

## Chapter 9

### MODERN ART DISINFECTION AND RESTORATION

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#### 9.1. INTRODUCTION

Paintings created between the late nineteenth and mid-twentieth centuries are painted on diverse supports (canvas, wood, paper, etc.) and employ various types of paint and techniques.

The materials that comprise these works of art are susceptible to deterioration owing to their storage and display conditions. Biodeterioration, particularly caused by insects and fungi on the artwork's support, including the base layers, adhesives and pigments, poses a significant threat to the integrity of paintings. Organisms that can have detrimental effects on works of art can develop as a result of the physical conditions in which they are stored and the presence of damage, such as cracks, cavities and other surface defects [9.1].

Dust and other particulates often accumulate on paintings, which can stimulate the growth of biological agents. When combined with poor conditions, such as exposure to high temperatures and humidity, organisms are more likely to develop and to damage works of art.

The dimensions of canvases can present challenges in employing traditional decontamination techniques [9.2]. It is important to note that traditional chemical treatments can pose a risk to the materials that form artworks, since varnishes and pigments are sensitive to solvents and other chemicals.

To address these concerns, effective treatments against biological agents for modern artworks have been developed through the utilization of ionizing radiation. The  $^{60}\text{Co}$  Multipurpose Irradiator at IPEN has played a crucial role in art preservation [9.3].

## 9.2. CASE STUDIES

### 9.2.1. Example 1: Metropolitan Transportation State Secretariat, São Paulo

The São Paulo Metropolitan Trains Company, known as Metrô, was established on 24 April 1968. Operated under the supervision of the State Government of São Paulo and overseen by the Metropolitan Transportation State Secretariat, Metrô is tasked with managing and enhancing the metro network. Additionally, it plays a crucial role in the strategic planning of passenger transport within the metropolitan region of São Paulo.

In the 1970s, Metrô introduced projects focusing on art and culture with the aim of strengthening ties with the public and enhancing the passenger experience for the more than four million people who use the transport system. The *Art in the Metro* project, initiated in 1978, saw the installation of the first works of art in an underground station. Over the years, the project has featured various art forms, including sculptures, murals and canvas paintings. As of now, there are 92 artworks displayed across 36 metro stations in the city of São Paulo [9.4].

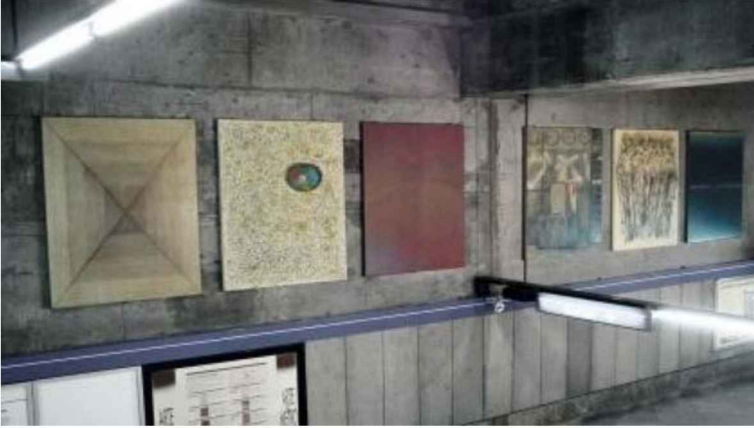
However, the longevity of some artworks came into doubt when 11 paintings on canvas exhibited signs of deterioration. These artworks were displayed in metro stations, where they were exposed to the environment. Dirt, soot from the operation of the transport system and acts of vandalism are constant threats to these artworks.

In a tropical country such as Brazil, with temperatures frequently exceeding 25°C and high humidity, pests such as termites can pose a significant threat to cultural heritage. Subterranean termites live in structures below ground level and in environments such as those found in underground stations [9.5].

An investigation confirmed the presence of termites in the artworks (Figs 9.1 and 9.2). This discovery prompted the need for a thorough intervention to address the termite infestation and ensure the preservation of these valuable pieces of the *Art in the Metro* project.

Gamma irradiation is an effective means of mitigating insect contamination of paintings, as the radiation levels used in this type of treatment are too low to cause changes in pigment colours or other undesirable side effects [9.6–9.9].

