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SAFEGUARDING + PROTECTING CULTURAL MATERIAL I.

July 1943 - AUG. 1944

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Department of the Interior, Bureau of Land Management, Section 3.3/NAD No.

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TECTING CULTURAL MATERIAL IN THE FIELD

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STARS & STRIPES 25 MAY 44
**Troops' Aid Asked
In Preserving Art**

ADVANCED ALLIED HEAD-
QUARTERS, May 24 — General Sir
Henry Maitland Wilson, Supreme
Allied Commander in the Mediter-
ranean Theater, has issued a
pamphlet on the preservation of
works of art in Italy to all troops.

The document, which points out
that Italy is richer than any other
European country in art treasures,
requests all officers and men to
recognize the importance of pre-
serving the art treasures in any
country they may enter.

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CORRISP. DI FIRENZE - No. 1 - Giovedì 23 Agosto 1944

UNA COMMISSIONE

per la rimozione delle macerie

Il Comitato delibera la nomina di una Commissione di Architetti e Tecnici perche' vigili sulla rimozione delle macerie, per il recupero e la preservazione di tutti i pezzi architettonici e artistici, per il loro smazzamento e la loro catalogazione e per l'eventuale ricostruzione. Il Comitato invita la Giunta Comunale a nominare un proprio membro.

Il Comitato chiama a costituire detta Commissione i Signori Dott. Giovanni Poggi, Presidente, Dott. Ugo Procacci, Prof. Roberto Salvini, Prof. Cesare Nasola, Dott. Carlo D' Raggiamenti, Dott. Genaro Guelli, Arch. Detti, Arch. Maggiore, Arch. Montanari, Ing. Diego Giusti, Dott. Carlo Levi, Dott. Sandro Contini, Arch. Michelucci.

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WAR DEPARTMENT PAMPHLET

No. 31-103

CIVIL AFFAIRS INFORMATION GUIDE

**FIELD PROTECTION OF
OBJECTS OF ART AND ARCHIVES**

WAR DEPARTMENT

12 MAY 1944

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WAR DEPARTMENT,
Washington 25, D. C. 12 May 1944

War Department Pamphlet No. 31-103, Civil Affairs Information Guide, Field Protection of Objects of Art and Archives, has been prepared by the American Commission for the Protection and Salvage of Artistic and Historic Monuments in War Areas and is published for the information and guidance of all concerned.

[A. G. 461 (10 May 44).]

By order of the Secretary of War:.

G. C. MARSHALL
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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NOTE

Civil Affairs Information Guides are designed to aid civil affairs officers dealing with problems in liberated areas, each guide being focused upon a specific problem in a particular area. These guides are not basic collections of factual information, as are the Civil Affairs Handbooks, nor are the recommendations contained in the guides intended to take the place of plans prepared in the field. They are rather designed to point the factual information toward the making and executing of plans by those civil affairs officers assigned to this work in the theatres of operation.

In no sense is a Guide to be taken as an order. Such orders will be issued in the normal manner.

Distribution of Civil Affairs Information Guides is made by the Liaison and Studies Branch, Military Government Division, P.M.G.O., War Department, Washington 25, D. C. Requests for additional copies should be addressed to the Chief of that Branch.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C., 31 and 32 as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

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I. THE IMPORTANCE OF SAFEGUARDING CULTURAL MATERIAL

The first aim of the President's Commission for the Protection and Salvage of Artistic and Historic Monuments in Europe is evident from its title. Its ultimate aim is part of the objective of this war, which is to preserve our civilization from destruction. A history of civilization and liberty is written in the artistic and historic monuments of Europe, monuments which are falling victims to the hazards of war or to the vandalism and cupidity of invaders. Insofar as this record of history disappears, some essential part of our intellectual heritage goes with it. More immediately, as well, Allied Military Government must create with the people of occupied and liberated countries such relations of sympathy and understanding as the restoration of the foundations of their cultural life will secure. Apart from the spiritual and aesthetic importance of works of art, it should also be remembered that these cultural objects have always been, and will continue to be of considerable economic value to the countries concerned. Their conservation and safeguard will help promote an atmosphere favorable to the adoption of peace treaties and to the application of their provisions.

In the light of such considerations, then, the Civil Affairs Officer will readily recognise the importance of safeguarding cultural material. It must be further recognised, as well, that works of art are especially in need of protective custody in that they are unique and irreplaceable. For most property an exact equivalent can be found or manufactured, or a cash compensation made. This is not the case however with works of art. The qualities for which they are cherished are the inimitable endowment of creative genius and the slow acquisition of time. Like an individual personality, a work of art once destroyed is lost forever.

II. THE NATURE OF THE JOB

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There are at present attached to the Allied Military Government specially qualified Army and Navy personnel forming a Subcommission for Monuments, Fine Arts and Archives. These men, both American and English, were formerly museum directors, librarians, archivists, architects, painters, sculptors, archaeologists and art historians. Their particular assignment is to protect and salvage cultural treasures. It is to be expected that such officers will be in charge of such work in every area occupied or liberated by the Allied Forces. It may be anticipated, however, that before these specially qualified officers can get to work there will be an interval during which it will be necessary for other officers to take the first or emergency measures

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towards getting the job done. This handbook is designed to help those officers. It should be regarded as something comparable to a first aid course which seeks to equip an otherwise untrained person with basic information and technique for administering immediate and temporary care. The objective here is not that of repairing and restoring art, for art restitution is a highly specialized skill, but that of safeguarding it and preventing any further damage until the expert arrives. Those tasks of repair which do not require any special skill, or which might easily be effected with the aid of simple directions, will be described in the text. Any further measures should not be undertaken if expert experience is wanting.

It is recognized that tools and equipment necessary to complete a job will frequently be lacking. On the other hand, the fortunes of war are so unpredictable that it is also likely equipment will, on occasion, be abundantly inherited. It would be most unfortunate in that case to be unable to make full use of it for lack of instruction. On that account, and not for want of realism, will the availability of equipment be assumed.

III. SELECTING OBJECTS WORTHY OF SAFEGUARD

It is not expected that officers will work in this field either with the spirit of an art collector or an art critic. They will, therefore, not be required to pass judgement on the artistic merit of objects of art, or in any way exercise their individual taste. In selecting those objects worthy of safeguard and conservation two main sources will be relied upon: the attitude and sentiment of the local inhabitants, and the opinion of the artistic and learned world in general. In relying upon local sentiment it will be necessary to exercise judgement with respect to the integrity and reliability of the persons involved. Members of organizations concerned with cultural matters are generally well-informed and competent. The educated people of a locality are also generally reliable, such as priests, clergymen and schoolmasters. Frequently, of course, there will be a large body of art around which local pride so obviously gathers, no doubt will exist concerning the care it should be extended.

The second source of information, the opinion of the artistic world, is embodied in such lists as are presented in this handbook, in the Baedeker Guides (published in Germany, but widely circulated and available in several languages), in the T.C.I. (Touring Club Italiano) guides, the Blue Guides (in French, some in English as well), and in the Grieben Guides (in German, some in several languages as well). The Baedeker Guides, the most popular, are both reliable and succinct.

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Monuments starred or double-starred by Baedeker may reliably be treated as of first importance. Locally published guides may also be found, but these vary greatly in reliability. But it is to be hoped, of course, that the lists published in the Civil Affairs Handbooks which supplement this Guide will be adequate.

IV. TYPES OF ART TREASURES AND MONUMENTS

For the purposes of the job at hand art treasures and monuments may be classified as monumental, or immovable, and non-monumental, or movable. The first classification includes Churches, Palaces, Monuments, and Cultural Institutions.

A. MONUMENTAL OR IMMOVABLE

Churches: In European towns or cities churches are civic as well as religious institutions, and often contain the most important works of art, archives, and records. They are almost invariably the most venerated monuments.

Palaces: In Europe the palace does not necessarily mean the dwelling of a wealthy or princely family. It may have been converted into a public building, and contain an art gallery, library, museum or archives.

Monuments: This is a catch-all term, including archaeological sites, structures of artistic importance and historical remains.

Cultural Institutions: This includes museums, galleries, libraries and scientific collections or collections of documents.

B. NON-MONUMENTAL OR MOVABLE

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The second classification, non-monumental or movable works of art, is generally, as already indicated, housed within or appended to any or all of the establishments listed above.

Sculpture: Either free-standing, or part of another object. The range is from medals, cameos, coins and small carvings in wood and ivory, to large figures and groups in metal, stone and terra cotta, glazed or otherwise.

Easel Painting: Either on canvas or wood, occasionally on metals, stone or leather.

Furniture: Both of houses and churches, usually of wood, sometimes of metal, rarely of stone. Often decorated with inlays or attached ornaments of other material, and frequently painted.

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Means of Transportation: Including coaches, carriages and early types of fire engines, locomotives and automobiles. Chiefly of historic interest, but sometimes of great artistic importance.

Material of Ceremony: Including flags, banners, decorative and heraldic devices, effigies.

Arms and Armor: Including swords, lances, bows and arrows, firearms, helmets, suits of armor and of mail for men and horses, and trappings.

Glass, Pottery and Porcelain.

Jewellery: Including small objects of personal use, such as snuff boxes and watches, as well as articles made of precious and semi-precious stones and metals.

Textiles and Costumes: Serving both religious and lay purposes. Includes not only wool, linen, silk and cotton articles, but also those made of fur, feathers, and occasionally metal.

Works on Paper and Vellum: Prints, drawings, paintings in watercolor, pastel or oil. Also paintings in watercolor on silk. Manuscripts on rolls or loose leaves. Books and bound manuscripts.

Minatures: On card, ivory or parchment

Scientific Collections: Including specimens of geology, biology, botany, natural history, ethnography and anthropology; also collections of scientific instruments and apparatus.

V. PROCEDURE IN SAFEGUARDING AND CONSERVATION

In time of war cultural material may sustain damage from a variety of causes, such as:

- Improper care and neglect
- Theft and looting
- Defilement or contemptuous treatment
- Conduct of military operations

The objective of officers seeking to safeguard cultural material is that of eliminating as far as practicable these sundry hazards, and establishing instead as safe an environment as possible. Before describing, however, the measures to be taken in regard to the different types of cultural material, it is necessary to acquire an awareness of certain underlying forces of a general nature which come into play.

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A. GENERAL CONSIDERATIONS

Responsibility: It should first be remembered that responsibility for the care and salvage of art falls upon the occupying forces. The occupying authorities will be regarded, justly or unjustly, as responsible for all damage done during the occupation, and they will therefore have to look after not only their own troops, but the local inhabitants as well. The aid of local authorities should naturally be enlisted, especially those who may have been professionally connected with cultural affairs.

Troop Discipline: A primary task is that of instructing and disciplining one's own troops. Even well disciplined troops tend to regard themselves as free to use anything which is obviously abandoned or damaged, especially in an enemy country. In this connection it should be remembered that during World War I valuable furniture was in many cases taken from vacated houses and used in the trenches, even as firewood. A temptation may be operative amongst troops to destroy objects which appear to symbolize the enemy. Or they may also be out on the souvenir hunt. It is best to enforce strict rules regarding the collection of souvenirs, discouraging thereby, on the part of the civilian population, pilfering and the sale of stolen objects to troops.

Enemy Pillage: Enemy agents, and local inhabitants in sympathy with them, may seek to destroy, damage, or steal objects of value, either to deny their use to the occupying authorities, or to make it appear that the damage or plunder was done by the occupying troops.

Undercover Traffic: The undercover traffic in objects of art may be considerable. Many amongst the local inhabitants, as well as the art dealers, may engage in theft and looting, considering the time of upheaval and unrest as a wonderful opportunity to make a grand haul.

Caretakers: Curators of public collections, and private collectors, may be in a suspicious and untrusting mood, and may seek to conceal their treasures in fear of expropriation.

Priority: The protection of those objects in good condition should be undertaken before those damaged are salvaged. This rule should be the guide at all times, and should apply wherever possible.

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B. DANGERS ATTENDING MILITARY OPERATIONS

Direct Hit: Picture galleries and museums are designed to admit light and to allow free passage to visitors. They are poorly made to withstand bombs and shells. Any bomb of the explosive or of the incendiary type would completely destroy an object of art, certainly any paintings which it came near. Protection against the heavier type of high explosive bomb is said to require 80 feet of earth or 12 feet of re-enforced concrete.

Air Pressure or Blast: This is more or less destructive, depending upon the proximity of the object to the center of the explosion. Even faint vibrations, if repeated, are weakening to works of art which are fragile. Those on canvas supports may develop cleavage in the ground or between the ground and the paint and have pieces of paint flake off.

Flying Glass, Splinters and Debris: Usually, of course, the amount of blast which would send these materials into the air would be enough to affect works of art in itself, and flying debris can be regarded as an accompaniment of the second danger.

Fire and Smoke: Flames are, of course, completely destructive to almost every variety of art object. True frescoes might possibly be able to withstand flames for a very short period of time. Paintings are very likely to be permanently damaged by smoke.

Exposure: There would be, of course, a risk of excessive humidity and temperature change in partially demolished buildings. This could include soaking from rain or from water used for fire fighting. There might be drifting snow or extreme cold. Any of these, even if sustained for only a very short time, would be serious.

Gas: To what extent poison gases, always to be considered as a possible menace, might be injurious to paintings and objects of art is not specifically known. Things left in museum galleries could not be protected against such implements of assault and, if they come to be used, pictures will certainly suffer serious damage from them. It has been assumed in general air raid precautions that, because of their acid properties, already known war gases may attack the painted parts of automobiles.

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C. SPECIFIC PROBLEMS

1. Buildings and Structures, Undamaged: In this case it is necessary to establish and maintain three things:

- A Guard System
- A Pass System for Visitors
- A System of Periodic Inspections

Where adequate guards are not available it may be necessary to limit the number of persons visiting the building at any one time. Religious establishments and structures around which national and local sentiment gathers might be the especial targets of the hoodlumism which invariably arises in time of war and unrest, or of the racial and religious antagonisms which might flare up. In such cases it will be necessary to take special precautions, perhaps even denying any access to the area. But while restrictions should aim at maintaining a safe environment, they should not be of such nature as to deny admission unnecessarily to interested troops and local inhabitants. In fact, in regard to troops, the policy of safeguard should at all times be sufficiently enlightened and so contrived as to enable, if not encourage, interested troops in viewing the monuments of the civilization they are fighting to preserve.

The usual precautions taken in building maintenance should, of course, be operative here as well. Fire prevention precautions and discipline should, for example, be maintained, smoking prohibited, inflammable material removed, and dry earth or sand provided if a water supply is not available. The premises should be cleared if the labor supply permits. In general, scrubbing and the use of strong soap and hot water on old woodwork, marble floors, inlaid pavements and so forth, should be avoided. Sweeping should be enough.

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2. Buildings and Structures, Damaged: It should be pointed out to begin with, there is nothing in the section immediately preceding that does not apply here as well. There are, however, additional problems. First, all damaged structures must be protected from trespass. On that account it might be advisable to build a fence around the structure in addition to detailing a guard to the premises.

Buildings or structures in a state of complete collapse require special care. They must not be regarded as merely a heap of rubble. The debris must be safeguarded for it contains all of the architectural evidence, however small, of the fallen structure. It must be remembered that restoration often can be made by experts from relatively minute fragments. If the moving and piling of debris, however, is essential, an effort should be made to keep related portions (continue next page)

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of the structure together. If the debris contains fragments of wall paintings, or similar objects of value, cover these with tarpaulin or canvas.

