabrics to varying RH depends both on the tension within them and on coatings, which have been applied to them. A stretched yarn behaves differently to an unstretched one, a sized fabric behaves differently to an unsized one. Given the conditions usually present in canvas paintings (principally due to their traditional preparation with animal glue size) higher RH will generally result in slackening or sagging. Expansion of the stretcher to take up the slack should be carried out with caution, since a subsequent fall in R.H. may mean that the canvas becomes too taut. However, if a canvas is allowed to sag for too long it can deform permanently.

From the mid-fifteenth Century, when canvas supports were introduced into European painting, their advantage over wood was seen to be principally one of lightness relative to size. They were portable and could even, if necessary, be rolled up. A cylindrical roller of the largest possible diameter should be used, one end of the canvas attached to it with tape and the painting rolled around with the painted

side outwards. In addition, tissue or non-stick film should be placed between each successive layer, and the whole assembly wrapped and taped round.

The original size layer and from subsequent support treatments such as lining, encourage the growth of micro-organisms and moulds (See Colour Plate No. 6 on page 121), which attack and weaken the fabric; also drying oils not only embrittle the whole structure but, through their own oxidation processes, promote oxidation and degradation of the fibres.

Damages

Canvases are vulnerable to all kinds of physical impact and stress due to the natural consequences. Holes, tears and dents are common defects. Canvas can be distorted by a label or patch stuck to the back, or by resting slackly against its stretcher. Repeated tapping-out can cause it to tear away from the tacks fastening it in place (a problem often worsened by rust from the tacks themselves) or to tear at the front edge of the stretcher. In association with the cracking of thick ground and paint layers, it can be distorted into a series of saucer shapes known as cupping. Often, cupping is absent in an area where the back of the canvas has been protected by the stretcher; this is the stretcher image and is usually bounded by continuous straight cracks corresponding to the edges of the stretcher bars. Sometimes, bubbled appearance of the paint layer is found which is called blistering. (See Colour Plate No. 7 on page 122).

Relining of Canvas Paintings

Ageing of canvas, tears, brittleness, loss of canvas, flaking, cracking, buckling, wrinkling, separation of the paint layer from the canvas, browning of the varnish are some of the problems encountered.

In case the canvas of a painting is very weak due to ageing, insect or fungal attack, it is necessary to provide an additional support to the canvas to strengthen it. The damaged painting is brushed clean to remove the dust, dirt etc., with brush, removed from the stretcher frame, front faced with tissue paper to avoid any damage to the paint layer. The backside of the painting is cleaned off all dirt and coated

with a molten adhesive (wax-resin in the ratio 3:1). A new piece of canvas similar to the original is coated with molten adhesive (wax and resin in the ratio 3:1). The prepared canvas is placed face to face with the original adhesive coated canvas. Ironing is under taken to adhere the two pieces of canvases. A glass weight is kept and pressed. Moistening and lifting with the help of the finger nails / blunt scalpel will remove the faced tissue. The canvas is stretched on to the frame and nailed using copper nails to avoid corrosion. While nailing cotton tape is run all around so that the tape will guard the canvas and facilitate the removal of the nails without affecting the original canvas. The wax-resin, which has come to the front, is removed and the lost areas are infilled and retouched after drying and smoothening. Varnish coat or a linseed oil coat is applied to the surface. This is called hot relining. (See Colour Plate No. 8, 9, 10 & 11 on page 122, 123 & 124). Damaged paintings after restoration get a fresh look. (See Colour Plate No. 12 and 13 on page 124).

The oil painting should be framed and given a glass front if necessary. When glass front is given, an interspacing is given so that the droplets formed on the glass will not touch the painting. Proper backing is provided either with coated plywood or aluminium sheets.Now a days cold relining is preferred. The canvas is cleaned and coated with Pedicryl in xylene and relined. This is reversible with diacetonealcohol.

Oil Painting on Canvas before and after Restoration

PAINTINGS ON PALM-LEAVES

Palm-leaf was one of the main supports used for writing and painting in the South and South East Asian countries including India, Nepal, Sri Lanka, Burma etc. A part of a 2nd Century A.D. drama illustrated on palm-leaves was discovered in Central Asia. These are perhaps the earliest known palm-leaf manuscripts. Two types of carriers for these types of paintings are mentioned in the ancient literature. They are palm-leaf manuscript and the birch-leaf manuscript.

Technique

The artists of the illustrated manuscript followed the technique of painting presented in the Shilpa texts such as the *Vishnudharmottara, Shilparatna, Manasollasa* and *Aparajitapriccha.*

The tender leaves of 4 -5 weeks old are cut into required size and dried under shade or buried under marshy water. On the contrary, they are boiled in steam or in turmeric solution. Such seasoned palm leaves were inscribed by stylus. Illustrating on palm-leaves was done by incising with a pointed stylus, pen or brush as in the case of paper.

As per the ancient texts the ground was prepared with a coat of clay over which a concoction of ground beans, milk, molasses, ground tamarind seeds, the oily extract of lemon leaves and the seeds of potherb were applied on the carrier. A white paint was applied on the ground applied earlier. Natural pigments were used for illustration. The pigments used mostly were black (lamp soot), red (vermilion or cinnabar), yellow, blue (indigo), grey (palm), green, white (chalk) and their mixtures.

Deterioration

Palm-leaf being organic in nature, its degradation is faster. Various degradations noticed are brittleness, weakening of the leaf, splitting and cleavage of the leaf, warping and distortion, damage by insects and fungi such as tunnelling, sticking of leaves, stain formation, blackening, discolouration, dust accumulation, cleavage between pigments and the leaf, flaking of pigments, fading of pigments and inks etc.

Conservation

Steam percolation is used to separate palm leaves, which are stuck together. Hard and brittle palm leaves are made flexible with a solution of 5% citronella oil in rectified spirit. Broken leaves are restored by lamination between sheets of acid free tissue paper or chiffon. Nepalese tissue with carboxy methyl cellulose (CMC) solution is used to fill holes made by insect attack. Lampblack mixed with essence of *gerkin* (Coccinea grandis - *Kovakkai*-Tamil) leaf is applied on the surface of palm leaf, if the incised writing is illegible.

Storage

Storage of palm-leaf manuscripts may be done by keeping the palm-leaves between two teak wood planks and wound by red linen thread, if available.

PAINTINGS ON BARK

Some of the trees growing in the Himalayas, have layers of barks. Birch bark was commonly used in the earlier days for writing purposes. The earliest Birch bark mannuscript known so far belongs to 2nd or 3rd Century A.D. The Bhoja trees grow at a height of 14,000 feet in the Himalayas. King Bhoja understood the use of barks of Bhoja trees for record keeping in the 17th Century. Paintings are also found on bark.

Techniques

Birch bark is composed of several thin layers of sheets as that of paper. Each layer is naturally adheared by as well as knots. When seperated, it will be like a tissue paper. It is brown in colour. Organic solvents will be able to dissolve the gum. The bark contains about 40% of cellulose. Salts of acrylic acid is also present. It contains about 10% of lignin, which is an unwanted compound as far as the preservation of birch bark is concerned. Painting is done on that keeping it as the support with water based pigments.

Detoriration

Birch bark is multi layered and therefore at high relative humidity, the adhesive property of the natural gum, which binds the layers is detoriarated and layers split. Due to age, the bark becomes stiff and brittle. It becomes brown due to acidity. Dust accumulation makes it dull. Flaking occurs. Stains are formed very easily.

Conservation

Since the paintings are water based, the cleaning should be undertaken very carefully with rectified spirit.

The colour might be lost by wet deacidification with water. Therefore, the acidity can be removed by the use of barium hydroxide in methenol. Cloth or tissue paper support may be provided with the help of 2.5 %. Carboxy methyl cellulose, which contains 0.5% orthophenyl phenol as a fungicide. Lost portions of pigments may be replaced with fresh water colours.

PAINTINGS ON PAPER

The word paper was derived from the word *papyrus*, name of a plant from which paper was made originally. Paper was invented in China. It was made originally form *papyrus*. Barks, hemp, old rags, fishing nets were also used to make paper. It was traditionally said to have been invented in 105 A.D. But not until 751 A.D., did the secret spread to Western Asia and Europe. With the introduction of paper in the 12th Century in India, the illustrations on paper manuscripts of larger format than the narrow palm-leaves began to come into vogue in Western India from the last quarter of the 14th Century. Many paintings done on paper were destroyed due to the highly perishable nature of paper. The use of paper, which could be prepared in sizes larger than palm-leaves, brought about a great revolution in the art of painting. Pen and brush could be easily used on paper as opposed to the use of the iron stylus on palm-leaf. A wider choice of colours was possible and the artist had greater scope to show his skill in presenting fine details. There are paper paintings found in several forms such as the miniature paintings, the scroll paintings, the accordion paintings and the water colour paintings.

Miniature Paintings

Though the paintings on paper were larger than the paintings on palm-leaves, they were still small, almost miniature compared to large canvas paintings. The first stage was to prepare the board. The second stage was to draw the preliminary outline. A thin coating of priming was then applied to the main figures. The next step, second priming of colour similar to the one required finally was used. More layers of print were applied, burnishing being an important step after each stage. Gold and silver foils or rakes were applied at the end.

The Scroll Painting

In India paintings were also done on scroll some times as much as 20-25 metres in length. Some of them were done on paper and given a cloth backing. A water-soluble binding medium possibly gum or glue was used along with the pigments for painting.

Accordion Painting

Accordion paintings were very popular in Thailand. They were done on thick paper joined together and folded like in accordion. The painting was either on one side or both the sides.

Water Colour Paintings

Watercolour paintings are done on paper with transparent wash colours. In watercolours, the pigment is mixed with a very small quantity of gum Arabic or egg white and the painting is done directly on paper that has no ground or priming. It becomes a part of the paper like dye does.

Deterioration to Paper

Cellulose is the chemical compound present in paper. Cellulose in paper is a condensation polymer. The main factors responsible for the deterioration of paper are,

1. Intrinsic Factors and
2. External Factors.

Intrinsic Factors

Acidity is the major deteriorating factor. The acidity in paper is due to the formation of acid with in the molecules. The alum used to size the paper, is hydrolysed and this process increases the acidity of the paper. The *lignin* present in the paper further increases the acidity. The residue of the chemicals used during the manufacture of paper increases the acidity. The cellulose, out of which paper is made, decomposes and increases the acidity.

Environmental Factors

The various environmental factors responsible for degradation are moisture, dust, oxides of nitrogen, sulphur and carbon, biological agents etc., besides mishandling, faulty storage and vandalism. Foxing is the formation of small brown spots, which are due to biological activity as well as due to iror impurity in the paper. The moisture in paper encourages mould and fungal growth and insect attack.

Because paper is naturally highly hygroscopic, atmospheric oxides of sulphur, carbon, nitrogen, hydrogen sulphide and other gases

with water vapour, will be converted to sulphuric acid along with other damaging chemicals and taken into the hollow paper fibres casing them to break down. Ozone is harmful to organic materials, including paper. Oils, fats and minute suspended particles from the atmosphere settle on exposed prints and drawings and find their way into the crevices between the paper fibres.

Photo-oxidation

Photo-oxidation is the greatest danger to watercolours. Many beautiful works have been ruined by the combination of light and atmospheric oxygen. If the colours are not uniformly affected, this will produce an imbalance in the design. Often, old mounts have obscured the edge, where the original freshness may be seen. Inorganic pigments or dyes are much less susceptible to alteration by light than organic ones. However, *vermilion* may blacken and *verdigris*, red lead, the chromates and lead white react with oxygen and other gasses in the atmosphere and darken. Other fugitive pigments and dyes include yellow lake, all the red lakes, cadmium yellow, gamboge, Van Dyke brown and indigo. If storage areas are too dry, gums on watercolours dry out and crack further and the pigments may be lifted from the surface of the support.

Insects and Other Pests

Species of insect do considerable harm to prints and drawings. The larvae of furniture beetles (*Anobium punctatum*) eat the softwood of frame backings and boxes, leaving frass in their wake along with a sticky deposit. They find paper even more attractive. This damage is evident in the common *'wormage'* to be seen as holes in paper supports, upsetting the visual image of the work. Booklice (*Psocoptera*) feed on moulds. Silverfish (*Lepisma sacchrina*) find the sizing agents in paper particularly attractive and can ruin the surface of a print or drawing. *Earwigs* (*Dermaptera*) leave stains from their excrement, as do house flies. In country areas, *thrips* (*Thysanoptera*) enter framed prints and drawings. But they die in situ, leaving small brown stains. The enormous damage that mice do to paper artefacts is well known. (See Colour Plate No. 14 on page 125).

Conservation of Paper Paintings

Conservation of paper paintings is just to enhance the life of the painting. The deteriorating factors can be removed. Foxing marks, brown colour due to acidity, stains, folds, wrinkles etc., should be removed.

De-acidification

When paper paintings are affected by acidity de-acidification is to be carried out. De-acidification is the removal of acidity from paper. This can be effected by dry as well as wet methods. The paper materials are dry de-acidified by keeping them in an ammoniacal atmosphere in a closed cabinet. In case of wet de-acidification, barium hydroxide solution may be applied at the backside of the painting, which neutralises the acid and acts as a reserve against further acidity. Barium hydroxide in rectified spirit is safer in case of watercolour paintings.

Restoration of Paper Paintings

Before starting the restoration of paper paintings one must have simple equipments to go about the fine job. The following are some of them:

Medium weight *kozo* paper, white blotting paper, melinex, silicone release paper, small scalpel, scissors, tweezers, burnisher, small paste brushes, small sable brush, small flat pieces of glass plate, small heavy weights.

Damaged Print on Paper

Restored Print on Paper

A clean, smooth laminated or glass tabletop should be utilised. First, the painting is looked for dirt and dust, which may then be lightly brushed away with a small sable brush, then a plastic eraser (provided the paper is not too soft) may be drawn down and across each edge, from both the front and back with extreme care so that no paper fibre is lost. A small piece of *melinex or cellophane* may be inserted in the tear to facilitate this action. Next, a piece of Nepalese or Japanese tissue paper should be cut with a scalpel, scissors or a wet brush. The later method may be the best, as the edge will be frayed and lie very flat, causing no ridge. This repair patch will be no larger than 1 mm on each side of the tear. The patch is laid out on a piece of glass and pasted. It is very important that the paste be as dry as possible to avoid any movement of water into the paper, which might result in, water staining. Any overlapping areas of the tear may be pasted together in the correct position. The remaining length of tear should be aligned correctly. Using tweezers, the patch should be lifted gently, work is held firmly in place with the left hand and the patch is then placed evenly along the tear, and gently patted to secure lit. A piece of blotting paper is then placed beneath the tear and a piece of silicone release paper above. The patch should then be gently burnished through this to secure adhesion. The silicone release paper should be discarded, then replaced with blotting paper topped with the glass and a weight. The sheet is then left at least for five minutes. Long tears may be dealt with in the same manner, but in stages, as they are difficult to manipulate. Abutting patches should be made.