The canvas paintings were carefully packed in wooden boxes for transport. Subsequently, the artworks underwent a thorough decontamination treatment, which involved subjecting the paintings to gamma radiation at the Radiation Technology Centre at IPEN, where they were exposed to an absorbed dose of 3 kGy. Control dosimeters were employed to verify the expected dose rate during the irradiation.



*FIG. 9.1. Paintings on canvas affected by termites in a metro station. Mixed and acrylic paintings on canvas by the artists Hiro Kai and Lúcio Yutaka Kume, 1988. Metro line 1, Liberdade Station.*



*FIG. 9.2. Paintings on canvas affected by termites in a metro station. Acrylic paintings and dry pastel on canvas by the artists Carlos Alberto Yasoshima, Hisae Sugishita and Laerte Yoshiro Orui, 1988. Metro line 1, Liberdade Station.*

### **9.2.2. Example 2: Museum of Modern Art of São Paulo**

The Museum of Modern Art of São Paulo is a non-profit, public interest civil society organization established in 1948. Its extensive collection, primarily featuring works by the most prominent figures in modern and contemporary art, especially from Brazil, comprises more than 5000 pieces.

Located in Ibirapuera Park, São Paulo's most important green area, the Museum of Modern Art of São Paulo building was designed by Oscar Niemeyer in the 1950s and adapted by Lina Bo Bardi in 1982. The museum spaces visually integrate with a sculpture garden, designed by Roberto Burle Marx in 1993 to house works from the collection.

Situated in a wooded urban park, the museum contends with an ongoing threat from termites. In response to this challenge, the  $^{60}\text{Co}$  Multipurpose Irradiator at IPEN has played a crucial and consistent role, offering consultancy services and administering disinfection treatments for works of art. Through these efforts, the facility effectively addresses and mitigates the challenges posed by insect control, contributing to the preservation of the museum's valuable collection. The processing of these materials is often challenging, since the museum has large works of art, including paintings and sculptures, in a variety of materials. These works are transported to IPEN with the assistance of companies specializing in the transport of works of art; custom packaging is designed for these works, and conservators supervise their handling (Fig. 9.3).

For works of art of various formats and large dimensions, which are common in contemporary art, dosimeters are placed at different points on the artwork in order to ensure uniformity of the treatment dose.



FIG. 9.3. An example of a large artwork treated with the  $^{60}\text{Co}$  Multipurpose Irradiator at the Nuclear and Energy Research Institute (IPEN).

In order to eradicate insects at all stages of development, most of the objects were treated with absorbed doses of up to 2 kGy. Since the objective of curative treatments is not to sterilize the objects, larger doses are not necessary, and so side effects are avoided.

### 9.2.3. Example 3: São Paulo State Government, Bandeirantes Palace

Bandeirantes Palace, situated in São Paulo and inaugurated in 1965, serves as the administrative headquarters of the government and houses the Artistic-Cultural Collection of the Government Palaces of the State of São Paulo. Encompassing the Boa Vista Palace in Campos do Jordão, this collection has been accessible to the public since the 1970s and comprises approximately 4000 pieces. Bandeirantes Palace houses a collection featuring works by artists such as Candido Portinari, Antonio Henrique, Djanira Motta e Silva and Aldemir Martins, among others. These include silverware, furniture, paintings, tapestries, pottery and various other objects.

A collaboration between IPEN and Bandeirantes Palace has played a pivotal role in the treatment of significant modern Brazilian paintings and antique furniture. The incorporation of ionizing radiation into these treatments has eliminated issues related to contamination by insects and mould (Fig. 9.4). This collaborative effort has contributed substantially to the preservation and safeguarding of these valuable cultural artefacts, ensuring their longevity and maintaining their cultural and historical significance.

## 9.3. CONCLUSIONS

These examples of radiation disinfection of modern art collections at the  $^{60}\text{Co}$  Multipurpose Irradiator at IPEN demonstrate the success and effectiveness of using ionizing radiation for preservation.

As an important part of Brazil's culture, the works of contemporary art treated in this study must be protected from biological agents in order to ensure their preservation.

Conservators benefit greatly from the ability to treat large works of art made of composite materials and in different formats in their packaging for transport and without having to handle them directly. Owing to the high penetration of gamma radiation, these works of art can be treated quickly and safely so they can be later restored by conservators.



FIG. 9.4. Paintings on canvas disinfected with ionizing radiation at the Nuclear and Energy Research Institute (Bandeirantes Palace collection).

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