Buildings or structures in a state of partial collapse may stand in danger of further deterioration. In such case every preventive measure possible should be taken. This may involve support or reinforcement of roofs, vaults and arches; shoring up of sagging walls, or strengthening of their foundation; or the use, wherever possible, of simple props. The task may be one for the engineers; but frequently, too, lesser skill will be able to do the job.

Wherever the danger of further collapse is so considerable that the safety of objects housed within the building is compromised, these objects should, of course, be moved to safety.

3. Archaeological Sites: In most European countries numerous excavations for archaeological study, both ancient and mediaeval, will be encountered. These are often open areas containing only foundations and trenches, and so may appear to contain very little of importance. But nothing on an excavated site, however small and insignificant in appearance, is without importance to scholarship. Consequently it is desirable to post adequate guard over an excavation and its headquarters (which will contain in its storerooms finds from the digs, and in its files irreplaceable records); to find the local inspector and the local guards; and to locate and keep watch over the antique dealers of the neighborhood, some of whom might take the opportunity of purloining or receiving objects from the site. Baskets or trays of pottery fragments are especially important, being the chief means of dating the strata in excavations, and so must not be disturbed or deprived of their labels. Earth strata are frequently so excavated as to expose them like successive steps. These, and mud-brick walls or rubble foundations, are often so fragile that they should not be trodden upon. Partial restorations of columns, etc., are often set up rather insecurely in archaeological areas, and might collapse with danger to life and limb if roughly handled. Frescoes in excavated tombs are especially fragile---even a slight explosion of a flash-bulb may dislodge them from a wall. Hence if gunfire is still in the neighborhood, such frescoes should be protected by shock-absorbent material, blankets and sandbags placed with a slight air space between them and the walls. Above all, men must be cautioned against chipping off souvenirs, picking out mosaic tesserae or pieces of fresco, or even picking up carved-stone fragments or potsherds from the ground.

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If antiquities are uncovered, either by the digging of trenches or by bomb explosions, whether in archaeological sites or elsewhere, they should be carefully collected, keeping related pieces together, and stored for safekeeping. Records should be kept indicating exactly as possible where each piece was found. Some effort to describe each object should likewise be made.

4. Archaeological and Prehistoric Collections: These consist mainly of sculpture, metalwork, coins, jewelry, glass, pottery, arms and armor, stone implements, and miscellaneous small objects. Instructions for the handling of most of these will be given in the following sections. Here the distinguishing features of archaeological material will be described.

The chief difference between archaeological objects and others of the same material is that archaeological objects are far older and have been dug up in ancient sites. This means that only fairly durable things have survived, though they may have been reduced to a very fragile condition. It also means that they are often fragmentary, but the fact that they may appear broken in no way detracts from their value. Whole collections often consist of fragments of pottery. Many objects also, such as pottery, have been found broken and have been restored. Restoration may be hard to detect, but such objects require special care since they are likely to break again if roughly handled or carelessly packed. Wherever packing is done wrap individual objects separately.

Archaeological collections may often include large groups of tools made of flint or other stone. These will withstand almost any condition short of shock or exposure to fire. They should, however, be protected from moisture lest inventory numbers be washed off. When packing, each piece (especially flint tools) should be wrapped separately, lest they rattle and break.

It is vital to remember, in connection with archaeological material, that information concerning the source of the material (where it was found and what it was found with) is of the utmost importance. Therefore, when moving the contents of a museum or private collection that contains archaeological material, send the regular museum catalogue or inventory with it. Most museums keep such inventories, giving the inventory number corresponding to the number on the object, together with information as to the source of the object. The museum inventory will include the entire contents of the museum, and it may not be possible to separate the parts belonging to the different types of collections. The museum catalogue or inventory should, nevertheless, be preserved.

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It may be that the contents of the museum or collection have already been packed as a war-time precaution and some or all of it stored in the building. In that case every effort should be made to obtain the packing lists, especially in the event that moving of the collection is contemplated.

When clearing an exhibition case or storage place in a museum, never separate an object from its label. Tie it to the object or put both by themselves in one closed container. If a new inventory number is added, put the same number on the object and label. If the museum catalogue cannot be found, preservation of labels becomes doubly important.

If a number of objects are kept as a unit in a museum, as for instance, the contents of a single tomb, do not fail to keep or pack these together as a unit together with their labels. A convenient system is to have a master number for the whole object, and a subsidiary number for each fragment or part, e.g. if the number for the object is I, the parts would be numbered I(1), I(2), and so on. This is very helpful in reassembling the fragments or parts of an object. When objects are broken into a large number of pieces, or have many detachable parts, separate numbering may be impossible. In such a case, put all fragments or all the detachable parts in a box labelled "Fragments (or parts) of No..."

If you have to number objects yourself, use something that is not easily detached or rubbed off. Paint may be used on stone, metal, ceramics, and wood (including the wooden stretchers on which canvases are usually mounted); adhesive labels on paper, leather, parchment; fabric attached with pins or stitches in the case of textiles.

Place the number where it is likely to do no damage or to be unsightly, e.g. on the back of the bases of statues, on the bottom of pottery or porcelain objects, on the stretchers of paintings. Place the number, as far as possible, in the same place on all examples of the same kind of object. This makes reference easier.

5. The Control of Temperature and Humidity: Scientifically most objects of art can be grouped together as being composed largely of biological fibres. These structures (for example, wood, canvas, textiles, etc.) are hygroscopic, that is, readily absorbing and retaining moisture, so that it is necessary to consider carefully the influence of humidity upon them. Numerous other materials, not fibrous, are readily perishable and need conditions of much the same kind for their well-being.

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Relative Humidity: The amount of moisture in the form of water which air can support varies with the temperature. For example, at 30 degrees fahrenheit the air can support 2.0 grains per cubic foot; at 60 degrees 5.8 grains; at 100 degrees 19.8 grains. Under these conditions the air is said to be saturated; any lowering of the temperature would result in condensation. If, however, at 30 degrees 1.0 grains per cu. ft. of water vapor is present, then at this particular temperature the relative humidity is 50 percent, since only half the weight of moisture in unit volume of air is present compared with the weight which could be supported at the same temperature at saturation.

Acceptable conditions for the majority of objects are:

60 degrees fahrenheit, with a tolerance of 10 degrees

60 percent relative humidity, tolerance 5 percent

An excessive relative humidity can be diminished by hanging up hygroscopic material, such as blankets or the like. Over dryness can be counteracted by such material wetted.

Constancy of atmosphere is more important, however, than attempting to attain the suggested conditions at the expense of great fluctuations in temperature and humidity. Fluctuations cause alternating stresses in biological fibres, which in time become fatigued, and subject to exaggerated liability to breakdown. Many materials accustom themselves to atmospheric conditions fairly well so long as large or unduly rapid variations in relative humidity and temperature are avoided. Common inexpensive instruments, such as thermometers and recording hygrometers, usually available do not follow fluctuations faithfully, and thus tend to give a false picture of what is happening. Such recorders are more trustworthy for fairly constant conditions.

6. Paintings on Canvas and Wood: Most paintings are combinations, often complex, of materials that respond unevenly and unequally to changing external conditions. The paint is likely to respond less actively than the support (the wood panel, the canvas, etc.), therefore, the most common point of weakness is in the attachment of paint to support. On that account safety precautions must concentrate on preserving the attachment of the paint, and on keeping the support intact and as inert as possible.

The following are the conditions of damage most likely to be encountered:

Flaking or peeling paint. Keep painting horizontal, face up, until it can be treated. Do not try to reattach paint by varnishing or by injection of adhesive.

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Apply a temporary facing of tissue-paper over affected paint. Use a thin, boiled flour-and-water paste, not a thick, or brittle, or hard-to-dissolve adhesive. If the paint is not too friable, apply the paste with a soft dry brush to the paint surface and lay the paper over it with another soft, dry brush; otherwise, put the paste on the paper. Always use a minimum amount of paste. There should be no apparent thickness of clear paste between paint and paper. The purpose of this operation is to hold loose paint and prevent further flaking.

If paint is powdery or otherwise too fragile to be touched at all, store the painting horizontally, face up. Support it with cushioning material, and protect it from drafts and dirt with a box-type cover, properly labeled, e.g. Painting: Fragile. This side up. Handle with great care.

Dull, blanched or dirty surfaces. No emergency treatment required.

Slack or wrinkled canvas. This may be the result of unusual dampness. If it is, no emergency treatment is required, since drying alone will tighten it. If the edges are weakened or torn reinforce them with surgical tape. Loose paint, however, should first be faced as described above. When the canvas is very loose gently tap in the corner wedges (keys) of stretcher being careful not to make canvas too taut. Do not try to flatten stiff, curled or buckled areas; cracking and flaking will result.

Torn or punctured canvas. Apply facing as directed above to all loose paint. Small holes need no further first aid treatment. Patch large tears with surgical tape on the canvas side. Further support may be given large paintings, after removing frames, by lashing them face down to ply-wood or composition boards covered with clean smooth-surfaced paper.

Partly burned, charred, or otherwise badly damaged paintings of fabric.

Lay face down on ply-wood or composition board covered with smooth paper. Remove stretcher by carefully pulling tacks. Fasten margins and all torn, burned or charred edges to the paper with scotch or surgical tape. Form a sandwich by lashing another board to the back. Reinforce both boards with cross-battens to prevent separation at center. Label fully. Preserve stretcher with frame.

Paintings on panels split, broken, damaged or weakened. Face all loose paint. Pack all parts securely on cushioning material having a firm support. Do not try to glue or fasten together pieces that are partly or completely separated.

Water-saturated panels. Dry out as slowly as possible. Watch for warping. If convex on paint side, retard drying by resting back on non-absorbent surface. If concave, accelerate drying by better air circulation

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at the back. Keep face up. Apply necessary facings to secure paint after the surface has become fairly dry.

Water-saturated canvas paintings. Dry face down on a smooth board which has been covered with oiled or waxed paper. Turn over when dry by laying another board on top of the canvas and turning over the whole sandwich. Remove paper cautiously to avoid lifting loose paint and face where necessary.

If painting has rolled up it will need expert attention as soon as possible. If that can be secured within a day or two do nothing. Do not even let the painting become entirely dry. If expert advice cannot be secured, dry the painting, unrolling it with great care when it is nearly dry but still flexible. Watch for flaked or loose paint while unrolling. Face wherever necessary. When thoroughly dry it can be re-rolled if tests show that it is not too brittle, and that flexure does not dislodge the paint. Do this only with large paintings difficult to handle when flat. Normally, leave paintings flat and attached to a plywood or composition board as described above.

Frescoes: In the case of frescoes and other paintings permanently attached to walls, facings should be applied to poorly attached or flaking paint as described in the previous section. If the flakes are large and heavy, or if general disintegration seems likely, the fresco should be covered with soft cushioning material and shored up firmly.

7. Works on Paper and Miscellaneous Supports: The word support refers to the material, such as paper, silk, ivory or vellum, on which the artist has made his picture, the scribe has recorded his information, or the printing ink has been impressed.

A fundamental characteristic of this group of objects is that damage or deterioration of the support is the most serious type of injury to which the group is liable. The relation of the support to the paint or ink which has been placed upon it is a decisive factor in the appearance of the picture or page; and a change in either modifies the combined effect. Common forms of damage or deterioration are holes, tears, stains, spots or change in original color. In most other kinds of pictures, when the support is damaged or weakened, the picture can be saved by transferring it to a new one or the original support can be reinforced without affecting the appearance or durability of the picture. But this is not possible with the group of objects in this category. Most of the objects concerned are executed on paper. Vellum, ivory and silk are the support in only a minority of cases.

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The hazards to which the objects in this group are subject arise from the nature of the support, and from the nature of the design materials.

a. Hazards arising from the support.

(1) Paper: An artificially prepared sheet chiefly composed of vegetable fibres. Sizing materials, pigments and fillers are sometimes present in small quantities to produce surface quality or color.

Deteriorated paper generally turns to the same dark rusty tones; brittleness and breakdown of the fibres generally accompanies discoloration. In many cases the discoloration can be corrected, but no way is now known to regain the original strong flexible character of the sheet. Nor at present is it known how to isolate all the specific chemical factors which lead to brittleness and discoloration. There are, however, some controllable causes which are known to bring about the change. These are:

- Prolonged exposure to light, especially strong sunlight.
- Exposure to certain gases. The atmosphere in industrial areas contains certain harmful gases, notably sulphur dioxide and chlorine. The fumes of sulphur dioxide will cause paper to discolor and to become brittle. Chlorine will attack wet or damp paper, bleach and weaken it. It is probable, though no data is available, that the effect of all toxic war gases will be deleterious.

- Prolonged contact with discolored papers. Papers made of ground-wood fibers, or other unpurified fibers, such as newspapers, low grade wrapping papers and boards, will discolor even under the most favorable circumstances. Many irreplaceable Old Master drawings which might have survived in good condition have become discolored and brittle as a result of their attachment to mats of poor quality cardboard or to newspaper paddings used in their framing.

- Prolonged contact with wood. This produces discoloration on the paper in a pattern identical with that of the grain of the wood.

- Fumes or solutions strongly acid.

- Imbibed oil or varnish.

- Mold or mildew. This is probably the greatest hazard to paper. Mold spores are universally present in the atmosphere. They will develop whenever they find conditions which are favorable for their growth. Moisture and food are their only requirements. Cellulose, which is the chief component of paper-making fibers, is an adequate food for many kinds of mold. Different papers offer an unequal resistance in regard to fungus infection. Chemical wood-pulp and groundwood fibers are more easily attacked than rag or the Oriental paper-making fibers. The adhesives commonly used on paper, such as glue and paste, are excellent food for mycelium growth.

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Certain preventive measures may be taken against mold. Be certain the materials being cared for are dry. Store objects in a dry, well-aired space. A high humidity permits the development of spores pre-existing in the paper and favors new infections. The relative humidity should be between 40 and 60 percent. A relative humidity over 70 percent is dangerous. Employ a fungicide. Paradichlorobenzene crystals (commonly used as a protection against moths) or thymol crystals are suitable. Sprinkle the crystals in the boxes, in the containers, or on the shelves where the objects are stored. It is the vapors from these substances which inhibit the growth of mold; and both paradichlorobenzene and thymol pass from a solid to a gaseous state without becoming liquid. Contact of the crystals with valuable paper, vellum or silk will produce no ill effects. But thymol vapors will attack a varnish film, so that if it is used care must be taken to protect panel and canvas paintings from the fumes. If thymol is available only in a liquid form (it will go into solution in an alcohol) soak a piece of good quality paper with the thymol solution. Then expose the paper to the air long enough for the alcohol to evaporate. This will leave a deposit of thymol crystals. The result is called "thymolized paper."

-Foxing is the technical term for a brown discoloration in the form of spots, which vary in size and in distribution. Mold also causes a spot-like pattern of black, grey, green, red, purple, or yellow stains. This may be the color of the mycelium (the threadlike elements forming the growing structure of the fungus) or may be a staining material emitted by the fungus as it develops. This kind of staining is the most stubborn discoloration with which the restorer of these objects has to contend. Its treatment should in all cases be left to the expert.