Any removal of papers, which were pasted and they need to be removed, tweezers may be used. When the paper is removed, it should be seen that the paper on which painted should never be thinned by the removal of the pasted one. In such cases, the adhered paper should be removed very carefully in such a way that the paper should be removed parallel to the surface so that the original painted support will not be damaged.

Stain Removal

The stains may be removed from the paintings by applying a 5% solution of chloramine-T in rectified spirit. This removes even

the brown colour formed by acidity. The pencil marks should be removed before it is immersed in water.

The foxing stains may be removed with the help of oxidising agents like hypo chlorite, chlorine-di-oxide (formed by mixing 5% solution of sodium chlorite with 2% formaldehyde solution in a closed chamber). The paper painting may be kept in a moist environment and kept in the vapour phase in a closed environment of the oxidising agents. The action should be carefully monitored. If the painting is over exposed, then the colour will be lost.

Storage

A suitable storage condition of constant temperature of 20°C to 22°C and a relative humidity of 45-60% in pollution free atmosphere is recommended. It should be seen that proper ventilation and air circulation is available as nitrogen will not harm either the paper or the pigments or the media used. if air-conditioning is not possible. Paper paintings should be periodically fumigated with the help of thymol or para-di-chloro benzene to eradicate the fungal and mould growths. Now-a-days, low nitrogen atmosphere is suggested for eradicating micro-organisms from fragile art and cultural materials.

PAINTINGS ON CLOTH

The creative imagination, evocative and educative power of India's wall painting tradition have also been applied since ancient times to narrative the *Chitrakatha* cloth paintings of the wandering bards.

Cloth paintings were used in several ways. They were used in temples as wall hangings for decoration and religious teaching. Temple cars were decorated with cloth paintings. The cloth scroll painting served as illustration by showmen during the narration of religious or heroic tales.

After the advent of canvas, cloth was used among the modern painters rarely and only as an alternate medium. Many folk arts are done on cloth. *Madhubani* paintings, *Warli* paintings, *Kalamkari* paintings, *Batik* art etc., are some of the paintings executed on cloth. The various types of cloth used are cotton, linen, silk, jute etc. In moist conditions, paintings on cloth are very badly affected by fungi. (See Colour Plate No. 15 on page 125).

KALAMKARI PAINTINGS

Kalamkari, literally means-done by pen (Pen work). The art of painting on cloth with dyes is found in Gujarat, Andhra Pradesh and Tamil Nadu. The technique is a painstaking process using natural - vegetable and mineral dyes. Though Masulipatam work is also referred to as *kalamkari*, it is strictly not pen work, for the outlines and main features of all the designs are printed with hand carved blocks, which are used repeatedly for years. The *Kalamkari* paintings of Kalahasti are painted temple hangings while the Masulipatam block-printed fabrics have little religious association.

Kalamkari Painting

Technique

Cloth is nothing but cellulosic material obtained from plant and woven into required size. The technique of *Kalamkari* painting is painstaking. A cloth is applied with a mordant-a substance, which combines chemically with dyestuff to form an insoluble material, which clings firmly to the fibres of the cloth. This gives a printed canvas-like surface. A pointed pen draws the contours and a round pen fills in the colours. Strictly, only this kind of work qualifies as *kalamkari* painting. The dyes used are both vegetable and mineral dyes.

Damage

Paintings on cloth are affected by insects, pests and micro-organisms like fungi, beetles etc. Fading, staining, loss of materials and mechanical damages are common. Natural pollutants in the atmosphere cause acidity in paintings leading to browning and finally to brittleness of the thread. Cloth being a good water absorbent, absorbs the acid dissolved in the atmosphere and becomes acidic.

Conservation

Fumigation is first carried out with thymol and paradichloro benzene. Acidity is then removed with the help of ammonia fumes. Small tears are mended by different methods of darning using threads weaker than the cloth. Holes are mended with strip / spot lining with fabric. The fabric has to be of similar weave count as that of the original painting and dyed using natural colours. In some cases when the painting is in an extremely weak and fragile condition, darning is not advisable. A concentrated solution of 20-25% poly vinyl acetate in acetone or Paraloid B 72 is used as an adhesive to carry out spot / strip / total relining.

BATIK ART

Batik art is a resist process, in India has sufficiently age-old roots. Even the prehistoric man was aware of this process and had been using bees wax, as well as, the animal fat over rock paintings. This process may be called as painting on hard surface. This art is currently done on cloth.

Technique

Tracing of the designs is made on the cloth distinctly. The portions of the cloth to be kept white in the painting are then covered with the molten bees-wax and praffin wax mixture. Care is taken to see that the wax does not spread beyond the traced boundaries. If first waxing is not enough, the process is repeated on either side till the surface really becomes resist proof. The whole painting is dipped in a dye of the lightest shade. The cloth is then dried in a shady place so that the wax already applied in the first phase does not melt in the sun. The process of second dyeing with a darker shade is then under taken in a similar manner. Here the molten wax is applied only to protect the portion, which has already been dyed. After the dyeing is complete, the wax is removed from the fabric by rubbing the painting with hands and then boiling in water. The painting is then washed and ironed. If the same drying process is mechanised, it is called calendering. Dyes are both vegetable and of animal sources. Mordents are the fixtures to the cloth and they are alum, chrome, iron and tin. Currently synthetic dyes are commonly used.

Damages

Batik paintings are damaged by micro-organisms due to moisture. They become brittle due to ageing and acidity. Accumulation of dust and formation of creases are dangerous to these types of paintings. Water stains are also possible. It tears along the creases, if the creases are not removed.

Conservation

Batik painting may be fumigated in a fumigation chamber if fungi (thymol) and insects (para di chloro benzene) have affected them. In case there are stains, the stains may be suitably removed using the

appropriate solvents. This is possible as the dyes are fast. Blood stains may be removed with hydrogen peroxide. Iron stains are removed with the help of oxalic acid solution. Water stains may be removed by immersing it in distilled water. Oil or grease stains may be removed by benzene. The natural browning may be removed by deacidification using liquid ammonia. The batik paintings may be kept framed or rolled, keeping acid free tissue paper as an interspacer.

PICCHAVAIS

Calligraphic art in both the Islamic and Hindu traditions was closely tied to religion. The Picchavais belong to the larger category of pigment painting on cloth.

Technique

The cloth is starched with wheat paste to prevent colours from bleeding through the material and running together. A broad brush of goat hair is used for painting large areas and a thin brush made from the hair of the tails of squirrels is used for the detailed work. Originally mineral and vegetable pigments were used. After the initial colouring, the surface is burnished by laying the paintings face down on a smooth rock and rubbing the reverse side with an agate stone. Detailed work is done only after this. Touches of gold and silver are generally used only as accents. However, there are several hangings in which gold is the predominant colour. Present day artists have switched over to synthetic pigments and dyes.

Damages and Care

Since the Picchavas are on cloth, it is affected by fungi, acidity and brittleness. Since wheat paste is used, the flaking is also be possible. The painting should not be folded. It should be hung.

PURIPAINTINGS OR PATTACHITRAS

Orissa has an art tradition from 6th Century A.D. as witnessed from the earliest wall paintings on the caves of Khandagiri and Udayagiri and Sitabhinji murals. Puri paintings are one of the India's oldest popular iconic traditions.


Pattachitra on a Palmleaf

Puri paintings are otherwise called as *Pattachitras*. The earliest indigenous paintings from Orissa are the *Pattachitra* done by the *Chitrakars*. The word *patta* is a Sanskrit word meaning canvas and *chitra* meaning picture. It is associated with the regional cult of Jagannatha, a manifestation of the god, Vishnu found at the ancient pilgrimage centre of Puri, Orissa. The themes are religious and mostly portray stories from *Mahabharata, Ramayana* and legends concerning Radha and Krishna, Lord Jaganath etc. They are usually created on layered cotton cloth primed with a mixture of chalk and gum that is then polished. Alternatively, artists may use supports of layered paper (usually newsprint) or wooden boards. Artists formerly made their pigments from locally available plants and minerals. Today many use commercially available pigment powders. After artists completely paint the images, they typically lacquer their work; this practice gives additional lustre to the brilliant colours to Puri paintings. Today Pattachitras are done on palm leaves also.

Technique

Tamarind seed paste is prepared by making them to swell by soaking them in water for three days and grinding them after removing the dark brown husk. The pulp is then heated in an earthen pot with water and made as a paste. Then two pieces of cloth of equal size are taken and stuck together with the help of the paste. Soft clay stone is then powdered and mixed with the tamarind paste. Two or three coatings of this mixture are applied on the prepared canvas on both surfaces. After dried, surfaces are polished with rough stone and with smooth stone or wood. Then the painting is executed over the cloth.

The colours used are white, black, red, yellow, green and blue. The colours are usually indigenous and are made up of vegetable and mineral origin. White is made out from conch shells, black is obtained from lamp soot, red and yellow are prepared from coloured stones, green is obtained from green leaves and gum of fruits of *kaitha*. Brushes are made out of hairs of mice. But, presently commercial synthetic pigments also used.

Deterioration

Cloth being organic in nature, it is easily attacked by fungi and insects. The layers get separated. The coating may be separated due to cohesion. Wrinkles may form due to improper pasting and drying. The pigments may be flaked off due to physical intervention. The lacqure gets whitened.

Conservation

The separated canvas may be re-fixed with tamarind seed paste or similar adhesive. Moistening and re-stretching using a stretcher frame may rid off the wrinkles. Spot relining with cloth may restore small loss of cloth. *Pattachitra* should be preserved in a cool and dry place.

SCROLL PAINTINGS

Painting on cloth is a living art in Nepal. Scroll paintings are patronised both by religious, royal and aristocratic societies. They have both Buddhist and Hindu subjects. Scrolls are very common in Nepal and they are termed as *pata*, *patachitra*, *torana* or *paubha* in Nepal. Another variety, which is primarily religious in subject matter and Tibetan in inspiration, is known as *Thanka* or *Tanka*. The Nepalese scrolls are both narrative and of the hanging type. *Thankas* are used as icons for worship while the other has a story telling purpose and deal with puranic episode. The scrolls have a great antiquarian value in the Indian sub continent.

THAN-KAS

Than-kas are pictures done on cloth and decorated with woven borders all around. Literally the term *than-ka* means any scrolled surface. The term *than-ka* refers to the pictures and mountings and not just the picture. *Than-kas* were very popular in Himalayan regions like Tibet, China, Nepal, Bhutan, Sikkim and Ladakh. The earliest examples of these paintings in Tibet date back to the 9th Century A.D. *Than-kas* were prepared for religious purposes and for hanging on the walls of the temples and monasteries. They were at times treated as banners and were taken out in religious processions. The execution of a *than-ka* was considered to be an act of meditation and worship. The subject matter was almost always Buddhist.

Technique

A *than-ka* has several parts. They are,

1. A central painting, which is always vertical in format.
2. Border mounting, which is stitched to all four sides of the central painting.
3. Two wooden rods one at the top and one at the base to support its weight and is used for hanging.
4. A support lining for the border.

The most suitable cloth is a closely woven white poplin or cotton or white silk. If large cloth is needed pieces are neatly stitched together. The *thanka* is finally mounted on a piece of silk by stitching. The dimensions of the silk border are fixed as follows: if a thanka measures 60 x 40, it will have bottom piece of 30 cm width, a top piece of 15 cm width and side pieces 7.5 cm width. The surface cloth on which the painting was executed was made by the application of a coating of ground on both sides. The coating was made of chalk and glue. Using a hard stone or conch shell, the ground was then polished. The pigments were primarily of mineral origin and were mixed with glue solution. The common pigments used were white, yellow, blue, red and black.

Rough outlines were first drawn with charcoal, they were then redrawn with black ink. Pure colours were used earlier days; later

artificial pigments were used. Details were filled in and gold was painted in. In places where gold was to be painted, yellow ochre was first filled in. The details of hair, moustache, beards, eyebrows and so on were done finally using very fine brushes.

Deterioration in *Than-kas*

Because of rolling, the surface layer of the painting gets cracked and the surface seems to have ups and downs. Sometimes, loss of paint is also noticed. Insect attack is another deteriorating factor. Since, *than-kas* are made of fabric, due to the absorption of moisture the fabric becomes acidic. Swelling is also noticed, which leads to disintegration of paintings.

Conservation

Since *than-kas* are paintings on paper as well as fabric, it is advisable to take precaution against insect damages. The cracks formed are eradicated by providing spot relining wherever necessary with the help of Nepalese tissue paper followed by chiffon cloth using *maida* flour paste. The insecticide (0.1% mercuric chloride) and fungicide (0.1% para nitro phenol) are mixed to the paste. In case of flaked paint layers a spray of gelatine may be given to fix them. After the restoration, a 2% solution of poly vinyl acetate in toluene or Paraloid B 72 may be applied as a protective coating.

Storage

Scroll paintings such as *than-kas* should not be kept hanging but must be rolled and kept inside individual boxes. These boxes may then be stored in wooden cabinets. If a scroll is to be suspended vertically, for example in an exhibition, two thick ribbons of length a few millimeters shorter than the height of the scroll may be fixed at the back of the scroll, with one end attached to the roller at the top and the other to that at the bottom as a special support. A red silk fabric may be given to the back as an additional support.

ANDHRA OR CHERIYAL SCROLL PAINTINGS

In Telangana, which is a part of Andhra Pradesh, painting tradition provides scrolls as a visual and story telling tool. The *Cheriyal* paintings are used by wandering bands to perform and narrate stories from Hindu mythology.

Technique

The narrative images are painted on cotton fabric. Several applications of a paste of gum, starch and chalk form the prime. A smooth stone is used to burnish between applications. Bright natural pigments like ochre, vermilion were used. Today however synthetic acrylic fabric paints are used.

Detorioration and Care

This is a painting on cotton cloth. Therefore fungi, insects etc., affect such paintings. Since starch and chalk form the prime, flaking occurs. If folded, the pigments will fall off. They should only be rolled and taken care off.

