Hanna M. Szczepanowska, *Conservation of Cultural Heritage: Key Principles and Approaches*, London-New York: Routledge, 2013, pp. 317, ISBN 978-0-415-67475-1

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Considered as basic regarding methods and practices required for future museum professionals who will work with museum collections and artifacts, *Conservation of Cultural Heritage*, is able to assists current professionals in understanding the multifaceted processes that archeologists must apply every day. Why this book is so valuable is because correlates the aspects of material science and the behavior of artifacts in a museum environment. It can be considered a reference book, in practical sense, both for the student as well as for museum professionals so that the protection of the collections is properly done.

Over 220 figures in black and white and over 160 plates redone in color variants, form this compact paper, imagines without which the processes explained could not be understood as complex, images that I consider necessary and helpful in perceiving the overall idea of the book. For each imagine individually is exposed the description of the picture and references. A large share of the pictures belongs to the author and another part is pictures that she agreed to be published in the book.

Following the content there is a list of figures (pp. viii-xxiii), list of plates (pp. xxiv-xxxv), list of tables (p. xxxvi), list of charts (p. xxxvii), preface (p. xxxviii), acknowledgment (pp. xl-xlii), foreword (p. xliii) and dedication (p. xlv), and at the end the bibliography (pp. 287-304), a list of useful websites (pp. 305-307), which appear throughout the text, citation methods, and its finished with an index (p. 308). Each fragment is short and concise, without exhaustive approaches regarding what will be later on exposed.

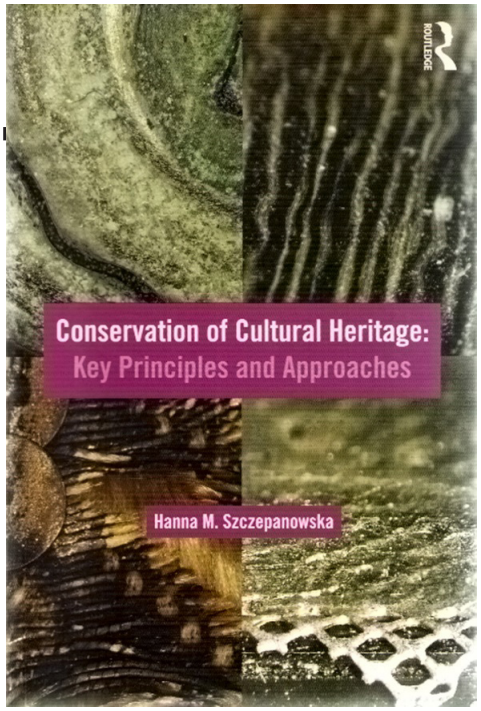
From reading the content, it can be noticed that this volume is structured into two parts:

The first part, *General collection care practices*, unites 4 chapters (chapters1-4, pp. 1-92), as it is mentioned in the first part, presents general elements regarding preventive conservation in a museum.

The second part, *Materials and conservation practice*, groups 6 chapters (chapters 5-10, pp. 93-285), where there are taken from certain types of materials that form museum collections, offering detailed information on them, from origins to definitions, chemical components, uses, how they are affected by certain harmful factors, how the negative effects of these factors can be controlled.

One of the objectives of this book is to develop a platform for understanding the museum professionals and conservators, by looking from both points of view at the many processes that are involved in care of collections.

Collecting as the `gathering of beautiful objects` has been practiced since antiquity, but it was only in the eighteenth century that this activity was formally defined with the purpose of displaying and making the collections available to the public. Conservation, an evolving concept, is one of the most important functions in a museum, listed as the second fundamental objective defining a museum `to acquire, conserve and educate`.



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The principle of practice, for preservation and conservation, remains the same and stems from the same base, to `preserve and do not harm`, this refers to consequences of interactions with the object, including reversibility whenever possible and minimal intervention.

For preventive conservation the general objective is to establish and maintain a stable environment, to use non-reactive, chemically inert materials in storage and on exhibition and to properly handle all artifacts. Pest management, housekeeping procedures and object handling are some of the top priority list for conservation.

These are the general ideas that are discussed in detail in the first chapter entitled, *Conservation in a Museum Context* (pp. 3-13), chapter that covers very well the basic elements for starting preventive conservation studies. The general framework, the museum, is the place where all the entire activity for conserving the artifacts takes place. How should a building dedicated to such a purpose should be, how should it be internally structure, which are its functions, who are the people that deal with the proper functioning... are answers to which this chapter answers.

The second chapter, *Preventive Conservation* (pp. 14-46), presents the inside organization of the museum, the components of the interior environment, as well as a managerial plan for its maintenance in normal conditions as well as in emergency conditions. A systematic examination of the relative humidity, temperature and lights monitoring instruments must be part of routine collections inspection and building maintenance.