The following table will serve as a guide in the selection of suitable solvents for the removal of the various types of stains and reinforcing mediums frequently encountered on old papers:

<u>Stain</u>	<u>Recommended Solvent</u>
Adhesive tape	Carbon tetrachloride or benzene
Duco cement	Acetone
Glue (linen or glassine tape)	Warm water
Lacquer	Acetone
Oil	Carbon tetrachloride or benzene
Paint	Mixture of alcohol and benzene
Paste	Water
Rubber cement	Mixture of benzene and toluene
Scotch tape	" " "
Shellac	Ethyl alcohol
Wax	Mixture of benzene and toluene

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-Insects. The following are the insects which are a threat to paper: Larvae of various kinds of beetles and moths, silverfish insect, cockroach, white ants, and boring insects (bookworms). A damp humid atmosphere is favorable to insect life, but some of the destructive offenders survive even in conditions of extreme dryness. The threat may be evidenced by any of the following: appearance of insects, larvae or chrysalises in the storage area, appearance of small holes ("mothholes") in objects, and presence of insect excrement.

The following precautions should be taken: Storage areas should be clean and free from animal or vegetable deposits. They should be a suitable distance from areas where food is prepared or stored. Before the objects are stored the storage area should be thoroughly sprayed with liquid insecticide or a powder insecticide sprinkled over walls, floor and shelves. Paradichlorobenzene, thymol, naphthalene, camphor crystals will give a limited amount of protection. These substances are highly volatile and must be replaced as they evaporate. Any commercial insecticidal powder may also be used. For spraying use carbon tetrachloride, benzine, petrol or a commercial spray.

Infected material should be fumigated. The Quartermaster Corps may be equipped with a fumigation chamber or cabinet used for clothing and bedding which would be suitable for this purpose as well. Lacking that equipment may be improvised by the construction of an air-tight cabinet of a size suitable for the objects to be treated. Since the fumes of the insecticide are heavier than air a suitable fungicide should be placed in a receptacle in the upper part of the cabinet. If improvised sterilization chambers are used in which a vacuum cannot be made before the gas is released, a longer exposure than the normal 24 hours should be allowed for books and bound manuscripts. Objectionable odors clinging to objects after fumigation will disappear in a few days. The following are the materials suitable for use as fumigants:

Hydrocyanic gas, 1 lb. of sodium cyanide per 1000 cu. ft.

Ethylene chloride (3 parts by vol.); carbon tetrachloride (1 part by vol.) 14 lbs. per 1000 cu ft.

Carbon disulphide. 6 lbs. per 1000 cu ft.

Ethylene oxide - carbon dioxide. 30 lbs. per cu ft.

Methyl formate - carbon dioxide. 28 lbs. per cu ft.

Arsenic and carbon compounds are unsuitable as fumigants.

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(2) Vellum or parchment: These terms are used interchangeably. They refer to any moderately good animal skin which has been prepared for writing or painting. Vellum is a tougher material than paper. It is more resistant to discoloration and brittleness than paper, but it is vulnerable to the same agents. It is more vulnerable than paper to high temperatures and extreme dryness. Discoloration is often purple.

(3) Silk: Made of woven thread which are the natural product of the larvae of certain moths known as silk worms. It is subject to discoloration and brittleness from the same agents which attack paper. It is particularly vulnerable to strong acids and alkalis.

(4) Ivory: The solid portion of the tusk of an elephant. Other animal tusks or bones are sometimes substituted. Ivory is a dense white laminated material which in cross section presents a pattern of intersecting curved layers resembling engine-turning. When cut into thin slices it provides a suitable material for miniature painting. It is a very durable material but it has several weaknesses: When exposed to high temperatures it turns brown. It turns black when fired. It is sensitive to changes in humidity. Prolonged dryness causes it to become brittle and, in extreme case, powderlike. When its flexibility has gone a high humidity will cause it to crack. If the ivory has not been properly sliced, or if it was cut in curved sheets which were subsequently flattened with presses, humidity changes will cause it to curl. Some gases cause it to discolor.

(5) Leather: Animal skin which has been tanned for use. It is used in book-binding. Deterioration is evidenced when the leather becomes cracked and powdery on the surface and very brittle. If it has been exposed to excessive dampness the skin may become weak but remain flexible as long as the leather is not allowed to dry. The following are the causes of deterioration:

Putrefaction

Prolonged exposure to sunlight

The action of certain acids:

Sulphuric acid, commonly present in the atmosphere.

Acid remaining in the skin as a residue of some part of the tanning process.

Acid remaining from the dyes or mordants (a material which serves to make leather absorb a dye or color).

Tension on the leather

The skins may have been split, artificially grained or stretched too tightly. This is a common cause for decay in bookbindings.

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Heat. Wet leather will deteriorate at a temperature of 120 degrees farenheit.

Leather bindings can be kept from decay by rubbing in any suitable dressing such as vaseline, lanoline, or castor oil after wiping with a damp cloth following a day's airing.

b. Hazards arising from the design material.

(1) Printing inks: These are durable and requires no special comment.

(2) Watercolors, other paints mixed with water, writing inks: These are usually affected by water and are faded by prolonged exposure to light.

(3) Pastel, pencil, chalk and charcoal: These differ from the preceding groups because they do not form a film on the support. Small separate particles adhere physically to the paper and to each other; consequently any slight abrasion will disturb them.

(4) Metal point: In using this technique the support, usually paper or parchment, is coated with a thin film of paint that has an abrasive character. This film is usually soluble in water. When the metal point is drawn over the paint, which may be white or colored, a pale grey mark is made. In time this mark corrodes somewhat to a darker and a warmer tone. Water, dampness, and changes in humidity are dangerous to this group. Humidity variations promote a loosening of the bond between the support and the coating of paint. This develops into flaking and losses in the paint film. As the drawing is an integral part of the paint film, losses in it are accompanied by parallel losses in the drawing.

The chief service which an inexperienced hand can lend in the care and salvage of this group of objects is drying. Immediate steps to dry objects should be taken. When paper is wet the fibers absorb water, swell and separate easily. A sheet which is strong and tough when dry, is weak and fragile when wet or even very damp. Extreme care and nimble fingers must be employed when handling papers in this condition. Always support wet sheets on a tray, a sheet of glass, or another piece of clean, stiff, dry, uncolored paper. Clean, white, dry blotters are excellent for this purpose.

Care must be taken to avoid prolonged exposure to strong sunlight, or prolonged exposure to high temperatures. Do not try to mend torn pages. Assemble and pack the fragments together. Avoid the use of glue or paste. If the use of an adhesive is unavoidable, use Scotch tape or an available commercial adhesive cement. These are not suitable for permanent attachments, but simplify problems of the expert when he deals with the situation.

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If pages adhere to each other or to the glass of their frames do not try to separate them.

Take care that all of the pages of damaged books are thoroughly dry. Open the book carefully and spread its covers flat on a table or shelf so that the pages will be exposed to the air for drying. Slender glass rods will help to keep the pages separated so that the air can circulate between them.

For a discussion of archives see the concluding section.

8. Sculpture and Metalwork: Stones used in the arts are of many different varieties, but they may be classified into two main groups. Soft and porous stones: marble, alabaster, limestone and sandstone. Hard and non-porous stones: basalt, diorite and granite. On the whole sculpture offers fewer difficulties than painting and records, but certain precautions beyond the obvious ones are to be noted. Stone and metal should be kept as dry as possible, in humidity well below 72 degrees. Wood, on the other hand, requires a certain amount of dampness for safe storage.

Stone that has been exposed to the weather must be thoroughly dried in the sun, except when color is present, and then drying should be done in the shade. The softer the stone the greater the drying time required.

Objects that have been exposed to chemical war gases should be washed with organic solvents such as benzene. If these are not available a strong solution of soap and water may be used.

Fractures in stone work can be repaired or strengthened with plaster of paris mixed with water and used in a consistency of thin cream. 0047

9. Furniture and Woodwork: The survival capacity of wood is remarkably great. Most old woodwork and furniture will not suffer under ordinary fluctuations of humidity and temperature in the climate to which it is accustomed. Woodwork that has become dried out may be treated as follows: Gently rub in with a cloth, or paint on with a brush, boiled linseed oil or linseed oil cut with a little turpentine. After sufficient time has elapsed for this to soak in wipe off any surplus remaining on the surface. After a day or two of drying a coating of good furniture wax should be rubbed on.

Woodwork that has been water-soaked should be dried out very gradually. No sudden heating and drying of the room should be attempted. This would inevitably cause splitting, shrinking and warping. If the air is very dry attempt to keep the temperature below 65 degrees fahrenheit. Never attempt to hurry the drying. When the woodwork is dried use the treatment described above.

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Where blasts or direct hits have seriously damaged interior woodwork, ceilings, panelling, wainscoting, etc. splinters, hanging pieces or beams should be detached by men who are good at carpentry. If these are in any way decorated, however slightly, number them and make a list of them and stack them nearby if the room or church is safe. Shore up or reinforce anything likely to fall or collapse. Repairs, however, beyond roofing and general enclosing should not be attempted.

Frequently woodwork and furniture are inlaid with other woods, bone, ivory, metals, etc. In such cases be sure that a thorough search is made in any ruined room for pieces of inlay. Put them in a box and, if possible, store them nearby. Label the box fully, stating what is inside and where it came from.

If inlays are loose but not yet fallen do not remove them. Procure some paraffin wax and melt it. Apply it with a brush gently over the surfaces, repeating the process until a good crust has been formed holding the inlays in place. This will be quite strong, and can easily be removed later when restoration can be accomplished.

If a building containing fine woodwork is necessary for billeting or office purposes have a carpenter sheath any wainscoting, door frames, or panelling with compo-board, plywood, or boarding to prevent damage from backs of chairs tilted, desks shoved about, and people carelessly leaning and moving.

Serious abrasions must be left for the experts. Treatment against fungi and insects is likewise difficult. Reasonable dryness and ventilation will prevent any sudden and damaging growth of fungi. But there are no emergency measures to be taken.

10. Arms and Armor: The principal thing to remember is that dampness (atmospheric moisture) causes iron and steel to rust. It is essential, therefore that arms and armor be kept in a dry place of even temperature, and that they be covered with a thin layer of mineral oil or white vaseline to keep the steel from coming in contact with the atmosphere. They should not be handled with bare hands, which sometimes give off sufficient salt to cause rust. Adhering to these rules will obviate the necessity of frequent cleaning. When objects are already rusty, however, it is necessary to use the most effective method of arresting further deterioration, because corrosion of iron and steel grows.

In cleaning arms and armor, avoid the use of an emery wheel, sandpaper and steel brushes. Acid should under no circumstances be used, for while it acts quickly, it will ruin the object so treated. Acid gives steel a permanent lead-like surface and the fumes injure any metal in the vicinity.

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Certain armor and weapons naturally retain their original highly polished mirror-like surface or their original color (blue or russet). Neither of these should be removed. Colored, etched, engraved, embossed, damascened, and gilded objects must be treated with particular care so as not to injure the enriched surface. It is advisable to cover the surface with vaseline or mineral oil and await the opportunity of consulting an expert. The background of etched areas is usually blackened. Care must be taken not to use kerosene for this will remove the background.

If the object is white, that is, not colored such as blue or russet, the following procedure should be followed:

To remove rust, soak in kerosene for several days to loosen the rust; most of this when softened yields to a stiff bristle brush. The surface, depending upon the condition of the object, should then be rubbed (in a parallel direction, not in circles) with steel wool or various grades of crocus cloth or fine emery paper moistened from time to time with mineral oil. After the object has been cleaned, the kerosene must be removed, otherwise the object will rust with twofold rapidity. This is done by letting the object dry, rubbing with a cloth, and cleaning the surface with alcohol. When rust appears as spots (pitting), a little powdered rotten stone may be rubbed in on the point of a stick of soft wood, dipped from time to time in kerosene. If the surface is disfigured by grease and paint only, alcohol or ammonia will remove this. Ammonia should always be washed off with water, the object thoroughly dried, and covered with oil.

To secure a polish, rub with rotten stone (or pumice) applied with a chamois or soft leather.

To prevent rusting, Apply an even coating of mineral oil or white vaseline on an absolutely dry surface. Lacquer also will prevent steel from rusting if properly applied. First, all grease and dirt must be removed (use benzine), and the surface must be absolutely dry. A coating of lacquer applied with a paint brush with fairly short bristles will stand considerable handling.

Arm or straps and linings. Sometimes the straps of a suit of armor may have been broken. It is better to tie the elements together rather than to try to restrap the armor, unless an experienced armorer is available. Armor which has been wrongly reassembled will not articulate because the holes which should contain false rivets (purely decorative rivets) have been utilized in riveting the lames together. If armor retains its ancient linings, do not soak in kerosene. If the armor is badly rusted on the inner surface, linings will have to be removed by an experienced armorer.

Leather. There is a good deal of leather associated with arms and armor, that is, straps, shields, sword hilts, scabbards, etc. Excessive dryness causes leather to become brittle. To prevent dryness, rub in vaseline of medicinal grade or anhydrous lanolin.

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Chain mail should be cleaned in a way similar to that employed in the days when it was worn. It was rolled in a barrel containing sand and vinegar, or placed in a bag with sand or sawdust, each end of which was taken by a man and worked like a two-man saw. To-day, rusted mail may be soaked in kerosene which will loosen the rust, and then placed in a tumbling machine containing sawdust. The links rubbing against each other give a good burnish -- much better than can be produced by any means of scratch brushing.

Firearms. Firearms should be taken apart; the iron and steel pieces should be soaked in kerosene oil to soften the rust, which is then removed with steel wool and fine emery paper. Pitting caused by rust may be cleaned by a hard wood pick soaked in kerosene. The original bluing or browning should not be removed.

The bore of a gun should be cleaned with a powder solvent (equal parts of gum spirits of turpentine, refined sperm-oil and acetone), and thoroughly dried with Canton flannel wads attached to the cleaning rod. If gun oil (cosmoline is used by the United States Army) is not available, a light mineral oil or vaseline may be used to protect the barrel from further rust. All the metal parts, internal as well as external, should have a protective film of oil.

Wood parts of firearms should not be varnished or lacquered. The wood can be cleaned by wiping with linseed oil.

Guns should be stored upright, side by side, in racks. Be certain that the hammers are forward so as to take the tension off the springs.

Blades of watered steel (Japanese blades, Damascus steel and Malay Krissees). If the blade is polished or if it is rusted, it is advisable to merely apply mineral oil or vaseline. Under no circumstances should one not recognized as an expert attempt to remove rust from such blades.

11. Textiles and Costumes: Textiles are among the most perishable of art objects. Many ancient fabrics may be brittle almost to the point of powdering on being touched; all are subject to severe damage from dampness, stale air, strong light or complete darkness, as well as insects. Textiles should be kept in a subdued light.

Unless gases are present, windows should be opened to permit a normal flow of air. Stagnant atmosphere encourages the development of both mold and insects. Insects such as moths, buffalo bugs, book lice, etc., should be looked for. If evidence of insects is found, an expert should be called in if possible. If no expert is available, the textiles should be wrapped as soon as possible in a good quality of brown wrapping paper, with paradichlorobenzene crystals plentifully sprinkled

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in the package. (A paper with high sulphite content, e. g. roofing paper, may affect colours in fabrics.) Waterproof tar paper should never be used. It may melt and stain the textiles beyond repair.