BENGALI SCROLL AND SINGLE PAINTINGS

Bengali scroll paintings, a narrative pictorial tradition linked with performance, disseminates India's rich cultural heritage of sacred and secular stories to village people throughout the present day State of West Bengal. The scrolls illustrate mythological stories in Bengali version of the epics, the *Ramayana, Mahabharata* and other local legends.

Technique

Scroll narratives are generally painted on sheets of paper that have been pasted together end to end and then mounted on cloth for greater durability. In recent production the paper may be commercially produced or may even be inexpensive newsprint paper that has been coated with a paste of lime or chalk and then smoothened. Scrolls made of thin paper that are not mounted on cloth suffer.

Damages and Care

The damages are semilar to paintings on paper. The Conservation is also similar to that. As the paper is of inferior quality, the life is also short.

GARODA SCROLL PAINTING

The Garoda scroll painting, traditionally produced in north Gujarat, is distinguished by its special format, which employs iconic panels for invoking deities, narrative panels that illustrate not one or two but several legends and didactic panels that illustrate various punishments for sins and rewards for virtuous behaviour. They are about 35 cm broad and five metres long.

Technique

A Garoda scroll is vertical and typically contains nineteen panels. The scrolls are generally made of sheets of inexpensive mill-made paper, which have been pasted end to end, but were formerly most likely made of cloth. In the past, water based pigments were derived from local plants and minerals. First the drawings are made by pencil and pigments are applied later. But now a days, synthetic pigments are used.

Damages and Care

The problems are similar to paintings on cloth. Conservation treatment is also similar to the paintings on cloth.If the paintings are on paper, their problems and care will be similar to the paintings on paper.

JADUPATUA SCROLL AND RITUAL PAINTINGS

Jadupaṭua (Jadu-magic; patua-painter) scroll paintings are particular kind of narrative scrolls as well as ritual images. They are generally called as magic paintings. This is so named as these types of paintings have portraiture of diseased tribal person in a ritual way, the ritual magically affecting the deceased's well being in the after life. Jadupatuas go village to village showing scrolls and narrating the stories depicted.

Technique

The scrolls are constructed of inexpensive sheets of paper that have been glued or sewn together and attached at each end to the bamboo poles as rollers. Sometimes, the scroll is attached to a cloth support for better preservation of the fragile paper.

Damages and Care

Since the papers are inexpense and lowgrade paper, moisture attacks much and paper gets easily degraded. The conservation is similar to paintings on paper.They should not be folded.

PAITHAN OR CHITRAKATHI PAINTINGS

The tradition and style are named after the village *Paithan* (Formerly Pratishthan), south of Aurangabad, Maharastra, where the first sets of paintings identified as a distinct folk idiom are reported to have been found. The tradition has been more recently termed *Chitrakathi* after the caste of artist-performers called *Chitrakathis* (chitra-picture; katha-story), who traditionally paint the pictures and tell stories.

Technique

These paintings are executed on imported, industrially made papers. The paint is applied to an unprimed surface. They are 25 x 40 cm and are found in pairs, two pictures being pasted back to back.

Damages and Care

Since the paintings are on paper, the problems and conservation are similar to paintings on paper. Since, the paintings are on both the sides, they should be stored flat, keeping an interspacer between them.

PAR PAINTINGS

Par means 'fold' in the Rajasthani dialect. Par paintings are large-scale horizontal paintings on cloth. The par tradition conveys the epic lives of local hero-gods to village people in rural Rajasthan. They are customarily opened, that is, unrolled only after sun set. It is a visual backdrop for story telling.

Technique

The narrative incidents are painted on cotton cloth that has been initially stiffened with starch and then burnished with a special stone device. The artist makes sketches and applied traditional watercolours. He outlines the forms and creates devil like eyes and moustaches.

Damages and Care

Since the paintings are done on cloth, the problems and conservation of these paintings are similar to the paintings on cloth They should inly be rolled and preserved.

MINIATURE PAINTINGS

The painting was executed in the beginning on rock, wall, wood, leaf, bark etc. After the entry of paper in to this field, small sized (miniature) paintings came into existence. There are various schools of miniature paintings. Even though their names are different their techniques are similar.

Technique

The paintings were created by coating natural earth on paperboard called *wasli*, smoothened or burnished and then mineral, metal or vegetable colours were used for the drawing on it. All have used watercolour as media. The pigments were dissolved in water by rubbing the pigment, filtering it to segregate the earthy solids and dried. At the time of the need, the solid is dissolved and mixed with gum glue or resinous materials or sometimes with honey or sugar into a paste of uniform consistency. Thus the pigment gets well mixed from strength applied at this time. This process is termed as tempering. Since the pigment is tempered, this process is termed as *tempera* technique. The technique of this type of painting was *gouache* technique. A number of artists of Mughal period have applied a thin layer of wax over the paintings. Such paintings can resist atmospheric moisture etc., and colours do not get affected very soon. In India, dry neem leaves and neem oil had been used traditionally as an effective measure to get rid off the biological activities.

Defects

Decay is nature's general law. Dust accumulation, dirt formation, insect attack, flaking of pigments, etc., are noticed. Support paper gets torn at times. The *wasli* (paperboard) the carrier gets separated due to moisture. In case of paper from wood pulp or grass, it is prone to decay when compared to the paper manufactured from cotton rags or hemp or flax. Paper is also affected by biological agencies like fungus, mildew, mould and *foxing*.

The fading of colours is noticed due to the action of light, fugitive nature of some pigments and dyes, when they are constantly exposed to UV light. Cleavage and cracking due to warping of the

wasli and flaking of the paint in general or specifically at some points. Stains of fly marks, oil, grease, water stain, rust, fungal stains, foxing marks, creases etc., are often found on the miniatures. The pigments used at times change their colour due to chemical reaction. For example, lead white will change its colour to grey due to the change of lead carbonate in to lead sulphide. In case the pigment layer is very thin the flaking will not be there. Normally, the use of pigment, Verdigris, is pleasing initially, but in course of time it gets charred and darkened. Some times the paper is lost. Verdigris is a dangerous pigment as far as cellulose paper is concerned. The paper gets acidic due to age and acetic acid. Some times colour change is noticed. Some times flaking is also noticed.

A Flaked off Miniature Painting
Courtesy : V & A Museum, London

Conservation

The snakes' left out skin, which is exactly of the size and shape of snake very thin and semi-transparent, is put in between the paintings. This removed the danger of paintings being eaten by moths. After rainy season, these paintings were dried under shade to get rid off the mould growth.

In case of any stain, the stain should be removed locally. Blotting paper is kept just below the stain and the stain is loosened to the blotting paper. In case of cracking and loosening of the paint layer, the loosened layer should be coated with 0.05 to 1% solution of methyl methacrylate or 1 to 2% solution of poly vinyl acetate in sulphur free toluene with the help of sprayer or fine brush. Flaking of the paint

layer is quite common in miniatures because the binding of the water-soluble paint to the paper is fragile. A powder called soluble nylon can be used to correct this condition. It is mixed with industrial methylated spirit to form a transparent adhesive, which is carefully applied to the underside of the flakes with a small brush. In case fungi have affected them, the leaves should be separated and are kept in side a fumigation chamber for at least a weak for its eradication. Only after this treatment any other treatment should be done. This may be repeated at least once a year.

When the *wasli* is in need of strengthening, the affected layer of the *wasli* is removed carefully and a lining is given either with Japanese or Nepalese tissue paper using *maida* flour paste adding a little of ortho-nitro phenol as fungicide. In case the edges are very fragile the edges should be strengthened similarly. If writings are visible at the back, the writing should be preserved using cellulose acetate foil and tissue paper. The ethereal hydrogen peroxide solution should restore the original colours of the blackening remains, the original paint was probably metallic silver, for which there is not satisfactory method of treatment.

PAHARI PAINTINGS

The word *'Pahari'* is the adjectival form of *'Pahar'*, that is, hill, meaning something coming from or belonging to the hills. *Pahari* is the generic name for the paintings done in the various hill states of Punjab. The art of miniature painting was brought to Punjab from the Mughal and Rajput states and along the way it collected the traditions of both schools that grew up in this region differed according to the states, which fostered them, the most important being Basohli, Kangra, Guler, Garhwal, Jammu, Kulu, Nurpur, Chamba, Mandi and Bilaspur. Metcalf was the first man to discover the *Pahari* paintings in Kangra. After the beginning of the 20th Century, Ananda Coomarasamy further discovered these paintings at Allahabad in 1910-1912. He divided the Rajput School in to two categories. They are the Rajasthani School and the Pahari School. Apart from the mythological depictions, the miniature also featured portraits of pictures of girls playing ball or musical instruments or amusing themselves with birds and animals. Like the later Mughal ladies, the *Pahari* ladies also liked to have them painted bathing, letting off fire works, playing checkers or their toilet.

Pahari Painting

Technique

Pigments used are yellow, red, blue and orange. Gold and silver were used for the decoration on clothes, utensils, thrones, chairs and carpets. Occasionally the whole background was painted gold, silver being used to depict water and lotuses. Silver burnished and so it appears grey black.

Damages and Care

Since they are the paintings on paper, the problems and care similar to the miniature paintings.

ORISSA PAINTINGS

The miniature painting existed in Orissa till the 19th Century AD. The manuscripts were written and illustrated in the same way as that of the Jain manuscripts but the pictures were not always coloured. Black and white drawings were quite common and even in the coloured drawings, the colours used were always subtle. There was striking resemblance between Orissa and Malwa paintings. The Orissa artist loved ornamentation and every available inch of space is decorated with the possible exception of the patches of colour against which the human figures are projected. The colours are vibrant. It was linen cloth, made by a special process, on which the folk artists have been painting since time immemorial. This traditional material made of linen cloth is the ideal foundation for the paintings, being pliable but relatively strong and on the whole resistant to humidity, neither warping nor losing its shape amasses of square metres.

Technique

Two pieces of cloth of the same size are struck together with a home made vegetable paste produced from the tamarind-seed. Then a powder prepared from soft clay-stone is applied both the sides. The canvass is rubbed with stone or smooth wood. Then the colours from both mineral and vegetable origin are used. Now a days commercial pigment powders are used.

Damages and Conservation

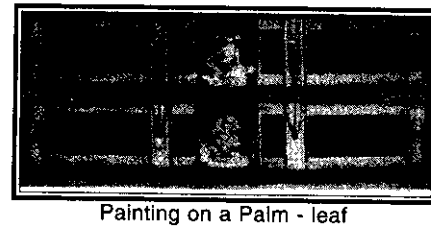
Since these paintings are on palmleaves, the problems and conservation and restoration procedures are similar to those for the miniature paintings on palmleaves.

PALA SCHOOL

In the 9th Century AD, a new school of painting emerged in Bengal under the patronage of Raja Dharm Pal and Deo Pal. Since it was patronised by the Pal kings (7th to 12th Centuries AD.), these types of paintings are called as Pal paintings. These paintings are based on Buddhist themes, *Jataka* stories. They were in vogue both in Bengal and Bihar.

Technique

These paintings were done mainly on palmleaves. The size of the paintings was approximately 22" x 2". They were also done on cloth. Red, blue, black, pink, indigo and reddish grey colours were used.



Painting on a Palm - leaf

Damages and Conservation

Since these paintings are on palm leaves, the damages and conservation treatments are similar to those for the paintings on palm leaves.

JAIN SCHOOL

The earliest of the paintings on Jain theme is found in the caves of Sittannavasal, Tamil Nadu. These are wall paintings. Many miniature paintings are found on palm-leaves. The main characteristic of the Jain paintings is the protruding eyes.

Technique

These miniature paintings were done on palm-leaves. The palm-leaves were narrow and hence the lines were drawn very carefully. The various colours used are black, yellow, crimson, green and blue. Red and black backgrounds are common. The painting was done after the text was completed. Palm-leaf was used till the 14th Century AD. The leaves were threaded with cotton and enclosed with in wooden covers. The insides of which were also painted.

Damages and Conservation

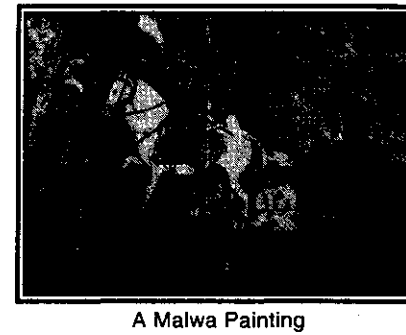
Since these paintings are executed on palm leaves, the damages and conservation treatments are similar to those on palm leaves.

MALWA SCHOOL

In 1454 AD, Malwa became the dominant power in the region. During the 15th century AD., contact with Persia was established and painters, calligraphers and manuscripts arrived to Indian court. The eyes of the figures are long and wide open. The hair of the women is braided into a long plait, which hangs down stiffly to the hips and is often tied at the end with ornamental tassels.

Technique

The miniature paintings were done on palm-leaves. The figures are usually projected against a background of solid colour. The colours used are red, green, blue, pink and yellow. The lavish use of gold is noticed.



A Malwa Painting

Damages and Conservation

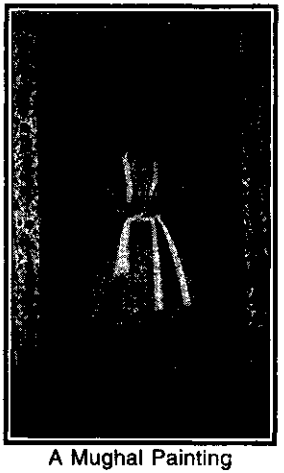
Since the paintings are on palm-leaves, the problems and conservation treatments are similar to that of paitings on palm leaves.

MUGHAL SCHOOL

The Mughal style of paintings are the admixture of both Rajasthani and Persian styles. The Mughals patronised this art and hence this art was named as the Mughal School of painting. The term Imperial Mughal denotes the work done under the emperors Akbar (1556-1605 AD), Jahangir (1605-1627 AD), Shah Jahan (1627-1558 AD) and Aurangzeb (1658-1707 AD). The 18th Century miniatures are larger than the earlier ones. In the 19th Century, the static quality becomes very marked. There is a distinct Western influence in the colours, modelling of planes and the fine brush strokes give way to filled in surfaces. As the Mughal Empire decayed, governors of various provinces declared themselves independent and assumed royal status. Murishidabad miniatures are very similar to those painted at the Mughal Court and declined after 1763 and embraced the indigenous style.

Technique

Following the sketch, the filling of colours, landscape or facial features are done. When the picture is finished, the supervisor would write on it the names of all the painters responsible. The depiction of under arm hair is an early Mughal characteristic and the pointed *jama* appears only in earlier periods. The halo is used to distinguish the emperor from the subjects.