There are ten agents of deterioration which pose potential risks to a collection are frequently mentioned in the conservation literature:

-direct physical forces
-thieves, vandals and displacers
-fire
-water
-pests
-contaminants (including pollution and radioactive materials)
-radiation (by light)
-incorrect temperatures
-incorrect relative humidity
-custodial neglect

All these agents are discussed in detail in terms of how they can have damaging on the museums' collections and warehouses.

For tracking artifacts, there are some methods used but each is selected in accordance with the artifact's material characteristics and each one has its advantages and disadvantages. There are listed the most common inventory methods, which can be found at page 48, as well as various methods, their impact on the items, represent the beginning of the third chapter, entitled *Collection care processes* (pp. 47-76).

The author offers international examples with a series of measures for evaluating the condition of museum collections in the context of the geographic location of the institution and its immediate surroundings. The purpose of a collection assessment is to identify areas that need improvement and assist museums in developing a program created to reach those improvements.

Examination tools, methodology of gathering information and formats used to document findings are diverse from collection to collection, to a museum to another. Any documentation report, in general terms, will contain several common components:

-record of condition: written description, database, topographic surface scanning

-photographic documentation: can include black and with photography, X-radiography, X-ray computed tomography, 3D imaging, UV and IR imagined and multispectral imaging

-supportive documentation: contextual information-provenance, historical evaluation, sketches, records of previous work, results of analytical testing, other information that contributes to a better understanding of the current condition of a site or an object

On an artifact, laboratory examination in carried out on a macro- or micro- level. Usually the first step to understand microscopic examination is to comprehend surface characteristics. Infrared spectrometry is, usually, the first step for understanding the general chemical composition of examined material.

For an exhibit to be successful two important tools are needed, the exhibit policy (to provide general guidance for adherence of the exhibit) and the exhibit development process (effort of curators, designers, fabricators and conservators). These are things presented in the last chapter, 4, from the first part of the book, *Exhibit and Storage* (pp. 77-92).

The fundamental common elements for a proper care of objects on exhibit and in storage are:

-understanding the artifacts, their structure, materials and state of preservation

-handling procedures and construction of physical supports based on artifacts needs

-secured access, for the exhibit and in storage areas, monitoring direct access to collections

-proper environment (light, temperature, relative humidity, pollution, off-gassing and vibrations issues) in exhibit and in storage

-microenvironment in display cases and individual enclosures

The cultural heritage is preserved because it can be a tangible link to our past or intangible such as beliefs, religious and moral values, ways in which societies lived, conducted transactions, and interacted with other societies, nations. Tangible and intangible connections are the components of the second part of the book, *Materials and conservation practice*.

According to the Code of Ethics of the American Institute of Conservation, museum preservation aims to `protect cultural propriety through activities that minimize chemical and physical deterioration and damage, and that prevent loss of informational content`. The role of conservation in a traditional museum is to preserve the physical, historic and aesthetic integrity of artifacts. The difference between 'classic' artifacts and what artifacts mean for Native American communities, or for Australian Aboriginal cultures or for Pacific Ocean indigenous cultures

are elements exposed in chapter 5, *Indigenous cultures and Western concepts of preservation* (pp. 95-108).

Chapters 6 and 7 discuss about *Organic materials of plant origin* (pp. 109-167) and *Organic materials of animal origin* (pp. 168-201), where each organic element is taken individually: introductive information regarding the history of the material, processing methods for those of animal origin, its characteristics, the deteriorations it may suffer during exposition but also outside the exposition time, conservation concerns, exposure in the collection, storage. There are presented: cellulose and lignin; historical writing supports; paper; textiles; wood; leather; bones: antler, ivory; keratin; hair, fur and wool; porcupine quill; feathers; baleen; wool and silk. Chemically, the main components of plant fibers are cellulose, lignin and hemicelluloses. Wood fibers contain more lignin, plant fibers more cellulose, cotton is nearly pure cellulose. A fiber's composition determines how an artifact react in contact with acids, in others condition – extended exposure to light. Historically plant-base artifacts are writing materials, textiles, baskets, gums, resins, dyes, pigments, tannins. The most important historical writing supports are papyrus, palm leaf, pith, tapa or bark cloth and paper. For each of it there is a description containing data on the first uses, area the process of obtaining the sheets, vulnerabilities and concerns related to conservation. Bone was used in to principal forms: cancellous and compact. Based on function, bones can be flattened or long. Ivory differs structurally from bone, but their chemical make-up is similar. Collagen, the main protein form inside, is so resistant to deterioration that in good condition it can survive for millennia and for centuries, it has been one of the most prestigious materials used in decorative carvings. It is very reactive to environment, because of its protein component, especially to humidity and temperature.

The 8th part manages the study for *Inorganic materials* (pp. 202-226), in special metals.

Just form the shape, inclusions, deposits of metal artifacts can be obtaining great information about their provenance, historical period, techniques of manufacture. Understanding how a metal object was made and finished determines which methods should be used for conservation treatment.