If the textiles are wet, they should be spread out, without stretching or pulling (which might tear the fabric), not on the floor but on a surface, e.g. a board table, covered with paper, which is completely dry, well ventilated, and shady. Don't store textiles which have been wet until they are entirely dry.

Don't brush or shake textiles. Cleaning requires a highly trained expert and should not be attempted by anyone else.

If signs of mildew or mold are present, wrap the textiles in as good quality brown wrapping paper as can be secured (never waterproof tar paper) with paradichlorobenzene crystals sprinkled in the package.

If vestments and costumes are strong and in good condition, they are best cared for by being suspended on hangers. If they are fragile, they should be spread out as much as possible, and kept flat. If they must be folded, fold with the lining in.

Tapestries and rugs should be folded. If large rolls are available, tapestries and rugs may be rolled, but only with the greatest care (with lining in) lest creases be pressed into them. Normally, an expert is required for this work.

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Small pieces of textiles should be placed in boxes. If the surface of the textiles is rough, or loose threads project from the surface, sheets of the best quality tissue paper available should be placed between the textiles. Small boxes can be grouped in wooden packing cases. These should be kept flat and not on end.

Textiles can be packed quite tightly while in transit, but should not be allowed to remain crowded once they have arrived at their destination.

Textiles under ideal conditions should be stored in uncrowded cases and boxes, in subdued light, with the relative humidity as low as possible, preferably below 30, in a room with a normal flow of air passing constantly through it.

12. Scientific Collections And Their Installations: The treasures preserved in natural history and kindred museums differ in a number of respects from those comprising the collections of art museums.

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The outstanding difference is that natural history specimens may have no commercial value and may appear to have no intrinsic value of any sort. To laymen, for example, a case containing unmounted and perhaps unattractive skins of birds, or mammals, a tin or jar holding faded and shrivelled reptiles, fishes or invertebrates, a box of mollusk shells, or another of pinned insects, might seem to be of very trifling significance. It might even appear as a question of slight importance whether such material were preserved or destroyed.

Hasty conclusions based upon the unattractiveness or shabbiness of natural history specimens may prove exceedingly unfortunate in connection with future scientific studies. This would be true not only as of the institution in which the material is preserved, but equally in other parts of the world.

The literature of systematic zoology is fundamentally based upon preserved specimens of animals, just as the literature of systematic botany is based on herbarium specimens of plants. The permanent repositories of such material are the natural history museums, whether these are independent institutions or particular sections of universities, biological laboratories, stations for experimental research, etc. Such collections are akin to libraries, because specimens represent one part of the data of science, just as published records represent another. In a sense, the specimens are the more fundamental of the two because study, writing and publication necessarily follow acquisition and preservation of the objects themselves. The specimens really constitute a sort of "reference catalogue" of nature.

The preservation of natural history specimens, properly protected from dampness, mould, decay, dust, light, insect pests or other agencies that might damage or destroy them is, therefore, one of the cultural responsibilities of civilized peoples. The published conclusions of any man of science may be more or less incorrect, but if the specimens upon which his conclusions were based are preserved in a museum, they are always available for re-examination by others in the light of new information. The same plant and animal specimens have, in fact, been studied and reported upon at intervals as great as a hundred years.

Many natural history museums contain among their collections preserved organisms of very great rarity, including plants and animals which have become extinct and which are, therefore, absolutely irreplaceable. A battered bit of skin and feathers, for example, which looks as though the refuse can or the incinerator would be its only proper destination, may actually be a fragment of a dodo, a great auk, or any one of scores of other species that have been exterminated by man during the historic period.

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Even more important, from the strictly scientific point of view, are the so-called "type specimens" of organisms, both plant and animal. A type in this sense means the particular example of a species upon which its original description and scientific name were based. The type remains for all time the standard with which other identical or related organisms are compared. There can never be more than one type specimen of any one species or subspecies, and, hence, if it is destroyed, the loss is irremediable.

Natural history collections differ from collections of artistic objects in that the most valuable specimens are not, as a rule, those placed on public display in museum exhibition halls. There are, of course, exceptions to this rule. If a museum possesses a single skeleton of a dinosaur or a single specimen of the extinct Labrador duck, the chances are that each may be mounted, properly cased, and placed on exhibition. Generally speaking, however, the great rarities, all of the type specimens, most or all of the specimens that have critical importance because of references made to them in scientific literature, the series of specimens that show the changes due to age, growth and geographic variation in the life of the plants or animals, are preserved in "study collections" that are available to accredited students but do not form a part of public displays. The great bulk of natural history museum possessions are, indeed, in the form of study collections, and they are usually the part of highest permanent importance to scientific research.

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Museum material of every sort is, of course, labeled and catalogued, with the object that there may always be a connection between the specimen and the pertinent information concerning it. In the case of natural history material, such identifying data is, if possible, of even more importance than in the field of art. A Rembrandt painting, separated from its numbered tag or other record, might still be identified as a Rembrandt. As a great work of art, it would at any rate continue to fulfill a part of its purpose, even if the name of its creator should be forever lost. But a natural history specimen, once separated from information about the locality and date of its capture, its sex, the color in life of the parts that change after death, etc., automatically loses a greater or less proportion of its usefulness and may become valueless, or worse than valueless. In many instances, indeed, it would be preferable for such a specimen to be completely destroyed than for it to lose its tag. With specimens of certain kinds, such as bones, fossils and rock samples, the card or paper label in the same container may be fortunately supplemented by a number on the specimen in white or black ink, which corresponds with a number in the catalogue in which all essential information is duplicated.

As a first step for the protection of natural history specimens one should determine whether any damage has been done to the collections and to the rooms in which they are stored. Repair, or boarding up, of broken windows should be done immediately. It should be remembered that the study collections of large museums are likely to be of more importance

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than the exhibition halls. The advice of the regular custodians, even if these are members of an enemy population, should be sought. No one knows better than they what care is necessary, and it is certain that no one will be more interested.

In the absence of such specialized help and advice, everything should be left as nearly in status quo as circumstances will permit. Wherever containers have been overturned by explosions but not otherwise damaged, it is better that they be left undisturbed until such time as a properly qualified person can examine the contents. Under no circumstances should a rearrangement be attempted by anyone else if specimens and their labels have become separated or mixed up.

The worst enemies of dried skins, fur, feathers, pressed plants and similar perishable material are dust, light, and insect pests such as moths and dermestid beetles. Wherever cases containing specimens of this kind have been broken, or punctured by bullets, insect pests should be poisoned with carbon dichloride, carbon tetrachloride, paradichlorobenzene, or ordinary naphthaline, after the breaks have been repaired or the holes in the cases covered with tape.

Specimens preserved in fluid should not be permitted to dry out if their jars or metal containers have been broken or overturned. They should be covered as soon as possible with 70% alcohol or a 4% aqueous solution of formol (a ten per cent solution of the commercial fluid). Alcohol is practically essential for crustaceans, shells, and similar limey organisms, which may be rapidly dissolved by formaldehyde gas.

Skeletons, fossils, rocks and much other dry material need a minimum of protection, chiefly from water, soot, etc.

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VI. PACKING PROBLEMS AND PROCEDURE

It may often seem that the best way to safeguard cultural material is to move it from the area of danger. It soon becomes clear, however, that the area of safety may itself actually stand in great peril, and that works of art may as readily sustain as much damage in transit as under any other conditions. Moving, then, should be one of the last safety measures resorted to. It is advisable to list objects under one's surveillance in three groups:

Objects to be evacuated

Objects to be placed in the safest storage place in the institution

Objects to be protected where found

When the list of objects to be evacuated is at hand, place inconspicuous identifying marks on exhibited objects; plan on paper how they are to be packed; know the order in which they are to be packed; decide what combinations of objects will make for the greatest efficiency. It is desirable to have listed exactly what each packing box will contain, but if this is not practical, a list can be made as the objects are packed, and then the box itself can be marked plainly.

Next, make location lists for the objects to be put in special storage on the premises. It is important that this be carefully planned in order to speed the process when action becomes necessary and to make sure that adequate space has been provided.

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When these two lists are complete, it should be possible to make an accurate estimate of the packing materials that will be needed.

Plan in advance where objects are to be packed, by whom, and what is to be done with them immediately after they are packed. Avoid gathering all the objects in one spot.

The exact method of preparing truck loads, and how they are to be checked out of the building, should also be planned in advance. Have but one loading platform so that there will be no chance that a container will leave the institution without being checked. Every container must be clearly marked so that note may be made of the fact when it leaves.

Before objects are packed and evacuated they should be put in the soundest condition possible the better to withstand the strain of transit.

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For convenience, art objects have been divided into seven classes:

- Pictures
- Small fragiles ('small' meaning 100 pounds or less and 'fragile' not only in material but also in construction)
- Small non-fragiles
- Works on paper
- Books
- Textiles
- Large objects

Though each of these classifications requires somewhat different packing procedure, there are certain general rules that apply to all.

Objects must be packed so that they float in packing material. This is to prevent vibration or shock from being transmitted from the outside case to the object. A brace attached to the object and to the outer wall of the container acts as a conductor of all vibrations of the box. This should be avoided.

Boxes should be made of $\frac{1}{4}$ to $\frac{1}{2}$ inch plywood with $\frac{7}{8}$ th inch lumber. Plywood is preferred because it is light, yet strong. It was found in England that the most convenient size was 25 inches long, 19 inches wide, and 12 inches high inside. Boxes made in one size, if possible, expedite construction and simplify transportation and storage. Convenient, safe hand-holds that will take the minimum space when boxes are stacked should be planned. Screws should be used in place of nails, especially for fastening the lids.

No packed box should have a weight greater than two men can carry safely.

A properly nailed or screwed case is better proof than a lock against theft.

If there is any threat of dampness, containers should be lined with waterproof paper, all joints overlapping 4 to 6 inches.

Packing boxes must be strong enough to carry the load intended for them. Do not overload any container, especially the lighter ones such as baskets and light boxes. A good principle is to put in only half of what you think would be safe.

Picture glass can be protected by making a lattice pattern of strips of Scotch tape or masking tape. Strips should come within $\frac{1}{2}$ inch of the frame and the spaces between the strips should not be more than the width of the strip. The Scotch tape made of brown crepe paper is best. Gummed paper and large sheets of brown paper pasted or glued on are not

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recommended because water is needed to make them adhere and to remove them.

The important exposed surfaces of valuable objects should be protected by cotton wadding, waxed paper, mulberry paper, tissue paper, or soft cloth. Except with paintings, where the papers are best, what is used makes little difference. In rare cases, the condition of the surface may be such that a protective coating must be attached. This should be done only by an expert.

Materials which may be used for padding: Excelsior. This should be fresh so that its resilience is at a maximum. Of the combustible materials, it is the best, but care must be taken that it does not come in direct contact with the object in the box. The safest way is to wrap the excelsior in light brown paper, making pads of various sizes and shapes. Quantities will be necessary.

Newspaper. This should be shredded or wadded. It has a tendency to pack down.

Mineral wool, a non-combustible material made of asbestos or gypsum. Glass wool should be generally avoided because of its abrasive effect and because of the danger to people who handle it.

A flammable material such as excelsior, fireproofed by soaking in one of the compounds used for that purpose.

Sand or any granular packing material that is poured into and around the object. The disadvantages of using this are the amount needed, the resulting weight, and the abrasive effect, especially of sand.

A. PICTURES

1. Oils, temperas, and transferred frescoes

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Removed from frames: Materials for outer protection are heavy brown paper, or corrugated cardboard used as one would use wrapping paper, or two sheets held in place, front and back, by Scotch tape. Care should be taken so that the tissue keeps the tape from touching the edges of the picture. Plywood or presdwood may be made into an envelope by separating the two sides with strips of wood. The tissue-covered picture is slipped into this envelope.

Containers. Crate, which would allow for some extra padding, or a regular packing box. Several pictures may be wrapped together if they are placed face to face and back to back with stiff cardboard (i.e., corrugated cardboard) between the paint surfaces which have first

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been covered with tissue or waxed paper. Then there must be at least two inches of firmly but not tightly packed padding between the pictures and all six sides of the box.

Pictures left in frames: These can be packed in a van without any wrapping if proper care is taken with padding and separators. A framework in the van to lessen pressure, and rubber strips on the floor might be satisfactory. Corner pads may be needed to protect the frames.

When packed in boxes, they should have corner pads and, if more than one picture is put in the box, cardboard the size of the box should be put between the pictures. Pictures not wrapped should always be put face down in the box.

2. Water colors. For matted water colors see Works on Paper. Oriental water colors that are usually stored rolled should be placed in metal tubes or wooden containers, made if possible especially for them, before being placed in outer containers. Guard against extremes of relative humidity.

3. Pastels. Do not remove from glazed frames. Protect the glass as directed above. The greatest but most expensive protection can be achieved by substituting for the glass some such inert material as Masonite or presdwood. Cardboard that tends to grow molds, as most do in more than average moisture, should be avoided.

4. Miniatures. Do not remove from mounting. Cover with tissue. Pack in cardboard boxes or leave in the partitioned trays which some institutions use for storage. Pack in wooden boxes that are of such dimensions that the small boxes or trays will fit efficiently. Allow for padding.

5. Large paintings. When a padding or contact packing is necessary the paint surface may need to be protected with pieces of tissue fastened together and fastened over the edges. Loose paint should be faced before packing.

The canvas may have to be removed from the stretcher and rolled. It should be rolled face out and on a drum of such diameter that the canvas does not go more than twice around. This method is exceedingly hazardous since the paint may crack if it is not sufficiently resilient. Waxed paper can be used next to the paint. Brown paper should be put around the roll.

The outer protection should be either a box, especially built, or a careful wrapping of paper, and padded packing in a tight van so that dangers are reduced to a minimum.

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B. SMALL FRAGILES

Included in this class of objects are: ceramics, terra-cotta, glass, ivory, jewelry, and small statues of wood, metal, or stone. In preparation for packing, completely cover the surface of the delicate object with tissue or a cloth such as cheesecloth. Wrap any projection, such as handle or arm, carefully and separately so that it is protected in itself from shock or vibration and when wrapped is as much as possible an integral part of the whole. Shredded waxed paper is excellent for the wrapping of the projection.

Use light cardboard boxes into which the wrapped objects can be put with sufficient tissue so that no part of the object is without shock absorbing support. When put into trunks, boxes, and similar containers, the small boxes should be arranged so that they can not shift position. Padding should be used if necessary. Use, if needed, regular packing boxes. Use, if more convenient, outer containers other than boxes. Among these are: trunks, which have, as disadvantages, excessive weight for the protection they afford, leather handles which become fragile with age, a tendency to twist unless packed in perfect equilibrium, locks which can be opened easily with a wrecking bar, and keys and padlocks to complicate matters. Wicker hampers are lighter, but have all other disadvantages of trunks and have questionable strength. Open trays placed on special shelves in vans, which, with careful packing and handling, might be serviceable. Metal containers, if on hand and if not too heavy, are excellent.