A Mughal Painting

Damages and Conservation

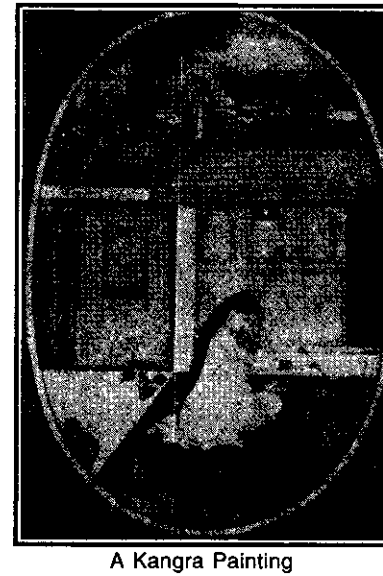
Since the paintings are on paper, the problems and conservation treatments are similar to that of miniature paintings on paper.

KANGRA VALLEY PAINTING

In the Kangra valley, artists worked under the patronage of the Hill Rajahs of Guler, Tira-Sujanpur and Nupur. There fore this art was called as the Kangra Valley painting. Mughal artists came to Kangra after the invasion of India by Nadir Shah of Persia in 1739. The Kangra face is distinguished by a straight nose, almost in line with the forehead, narrow, curved eyes and delicate modelling. The hair is carefully executed and falls in a well-ordered cascade down the back. The Kangra landscape is naturalistic being that of the area itself.

Technique

For this painting hand made Sialkoti paper was used. A preliminary sketch is made in light red colour with a brush. The paper was then primed with white paste and the surface is smoothened. The outlines were then redrawn in brown or black. Pigment was applied first to the back ground then to the figures. The outlines is now redrawn and the picture is completed. The artists made use of pure colours like yellow, red and blue and they have retained brilliance even after two hundred years.



A Kangra Painting

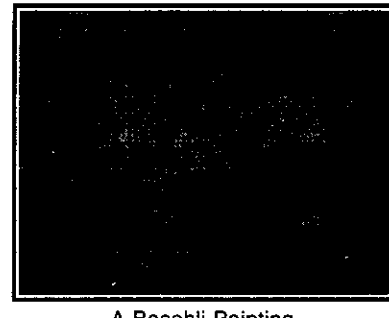
Damages and Conservation

Since these paintings are on paper, the problems and conservation treatments are similar to the miniature paintings on paper.

BASOHLI PAINTINGS

In the seventeenth and eighteenth Centuries *Rasamanjani* became a favourite text with the rulers of Rajasthan and the Punjab hill states. A series of paintings on this text were painted for Raja Kirpal, Pal of Basohli. Basohli style of painting arose as a result of the intercourse of the folk art of the hills with Moghul technique. Basohli style of painting is not merely an importation of Moghul art from Delhi but the development of a local style. Vibrant colours like yellow and red which Basohli artists used so liberally seem to penetrate the eye, and move us deeply distinctive treatment of clouds, lightning and rain is another characteristic of Basohli painting.

The Basohli style arose as a result of the intercourse of the folk art of the hills and the Mughal technique. The genuine Basohli primitives may safely be ascribed to the period 1661-1673 AD. Architecture with turrets panelled doors, latticed windows, stone trellis work and painted wooden pillars, which figure in early Basohli paintings. The Basohli artists balanced the architectural features of the miniatures with expanse of open country so that there is a sense of out door living. Inlaid panels and goblets placed in wall niches, Mughal touch, are another early Basohli characteristic.



A Basohli Painting

Technique

The pigments used are the same bright reds, yellows and blues of Malwa paintings, highlighting the vital quality of the work.

Damages and Conservation

Since the painting in on paper the damages and conservation treatment are similar to those for the miniature paintings on paper.

WARLI PAINTINGS

Warli paintings are folk paintings from Maharastra and are very different from other folk and tribal paintings in India. Warli is the name of a tribe, which inhabit in Thane district of Maharastra. Traditionally, the interior walls of their houses were decorated with this art by the women folk. As the life of the *Warlis* link closely with nature, they worship the nature in different forms – Sun and moon, god of thunder, lightning, wind, rain, and several others. Usually the Warli paintings are done during the marriage ceremony. Warli paintings have various subjects or themes, which depict a story from their daily activities.

Technique

The kitchen walls are plastered with cow dung and coated with red mud. In the central square is the mother goddess and all around it animals and men doing various activities like dancing, playing music, climbing trees, carrying loads or just standing with their limbs flying in the air. Today small paintings are done on cloth and paper.

Deterioration

The paintings are on both cloth and paper and insects and fungi in moist conditions affect them. The pigments sometimes get separated and flaked off. Wrinkles are also seen. Due to age they get brittle. Acidity affect the Warli paintings.

Conservation

Careful maintenance is very important. Fungal attacked works may be fumigated in fumigation chambers with thymol. If they are attacked with insects, insect repellents such as para-di-chloro benzene are used to rid off them. Now-a-days low nitrogen non-toxic pest control measures are undertaken. As no chemical is included in this process, it does not harm the personnel who look after the paintings as well as visitors.

PITHORA PAINTING

Pithora painting is ritualistic painting done on the walls by tribes like Rathwas, Bhilals and Naykas, who live in the central Gujarat. In several villages in and around Tejgadh. One can find Pithora paintings in their inner walls of the house. It is believed that the execution of the Pithora paintings in their houses brings peace, prosperity and happiness. The central theme is a horse or bull, which might be a vision of a God. It may be crude but it is crudity that adds to the beauty of this painting. Only males from the tribe are allowed to learn this art. The Pithora artists are called *Lakharas* or the head priests. The artists are not worried about the style, the surface, texture, the quality of material or the medium.

Technique

The painting is done on the inner walls of the houses of the tribes. The colour required is prepared out of colour powder mixed with milk and Mahuda - a liquor prepared from the divine Mahuda tree. The flowers of the Mahuda tree are fermented in water and distilled. Both the Mahuda tree and the liquor thus prepared. Now a days commercial colours are used in these paintings. The main colours are yellow, indigo, orange, green, vermilion, red, ultramarine, black and silver. The brush is prepared either by chewing or beating the ends of a bamboo stick or a twig. The modern brushes replace this traditional brush. These paintings are now a days drawn on cloth also.

Damages and Conservation

The defects normally found are cracks, flaking, stains, fungal growth and accumulation of dust and dirt. Treatment of Pithora paintings is similar to that of the Warli paintings.

MADHUBANI PAINTINGS

The tradition practised and transmitted from generation to generation by non-professional women artists who paint on the floors and walls of their homes to make daily life and special events auspices, is variously called Mithila or Maithil painting after the region and Madhubani painting after a modern day district in the region that has become an important painting centre. Therefore the folk paintings of Mithila is known as Madhubani paintings. Madhubani means forest of honey. The chief aim of the Madhubani painting was to present the innumerably graphic aspects of religion to the people, literally for household use. It was only about a decade ago that the paintings were brought from the walls and floor to prepared cloths.

Technique

The wall is plastered with cow dung and wears an even smoothness. Mud walls are first white washed and then the paintings are done straight on the smooth mud surface. They use lime for white, vermilion for red. For outlines and tiny details, a small bamboo twig is used, its end being slightly frayed, so that the fibre is like hair, while for putting on the larger washes, a small piece of cloth is tied to a twig, popularly known as *pihua*. This is a co-operative community art in which the more skilful women of the caste come into help, their sisters and younger girls stand by to watch and learn. The old woman starts on the outlines and others fill up the colours and help the old woman. Nowadays Madhubani paintings are done on cloth also.

Damages and Conservation Measures

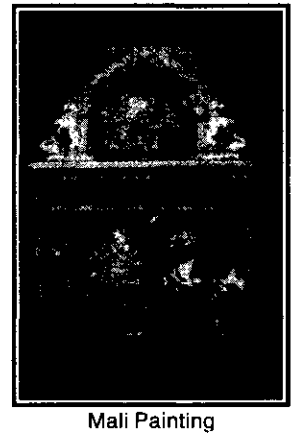
The paintings are behaving as that of paintings on dry walls. The conservation treatment is similar to tempera paintings. In the case of Madhubani paintings on cloth, the problems and conservation measures are similar to those on cloth.

MALI PAINTINGS

Mali, gardener or garland making caste in the Parnea district of Bihar provides flower and garlands for worship and other celebrations. They also traditionally made paintings on caskets used in various religious rituals. These paintings are called *Mali Paintings* after their name.

Technique

Each casket consists of four paintings on paper, which are pasted to the sides of a simple framework of bamboo strips. The framework, which may be up to 4' height, is square and may also taper at the top to form a 'pyramid'. Images for the casket are rapidly painted in transparent water based pigments on unprimed paper. Formerly, the *Malis* made their own pigments. But now they use the commercial colour powders. The colours are bright yellow, magenta, dark green, blue as well as black. Styles vary from family to family.



Mali Painting

Damages and Conservation Measures

The paintings are on paper and therefore, the damages and conservation treatments are similar to those of the paintings on paper.

KALIGHAT PAINTINGS

The Kalighat painting tradition, which originated to provide icons of deities for private worship but came to provide many other kinds of images as well, is associated with the famous pilgrimage site of Kali temple on the southern edge of present day Kolkata (Calcutta), on the bank of a canal of the Hooghly river. Kalighat paintings, so called after the area immediately around the Kali temple (Kali; ghat-landing place) were sold at shops and stalls around Kali temple as well as other temples in the Kolkata area as souvenirs of pilgrimage. The tradition is from 1830 A,D. onwards. One of the Europeans to collect Kalighat paintings was Kipling, whose present of a collection to the Victoria and Albert Museum, London generated scholarly interest.

Technique

In the Kalighat paintings, water based pigments are used. This painting is done on unprimed, newsprint, mill made paper usually about seventeen inches by eleven inches in size. First the composition is drawn by pencil over which transparent colours are given. Details like dress, jewellery are made by shading.

Damages

Various damages, which may happen to the Kalighat painting are

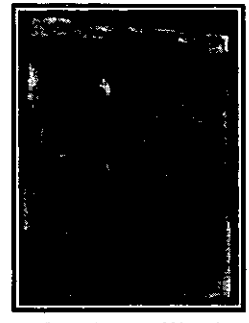
1. Becomes brittle
2. Cracks due to folding
3. Becomes acidic
4. Takes up stains
5. Takes up dust and dirt
6. Wrinkles are formed.

Conservation

The earlier repairs by pasting papers may be removed by softening with water-rectified mixture in the ratio 3:7. De-acidification is done with barium hydroxide in methanol. Wrinkles are removed with the help of water rectified spirit mixture in the ratio 1:8.

PAINTINGS ON WOOD

The *Rig-Veda* mentions the use of wood for artistic carvings. The inscription of Mahendravarman at Mandagapattu in South Arcot tells us that wood was used for the construction of the shrine, temple cars etc. Doors, pillars, portable shrines and storage boxes in temples and at houses were decorated with paintings. They were generally religious themes. Wooden frames for palm-leaf manuscripts were at times painted.



Painting on Wood

Technique

The tempera technique was used to paint on wood. Natural resin or lac coating was given as a protective polish layer. Boxes were painted directly or over the cloth, which was pasted on the wood.

Deterioration of Paintings on Wood

Warping of wood and changes in relative humidity lead to flaking of paint. Oil, grease, dirt, accretions, etc., result in the painting being masked. Due to high humidity, water colours fade. Insect attack causes damage not only to the pigment layer but also to the wooden support. Cracking and splitting is seen when two or more pieces of wood are joined to make a large support. Some times bulging of the paint will form and any tapping of the layer will result in loss of the painted layer. Fungal growth is also noticed.

Conservation

Fumigation with thymol and para-di-chloro benzene is necessary to prevent further fungal or insect attacks respectively. Dirt, oil, grease accretions are removed with rectified spirit, pyridine or 2% solution of ,Extran rectified spirit. Water should be avoided, as water tends to dissolve the pigment and glue. Cleaved paint layers can be fixed with 2% poly vinyl acetate nor 2% Paraloid B 72 in acetone. A G-clamp is used to rejoin the separated pieces of wood. Putty of lime is used to fill in the cracks. Retouching of the painting is then carried out on the putty filled areas using water / acrylic colours to differentiate the restored area.

THANJAVUR PANEL PAINTINGS

The Thanjavur Panel Paintings (*Palagai Padam*) belongs to the Thanjavur School of Art. It spread during the period of Serfoji II between 1798-1832 A.D., as he was a great patron of arts. These paintings were used for worship in houses, temples and *bhajan mantaps*.

Technique

The production of a Thanjavur painting is a long drawn and tedious process. Jack or teak wood planks were joined together to form the support. An accessory support of mull cloth was used. Tamarind seed gum was used to stick the accessory support. A ground of lime with glue was coated on the cloth. Burnishing with a stone was carried out in order to achieve a smooth surface.

On this prepared surface, the drawing was executed. The drawings were all standard traditional sketches, where the imagination of the artist did not come into play. Areas where the gems were to be set, gesso work carried out etc., were marked. The relief of gesso work was done with *sukkan* (a paste of unboiled lime stone ground fine and mixed with gum Arabic). Gold foil was pasted on the raised relief areas. The areas to be coloured were painted with water based natural pigments. A final coat of lac was provided to give it sheen look and as a protective layer.

Damage

Thanjavur paintings, being composite in nature, give rise to multiple problems. As the main support is made up of wooden planks joined together, they give way due to age and cracking. Flaking is noticed in the paint, cardboard, cloth layers. Insect / fungal attack results in loss of gemstones, pigments etc. Fading of pigments, stains and soot deposits are common. Lac darkens resulting in a dull appearance. (See Colour Plate No. 16 on page 126).

Conservation of Thanjavur Paintings

Main Support

The main support of the paintings was jack or teak wood planks. A G-clamp is used to join separated planks, cracks are filled with *sukkan* putty and levelled. Iron nails are removed, if any, to avoid rusting. Rust leads to cracking of the wood.

Accessory Support

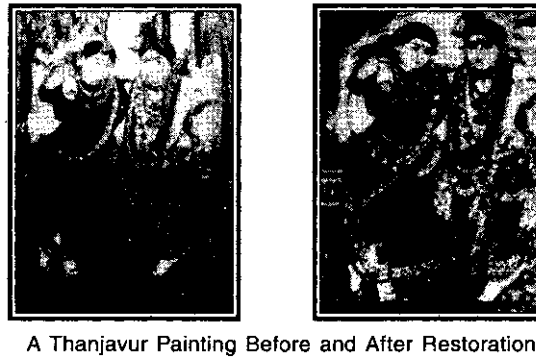
Cardboard and cloth are accessory supports. Injecting gum Arabic can rectify loss of adhesion between the layers. In some cases where fungal attack to the support is immense, it is advisable to transplant the painting onto a new wooden support.