In the introduction of the subject it is presented the historical part regarding metal use, after which is explained how some alloys were born, which metals an alloys contain and which were the most common mixtures (steel, bronze, brass, duralumin). Even the metal processing technologies are presented and is explained the extraction mechanism (smelting, casting, hot-working and cold working, annealing, soldering and brazing).

One of the most common degradation on metal is corrosion. This implies chemical changes within metal, because depends on the metal's composition, structure and environment. There are two types, active which can completely damage the metal and passive, when a patina exists, protecting the metal from further deterioration. There are several types of corrosion, depending also on what started the process: uniform corrosion, galvanic corrosion, crevice corrosion, pitting, intergranular corrosion, stress corrosion, selective leaching, parting, oxidation. Corrosion provides information about their past, the conditions in which they were stored.

In chapter 9 are presented *Non-metal minerals and artifacts* (pp. 227-259). This chapter includes an integrated studio, signed by Steven Koob, on glass, which presents data on the physical and chemical composition, methods of manufacture, preservation and deterioration, factors of deterioration, crizzling or atmospheric deterioration, treatment of glass in museum, repair and restoration, recommendations for museum exhibition and storage. It is indeed a compact study, because it presents in detail all the elements presented above.

Used from antiquity, minerals pigments, mineral and non-mineral, are important for conservators for their impact on artistic palette or for their effect on the substrates on which they have been applied. For example, traditional white pigments, calcium carbonate and calcium sulfate, used in ancient Egypt, come from calcitic stone and gypsum, minerals that can be found in nature. For black pigment in antiquity was magnesium oxide, pyrolusite, carbon from crushed charcoal or carbon from soot.

There are described, individually, the most often found mineral pigments, from where they come from, where they have been used, sensibility and reaction to different factors as well as the latest uses:

-orpiment: bright yellow mineral arsenic sulfide

-realgar: red mineral arsenic sulfide

-ultramarine: blue pigment, known as lapis lazuli, from nature is taken as mineral lazurite or sodium aluminum silicate

-azurite: blue mineral pigment, a basic carbonate of copper

-malachite: it may be the result of blue azurite change as time goes by into green malachite

-iron oxides: comprise both oxides and oxide hydroxides of iron

-vermilion/ mercuric sulfide: red pigment from cinnabar mineral

-red lead: pigment which have the same composition and structure as the mineral minium

-Egyptian blue: calcium cooper silicate, the first synthetic inorganic pigment made in antiquity, extremely used on mural paintings

-enamel: artificial blue pigment from coarsely ground potassium glass, colored blue by the addition of cobalt oxide

-lead white: basic lead carbonate

-verdigris: bright green pigment, formed by a group of green copper-based pigments (cooper acetates, copper chlorides, copper carbonates and mixtures)

One of the oldest technologies, ceramic, their resilience permitted to survive, not in perfect condition, most of the time, under pressure and weight of soil in archaeological finds and underwater archaeological sites. Ceramic artifacts are categorized into three broad categories based on the type of clay used, porosity and temperature of its firing: earthenware (burnt at a lower temperature, between 1000°C – 1200°C), stoneware (between 1100°C – 1300°C), porcelain (impermeable, between 1200°C – 1400°C). As for coloring pottery, the simplest and practiced methods consist in adding pigments to glazes. The first known colorants were

red iron and black manganese oxides, applied on surface, either before or after firing. The firing process is necessary for ensuring the stability of ceramics. Even though the firing temperature and process depend on the type of clay used, the moment of extinguishing the fire will affect the final product – its structure and color. The initial examination of ceramics begins with an optical evaluation: description of characteristics, type of decoration, damage, and other features that impact conservation treatment. A scientific analysis supplements optical and microscopic examination. In laboratory, analysis techniques which usually require sampling of material are: scanning electron microscopy, electron microprobe analysis, X-ray fluorescence, atomic absorption spectroscopy, X-ray diffraction analysis. Ceramic pieces should not be stored on each other, but separated so that the pressure of the fragments does not result in damage. Also the ceramic is affected by natural factors such as humidity, temperature, excessive light that when close to the object is heats it up, producing a change in the structure of the artifact.

As for the final chapter, 10, *Man-made materials* (pp. 260-286), it shows the impact that occurred with the technological evolution of the chemical components of the material, talking about objects used for space exploration, the new digital era and the virtual one and how it will relate classical methods to the new digital collections.

There are two major groups of man-made materials: natural materials altered by man and materials artificially produced in laboratory. Synthetic, man-made polymers represent materials which are one of the most problematic for museum's collections, because of their chemical complexity and unpredicted longevity. The research for materials designed for space exploration was based on three main areas: space suits, early satellite power systems, heat shields.

It is a study so complex that it would not be wrong if we call it a tool manual that can be used in conservation practices for artifacts in museums. Plentiful ingestion information, of the methods, correlated with images, make this paper to be a starting point for beginners but also a reference for specialists. It is to appreciate how the author collected information and how they were exposed. Everything is painstakingly organized, shared and where specific information is beyond her specialization this fact is mentioned.