C. SMALL NON-FRAGILES

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This group includes silver, coins, gems, enamels, bronzes. Treat like small fragiles, except that for the most part these objects will not need as much surface protection or padding when placed in either the cardboard inner boxes or the wooden outer ones. If the object is large enough, wrapping in blankets before placing in a truck may be sufficient. Some objects, though classed as non-fragiles, will have to be packed as fragiles because of their deteriorated condition. Put coins and other small objects in small cloth bags or paper envelopes and mark them carefully. Do not overload outer containers. Coins and many other small objects which weigh little individually, make a considerable weight in large numbers.

D. WORKS ON PAPER

This group includes etchings, engravings, drawings, etc. For surface protection put into or leave in window mats. Directly over the face of the print or water color place glassine or pure mulberry fibre paper. Sized tissue should not be used. Outer protection: Solander boxes are recommended as a first outer protection. Brown wrapping paper

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packages may be made of six to twelve prints, with stiff boards cut to size and placed at top and bottom. Wooden boxes should contain solander boxes or paper packages. The large box should be lined with waterproof paper and padded only if necessary to keep the contents from moving.

E. BOOKS

Handle like prints except when wrapped. Added stiffening is usually not necessary. Valuable bindings should be wrapped in tissue and then put into cover boxes. If these are not available use corrugated cardboard. If inlaid or jewelled treat like small fragiles.

Make packages of books of the same size, using tissue or brown paper, binding tape, or fine but strong twine. This will insure greater protection of all bindings and lessen movement in the large packing boxes. Those should be waterproofed, of convenient size, and packed in such a way that there is no chance for the books to move. If books are wrapped, fill cracks with crumpled newspaper or excelsior. If books are not wrapped, fill cracks with crumpled tissue paper.

F. TEXTILES

In addition to the dangers which beset other valuable objects this group presents the danger of damage from creasing. When a fold is pressed tight without proper protection, threads may be broken and the whole structure endangered.

Surface protection: In any one bundle only pieces of one kind should be put together. When pieces are to be folded, several layers of tissue should be so placed that the paper is the inner part of the fold.

Outer protection: for textiles attached to frames, use cardboard or presdwood under each frame and of exactly the same size as the frame to stiffen the cloth to which the textile is attached. This will lessen vibration. Several frames of the same size can be placed together. Wrap in brown paper. Place in wooden boxes, waterproofed and large enough to allow for some padding.

In the case of textiles not attached to frames: Wrap in bundles as described above. Wrap in brown paper. Pack in cases just tightly enough to prevent shucking.

In all cases guard against insects such as moths. Be sure that there are no evidences of insects before packing. Bundles containing wool should have crystal of paradichlorobenzene sprinkled in them.

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G. LARGE OBJECTS

These include statues weighing several hundred pounds, walls of tombs, and furniture. The danger in moving and packing any valuable object is increased by unusual size or weight. Each large object is a special problem and will require a good deal of time for careful handling.

Inner boxes is the best method of packing a large statue. The surface must first be protected where it may be touched by braces. Then it can be put into a box and braces cut, or pads arranged so that strains will be lessened when the statue's weight is shifted from the normal position. The packed box which has only braces should then be placed in a larger box which would allow for 6 to 8 inches of well-packed excelsior on all sides. When only pads are used, it may not be necessary to use another box. In some cases no such elaborate packing would be necessary because the known internal strength is such that only surface protection is necessary. The experience of the men packing large objects is doubly important as it requires the co-ordinated action of several, and in some cases requires the use of such apparatus as lifting trucks and block and tackle.

The three major precautions:

Make a careful written and photographic record of the condition of the object before it is moved.

Put the object in as nearly perfect condition as time will allow before moving it.

Plan for periodic inspection of objects at the repository and of those in storage at the home institution. This inspection should be made by trained conservators who are prepared to make simple repairs and restorations. It should never be attempted by anyone not trained to do them.

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VII. RECORDS AND LABELS

It is exceedingly important that all safeguarding and salvage work be accompanied by the maintenance of careful and detailed records, listing each object as well as the condition in which it was found, and giving explicit account of any treatment, however slight, it may have received, including records of removal. Such records are indispensable in carrying forward the work of restitution, and in providing evidence as to the performance of the occupying authorities, who may expect to have charges of damage and looting levelled against them. These records should comprise, or form the basis for a descriptive catalogue giving verbal descriptions supplemented, wherever possible, by photographs or by drawings. Most public and many private collections, to be sure, are catalogued to begin with. These catalogues, however, may not be available, or if they are, may afford considerable discrepancy between their listing and the actual inherited collection.

It is recognised that the work of cataloguing is a considerable task, requiring in most cases highly trained specialists. The officer who is not especially trained may, nonetheless, by seeking to fill out the following outline to the best of his ability advance the work of restitution immeasurably.

Such preliminary record should list:

Type of Object

For example: Painting, sculpture, pottery,
textile, book, etc.

Such further description as is possible

For example, in the case of a painting, whether a portrait, a landscape, a still life, a mythological or historical scene, etc.

In the case of pottery, whether a bowl, jug, beaker, etc.

In the case of sculpture, whether a head, bust, group of figures, etc.

In the case of textiles, whether a dress, coat, rug, wall hanging, etc.

Material

For example, in the case of painting whether on canvas, or wood, etc.

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In the case of sculpture, whether stone, metal, wood, etc. There is often doubt as to material, but even an approximate description is useful.

Size

Greatest length by greatest width or thickness, measured in a straight line.

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VIII. DEPOSITORIES OF BOOKS, MANUSCRIPTS, ARCHIVES, AND RECORDS*

A. LIBRARIES

The countries of western and central Europe are covered with a network of public, semi-public, and private libraries that range all the way from institutions holding millions of books to small county, municipal, and private collections. There are in Austria, Belgium, France, Germany, Italy and the Netherlands some 250 major libraries housing more than 100,000 volumes each, which together possess the impressive number of fifty-five million printed books. In every country the state maintains at least one national library that is of outstanding importance because of the magnitude and the universal character of its holdings. Next in rank are the libraries of universities. Many of them go back to the middle ages and have been constantly enriched so as to become research collections of great value. The larger cities have also established municipal libraries with hundreds of thousand of books, while at the same time, providing branch libraries for the benefit of the reading public. Apart from these first-rate centers of information, collections of incunabula and rare books may be found in small communes and in the hands of families and private collectors. Many a French or Belgian chateau and many a Dutch or German town hall houses treasures of books that are unique and cannot be replaced.

B. MANUSCRIPT COLLECTIONS

In addition to printed books, practically all the larger libraries possess manuscript collections of extraordinary value. State and university libraries have received, either as their first endowment or at a later time, the precious codices of abbeys and monasteries that contain the literary heritage of classical antiquity, the earliest texts of the Bible, and the works of the church-fathers, and they have added to them constantly by purchasing manuscripts or obtaining them as gifts. In recent decades, collections of papyri that were brought to light in Egypt and other countries of the Near Orient, have found their way into the manuscript divisions of many libraries, and papers of statesmen, politicians, scholars, authors, and poets have further contributed to the richness of these depositories.

Many learned societies, too, possess valuable collections of manuscripts relating to their special fields of research and interest, and numerous small towns, noble families, and private collectors may treasure codices and manuscripts in their safes where they are stored away together with their important legal documents.

* Since this section and section 7 entitled, Books on Paper and Miscellaneous Supports, beginning on page 13, were prepared at different times there is, to some degree, duplication of material in the two. Since section 7, however, does not deal with libraries and archives in themselves, it appeared desirable to add this section to cover these items.

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C. ARCHIVAL DEPOSITORIES

Archives are generally understood to consist of the records produced and received by government agencies, institutions, corporations, business firms, and families, in so far as these records constitute organized bodies, are considered worthy of permanent preservation, and are no longer needed for current administration. The wealth of such material, created by the authorities and organizations of European countries in twelve hundred years of documented history, is obviously overwhelming, and to guarantee its preservation and to facilitate its use by the government, by scholars, and by the interested public, special depositories have been established in great number. It should be noted that archives have a twofold character and use. They are, in the first place, records of the activities and the legal rights of the creating agency or its successor agencies and, though generally non-current, may reassume at any time importance for the maintenance of their rights and for the formulation of their policies. Archives of public authorities are, at the same time, essential for the protection of the legal rights of citizens. Secondly, archives constitute an unsurpassed source of information concerning the political, social, and economic developments of the past, - information that is indispensable for a diagnosis of our present-day society. Though the holdings of many archival depositories date back to early medieval times, it would be utterly wrong to think of them as rare documents that are of interest to antiquarians and genealogists only.

Easily the most important category of archives are the state and other public archives, that is, the non-current records of the national governments of Europe and of their subdivisions, including those of predecessor authorities. Archives of ministries and other central agencies are either concentrated in national archival establishments or kept in ministerial depositories, while those of state authorities on the provincial and local levels are preserved by provincial archival agencies. To the latter have also fallen most of the previous archives of ecclesiastical institutions such as bishoprics, chapters, abbeys, and monasteries, which comprise thousands of documents on parchment. All the larger communes possess impressive accumulations of archives, and even the smaller ones may keep in their archives vaults hundreds of parchments and series of paper records that, in unbroken sequence, reach back to the fifteenth or the sixteenth century.

Of the non-public archives, those of business firms and corporations are mostly in the custody of their creators or of their legitimate successors. In some instances, however, they have been assembled in special depositories called archives of economic history. Archives of private families are particularly numerous and rich in Germany and in Austria because there the property right and, consequently, the archives of the great noble families have been left relatively untouched in the course of revolutionary movements.

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D. RECORDS

From our definition of archives it should have become clear that no sharp border-line separates them from records, public as well as non-public. Many government agencies and many organizations and corporations keep their older records together with their current material. The administrative records of today are the research materials of tomorrow that will be indispensable to the historian, to the sociologist, and to the economist. They should receive the same care as cultural objects. Records of public and non-public authorities also play a vital role in the administration and rehabilitation of an occupied country, and for this reason, too, officers should give fullest attention to them until they are convinced that they are adequately protected and cared for. The following types of records are generally considered of particular importance for the prosecution of the war and for administrative purposes:

Records of military and police authorities of enemy and Quisling governments.

Records of courts, especially commercial registers, real estate books, and other records necessary to establish property and other legal rights.

Records of labor exchanges and employment offices.

Records of agencies engaged in controlling the production and distribution of food.

Vital statistics on which many refugees and prisoners in concentration camps must depend for their legal identification.

Records of industrial and business concerns and firms and records of insurance companies and banks.

Records of public utilities.

Records of notaries that are indispensable in determining many kinds of property and other rights and constitute, in addition, an important source of social and economic history.

E. BUILDINGS

Most of the great national depositories of books, manuscripts, and archives, many libraries of universities and larger cities, and a number of important provincial and municipal archival establishments are housed in buildings of modern construction that, in normal times, afford to their holdings protection from physical dangers and that, consequently, should have helped to a considerable extent to diminish war-time losses and damages. It should be borne in mind, however, that in Europe, unlike in the United States, fireproof buildings have not been provided for the accommodation of local and smaller provincial institutions. Most of them

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are housed in historical structures, such as palaces, old fortifications, and monasteries, and in many cities and towns the town hall, frequently a building of the fifteenth or sixteenth century, is used to give shelter to the municipal archives and library as well as to the local museum. It must be anticipated that collections, preserved in such older buildings, have suffered incomparably greater damages than those kept in special buildings of fireproof construction and will demand immediate attention. Likewise, records of local courts and of municipal offices will be in particular need of protection because, together with their creator agencies, they are for the most part housed in historic structures, while, on the other hand, those of central agencies and organizations may have enjoyed excellent storage conditions and, accordingly, relative safety.

F. PERSONNEL

All the larger depositories of books, manuscripts, and archives are staffed with trained personnel that is part of the national or of a municipal hierarchy and mostly appointed for lifetime. Small communal collections of books and manuscripts are frequently entrusted to the care of local historians, ministers, or school-teachers, while the town clerk may have archives as well as records under his custody. In other places, one and the same person serves as archivist, librarian, and museum curator of his community. Administrative personnel is, as a rule, responsible for the archives and collections of a noble family. Records of agencies and organizations are serviced by special personnel that can be expected to be thoroughly experienced and to possess a good knowledge of the records.

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G. PROTECTION AND SALVAGE OF BOOKS, MANUSCRIPTS, ARCHIVES, AND RECORDS

1. Extent of damage to be expected. It is certain that in areas exposed to allied aerial attack and in those the invasion of which has long been anticipated, the most important cultural materials have been removed to places of comparative safety. It is also certain that the size of many collections has made their wholesale evacuation impossible and that considerable portions of them have remained in their customary depositories, subject to the vicissitudes and dangers of modern war. Furthermore, places of safety that during the siege of the "European fortress" seemed to afford complete protection to evacuated materials will be in the midst of combat action after the invasion has started. It must be expected, therefore, that, in spite of protective measures, many depositories of books, manuscripts, archives, and records will suffer extensive damages through aerial and artillery bombardment and through fires and subsequent extinguishing activities. This is in addition to the consideration that depositories of cultural materials may be wholly or partly destroyed if the Nazis decide to apply a scorched earth program to them.

2. Dangers menacing cultural materials and records. Even after fighting has ceased, cultural materials and records are in grave peril. Books, manuscripts, and other documents have a commercial value that, in normal

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times, makes them desirable objects for capital investment and that, in a period of crisis, may completely overshadow their cultural significance. In Nazi-controlled Europe, a great many people have acquired art and cultural objects as a means of protecting at least part of their wealth against inflation with the result that prices have reached unreasonably high figures. This situation will probably induce lawless elements among the civilian population to loot books, manuscripts, and archives before allied authority has become firmly established. Mobs may also try to destroy the real estate books and other property records in courts and archival depositories, documents that are often considered to stand for, and to guarantee, the capitalistic system. Likewise, attempts to destroy, or to tamper with, other types of public records and the files of business firms, must be anticipated. Many of them will have been removed or destroyed by the retreating enemy. Where they are left behind and found intact at the time of occupation, officials, Nazi-sympathizers, and other persons may make every conceivable effort to destroy, to mutilate, or to conceal material that it would serve their interests to have destroyed, or that would be essential for Allied Military Government; and to avoid this, speedy action will be necessary. Lastly, all records and cultural materials may be greatly endangered if the structures housing them are used for the billeting of allied troops. We may assume that they will not indulge in souvenir hunting if properly warned, but we cannot expect battle-weary soldiers to have much regard for old books and dusty papers, stored along the walls of a room, and to leave them on shelves and in showcases that could be used for the storage of equipment and food.

3. General protective measures. It can be assumed that, when places are occupied by allied troops, a proclamation to the civilian population will be issued. This proclamation should include a warning to the effect that depositories of cultural materials and records are under the special protection of the allied powers and that the pilfering, removal, destruction, and mutilation of books, manuscripts, archives, and records will be severely punished by our authorities. Desirable though it may be, the great number of depositories will make it impossible to protect all of them by military guards. This should be done, however, in the case of all buildings that, because of damage to walls, windows, and doors, can be entered by unauthorized persons. Others should be locked until they can be opened and inspected by especially trained officers. Records of military and police authorities of the enemy and of Quisling governments, papers of fascist organizations, and the files, plans and drawings of public utility companies should be confiscated without delay, sealed, and closely guarded until provision can be made for their examination and utilization. All depositories that must be left without protection by guards or sentries should be made known to military police formations with the request that they receive particular attention and that patrols be instructed to keep a watchful eye on them. Where, because of lack of other suitable structures, depositories have been used for billeting troops, commanding officers should be urged to move the troops to other quarters as soon as possible and to give, in the meantime, special attention to safeguarding the contents of such depositories.