Loss of Gemstones, Pigments, Gold Gilding etc.

Missing gemstones are replaced with new ones. Gold leaf is also replaced with the help of gum Arabic. Infilling with *sukkan* and retouching of paint with watercolours is done wherever necessary. Dirt, dust, soot etc., are removed from gold leaf covered and painted areas using rectified spirit or acetone. In areas covered with varnish, rectified spirit is used to clean the varnish. If water is used the water-soluble colours will get dissolved.

Framing and Backing

Paintings may be fumigated before framing. Any gap between frame and painting needs to be corrected. A coating of insecticide, sandal wood powder is given at the back to prevent insect / fungal attack.



A Thanjavur Painting Before and After Restoration

PAINTINGS ON LEATHER

Art on leather originated from Persia. Illustrated manuscripts were bound with richly decorated leather covers. These covers were either painted with miniatures or leather tooled and embossed with gold was used. Historical documents refer to the use of leather stretched on a panel for painting. This practice occurs infrequently after the 16th Century A.D. Miniature paintings on leather were found in the form of royal playing cards. The themes of these cards were primarily based on Hindu mythology. Circular leather paintings were made in Andhra Pradesh and Karnataka and they are now mostly preserved in museums and also with individuals.

Technique

Skin is a network of protein fibres chiefly *collagen*. Leather is nothing but animal skin, which is dehaired, defatted, and made non-putrient and impervious to water. Unless cured, raw skin degenerates by natural process, mould and bacteria. Tanning is a method of finishing skin to produce leather. Tanning is done with the help of barks of certain trees, minerals like chromium salts etc. This process of tanning renders the leather impervious to water while preserving its flexibility.

The processed leather is used as a support for paintings. A ground (chalk or zinc white) is prepared by priming the leather. The subject is drawn and natural colour pigments applied. Varnish is applied as a protective coating.

Deterioration

Leather being organic in nature, easily deteriorates. High humidity encourages the growth of micro-organisms, insects and pests. Dryness leads to brittleness, wrinkling and hardening of the leather. Dust, grease and dirt obscure the painting. Natural pollutants like oxides of sulphur, carbon, nitrogen, etc, dissolve in the moisture present in the atmosphere, resulting in acidity to the leather.

Conservation

To treat the hardened and brittle leather, softening materials or dressing chemicals like castor oil, lemongrass oil, citronella oil in

rectified spirit is applied at the back. This restores flexibility. O.1% of chlorophenol is added as fungicide. Wrinkles may be removed by placing the flexible leather under a weight press. Glycerine and rectified spirit are also used to flatten wrinkled leather. Fumigation with thymol / para-di-chloro-benzene is required for prevention of insect / fungal attack. It is always better to maintain the temperature at 20±1° C and the relative humidity between 45-60%.

Leather Painting Before and After Restoration

Storage

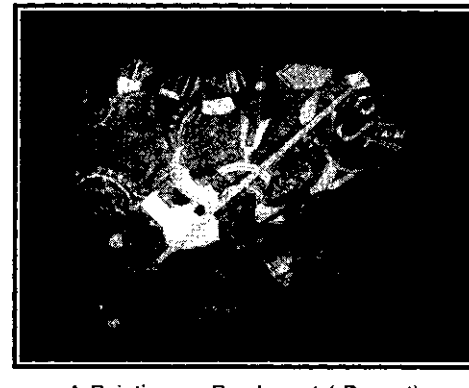
The paintings on leather may be kept in shallow drawers one above the other keeping acid free tissue paper in between. The temperature and relative humidity affect the leather painting. Therefore control of the environment should be done very carefully.

PAINTINGS ON PARCHMENT

Parchment is the transluscent leather portion i.e. the flesh side of the leather. Puppetry was present in 9th Century B.C. The animated shadow puppets created on parchment were originally created as a mean of entertaining the temple elite. They were necessarily enacted at nights, and the shadows cast by the puppets on to a cloth screen create a sense of mystery and divine inspiration. Hindu epics, especially from *Ramayana* and *Mahabharatha* were the main themes of these puppet shows. This art of parchment puppets spread to other countries like Indonesia, Cambodia and Thailand. Throughout Asia, for thousands of years, the puppet theatre had been not only a favourite entertainment but also a means of preserving regional folklore myths and legends. Evidence shows that puppetry was present even in the 9th Century B.C.

Technique

As the theatre performs with in a temple sanctuary, the puppets have always been made of deer skin parchment. Since the parchment is transluscent, the puppeteer chose such a parchment and copied the outlines of the figures on a parchment and then used a variety of coarse and fine chisels to cut away the parchment, faithfully reproducing the facial expressions, decorations and stance. As a support to the thin leather and a central handle for the puppeteer, a split bamboo stick was sewn the length of the puppet. The finished assembly was painted using dyes.



A Painting on Parchment (Puppet)

Conservation of Parchment

Normally parchment gets hardened due to drying. Wrinkling is also found due to the loss of oil content from the parchment. Due to excess of moisture parchment bulges out and also becomes a source

of food for micro-organisms. The hardness can be removed and softness tendered by applying a 2% solution of citronella oil in rectified spirit. Rubbing with a soft cloth makes the parchment softer. Castor oil can also be used. Wrinkling can be avoided by keeping weight over the area after softening. The parchment artefacts may be fumigated in an airtight chamber keeping para dichloro benzene as an insect repellent. Thymol fumigation is done for fungal eradication. This can be kept in small sachets and placed in the shelves where they are displayed or stored.

Storage

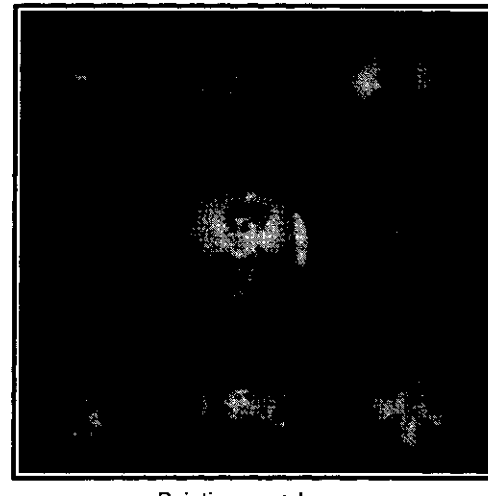
Parchment artefacts may be stored in shallow drawers keeping interleaves of acid free tissue paper or oilpapers in between. Silica gel with self-indicator may be kept to absorb the excess moisture in the cabinets. The used silica gel may be rejuvenated by heating.

PAINTINGS ON IVORY

Miniature paintings were done on ivory. Ivory was once a fashionable and inexpensive base for the painting of miniatures. This art was practised by the British and was introduced in North India around 1785 A.D. Secular portraits, religious myths and nature were the common themes. Playing cards used by the royal personalities were also painted on ivory.

Technique

Ivory is the tusk of elephant or walrus etc. Ivory is mostly dentine. Thin slices of the tusk, seasoned or pressed to keep it from warping was polished, smoothened and then used as a support for painting. Due to the smooth surface of the support repeated strokes were necessary to execute the painting. The pores in the ivory absorb the water colour pigments. Soft and fine squirrel hairbrushes were used for painting. The technique employed watercolours applied with the aid of a magnifying glass in a laborious network of stipped dots and crosshatched strokes. The completed picture was glazed with a solution of gum Arabic and glycerine to bring out the colour and provide a binding protection.



Paintings on Ivory

Deterioration

Ivory consists of an organic matter, named *ossein*, besides calcium phosphate associated with carbonate, fluoride and magnesium. Ivory is anisotropic and has directional properties. Relative humidity, heat, atmospheric pollutants easily affect ivory paintings. Warping and decomposition are the result of prolonged action of water on

ossein. Atmospheric acids and the porous nature lead to easy staining, deterioration and brittleness. Sunlight affects the natural colour of ivory and of the pigment. Insect attack leads to loss of pigments.

Conservation

Ivory objects retrieved through excavations are normally found in fragile and weak condition. Some times they will be found in pieces. As ivory is porous, soluble salts from the soil are readily absorbed in to the ivory objects. Because of the delicate nature of such objects, physical treatments are desirable, except in certain cases. Stains may be removed locally with organic solvents. Use of acids and alkalis should be avoided. Cotton swabs soaked in ammonia or 10% hydrogen peroxide may be very effective to get rid off the accretions. Vacuum impregnation may be done with 5% solution of poly vinyl acetate in acetone for achieving better results in strengthening the fragile ivory paintings .

In case of ivory paintings in fairly good condition, the following treatments may be carried out. 1-2% *Extran* in rectified spirit is used to remove grease, dirt, soot etc. The use of water should be avoided, as water-soluble pigments used will be damaged. Cracked areas should be filled with a 5% solution of poly vinyl acetate in acetone or nitro cellulose based adhesive and pressed or kept tied to press the adhesion. In case there is any warping, the ivory painting should be moistened at the concave side and loaded with some weight keeping a pad. This process should be repeated till it gets flattened.

Storage

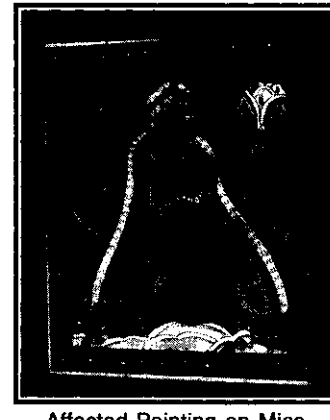
Since ivory paintings may take abrasions, they may be wrapped in cotton wool and tissue paper and kept in padded shallow drawers. Silica gel with self-indicator may be used to absorb the excess moisture.

PAINTINGS ON MICA

Mica was used as a support for paintings. The art of painting on mica was prevalent in North India and later spread to the South. Mica paintings are rather small in size due to the fact that only small sheets of this material were available. Mica is transparent mineral composed of complex mixtures of potassium silicates. The variety of mica used most frequently by the Indian Artists is *muscovite* $(H_2KAl_3SiO_4)_3$, which is found widely through out South India. The mica is formed between strata of granite and the transparency of the material is a result of the heat and pressure created between the layers of rock during formation. Mica consists of many interlocking platelets, resulting in a laminar structure, which can be split easily into thin sheets.

Technique

Mica is a mineral found in the form of small sheets, these sheets are thin, but extremely smooth. Little or no preparation of the mica was carried out prior to the application of paint. Watercolours were not used on mica because of its non-porous properties. Hence tempera paints were used. The pigments used were mixed with varying quantities of binding medium and thickly applied with a brush. Loud, opaque colours were used on the transparent ground. Some times, paint was brushed on both the front and the back surfaces of the mica sheet to increase the opacity and give a more three dimensional appearance to the painting. The subject of paintings catered to the British's taste for the exotic and consisted of depictions of festivals, nature, illustrations of various occupations etc. The paintings were not fine or sophisticated works, but exist as small souvenirs for tourists. The Chennai Museum has many of them.



Affected Painting on Mica

Deterioration of Paintings on Mica

Mica presents many problems as a support for painting due to the smooth surface, as this provides very little key for the paint to adhere to. Weakness occurs in such a way that the binding detaches between the mica and cardboard to which the painting is pasted. The boards may get more acidity and get brown colour and the colour may be transferred to the mica. Careless handling or the action of humidity may make the mica to crack. Loss of paint is possible. Distortion of the mica sheets may cause detachment of the water colour paint from the smooth surface of mica. The differences between the paint layers may cause peeling and paint loss. Mica being soft in nature, scratches due to abrasions is common. Insect attack results in the loss of pigment. Mica is fragile and heavy shocks result in breakage.

Conservation of Paintings on Mica

Fumigation is to be carried out for insect, fungal attack etc. Dirt, stain, grease etc., can be cleaned with a solution of 1% Extran in rectified spirit. Water should be avoided, as tempera paintings are water-soluble. Loss of pigment is a result of cleavage between the pigment and the mica support. This can be rectified by injecting a 2% solution of Paraloid B 72, poly vinyl acetate in acetone in the cleaved areas and by using a weight press. Consolidants are 5% Paraloid B 72 (ethyl methacrylate / methyl methacrylate co polymer in acetone), 2% Isinglass (fish glue in water to which a little of industrial spirit is added). Mounting can be done by encapsulation using ***Melinex***^{R} or Cellophane.

Storage

Storage of mica paintings is very crucial, as mica is fragile, soft and smooth. It is advisable to provide an interleaf between painting and the glass front. Soft felt cloth can be used to wrap the paintings during storage.

PAINTINGS ON GLASS

Painting on glass is normally called as painting on reverse glass. The technique of painting on glass was popular art in Europe before the 18th Century A.D. The motive has usually been to imitate the effect of stained glass windows. It is learnt that in Canton, the Jesuit Priests taught this art to the artists and artisans. The glass manufacturing countries in Central Europe produced inexpensive glass, which began to be used as a base for painting. China learnt this art from Europe, which later spread to India. It is learnt that Chinese artists were invited to the court of Tipu Sultan and the paintings produced by them are now in the Jaghmohan Palace Art Gallery, Mysore. It first spread to Central India and then to Thanjavur. Portraiture and religious themes were common.

Technique

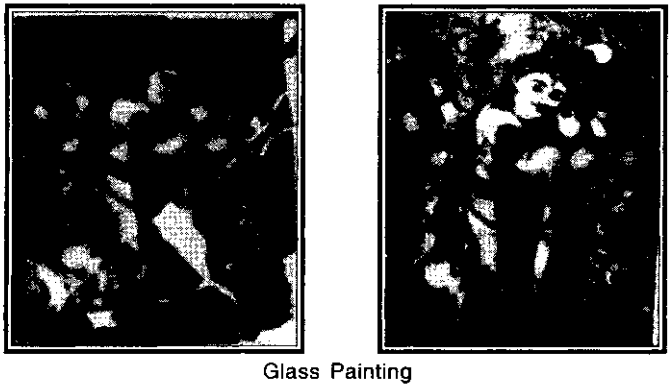
Glass is a super cooled liquid. It is a silicate of alkali metals like sodium and potassium and lead. Painting on glass necessitates a different procedure than painting on solid opaque surfaces. The picture, which is generally coloured in tempera, is started first with the brush outlines and necessary details, which when finished, appears uppermost. Then, the larger areas of opaque colour are brushed in. Shading is used for drapery, face and body to achieve fullness. Gold leaf, small sequins and other shining particles are used to imitate jewellery. Some times portions of the picture are mirrored with mercury. In some places metal foil or gold paper is fixed behind the picture and the portions of the picture left bare are seen as gold. The picture is then mounted with its unpainted side foremost so that it is seen through the glass. Paintings on glass were also executed in oils, though these are less common.

Damages

The glass is the support and so if it breaks the painting is lost. Moisture causes flaking of the glass. Flaking of paint, loss of pigment due to insect attack and humidity are common. Pigments fade due to age and alkaline nature, glass disease (i.e. opacity occurs, gold, gild paper etc., detach due to loss of adhesion.

Conservation

Breakage of glass results in loss of painting and can be only partially mended with the help of an adhesive like poly vinyl acetate or Paraloid B 72 in acetone. Missing portions are replaced with acrylic sheets of the same thickness and painted over using tempera colours. A broken and restored glass painting should be mounted between two sheets of glass. Gum tape should be used to seal the edges in order to prevent entry of dust and moisture. Sometimes the same painting in done exactly and the painting is kept below the original, so that the lost portions will not be visible.



Glass Painting
Before and After Restoration

Backing

The back of a glass painting should be well protected. A proper backing of either chemically treated plywood, wooden or aluminium sheet protects the painting from dust, moisture, fungi and insects.

Storage

Storage and display of glass paintings are critical due to the extremely fragile nature of the paintings. Scratches should be avoided while storing. Paintings should not touch each other.

PAINTINGS ON CERAMICS

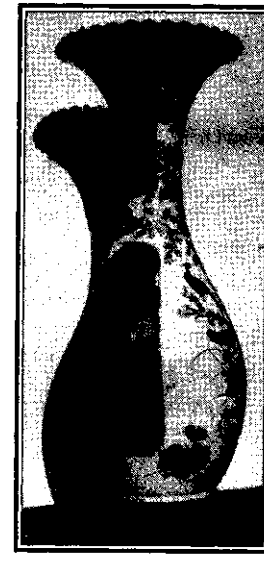
Early man started using the naturally available materials for his daily use. Clay was certainly among man's earliest discoveries of natural materials adaptable to his needs. Ceramics is the general term for an object made out of clay like pottery, porcelain and eartheware. Ceramic materials were in vogue in the sites of ancient culture throughout the world. The red and black wares. polished wares, megalithic potteries and the modern glazed wares are familiar to India.

Constitution, Types of Ceramics

Ceramics has its principal raw material clay, whose ingredients are alumina and silica, with varying quantities of other minerals. The composition varies from clay to clay. When clay is fired, dehydration, oxidation and vitrification take place. Ceramic objects differ according to the kind of clay used and the heat applied in firing. The various types of ceramics are earthenware, terracotta, stoneware, porcelain. Clay forms may be decorated in a wide variety of ways glazed or unglazed.

Paintings on Ceramics

There are two methods of paintings on terracotta. One is drawing the designs on the wet surface or the clay vessel of object and firing and the other is drawing the designs or figures on the fired surface and refiring the objects. The designs, which made before firing lasts long and the firing of the pigments after the first firing is not lasting as the previous one.



A Painted Vase

Pigments Used in Ceramic Painting

The pigments used in the ceramic paintings are mostly earth colours. They are the red ochre, terreverte, lapis lazuli etc. Since these pigments are vitrified,

there is no change in the colour of the pigments.Nowadays synthetic pigments are used.

Deterioration of Ceramics

Ceramic paintings are normally the designs found on the ceramic vessels and utensils. Most of the ceramic objects are excavated and are saturated with the salts of the soil, if they are unglazed or broken. Efflorescence will be formed in the case of excavated ceramic paintings. Weathering will take place. This will result in the flaking of ceramic layer.

Conservation of Ceramics

The excavated ceramic objects may be soaked in running water and the salts present are leached out by this process. Any stain found on them may be removed by using solvents like acetone, benzene etc., after they are dried. In order to remove the dirt 1% soap solution like Extran, in water may be used and brushed well with a soft brush. Encrustation on the ceramics may be softened by moistened pads. Fine scalpels may be used to take off the softened encrustation.

Mending of Ceramics

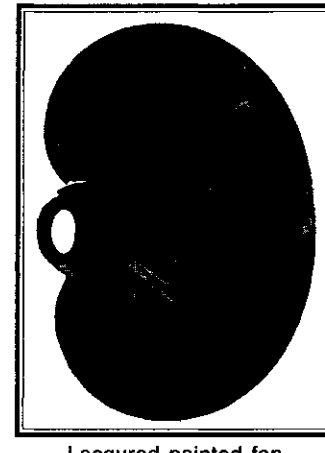
Most of the excavated ceramic paintings are found broken and portions are not found. The broken pieces have to be mended. It requires a great patience. It is always better to number the pieces and put them together. The broken edges should be cleaned with a soft brush and then with rectified spirit or other suitable solvents. The adhesive, normally, the acrylic resin, should be applied at the broken edges and joined. Normally, M-Seal is a suitable adhesive to have the reconstruction. Many objects have been successfully reconstructed. Many restorers in the reconstruction of the ceramic objects and paintings, successfully use Duco cement (Cellulose nitrate adhesive). The joints should be filled with fillers like acrylic resin and matched with acrylic colours.

LACQUERWARE

Lacquering was a very popular technique for finishing an object. Wood, cane, leather, papier-mache, metal etc., is the base of lacquered objects. On all lacquered objects, decoration of various types is applied. Gold leaf designs are also common on lacquered work. The lacs are of two different varieties. One is made by using the processed and coloured sap of a tree (rheas verniofera). The resin form the tree, Ficul religiosa, is also a lac. The resin after processing, results in the lac of commerce i.e. shellac.

Damages to Lacquerware

Moisture affects the lacquerware. The objects on contact with water become chalky or white or opaque. Very low humidity makes the lacquer objects brittle and the lacquered portions may be chipped off. They are easily abraded.



Lacqured painted fan

Conservation Measures

Lacquered objects and lac-coated objects should not be cleaned with water or an aqueous solution, as they become opaque or white with water. As they are fragile, shocks and abrasion should be avoided. Soft brushes should be used for cleaning. They should be wrapped in soft tissue paper and kept in padded boxes or shelves.

ENCAUSTIC PAINTINGS

Encaustic paintings are made from pigments suspended in hot wax. It is one of the oldest sophisticated forms of painting. The ancient Greeks probably developed the process and the name is derived from the Greek *enkaustikos* meaning to burn in, referring to the final step. The Egyptians used encaustic paint on walls and on the outer panels of sarcophagi, representing the deceased with particular effectiveness. Paintings made with the wax medium have lost for a very long time with out any conceivable change. The wax paintings have remained stable and are impervious to water.

Technique

The paint for the encaustic paintings is made out of bleached white beeswax as binder, 25% resinous or oily component such as linseed oil as the hardener of the vehicle and the pulverised artist's pigment. The palette is kept heated from 65-80°C and the paint is kept in the molten condition with out bubbles, smoke etc. Natural bristle brush should be used. Thick paint should never be used. The action should be very fast as the paint applied dries very fast. In order to decrease the drying, a heating lamp is used in front of the panel, which is painted. This is burning in, which makes the paint layer to soften and fuse into the ground. After the final burning, the painting will have a soft matte surface. After a few days, the painting may be polished with a cotton cloth to harden the surface and produce a semi-gloss finish.

Damages

Heat makes the encaustic paintings to melt. Cold condition makes the paintings to become brittle. Solvents can soften the wax. Dust accumulation makes the painting to get a dull colour.

Conservation

Extremes of heat and cold should be avoided to prevent softening or cracking of the picture. In order to avoid dust, heat and cold the painting may be framed heavily with glass front.

ANALYSIS OF PIGMENTS, MEDIA AND VARNISHES

Introduction

It is necessary to identify the materials used in paintings, to measure the properties of their component parts and to understand the mechanisms of aging, stabilizing and consolidating. Art restoration is important, if we are to preserve our history and culture. It involves the repair of damaged areas on a piece of art work. Restorers must identify the pigments and binders used in a piece of art work but they also have to find a suitable modern equivalent. Finding a replacement will be difficult since pigments may discolour over time and the restored area as it ages, must continue to match the original pigment. The same colour can be reproduced with chemically different pigments. The choice of a pigment could vary according to workshop, school or period within a painting, when different pigments were assigned for different pictorial purposes. Identification of pigments and the variation of pigments, which reflect workshop, technology and the techniques of the painters. Identification of pigments will help dating and detection of fakes. Non-destructive pigment identification method using infra-red colour photography, ultraviolet colour photography, microscopic examinations and other non-destructive and destructive instrumental analyses have been adopted by various conservation scientists in the past.

Sampling of Materials

The notoriety of the analytical chemists as destructive scientists has been the maxim through the past centuries. Substances given for analysis would never return back whole. But this notoriety is now a phenomenon of the past because, now there exists a large number of modern instrumental techniques at the behest of an conservation chemist with which he can analyse materials with an insufficient amount of the sample or some times with no damage to the material or object at all. The earliest demand for chemical analysis is made in the field of metals. Only since the middle of the 19th Century

non-destructive analysis has come to be practised mainly by the impact of physics on chemistry through the incursion of instrumentation.

The sophistication of these instruments have evolved to such a degree that the analytical factors such as precision, sensitivity, selectivity and non-destructivity have taken a leap in the 19th Century, especially with the coming of the age of electronics.

When a series of objects is to be analysed there are certain questions, which must be asked before one decides upon the method of analysis to be used. Before choosing a particular sampling technique, it is imperative to consider whether the analysis is intended to involve only the surface, body or the whole of the object, then resort to sampling accordingly.

From the angle of conservator or conservation scientist, the term sample cannotes in its broadest sense, the fragment under examination, whether it is detached or not, from the antiquity. The method of sampling should not disfigure the antiquity as it is likely to spoil the aesthetic beauty and hence its antique value. A very simple method of sampling of homogeneous materials, especially metallic objects, without causing visible damages consists in rubbing with a roughened quartz rod across the specimens to be analysed and dissolving the rubbed out sample in suitable solvents. Alternatively a drop of concentrated nitric acid by means of a capillary tube on the spot area of the specimen to be analysed, leave it for a minute, suck the solution thus formed by a capillary tube and analyse drop of the solution by the technique adopted by H. Weisz.

Pigments

The pigments are finely divided colouring matter. Paint is a colouring matter (either a pigment or dye), that is suspended in a binding medium like oil or glue. Dyes are soluble colouring matters. Pigments used in the paintings may be natural (from minerals and plants) and synthetic. The most common natural pigments are:

Pigment	Compound	Colour
Antleritc	-copper sulphate	-green
Atacamite	-copper chloride	-green
Malachite	-copper carbonate	-green
Terreverte	-magnesium hydrous iron and aluminium potassium silicates	-green
Red lake	- madder, lac, kermes, cochneal	-green
Verdigris	-dibasic copper acetate	-green
Gypsum	-calcium sulphate	-white
Kaolin	-aluminium and silicon oxides	-white
Calcium white	-calcium Carbonate	-white
Mica	-potassium aluminium and silicon oxide	-white
Talc	-magnessium and silicon oxide	-white
Lead white	-lead oxide	-white
Zinc white	-zinc oxide	-white
Titanium white	-titanium oxide	-white
Chalk	-calcium carbonate	-white
Realgar	-red arsenic ore	-orange
Smalt	-potash glass tinted with cobalt oxide	-red
Minium	-red lead	-red
Red ochre	-iron oxide	-red
Vermilion	-cinnabar	-red
Hematite	-iron oxide	-red
Indian Yellow	-calcium or magnesium salt of euxanthic acid	-yellow
Chrome yellow	-lead chromate or lead chromate with lead sulphate	-yellow
Yellow ochre	-iron hydroxide	-yellow
Orpiment	-arsenic sulphide	-yellow
Gamboge	-natural gum, resin	-yellow
Indigo	-Dye extracted from fermented leaves of *Indigofera sumatrana* (Indigotion)	-blue
Prussian blue	-ferrousso ferri cyanide	-blue
Lapis lazuli	-aluminium sodium silicate associated with sulphate of sodium	-blue
Azurite	-basic copper carbonate	-dark blue
Bone black	-carbon	-black
Lampblack	-carbon	-black
Charcoal	-carbon	-black

Pigment Analysis

Analysis of pigments helps the conservator in two ways.

1. It provides the conservator the data regarding the condition and the materials used in the painting. It helps the conservator to decide what method or materials may be safely used in the restoration work.

2. It provides sufficient clues for the painting's authenticity. With a cumulative growth of knowledge of the materials used by a particular artist, which is obtained by scientific analysis, a new painting of that artist can then be examined and the results compared with known ones to decide authenticity.

Medium

One must know the medium in which the painting is done before proceeding in the restoration process. It can be oil, tempera or water. Drying oils are commonly used. They dry due to oxidation and polymerisation and not by evaporation. In the making of all paintings, usually two media are used together. One is glue in the ground and oil in the paint. There is a possibility of tempera in the paint layer also. Analysis such as gas-chromatographic analysis and 'staining technique' are used to identify the oils, resins etc. This will help to conclude whether the oil used was linseed, walnut or poppy oil and the resin used was dammer, mastic or any other resin.

The melting of the media may be noted by subjecting a prepared cross-section of the paint in a controlled temperature oven and gradually increasing the temperature when melting is seen by the appearance of fine bright droplets. The melting points of the media used are given below:

Medium	**Melting Point**
Bees wax	60°C
Resins	120°C
Dried oils	160°C
Egg-yolk	200°C

Varnish

Varnish is a solution of natural or synthetic resin, which dry to a solid, relatively transparent and continuous film when spread thinly on a surface. It can be natural or synthetic. It is a transparent coating given on the top of the painting. When completely dry, it serves to give the painting a uniform shine and full value to the colours used. The characteristics of an ideal varnish are,

- ❖ Ability to protect the painting from impurities.
- ❖ Transparent and colourless.
- ❖ Ability to take any consistency.
- ❖ Should not bloom.
- ❖ Ability to be removed when required.
- ❖ Non-glossy to the painting.
- ❖ Non-reactive with the material of the painting.
- ❖ Not changing its colour and elasticity with time.
- ❖ Not decomposing with time.