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4. Use of local personnel. Officers are urged to locate the custodians of books, manuscripts, archives, and records at the earliest possible time and to utilize them in all operations of protection and salvage. Their professional experience and their intimate knowledge of the collections will be indispensable in ascertaining the condition of the respective depositories, in determining losses, and in carrying out, if necessary, the removal of endangered and damaged objects to places of safety. Responsibility for identifying material, for making final estimates of losses, and for suggesting any necessary emergency repairs should be left to them entirely; and their work will be facilitated if they are called upon to assist at the first stage of the rescue program. That local custodians of liberated areas will participate wholeheartedly in this program cannot be doubted, and, in enemy territory, too, librarians and custodians of manuscripts may be expected to show a similar spirit of cooperation for the sake of their collections. Caution, however, is called for in the treatment of the keepers of archives and records of enemy and Quisling governments. They should be warned expressly and repeatedly against destroying, removing, mutilating, and otherwise tampering with, archival and record material. They should also be required to produce their inventories, card catalogues, and check-lists and lists of all records that have been evacuated to places of safety. All such finding aids and lists might be temporarily sealed or stored in sealed vaults or locked rooms to make sure that all archival and record material can be thoroughly checked at a later time.

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All custodians of cultural materials and records should be asked to submit immediately lists of archival and record material that has been evacuated from other places and temporarily stored in their respective depositories, for it is expected that frequently archival and library buildings have been used for the emergency accommodation of the most important types of official records.

If the local custodians have fled or cannot be found, interested persons, such as local historians, ministers, school-teachers, or notaries, should be asked to serve temporarily as curators of the various collections. At the time of their appointment, an appropriate oath should be imposed on them.

5. Examination of structures. The condition of the structures used as depositories of books, manuscripts, archives, and records should be ascertained by officers immediately following the occupation of a city. Where the custodians of the different collections can be located without delay, they should be present during the inspection to supply all information that may be required. It is also suggested that a local architect participate in the inspection tour so that estimates for minor repair work may be obtained without delay. Examination of depositories in fireproof and modern structures should be postponed until those housed in artistic and historic buildings have been inspected.

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6. Collections in undamaged or slightly damaged buildings. If the structure housing a given collection is found intact, it can be assumed that the collection itself has not suffered any damage, and that it can be left to the supervision and care of its permanent or temporary keeper. Nevertheless, all rooms, vaults, and stacks should be thoroughly inspected in the custodian's presence, and a document stating their condition and that of the collection should be prepared and signed by an officer and the custodian. The custodian should then be charged with the responsibility for the collection and ordered to close the establishment for the public until further notice. He should be instructed to take all measures necessary to prevent fire, pilfering, and the entrance of unauthorized persons, and to send in daily reports to the officer in charge.

When, in the course of the inspection, it is found that the building housing a collection is damaged but still capable of giving it adequate protection, damages should be listed and the necessary emergency repairs initiated as soon as possible. These measures will include the mending of pierced roofs, the replacing of window panes or the boarding up of windows, the reparation of doors and locks, and other minor restorations, and while they are under way, the building should be guarded by sentries. If the emergency repairs are completed before AMC assumes its functions, rooms, vaults, and stacks of the depository should be inspected by the officer in charge in the presence of the permanent or temporary custodian and the latter charged with the care and supervision of the collection in accordance with the procedure outlined before.

7. Collections in seriously damaged buildings. If the structure housing a collection has been so seriously damaged that extensive and time-consuming restoration is necessary before the contents can be properly protected, it may be necessary for the collections to be removed to a temporary storage place. Officers should realize that, even under normal conditions, the transfer of a collection of cultural materials and records is a complex and delicate operation, which must be carefully prepared and carried out. Many of the objects involved are of a fragile nature and may easily suffer damage if roughly treated. Furthermore, unless care is taken, their arrangement and identification, frequently the result of years of industrious labor, may be so greatly impaired that the materials cannot be used without serious difficulties. It is obvious that a war-time removal, carried out with untrained personnel and with unsuitable packing materials, constitutes a particularly difficult task and should be undertaken only if the preservation of a collection makes it absolutely unavoidable. As a first step, it will be necessary to survey the collection, to determine the approximate number of cases or containers that will be needed, and to plan in what order the material will be taken out and stored in the new temporary depository. With the possible exception of recent records, which might be moved wrapped and tied up in bundles, all material should be packed in such containers or boxes as may be available. Sturdy pasteboard boxes are, as a rule, preferable to wooden boxes, which, at least, should be lined on the inside with layers of newspapers before they are filled. The proven method of packing

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books, archives, and records is to lay them flat on top of each other, filling empty spaces with crunched newspapers or rags so that they cannot move. It is permissible, however, to stand books and bound volumes vertically on their lower edges (never on their fore-edges). Modern archives, records, and books are considerably heavier than older material, and large boxes should not be filled with them to capacity. Every box or carton should receive a consecutive number after it has been packed, and its contents should be briefly but carefully entered in a packing list to make possible their checking at the place of destination. It is highly desirable that all material be packed in its exact order that all labels or other identification marks that might fall off in the course of the operations be preserved. Parchments should remain in the small pasteboard cartons in which, as a rule, they are stored, and a number of cartons should be packed in a larger container or box. They should be handled with great care in order to avoid damaging the seals. Collections of seals, dies, maps, plans, and drawings should be transported in their original storage cabinets, unless the size of the cabinets makes this impracticable. In this latter case, it is desirable that seals be packed in small cartons between layers of cotton or, lacking this, in rags or crunched paper, and that maps and plans be rolled on wooden poles. Finding aids, such as catalogues, inventories, and the like, should not be packed together with the collections. They should be taken separately to the new storage place by the officer in charge after the packing operation has been terminated.

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More than ordinary care is required when collections damaged by fire or water are moved to a new storage place. Wet books and documents should be wiped off superficially, packed between layers of dry newspapers, and immediately unpacked at the place of their destination. Material that has been exposed to heat and become brittle should be treated as gently as possible and not unnecessarily handled. Charred and burned books and bundles should be wrapped in paper or put in small cartons before being packed in larger boxes. Fragments of burned documents should be assembled and also put in special small cartons.

In many cities and towns, safes are used for the storage of incunabula, parchments, and other important documents. Where such safes have been in the midst of a conflagration, they should be allowed to cool off before being opened, because the sudden inrush of fresh air might cause instantaneous combustion of their contents.

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8. Collections in partly or wholly collapsed buildings. Serious problems will be encountered in the salvaging of objects from partly or wholly collapsed structures. It will be necessary to give immediate attention to the safeguarding of those books and documents that might be buried under debris and rubble on the streets, before bull-dozer have started clearing them for military needs. If time is not available for salvage operations, it should be requested that all debris be pushed from the street to the inside of the buildings so that they can be searched for books and documents at a later time. Material in partly collapsed buildings should not be removed before their condition has been examined by engineers or local architects and it is certain that they can be entered without danger. The main principle to be kept in mind in salvaging material under such conditions is to keep together as much as possible material that is found together.

9. Temporary storage places and their equipment. Structures selected for the emergency storage of books and manuscripts should preferably be isolated buildings, located on high ground, and easily guarded. They should have an adequate number of dry and well-ventilated rooms with solid doors and good locks. Warehouses in the suburbs and empty factories may frequently be used with advantage. Basement areas and attics should be strictly avoided for lengthy storage, unless no other accommodation is available.

Before any material is moved to the new storage place, all rooms should be cleaned and thoroughly aired. Since books and documents will absorb moisture if stored on concrete and other floors, reasonable efforts should be made to provide suitable equipment, such as bookcases and shelves. When no such equipment is obtainable, all parts of the floor intended for storage purposes should be covered with boards, preferably resting on bricks or other supports. Makeshift shelving might also be constructed by placing boards on piles of bricks of equal height and by repeating this process until a number of tiers have been erected. Books and bound volumes, with the exception of oversize and particularly heavy material, should be placed on their lower edges and held in vertical position by using bricks as bookends. Documents in boxes, cartons, and bundles should be stored flat.

10. First-aid treatment of damaged materials. First-aid treatment will consist in gently shaking out loose dirt and carrying out all other operations needed to prevent physical deterioration of material that has become wet or partly burned. It does not include the repairing of damaged or torn documents, the restoration of bindings, the removal of stains, the reinforcing of papers and parchments, the treatment of faded writing, the photographic reproduction of decaying items, and many other processes of rehabilitation that, because of their delicate nature, must be left to the expert. Officers should also prohibit temporary custodians from undertaking any of these operations and instruct permanent and professionally trained keepers to postpone them until first-aid treatment has been given to all damaged materials.

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It should be constantly remembered by officers and other persons engaged in salvage operations that paper and parchment are sensitive materials and that the physical strength of those exposed to fire and water has been considerably reduced. All first-aid treatment, therefore, should be applied with the utmost care, gentleness, and patience, and violence should be avoided under all circumstances.

11. First-aid treatment of paper material damaged by water only. Loose documents that have been damaged by water only should be taken out of their bundles and boxes, and individual documents, pages, and folds should be separated while the material is still wet. This should be done by cautiously inserting a dull paper-knife and levering gently and patiently. After the operation has begun, a small round stick or pencil, which is rotated between the fingers, may be used instead of a paper-knife. Documents that have thus been separated and unfolded should be dried by hanging them over lines, and though the air in the working rooms may be warmed up moderately by turning on central heat where available, documents should not be dried on radiators, nor should they be exposed to direct sunlight. Documents, while still fairly damp, may be placed individually between sheets of blotting or absorbent paper, if this is at hand, and pressed and flattened by putting a heavy board on top of a pile of material. 6632

Printed books and bound volumes of documents should receive similar treatment. The pages while still wet should be carefully separated, and the volumes, partially opened, then stood in open air on their upper or lower edges and allowed to dry. Blotting or absorbent paper may be placed between the individual pages of a book, when they are still fairly damp, and books thus treated may be pressed by placing a heavy board upon them.

12. First-aid treatment of burned paper material. Paper material that has been exposed to heat, but not actually burned, will be brittle and should be permitted to absorb moisture from the air to acquire its original flexibility. This could be done by keeping them for some time in a "humidifying chamber", that is, a closed, warm room in which large containers with water are placed. Books should be partially opened and stood on their upper or lower edges. Loose papers must be taken out of their boxes, cartons and bundles and spread on tables or emergency shelves.

Books and documents that have been actually burned or charred may, at first sight, seem impossible to salvage. Experience shows, however, that frequently they have been damaged on the outside and along the edges only and that a large portion of their contents is still legible. Such material if dry should be kept in such receptacles as are available and not touched. Burned books and documents that have become wet during fire extinguishing activities should be dried like ordinary wet material and then stored away safely.

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13. First-aid treatment of parchment material. Parchment, although apparently sturdier and tougher than paper, is actually more sensitive to damage by water and fire, and, for this reason too, old documents on parchment and codices should receive preferential first-aid treatment. Parchment material if soaked and allowed to remain so for any length of time will become a gluey mass. It should be treated like wet paper material, and particular care should be taken to separate the folds of all documents before they are dried by airing. Parchment documents and books that have been exposed to heat should be wrapped in a damp cloth and allowed to absorb moisture until documents, pages and folds have become more flexible and can be cautiously separated should they be stuck together. Parchment material thus treated should then be dried like paper material.

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NOTES ON
SAFEGUARDING AND CONSERVING
CULTURAL MATERIAL
IN THE FIELD

Part I

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AMERICAN DEFENSE - HARVARD GROUP
Committee on Protection of Monuments
1943

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INTRODUCTION

The following pages are not a manual on the care and conservation of the monuments and materials of culture. Such a manual would run to many hundreds of pages, would contain much that is so tentative or disputable as to be dangerous for all except experts, and would be almost useless except to those trained by practical experience.

What is attempted here is a guide for giving First Aid to buildings, monuments, the contents of libraries, art museums, and scientific collections, which have been damaged or put in jeopardy by the operations of war, and are in danger of further damage and of disintegration.

The inspiration has been the famous definition of the American Red Cross First Aid Text-Book: "First aid is the immediate, temporary care given in case of accident or sudden illness before the services of a physician can be secured." With that definition in mind, the series of notes which follow has two aims:-

(1) To lay down some principles and precepts (the "don't's" as frequent as the "do's") which may enable a reasonably intelligent person, with some mechanical sense and an orderly mind, so to deal with cultural material as to prevent its taking further harm until an expert can get to work. Also, as experts in one type of object are not always equally knowledgeable in others, even an expert may find here something which will be useful to him in fields with which he is un-

familiar, pending the arrival of specialized help.

(2) To put forward an orderly sequence of action, so that no important step should be overlooked. Often, in anxiety to get to work, some indispensable preliminary is forgotten, and later work is made more difficult.

The plan of the notes is simple. Part I consists of an analysis of the problem of safeguarding, with a statement of principles and of courses of action which apply to all types of material. This part is complete in itself. Part II is an expansion and application of Part I. It deals with material of specific types, discussing the dangers to which each type is specially liable, and how best to deal with these. The section concerned with each type is written by an expert in that particular type.

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I. THE IMPORTANCE OF SAFEGUARDING CULTURAL MATERIAL

The authorities in military occupation of any country have duties which go far beyond the immediate ones of establishing order and of providing for the material needs (food, shelter, clothing, health, transportation, etc.) of the population. They must also create with the peoples of such countries relations of sympathy and understanding designed to inspire confidence and a sense of security; restore the foundations for their cultural life; and develop an atmosphere favorable to the adoption of peace treaties and to the application of their provisions.

In all such countries are monuments and sites cherished by their peoples: churches, shrines, civic buildings, burial grounds, statues, paintings, together with libraries, historical archives, scientific collections and other material indispensable to learning and culture. Buildings and their contents may have been destroyed or damaged; collections may have been dispersed, confiscated or looted. Every kind of cultural material risks further injury or destruction. At the same time, military operations such as trench digging or even bomb explosions may have revealed hitherto unknown monuments of the past.

Safeguarding cultural monuments will not feed hungry people, nor give them physical security; but it will affect the relations of armies with the peoples

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whose countries they occupy, and it will affect the relations between those peoples and the governments of the United Nations. It will show respect for the beliefs, the culture, and the customs of all men; it will bear witness that the cultural heritage of any particular group or society is also the cultural heritage of all mankind; it will help to lay a firm basis for activity in the arts, the sciences and learning after the war; and it will conserve things that are often of considerable economic value to the countries concerned.

It may be asked why such works as those described above should receive special treatment compared with other kinds of property. The answer is that they are for the most part unique and irreplaceable. For other property an exact equivalent can often be found, or a money compensation made; cultural monuments, once gone, are gone forever.

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II. THE CHOICE OF CULTURAL MATERIAL TO BE SAFEGUARDED AND CONSERVED

1. The officer charged with safeguarding and conserving cultural material should first find out what needs to be safeguarded, and put the various buildings, objects, etc. roughly in order of importance, as a guide to priority in action.

Two main factors have to be taken into consideration:

- (i) The attitude and sentiment of the local inhabitants.
- (ii) The opinion of the artistic and learned world in general.