Even though there is no varnish, with all the qualities of an ideal varnish, one has to choose the best among the available ones. The most common resins used in varnish are mastic resin (*Pistacia lentiscus*), sandarac (*Callitris quodrivalis*), dammer (*Dammer orientalis*), shellac (*Coccus lacca*) (shellac is a secretion from the insect *Laccifera lacca*), copal (fossils), amber (Fossil) etc. Even though there are a number of resins available for the preparation of varnish the most commonly used varnishes are dammer varnish (dissolved in turpentine), mastic varnish (dissolved in turpentine) and acrylic varnish (methacrylate in petroleum solvent).

All the varnishes after exposure for a long time become opaque. The natural resins such as mastic, dammer, lac etc., are more vulnerable than the synthetic ones such as Paraloid B 72 or MS 2A Ketones.

Solvents

Conservators in order to dissolve the hardened varnishes mainly use solvents. The solvents are organic in nature and they evaporate

when exposed to atmosphere. The characteristics of a good solvent are

1. Volatility
2. Solvent strength and
3. Solvent toxicity.

Various solvents used are propane, cyclohexane (aliphatic hydrocarbons), toluene, benzene, xylene (aromatic hydrocarbons), petroleum ether, gasoline, naphtha (petroleum products), rectified spirit, glycol (alcohols).

Turpentine is called as *'restrainer'* or *'retarder'*. This is to restrain or retard the solvent action of stronger solvents while the hardened varnishes are removed from the surface of the painting under cleaning.

A solvent is applied on the varnish layer. The varnish absorbs the solvent and swells. This swollen varnish is then wiped off with cotton swabs using the same solvent or other solvents.

Adhesives

Adhesive is an agent, which joins one material to the other by bonding. In the case of paintings adhesives are required to join the broken paintings, cupped up pigment layers, cohesive layers of paint and the support etc. An adhesive is said to be working well when the elements of bonding are satisfied. For an adhesive to be called a good one, it must have, reversibility, viscosity, softening point, wetting, impregnation or penetration, cold-flow, permeability to toxic vapours, permeability to moisture and mould growth, insect attack, toxicity, flexibility, bonding strength.

Water-based (starch, dextrin, gums, glues, albumin, casein, sodium carboxy methyl cellulose, lignin, poly vinyl alcohol) and solvent-based (Poly vinyl acetate, poly vinyl chloride, poly acrylates, ply methacrylates, rosin esters, nitro cellulose, cellulose acetate, BEVA Pedicryl 126) adhesives are the two types of adhesives. Choice of the adhesives in the tropics is very important. During the season when the relative humidity is very high, water-based adhesives may not

suit the bonding of materials, as this will encourage mould growth. Now a days silicon resin is used invariably at all times and on all materials.

Analytical Tools

Among the classical micro chemical methods, Weisz Ring Oven Technique is used in the Chemical Conservation and Research Laboratory of the Government Museum, Chennai to identify the elements. Chromatography is also used for the identification of elements thereby the pigments. There are many sophisticated methods available for the analysis of pigments and other layers in a painting.

The main techniques, which have been used by various scientists for analysis of paintings, can be categorised as follows:

1. Optical Microscopy
2. Emission Spectroscopy
3. X-ray Diffraction
4. X-ray Fluorescence Spectrometry
5. Mass Spectrometry
6. Neutron Activation Analysis
7. Infra-red Spectroscopy
8. Raman Spectroscopy
9. Laser Induced Breakdown Spectroscopy

FRAMING AND MOUNTING OF PAINTINGS

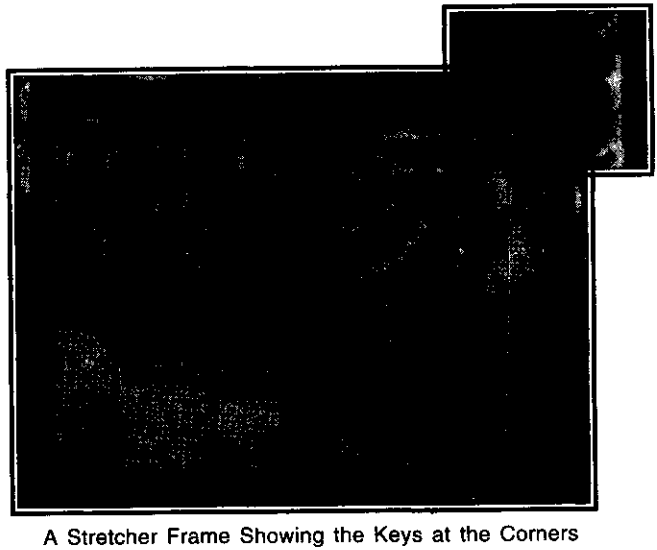
Frame should complement and protect a picture. Paintings or pictures, which are set in to frame which is in effect, an air tight box have held their condition far better than similar works exposed to the air with out any frame. Correct fitting of the picture in the frame is very important. The framing is not a cumbersome one. It may have the glass sealed, to have the face of the picture some distance behind that and to have a tight backing. This type of framing keeps out dirt, it protects the pictures from minor accidents, it keeps out water, and it reduces extreme and rapid changes of temperature and relative humidity. The glass front is made airtight by keeping rabbet. The edge strip keeps the glass away from the picture. Another edge strip keeps away the backing from the picture. The backing should be made by hard board, tin sheet or wood fibreboard and coated with materials like varnish to avoid moisture.

There are different types of frames. The frames are made of wood. This acts as a buffer maintaining the relative humidity. But when paintings are sent out from one place to the other the relative humidity changes. Metal frames are not easily damaged and scratches are barely discernible, which makes them ideal for travelling exhibitions.

Different types of ornamentation are made in the frame. Normally the frames of the British period were coated with gold gilt. Plaster ornamentation was also done in most of the cases. Cedar wood, sal wood, deodar (cidrus deodara) etc., were generally used. The supporting materials are subjected to the Oddy's Test for the expulsion of harmful gases. Suitable coatings are given to avoid the harmful gases from the frames to the pictures. Like most fabrics, canvas responds to atmospheric conditions, becoming tighter in dry weather and looser in moist condition. There fore the canvas paintings have keys in the stretcher frame. The keys are small triangular wooden wedges that fit into slots at the four joining corners of the stretcher. They are tapped in further to taut a slackening canvas, or to flatten nipples caused by improper stretching. The front should be protected with some cushioning materials, when hammering is done at the back

or screws are tightened or loosened. While glasses are fixed, it should be noted that the frame should not tilt. Otherwise the glass will break. The most extreme framing is done with no frame but merely fabric-masking tape. Perspex has been moulded to make frames, as well as a picture glass substitute.

There are mainly three types of mounts. They are *solid mount* (the print or drawing is pasted to a cardboard), *overthrow mount* (when a damaged or torn print or drawing is laid on a cardboard by pasted guards of paper and to this cardboard another cardboard frame is hinged using linen so that the torn print or picture is concealed) and *window mount* (preparing two boards, cutting rectangular openings in them depending upon the size of the picture and glazing each side with a sheet of cellulose acetate). A picture with a thin support must have a suitable mount. The picture cannot be handled safely with out the auxiliary support. Mount should be free from acid. A window mat, a cut-out border, fits over the mount having the picture free. Usually a thin slip-sheet is laid, for protection, over the picture and under the window mat. The best way of protecting miniatures is to place them between hinged mats fabricated of all rag mount board, with a window cut on the top mat.

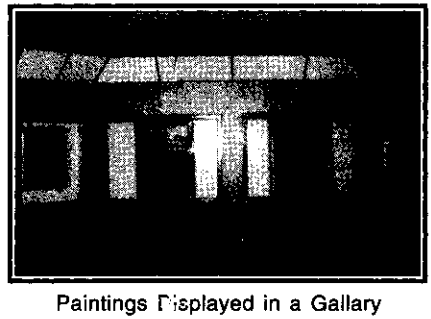


A Stretcher Frame Showing the Keys at the Corners

DISPLAY OF PAINTINGS

Display of paintings in a gallery either on the wall or panel is a skill in itself. Selection of a hanging space in a gallery or any other place either on the wall or panel is of foremost importance. It should be aesthetic and it should help in the preservation of the painting. The painting should neither should be suspended near the kitchen or near radiators. Dust should be protected by necessary filter in case the gallery is air-conditioned. Sudden and frequent changes in temperature should be avoided.

Hanging or suspending the painting in a suitable space in a gallery is another important aspect. Paintings should be suspended using wires of numerous strands. Paintings or pictures should be suspended with a slight forward tilt rather than flush against the wall. This will minimise the amount of dust deposited on the surface and leave room for air to circulate behind the painting. Small cleats at the back bottom canvas of the frame will project the painting sufficiently to prevent dust from collecting between the picture and the wall. The paintings should be inspected once in six months and taken down from the wall to ensure that the hanging wire is intact. Dusting should be done gently with a feather touch duster or a soft brush. If there is any sign of flaking, then dusting should be avoided.



Paintings Displayed in a Gallary

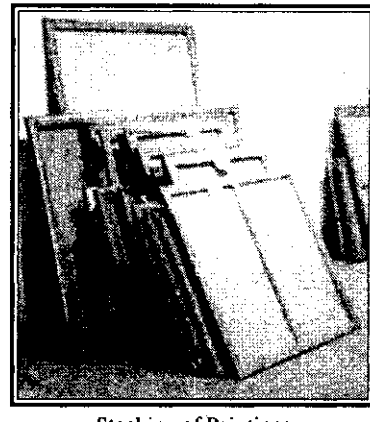
STORAGE OF PAINTINGS

There is a natural tendency to relax conservation vigilance when the museum objects are out of sight in storage or in vaults. The basic principle of storage is to keep the objects in a physically secured environment and yet to permit ready access for inspection before their removal to the galleries, storage or other locations.

There are various storage devices and they are expected to meet the physical and environmental criteria intended for preserving the prints, pictures, drawings, paintings etc., against damages.

Stacking

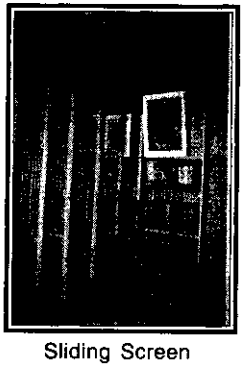
Paintings and flat framed works, prints, photographs etc., may be placed on pads and stacked vertically using cardboard as separators. In group stacking it is necessary to ensure that the pads are skid-proof, that the angle of stacking is average, and that the largest objects are kept first.



Stacking of Paintings

Drawers and Cabinets

Drawers and cabinets are used for storing flat works of art on paper, cardboard, cloth, maps and similar items. Interleaves of acid-free tissue papers are used.



Sliding Screen

Sliding Screens

Sliding screens are very common for paintings and flat works and occasionally for decorative art, which can be suspended by appropriate hooks. Such a system economises the floor space and is efficient for examination and retrieval purposes.

PACKING OF PAINTINGS

Serious damage may occur to paintings when they are transported from one place to the other. The primary aim of packing of paintings, prints, drawings etc., is to protect them physically and environmentally at all stages through, to the place of exhibition in relation to the type of transportation. The packing system should not involve complicated procedures in packing and unpacking. When they are sent out of the country for exhibition, the customs officials will open the package for verification. One should be able to open and show the objects, if necessary. The materials of packing, packing systems and guidelines in packing are essential to safeguard the paintings for posterity. When paintings are being packed for transportation, all screw eyes, nails and other projections should be removed to prevent their scratching the surface of other paintings. It is better to leave the frames of the paintings while packing for added protection to the paintings. Folded newspapers or corrugated cardboard can protect the corners of the frame. Now moulded thermocoles are available for this purpose. If the paintings are with glass, it is advisable to place a few strips of masking tape vertically and horizontally on the glass to help prevent shattering if pressure or movement causes stress. During hot weather paintings on wooden panels should not be left in a closed car. The painting will bend damaging the painting.

Packing Materials

Natural materials such as wood are used in packing to avoid cost as well as environmental changes as wood buffers environmental changes. Packing containers are made out of wood, plywood, fibreboard, block board, steel etc. Traditionally cushioning materials such as cloth, straw, gunny bags were used. In recent years a variety of foamed plastic materials in the form of balls, peanuts, spaghetti derived from polyethylene foam, poly styrene foam and poly urethane foam are used to surround packing or float packing. Rubber, polythene air bubbles also are used. For wrapping the paintings and similar artefacts acid free tissue paper, corrugated paperboard, polyethylene wrapper, polyethylene cellular film, polyethylene air bubbled sheets etc., are used. For binding, pressure tapes are used.

Single Packing

Single packing is very simple and is meant for paintings, prints, drawings, photographs etc. They are wrapped with tissue paper or kraft paper and surrounded with additional soft paper padding materials and kept in a slightly larger container made out of wood, plywood or hard board, which is provided with a convenient handle to carry.

Multiple Packing

This packing in which more paintings, prints etc., arranged in layers separated by rigid panels with the free space at the perimeter and edges, which are stuffed with cushion shreds is called multiple packing. Instead of rigid panels interleaving the objects corner pads and the slack face all around may be used are filled with cushioning materials.

Horizontal Tray Packing

Accommodating paintings and similar art objects in individual adjustable tray designed with shock absorbers at the corners, which are in turn grooved to the inner walls of the packing case is the horizontal tray system of packing.

Vertical Tray Packing

Panels fixed with paintings etc., are slid vertically, which can slide out and in along the grooves made at two opposite inner walls of the packing cases is vertical tray packing. The vertical panels may have holes or slots for fixing the paintings to it.

Track System of Packing

In the place of vertical sliding panels, a system of tracks can be installed inside the packing cases in order to pack the framed works by sliding along the tracks. In this system also we can accommodate framed paintings, works on paper, photographs etc. Proper shock absorbing materials between the tracks and inner walls of the packing case will avoid the transfer of shocks to the packed paintings and other art objects.

Horizontal Slide-out Tray Packing

In this type of packing the slide-out panels are like trays to which the objects are attached. Cushioned fixtures having winged nuts should hold the objects

Conservation Measures

The following tips may be kept in mind while the packing is done:

1. Airtight packing cases will avoid change of relative humidity and therefore mould growth is avoided.
2. Before packing all the interior wood, filling materials should be fumigated with a suitable fungicide like thymol. Oddy's Tests are performed to assess whether they emanate harmful gases.
3. The paintings and similar art objects should be eradicated from fungi and other pests.
4. The packing case should be marked with the directional marks at which it should be positioned.