If these coincide, as to the importance of some monument or material, so much the better; if not, as sometimes happens, give greater weight to local opinion.

To assist in making such a selection and arrangement, lists of monuments and material in different districts have been prepared by competent authorities for army use. These differ from accounts in guide books in giving more weight to local opinion, and by including:

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- (a) Private collections not ordinarily accessible to the public.
- (b) Installations and collections whose primary interest is in connection with learning and research.

If such lists are not available, recourse must be had to guide books. Baedeker's guides (published in

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Germany, but translated into several languages) are both reliable and succinct; and monuments which are starred or double-starred may justly be treated as of first importance. Other well known guides are the Guides Bleus (Blue Guides. Usually in French; some translated into English), and Grieben's Guides (German, some translated into other languages). Local guides may also be found, but vary greatly in quality. They are apt to be incomplete and inaccurate.

2. Whatever the written source of information, it should be supplemented and corrected by local information.

(a) In some countries, there are organized services concerned with historic and artistic monuments, whose members are generally well informed and competent. Information about such services is included in the lists of monuments mentioned above.

(b) Educated people of a locality, such as priests, clergymen, and schoolmasters, are sometimes considerable authorities on local monuments.

Get into touch with such people as soon as possible and seek their advice and cooperation. In general, take the line that you are there to help them, rather than asking them to help you. But remember also that local people may be ignorant, or infected by local rivalries, venality, hostility, or desire to please. So, unless you are sure that local helpers are competent and disinterested, check their information from other sources.

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III. TYPES OF MONUMENTS AND CULTURAL
MATERIAL

In safeguarding and conservation, two main factors determine what can and should be done:

- (i) The physical character of the objects concerned.

Different materials are subject to different kinds of risk, or to varying degrees of the same risk, so that different kinds of protection and treatment may be needed.

- (ii) Whether the objects concerned are movable or comparatively immovable.

Immovable and very heavy or bulky objects will have to be dealt with wherever they happen to be, and surrounding conditions accepted. Movable objects can be moved to places where conditions more favorable to safety can be set up.

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It might seem desirable to list the monuments and cultural material which may be encountered according to physical character. In fact, this is impractical (a) because many objects are composed of several different substances (b) because they are usually found grouped not according to their physical make-up, but according to the purpose they serve, or to the field of learning concerned with them. The following list is, therefore, based primarily on the groups in which objects are likely to be encountered, notes on their physical character being added. At the same time, they are

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divided into immovable and movable objects, since this does not disturb the main basis of the list.

1. Immovable objects

(i) Buildings of all kinds, religious, civic and private. The main materials of construction, each constituting a different problem, are stone, brick, wood, plaster, and earth.

(ii) Fixtures in buildings, such as fireplaces (stone, plaster and wood); staircases (stone, brick and wood); ceilings (stone, plaster and wood); galleries (brick, stone and wood); choirstalls, tombs and shrines in churches (stone, brick and wood); mosaics (glass); stained and painted glass windows; mural paintings (on plaster or clay surfaces which form part of the wall, or on canvas attached to the wall by adhesives -- technically "marouflaged"); ornament in relief attached to the structure (stone, brick, plaster, wood).

(iii) Commemorative monuments, such as triumphal arches, towers, pyramids (stone, brick and occasionally wood), and shrines.

(iv) Large statues and sculpture groups (stone, metal, wood, and plaster.

(v) Burial grounds and tombs (stone, brick, plaster).

(vi) Archaeological sites, including those which are known to be important, though not yet excavated.

(vii) Elaborate scientific installations.

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2. Movable objects

(i) Sculpture, either free standing or part of another object. The range is from medals, cameos, coins and small carvings in wood and ivory, to large figures and groups in metal, stone and terra cotta, glazed or otherwise.

(ii) Easel paintings, either on canvas or wood, occasionally on metals, stone or leather; miniatures on card, ivory or parchment.

(iii) Furniture, both of houses and churches, usually of wood, sometimes of metal, rarely of stone. Often decorated with inlays or attached ornaments of other material, and frequently painted. 6622

(iv) Means of transport, including coaches, carriages and early types of fire engines, locomotives and automobiles. Chiefly important historically; but sometimes of great artistic importance. Wood, metal, leather and fabric are the materials chiefly used.

(v) Material of ceremonial, including flags, banners, decorative and heraldic devices, effigies. Fabrics, wood, leather, plaster and occasionally metal, often painted and gilt, are the materials mainly involved.

(vi) Arms and armor. Includes swords, lances, bows and arrows, firearms, helmets, suits of armor and of mail for men and horses, and trappings.

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Mainly constructed of metal, but wood, leather and fabrics often involved, also stone and flint.

(vii) Glass, pottery and porcelain. Objects are generally small in size, though occasionally large vases, cisterns, etc. occur.

(viii) Jewellery, usually made of the precious metals, with precious or semi-precious stones, sometimes ornamented with enamel. In this category may be included other small objects of personal use, such as snuff boxes and watches.

(ix) Textiles and costumes serving both religious and lay purposes. Includes not only wool, linen, silk and cotton articles, but those made from fur, feathers, and occasionally metal.

(x) Works on paper and vellum. Fall into two groups:

(a) Prints, drawings, paintings in watercolor, pastel or oil, and manuscripts in the form of loose leaves, or a roll. With these may be included paintings in watercolor on silk. The important fact from the point of view of safeguarding and protection is the fragility of the support, rather than the nature of the medium, but it may be noted that drawings and pastels are apt to be more fragile than watercolors and prints, as the medium is less firmly incorporated with the material on which they are made.

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9.

(b) Books, and bound manuscripts. Differ :
from the objects listed under (a) in be-
ing a tight bundle of sheets, and because
materials such as glue, thread, leather and
fabric enter into their composition.

(xi) Scientific collections of all kinds, includ-
ing

(a) Geological and mineralogical specimens

(b) Biological and botanical specimens.

As a rule consist of very fragile organic
matter.

(c) Natural history specimens. Cover a
wide range of substances.

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(d) Ethnographic and anthropological
material. Even more varied in the substances
involved.

(e) Scientific instruments and apparatus.

Glass, metal, wood and (occasionally) stone
are the main constituents.

At first sight, this list appears formidable. Cer-
tainly it indicates the variety and complexity of an
expert's work in conservation and restoration. But
from the point of view of "First Aid" in protecting
and conserving, the matter is simplified by the fact
that the various types of objects can be arranged into
a comparatively small number of groups, each of which
can safely and properly be treated in the same way.

NOTES ON SAFEGUARDING AND CONSERVING CULTURAL
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10.

Before any discussion of procedure, the principal risks to which monuments and materials may be exposed must be considered.

IV. RISKS TO MONUMENTS AND CULTURAL MATERIALS,
AND THEIR CAUSES

These fall into three main groups:-

1. Various agents of damage and destruction
2. Theft and looting
3. Defilement and contemptuous treatment.

1. Agents of damage and destruction

Those most likely to be encountered are:

- (i) Heat. This may destroy objects without their bursting into flame. But some objects may be unharmed by a degree of heat which, if air is admitted, will cause them to burst into flame and be destroyed.
- (ii) Thermal shock. A sudden and great change of temperature, such as occurs when cold water falls on hot glass or metal, or freezing and thawing alternate quickly.
- (iii) Dryness. An atmospheric condition in which relative humidity is below 30% (1). Common in desert areas and buildings heated by pipes, radiators, or similar means.
- (iv) Water. Complete immersion or wetting of the surface.

(1) Please see next page.

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- (v) Dampness. Partial contact with water; an atmosphere in which the relative humidity is above 60%.
- (vi) Blast. Concussion or vibration produced by explosion.
- (vii) Mechanical violence. The fall of an object; the sudden impact of falling or flying material; extreme bending or flexing.
- (viii) Abrasion. Chafing from rubbing or sliding contact with other material.
- (ix) Light, usually from the sun.
- (x) Darkness.
- (xi) Smoke and dirt, including carbon from the burning of fuel or other matter; dust carried in the air; greasy deposits from various sources.

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(1) (Please see page 10.) The action of atmospheric humidity on objects is not, as a rule, dependent on the actual amount of water vapour in the atmosphere (i.e., on what is known as the absolute humidity), but upon this amount expressed as a percentage of the total amount of water vapour which the air could support when saturated (i.e. at the point when moisture begins to be condensed out and deposited on surrounding objects). This percentage is known as the relative humidity. The significance of this is due to the fact that the capacity of air for absorbing water vapour increases as the temperature rises; so as air gets warmer, if the absolute humidity remains the same, the relative humidity decreases, and the point at which moisture may be deposited from the air becomes more distant.

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(xii) Gases.

(a) Those like sulphur dioxide and hydrogen sulphide present in small amounts in industrial atmosphere.

(b) Toxic war gases.

(xiii) Mold. Mildew, small plants, fungi and lichens, which utilize a material as food, causing discoloration and decomposition.

(xiv) Insects. Beetles, weevils, borers, termites and their larvae, which infest organic material.

This again appears a formidable list, but there is comfort in the fact that some of these agents of destruction such as blast and toxic war gases are not very likely to operate; the others are unlikely to be active all at the same time; and some, such as dampness and mold, are causally connected, and may be guarded against by similar treatment.

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The causes of the above listed agents of damage and destruction may be:-

(i) Natural forces

(ii) Military and police measures

(a) Repressive, involving the use of explosives, such as tear gas, and water.

(b) Constructive, such as building, making roads, drainage, etc.

(iii) Carelessness and ignorance

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13.

(iv) Wanton and malicious action

The last two are more likely to occur under the conditions of military occupation than in normal conditions.

(a) Even the best disciplined troops tend to regard themselves as free to use anything which is obviously abandoned or damaged, especially in an enemy country.⁽¹⁾ There is also a temptation to destroy objects which appear to symbolize the enemy.

(b) Local inhabitants or enemy agents may also destroy or damage things, either to deny their use to the occupying authority, or to make it appear that the damage was done by the occupying troops. In the latter case, the motive may be the hope of some compensation.

2. Theft and looting.

This, like carelessness and wanton damage, is a more serious danger under the conditions of military occupation than in civil life.

(i) Looting and theft on any scale by occupying troops may be very improbable. But there is

(1) In the war of 1914-1918, valuable furniture was sometimes taken from houses vacated by their owners, and used in trenches, even as firewood. Sometimes, fires kindled for warmth, resulted in much damage.

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14.

always likely to be the taking of things as souvenirs, or as extra comforts for barracks and billets; and occasional theft for gain is always possible.

(ii) Local inhabitants, tempted by things being abandoned or damaged, may also steal, either to line their pockets, or (especially in countries where looting has been extensive or much damage done) to supply themselves with necessities and conveniences.

The theft of movable works of art for resale is particularly likely, since the market for these is considerable and there are plenty of unscrupulous middlemen ready to deal in them. Theft, or its equivalent, for motives other than personal gain must also be taken into account. Hostile agents may seek to discredit the occupying authorities; curators of public collections and private owners may fear that the objects in their charge will be taken for purposes of restitution or compensation, and may conceal them. This will be especially the case when these objects have come into their hands as the result of looting, confiscation, or purchase (fraudulent or otherwise) by the enemy.

3. Defilement or contemptuous treatment.

This is most likely to affect religious buildings, sites and objects; but may also concern buildings, etc. round which national or local sentiment centres.

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15.

It is particularly to be guarded against when troops of one race and religion occupy countries of a different race and religion. Usually defilement or contemptuous treatment is due to pure ignorance. Conduct perfectly proper in a Christian church may be wrong in a mosque, and vice-versa; military or other use of a cemetery which would seem harmless in the West, may be a deadly insult in the East. Sometimes, deliberate defilement or contemptuous treatment may occur where races and religion are concerned between whom feeling runs high.

In either case, the results are likely to be disastrous. The monument or object concerned may not be damaged; but relations between the occupying authority and the local inhabitants will be affected for the worse.

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16.

V. PROCEDURE IN SAFEGUARDING AND CONSERVATIONA. General principles

1. Safeguarding and conservation are of two types.

(i) Dealing with the risks to which monuments and materials are exposed

(a) By establishing protection against the risks

(b) By removing the causes of the risks.

The second of these methods is often forgotten, but may be more effective.

(ii) Treatment of objects, to stop deterioration or to make good the damage.

Both types should be kept in mind; and both should be utilized at the same time, when necessary.

2. In dealing with risks and their causes:

(i) Estimate which are the most serious and cope with them first.

Decision will depend upon three variable factors:-

(a) The risks present at a given time and place

(b) The chances of their coming into operation

(c) The nature of the monuments and material to be protected.

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For example, the risk of dampness and flood in a desert area is so slight that immediate precautions against them are usually needless. Elsewhere, there may be grave danger of fire and flood; but if the objects concerned are stone and metal, both risks may be less serious risks than the imminent collapse of a damaged building. Conversely, such a collapse might threaten objects of wood and paper and canvas less than fire and flood.

(ii) Enlist the cooperation of all branches of the occupying forces to remove or limit the causes of risks.

Cases in which such cooperation may be important are:-

(a) Activities of the occupying forces such as artillery and bombing practice, or the use of heavy transport, which increase the risk of vibration and shock; cooking, which increases the risk of fire and of smoke damage. The removal by occupying forces of sandbagging and other protective measures already installed should be prevented except in cases of great emergency.

(b) Building and construction work which

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may cause

- (1) Subsidence of ground and flooring
- (2) Damage to ruins and ancient sites, either because they are an obstruction or because they are sources of material. Such remains are often regarded as "mere ruins" and even in times of peace are exposed to the depredations of contractors and builders. Particularly liable to damage, are prehistoric mounds, and megalithic monuments.

The authorities responsible for construction work should be asked to take precautions against such damage, and to warn contractors they employ.

- (c) The enforcement of strict rules controlling the collecting of souvenirs.

This cuts at the root of pilfering by troops, and of inhabitants stealing objects in order to sell to troops.

(1) In some countries, e.g. Italy, it is an offence to buy or sell antiquities without government permission. Enforcement of any such local laws by the occupying authorities might be judicious and well regarded by local inhabitants.

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(d) Taking all possible steps to make clear that defilement of sacred places may have most disastrous effects. It should be explained what constitutes defilement and contemptuous treatment.

(e) Limiting the number of persons visiting at any one time, museum collections, archaeological sites, etc., from which objects might be stolen, or where damage might be done, unless enough competent guardianship can be insured. Local guardians will probably not be able to deal effectively with occupying forces, and they will need to be reinforced by military guards.

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(f) Installing protection against possible enemy action (e.g. air raids, artillery fire, sabotage) designed to discredit our standing with the local population, by adequate sandbagging, reinforcement of buildings, posting of guards.

3. In the treatment of objects

(1) Remember that your work is to apply first aid, and not to attempt to do the work of experts. If you are an expert in certain fields, use your knowledge; but don't try to act as one outside those fields.

NOTES ON THE OUTFIELDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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(ii) For various types of work, you have experts available in the services. It is for you to get their collaboration and tell them what you want done.

(iii) Speed may sometimes be of the first importance; but don't let haste breed carelessness. It is easy to do more harm, by careless handling, to objects by nature fragile, or made so through damage, than by doing nothing.