ENVIRONMENT FOR PAINTINGS

There are four main factors affecting the conservation of collections for which conservators established standards. The role of preventive conservation is to apply these standards to specific collections and effectively implement them in particular museum or gallery buildings. They are

1. Relative Humidity
2. Temperature
3. Light Levels and
4. Air Cleanliness

Relative Humidity

Relative humidity (R.H.) is defined as the ratio expressed as a percentage of the absolute humidity of sampled air to that of air saturated with water at the same temperature. The type of damage depends on upon whether the material is organic or inorganic.

In the case of paintings, mostly organic in nature, changes in the relative humidity induce fluctuations in the size of the painting, fluctuations, which in most materials are many times larger than those produced by temperature fluctuations. If restrained during these fluctuations, cracking, stretching or tearing can occur. If the relative humidity is too high swelling, mildew and mould growth can occur. If the RH is too low for a long time, the flexibility of the materials may be lost. The international standard of relative humidity is 50-55 percent. In tropical climate like India, the paintings are acclimated to relative humidity levels higher than the museum norm. Even though maintaining the right relative humidity is difficult in India, it is better to have a relative humidity ranging from 45 to 60%.

Air Cleanliness

Air cleanliness refers to two distinctive classes of materials, which museums should remove from the air. They are

1. Particulate matter or dust and
2. Gaseous pollutants.

The particulate matter includes dust, lint, tobacco smoke, coal, oil smoke and bacteria. Air can be filtered and the dust reduced. The wall space should be sealed to arrest the concrete dust. High efficiency vacuum cleaning will result in house keeping.

Temperature

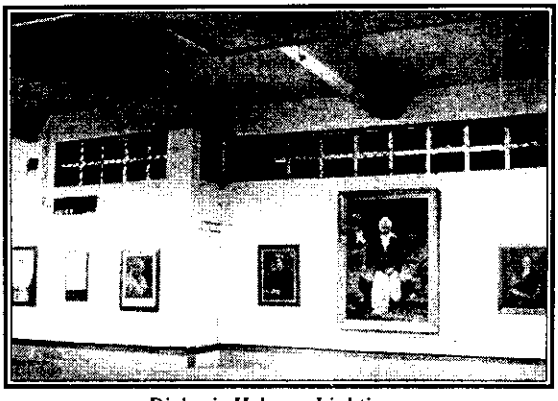
Temperature is a measure of heat. Temperature is one of the factors, which also has to be controlled for the upkeep of the paintings. Chemical reactions occur faster at higher temperatures, and therefore low temperatures are preferred. When the staff and visitors' comforts are concerned, the temperature difference may not be a factor to be worried. The ideal temperature for paintings will be 21°C ± 0.5°C. If at all the Painting Gallery should be air-conditioned, the air-conditioning should be for 24 hours a day. Otherwise the paintings will be damaged due to the fluctuation in temperature.

Lighting

Lighting is very important to paintings. There are two types of lights. They are natural and artificial lights. Light has a very bad constituent called ultra violet light. This portion of light would weaken the organic matter and the colour would fade and the materials will appear old. Natural light has more ultra violet light and therefore use of direct sunlight should be avoided in museums / galleries. Paintings should never be displayed near open windows, as the light would fade the objects, if they were exposed to the natural light. Tube lights produce ultra violet rays and therefore use of fluorescent tube lights in the galleries should be avoided. Lights, which will not emit ultra violet rays are available. Fibre optics, halogen dichroic lamps are also very much in use.

Fibre Optic Lighting

Fibre optic lighting is free from heat, UV and IR rays. The dichroic halogen lamps will not emit heat on the paintings but the



Dichroic Halogen Lighting

heat is dissipated to the back of the lamps and therefore they are preferred in museums and galleries.

Light levels for paintings vary from type to type. In the case of watercolour painting, since they are very sensitive, the light level is only 50 lux (Lux is the unit of light). In the case of oil paintings, the permitted light level is 100 lux. Dichroic Halogen Lamps dissipate heat at the back side and therefore heat does not affect the paintings.

AUTHENTICITY

Detection of forgery depends on the evidence of presence of discrepancy, if any, in the painting. If the painting so doubted is subjected to intensive scientific analysis for precise identification of the materials and techniques employed in it. The data so obtained has to be compared to the data bank already compiled on the artist in question and thus the possible presence of forger's hand emerges.

Each painting has its own set of specific combinations that is an unique to it as a finger print is to a person. Ultra violet and infra red photography allow immediate visualisation of pigments within a painting. In the case of fakes, the colour apperance could be very close to that of the originals but the pigments used are generally very different.

At present the usual practice of authentication of objects, which are purchased for museums and galleries are based on stylistic, artistic considerations, which is described by the members of the Art Purchase Committee who are commonly Museum / Gallery Directors or Curators. It is not definite whether the objects purchased or objects returned from outside exhibitions are originals or the fakes.

Reproducing the masterpieces was an accepted fact and was widely practised for centuries by student artists to polish up their techniques in Europe. In India also this practice prevails. Lately a large number of instances have come to light where these simple craftsmen were being exploited by the people in the art trade to produce fakes and forgeries almost in all types of art works. The art works of recent origin were very cleverly camouflaged to look old and vice versa. This gave smuggling of art works a great boost and the illicit trade is rampant today.

Faking of art objects has increased in the last decade in India. There were famous forgeries like the Piltdown forgery during the last century, which rocked the art and archaeological world. Since then, many instances have come to light and are well known all over the world and India is no exception. In recent days, we have come across

the faking and forgeries in respect of paintings, ivories and even stone objects. Scientific study has become more imperative in the field of art objects. Anyhow, scientific study takes more time for which the objects have to be subjected to detailed technical study.

Radiology is one of the fundamental non-destructive methods of investigation and examination of works of art such as paintings, paper materials, wooden objects, metal objects, ceramics etc. It has been used in the past and is used in the present in the detection of forgeries of the original works. When x-rays are allowed to fall on an x-ray film through the object to be examined, a shadowgraph is formed on film depending upon the structure the object. The latent image is developed, like photographic film to obtain the image of the inner structure of the object called radiograph. In the case of painting, the radiograph registers its various parts from the support up to the surface coating. This information is used to conserve and to identify the paintings. Radiography could help in characterisation of these art works in order to finger print them for legal purposes.

Finger printing of art objects and antiquities of all materials could be done if some documentation technique could be used such as Macrophotography, Infrared Photography, Radiography. Analysis of elements through classical as well as sophisticated instrumental methods will reveal the composition of the art objects. These records should be kept a secret. Otherwise the culprits will use this data and fake objects will be produced in plenty.

DATING OF PAINTINGS

Dating of painting is also necessary to evaluate the importance of them. There are many a ways of determining the age of the paintings. They are,

1. Stylistic dating
2. Dating from the colophon
3. Dating through analysis of the pigments

Stylistic Dating

An expert may be able to identify a painting through its style. Most of the paintings may be identified like this. But every body cannot depend on this methodology.

Dating from the Colophon

Some of the miniatures and oil paintings used to have the name of the artist and the date of painting. Most of the paper prints used to have the dates of engraving or painting. The dates given are the original ones. These dates are normally the real ones.

Dating through Analysis of the Pigments

Pigment analysis is one of the very important sources of dating of paintings. For example, natural pigments were used in the earlier paintings. Slowly the painters changed their pigments from the natural to the commercial one. The analysis will give a true picture of the age of the paintings. Normally the craquelure on oil paintings will be a proof for antiquity. Similarly the bloom is also a proof for antiquity in the case of paintings.

GLOSSARY

Binder

A non-volatile adhesive liquid portion of a paint that attaches pigment particles and the paint fills as a whole to the support.

Bleeding

The action of the binder, vehicle or solvent used in a paint system that causes diffusion of colour into an area where it is not wanted.

Blistering

The bubbled appearance of the paint layer is called blistering.

Blooming

When varnish looses its transparency, the painting appears to be covered with a bluish white haze. It is called blooming.

Cleavage

Cleavage is the detachment of any two layers of painting.

Consolidation

The process of providing adhesion between different loose layers of a painting is called consolidation.

Cracking

Cracking is nothing but splitting of the paint surface.

Darkening

When the drying oil get darkened, it is called darkening.

Discolouration

Colours fade due to exposure to light. This is called discolouration.

Drying oil

An oil when spread into a thin layer and exposed to air, it absorbs oxygen from the air and converts into a tough and leathery film.

Embrittlement

Due to ageing, the paint loses its elasticity and becomes brittle. This is called embrittlement.

Flaking

If the cleavage in a painting is not taken care of, then the paint flakes off. This is called flaking.

Fly Marks

The excreta of fly are called fly marks, which are normally removed by swabbing with water. Some times it may be required to clean with a soft brush.

Foxing

It is the formation of small brown spots, which are due to biological activity as well as due to iron impurity in the paper.

Fresco

A painting technique in which the pigments are dispersed in plain water and applied to a damp plaster wall. The wall becomes the binder as well as the support for the paint.

Gesso

A white ground material for preparing rigid supports for painting made of a mixture of chalk, a little white pigment and glue.

Glaze

A very thin transparent coloured paint applied over a previously painted surface to alter the appearance and colour of the surface.

Hygroscopic

Absorbing or attracting moisture from air.

Inpasto

A style of paint application characterised by thick, juicy slabs of colour.

Infilling

The filling of the lacunae in the paint and ground layers of a painting after consolidation with suitable putty is called infilling.

Matte

It is flat or nonglossy or having a dull surface appearance.

Over Painting

Over painting is the action done by an artist to hide the defect or damage either at the time of painting or at the time of some repairs in a later stage.

Palette

The surface on which a painter's pigments are mixed; also a range colours an artist uses.

Picture Cleaning

It is the removal of varnishes or incrustations, which obscure the painting.

Powdering

The paint layer becomes powdery due to the loss of cohesion between the paint particles. This is called powdering.

Preservative

A material that prevents or inhibits the growth of micro-organisms in organic mixtures.

Relative Humidity

Relative humidity (R.H.) is defined as the ratio expressed as a percentage of the absolute humidity of sampled air to that of air saturated with water at the same temperature.

Relining

Providing reinforcement to a weakened support of a painting is called relining. There are strip relining, full lining, loose lining and marouflage. It can be hot or cold.

Retouching

Retouching is nothing but reconstituting the broken continuity of a painting thereby the viewer can appreciate the painting without being disturbed by the losses in the painting.

Strainer

A type of wooden chassis for textile / canvas supports that has rigid, immovable corners.

Stucco

A surface finish composed of Portland cement, lime, sand and water.

Tempera

A technique of painting in which water and egg yolk or a whole of egg and oil mixture form the binder for the paint.

Watercolour

A technique of painting using a binder made from from a water-soluble gum. Water colour paints may be transparent or opaque.

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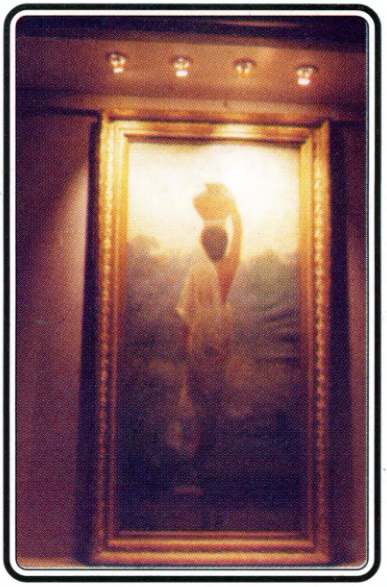
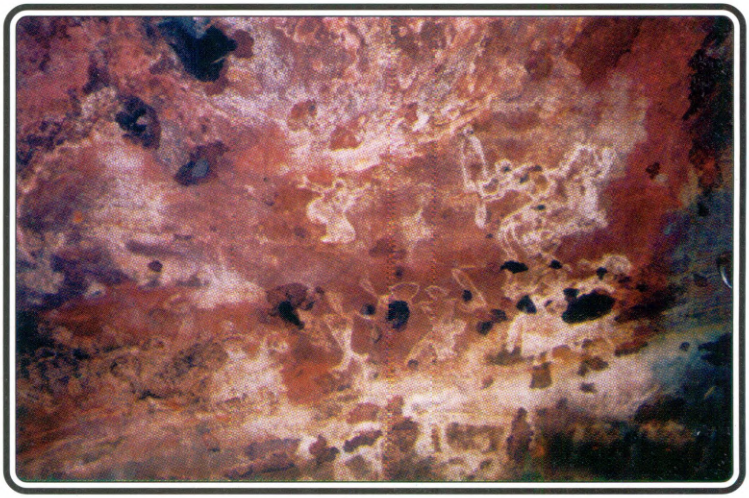


1. Fibre Optic Lighting

2. Dichroic Halogen Lighting

3. Wall Painting at the Hands of Vandals



4. Growth of Moss and Lichen on a Rock Painting

5. A Wall Painting

6. Fungal Attacked Oil Painting on Canvas

7. A Badly Blistered Oil Painting on Canvas

8. Front Facing with Tissue Paper

9. Coating of Molten Wax-Resin Mixture to the Fresh Canvas

10. Relining New Canvas to the Old by Heating

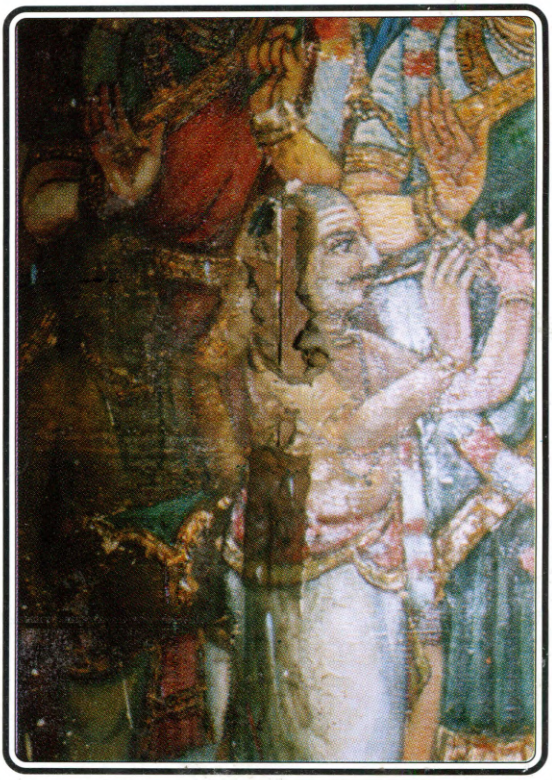
11. Removing the Front Tissue Facing

12. A Torn Oil Painting on Canvas

13. Restored Oil Painting

14. Insect Attacked Miniature on Paper

15. Fungal Attacked Painting on Cloth



16. Loss of Canvas, Putty along the Joint of a Thanjavur Panel Painting