(iv) The protection of objects in reasonably good condition should be undertaken before those badly damaged are collected or salvaged. An exception to the rule is that of a badly damaged building which threatens to fall on undamaged objects it contains. Prevention of its collapse may be the best way to save the objects. 661

4. The occupying authorities will be regarded, rightly or wrongly, as responsible for all damage done during the occupation; and there will be plenty of people ready to accuse the occupying forces of having done damage which took place before they arrived or was done by local inhabitants. It is essential therefore to keep records (1)

(1) Of the state of monuments and material when

(1) Further details on this important matter are given in Section B4 below.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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taken over

(ii) Of all steps taken to remove or limit risks

(iii) Of all steps taken to treat objects.

5. Consult and collaborate with local authorities as far as possible, especially those concerned with the care of monuments, historic sites, etc.

But be sure that they are competent and trustworthy. (2)

6. Restitution of looted or confiscated property, or compensation for what has been damaged, are wholly distinct from safeguarding and conservation. They involve complicated questions of identification of objects, the method and circumstances of seizure or destruction, and of valuation, which require determination by a judicial body, assisted by experts. The business of those charged with safeguarding and conservation is to preserve the status quo as far as possible, pending action by some such body.

B. Practical measures

A fixed sequence of practical measures is neither possible nor desirable. Differences in the seriousness of risks, in the character of objects, and in their condition, at any particular time and place, forbid such a thing. Moreover, two or three measures may, and as a rule should, be taken simultaneously. The following out-

(2) Official information on this point is likely to be available.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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line of procedure must therefore be read in the light of the general principles given under A above, and of common-sense. Some of the measures described may on occasion be unimportant or useless; some may be impossible. But all should be considered; and No. 1 (posting a guard) should be an invariable preliminary to any other action.

1. Post guards over any monument or material likely to be stolen, defiled or damaged by human agency. Obvious examples are buildings containing valuable collections of movable objects; movable objects which have been salvaged; sacred sites; damaged buildings and archaeological sites or excavations, especially those which are in a dangerous and unstable condition. Temporary fences of even some strands of wire may be useful aids to efficient guarding.

Sometimes competent guardians may be available locally, such as officials of services concerned with the care of monuments, staffs of museums and libraries, the owners of private collections, the janitors of public buildings, priests or sacristans of churches, and so on. If so, try to discover and make full use of them. But do not, without the sanction of higher authority, leave matters entirely in their hands.

(i) Occupying authorities are responsible, or will be held responsible for what happens within their area. This responsibility cannot be

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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accepted without adequate control of the situation; and in the case of monuments and materials of culture, effective guardianship is the first and essential step in this control.

(ii) Apart from the matter of trustworthiness, local officials and inhabitants, especially in enemy countries, may not have enough authority to deal with members of the occupying forces. Language difficulties may also lead to misunderstanding, or worse.

2. Establish as safe an environment as possible for the material to be safeguarded. This can for the most part be done without handling the material. Measures necessary include:

(i) Precautions against fire

(a) Remove inflammable material from the immediate neighborhood.

(b) Forbid smoking and lighting of fires in immediate neighborhood.

(c) Organize means to put out fires. Discover the nearest water supply; provide hose pipes, buckets, dry earth or sand, and shovels; see that such men as you control understand their duties in case of fire. As regards patent extinguishers, only those charged with carbon dioxide are

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safe for all types of use. Others may do more damage than they prevent; and water, though itself a source of danger, is better.

(d) Check over electric and gas installations to see that they are reasonably safe.

(e) Provide fire-resistant screens and curtains. These may cover particularly precious or vulnerable objects, and so limit the amount of harm done while a fire is being got under; and can be used to block doorways or windows, to help isolate a fire.

(ii) Precautions against rain and floods

(a) Bale and pump out, or drain, flooded basements, crypts, excavations, etc.

(b) Block holes in roofs and walls.

Tarpaulin and canvas can be used temporarily.

(c) Cover or repair broken windows, and secure holes in floors.

(d) Repair or establish drainage system. Trenches leading to a sump may be better than nothing.

(e) Temporarily cover fragile objects, e.g. books, manuscripts, paintings, expos-

of temperature, and against damage from

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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ed to the weather. Such covering will also be useful against sudden and great changes of temperature, and against damage from excess of light.

(iii) Precautions against blast and mechanical violence

(a) Try to have diverted from the immediate neighborhood artillery practice, the regular use of heavy trucks, etc.

(b) Shore up or pull down buildings near by which seem likely to fall, especially if they are likely to fall on what you are trying to safeguard.

(iv) Precautions against smoke, dirt and gases

(a) Try to prevent the burning of garbage, cooking on a large scale, the operation of workshops and factories which emit smoke, in the neighborhood.

(b) If this is impossible, and the danger seems serious, keep the openings into buildings closed as far as possible; or hang blankets, canvas, etc. (preferably dampened) over them.

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(v) Precautions against insects

(a) Search for and destroy the nests of ants, termites, etc.

(b) Make use of various insects deterrents, by spraying or sprinkling on floors, dis-

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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tributing in pans, etc. Don't let these deterrents come into contact with valuable or important objects, except under expert advice.

3. Give indispensable "first aid" treatment to the material concerned. When there is doubt as to the necessity or safety of handling anything, don't handle except under the instruction and supervision of an expert. Sometimes, however, the danger of leaving alone may seem greater than that of acting. Among such cases are:

(i) Buildings and large monuments which threaten to collapse wholly or in part.

These are not only a danger to themselves, but may in their fall damage or destroy other things. Even temporary shoring up is a matter for experts; but in the Engineers or among men who have been miners, there should be those able to do what is necessary.

(ii) Objects which are wet or damp.

These should be dried by exposure to the air.

(a) The handling of wet or damp objects wholly or partly composed of organic materials is particularly dangerous. If in doubt, leave them alone. (See also paragraph iv below.)

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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(b) Drying should be slow. Don't use heat, don't put in the sun or in a wind. If, as sometimes happens, objects are stuck together (e.g. pages of a book, sheets of manuscript), don't try to separate them. As they dry, they may fall apart; if not, separation is the work of an expert. Don't touch or rub the surface of paintings, water colors, drawings, manuscripts, books, or textiles, or of any object that is covered with gesso, gilding or color. Metal, stone and wood objects, glass and glazed pottery, may however be gently wiped with a soft absorbent cloth or with absorbent cotton.

(c) When objects are laid out to dry, put them, if possible, where they can safely remain long enough to dry thoroughly. This avoids

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(1) The danger of handling again while they are wet or damp.

(2) The risk of mold when objects composed of organic materials are put back into cases, etc., while still damp.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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(iii) Objects which have been exposed to smoke or gases.

Get gas experts who know methods of decontamination to make sure that no poisonous gases are still in contact with the objects. Then, if the objects are safe to handle, air them out, without exposure to wind or sun. Don't attempt to move charred or partially burnt objects. (See Section iv below). Don't try to rub off smudge, dust or oil deposits.

(iv) Objects which are broken, partly destroyed by fire, or are disintegrating as the result of damp, heat, chemical action, etc.

(a) Whenever possible, e.g., when they are not in the way of necessary traffic, are not in places exposed to vibration or shock, and the cause of disintegration is not still operating, leave them where they are, until an expert can get to work. Meanwhile, cover the remains with a box or temporary shelter, conspicuously labelled "Don't Touch", with a description of what it covers.

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(b) Sometimes

(1) Fragments are too widely distributed to be protected, and may form part of a mass of debris cov-

NOTES ON THE S. GUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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ering floors or ground.

(2) The position of the remains may be extremely inconvenient, and expose them to risks caused by nearby movement.

(3) Unless something more than covering is done, the causes of disintegration, notably damp and insects, will continue to work.

In such cases, when fragments are easily identifiable as part of a particular object, collect them in a box or tray, clearly labelled with what the object is, and where the fragments were found. Remember to save even the smallest pieces. In the reconstruction of an object these may be of cardinal importance, and make the difference between complete reconstruction and an approximation.

In the case of mixed debris, pick out the larger fragments and put the remainder into boxes or trays, labelling both the larger pieces and the boxes, according to where they were found. Sorting according to material (e.g. stone, metal, pottery, paper, etc.) will help later work.

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NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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(c) Charred and wet fragments should be handled with the greatest care. Charred fragments should be invariably put in covered boxes or trays; wet fragments should be laid out so that they can dry slowly. (cf. Section 11 above).

4. Records and labels

This part of safeguarding work is often neglected and sometimes forgotten. It is, however, of the first importance.

(a) As pointed out earlier, records of the condition in which materials and monuments were found, and of the steps taken to safeguard and conserve them, are a great protection to the occupying authorities against charges of damage by occupying forces. Labelling, with an inventory, will enable charges of looting to be met; and will be useful in tracing anything stolen or lost.

(b) Such records, together with careful and accurate labelling, specially of fragments of objects, will be invaluable in the work of repair and reconstruction.

Written notes, photographs and drawings should all be used.

(1) As soon as a guard has been posted, photograph the monument or material, prefer-

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NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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ably from two or more points of view, with details (a Contax or Leica camera is very convenient to use). Supplement with written notes, and where necessary with diagrams and plans, the latter giving approximate measurements. Where no camera is available, and in dark buildings, excavations, etc., where photography is difficult, drawings will be required. These need not be works of art.

Even if the monument or material is in such a state that the need to save it from further damage is urgent, the moment that work has begun, make your records.

(ii) In the case of all movable objects, make lists, numbering each object to assist in identification. Some collections are likely to be so large that such a list would be impossible to make. In most public, and many private collections, however, inventories and published or unpublished catalogues exist; and immediate steps should be taken to secure these. As a rule, inventories are more complete but less informative. At the first opportunity, check inventories and catalogues with the objects, which in most public and many private collections will already be marked with an inventory or catalogue number,

NOTES ON THE SAFE GUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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and/or have labels attached to them. In the case of archaeological and scientific collections especially, see that the object and label are never separated, as in many cases the label is the only means of knowing what the object is. In the case of churches and public buildings, guide books will often list the more important objects; and in some countries (notably Italy) there are official publications giving complete lists of contents.

Don't be content with one copy of any list, inventory or catalogue. Spare copies will be required

- (a) In case of loss
- (b) For various branches of the occupying authorities (probably)
- (c) For each type of expert concerned with restoration work.

Curators and custodians, and private owners can be of the greatest assistance in all this work.

- (iii) In the case of
 - (a) Broken objects, when the number of fragments is small
 - (b) Objects composed of several pieces which are easily removable

see that each fragment or each part is numbered. This is especially useful if the object has to be moved, with the likelihood of some fragment or part going astray. A convenient system is to have a master number for the

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NOTES ON THE O. PLUGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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whole object, and a subsidiary number for each fragment or part, e.g. if the number for the object is I, the parts would be numbered I¹, I², and so on. This is very helpful in reassembling the fragments or parts.

When objects are broken into a large number of pieces, or have many detachable parts, separate numbering may be impossible. In such a case, put all the fragments or all the detachable parts in a box, labelled "Fragments (or parts) of No...."

(iv) If you have to number objects yourself, use something that is not easily detached or rubbed off. Paint may be used on stone, metal, ceramics, and wood (including the wooden stretchers on which canvases are usually mounted); adhesive labels on paper, leather, parchment; fabric attached with pins or stitches in the case of textiles.

Place the number where it is not likely to do damage or to be unsightly, e.g. on the back of the bases of statues, on the bottom of pottery or porcelain objects, on the stretchers of paintings. Place the number, as far as possible, in the same place on all examples of the same kind of object. This makes reference easier.

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NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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VI. MOVING WORKS OF ART AND CULTURAL MATERIALA. General considerations

1. Movable objects which have to be safeguarded will sometimes be in particularly dangerous situations. They may be in damaged buildings in imminent danger of collapse, which cannot easily or quickly be made safe; they may be exposed to the weather, and cannot easily be protected; the risks of fire and flood may be so acute that ordinary precautions are of little service. Also they may be in buildings which are indispensable for administrative, police or military purposes, in which it is difficult or impossible to establish reasonably safe conditions.

In such cases, a decision to move the objects may have to be made. In every case, the presumption should be against moving, unless expert help is available. The danger to delicate objects of improper packing, unskillful handling, and unsuitable means of transport, is so great that even remain-
(1)
ing in a dangerous situation may be less risky.

(1) An expert in packing and transport need not be an expert in cultural material. The British Navy packed, loaded into a warship, and unloaded, the exhibits sent from China to the great Chinese Exhibition in London in 1935-6. They treated the exhibits in the same way as live ammunition, with complete success.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL
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2. In deciding whether to move objects or not, the following points should be taken into account:

(i) All the objects involved may not need to be moved. Classify roughly the objects according to the risks of staying where they are, or of being moved. But remember that some objects of which the material will normally stand up to a good deal, e.g. stone, may be very elaborate and delicate in construction, and so difficult and dangerous to move.

This classification will help to settle what must be moved, and what may be left; and at the same time will give some idea of the size and nature of the problem of moving.

(ii) Investigate the amount and suitability 6595 of the packing material you can get. (Methods of packing various types of objects, and the necessary materials, are considered in Section B7 following and in Part II.)

(iii) Investigate the means and quantity of transport available, and the kind of road it will have to use. Unsprung, metal-tired wagons on unmade roads, are likely to damage delicate objects beyond repair. Remember that army vehicles in general are not sufficiently well sprung to transport unpacked or unprotected objects of a delicate or fragile type.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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(iv) Make certain that you can get reasonably suitable new quarters for the objects, and adequate in extent. What matters is the ^{111t} suitability of the receiving place relative to that of the present position of the objects. In searching for the ideal, do not forget the tolerable.

(v) While some objects are being moved, steps can generally be taken at the same time to reduce the risks to what is left behind. This seems obvious, but is often forgotten.

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B. Packing and transport

1. Number and list single objects, fragments of objects, and constituent parts of objects.

This is essential if confusion and loss are to be avoided. Bulky things, such as large pieces of furniture and suits of armour, will almost certainly have to be taken to pieces for removal; and even temporary loss of a part will cause trouble.

2. Plan where the objects are to be placed in their new quarters.

It will probably be impossible to fix exact locations for every object or case; but those of the larger pieces can be settled. See that different types of object are placed where they are safest. For example, put inflammable material where fire is

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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least likely; organic material away from damp; water colors away from strong light; wood where insects are least to be feared, and so on.

3. Assemble your packing materials according to the kinds of object to be packed.

These are likely to include paper, cardboard, wood, cloth of various kinds, various soft fillings such as excelsior and sawdust, boxes of various sizes and materials. What is best used and what will serve in necessity is described later.

4. Organize your labor.

Give each man a definite type of job, or the handling of a particular kind of object, so that he becomes used to it.

5. Number each packed object or case, and list them.

These numbers and lists are not the same as those of separate objects and serve a different purpose. Make lists in triplicate

- (i) To check packages and cases out of the old location
- (ii) To check them into the new location
- (iii) For the driver of the vehicle

6. Plan your transport

Allot objects or cases to definite vehicles, according to capacity. A good system is to number each vehicle, and chalk the corresponding number on

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NOTES ON THE SALVAGE AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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the packed object or case. This number is additional to its serial number. Remember to allot the heaviest things to the strongest vehicles, and the most fragile to those best protected from shock and vibration.

7. Packing materials and methods

(1)

General rules which hold good in all cases are:

(i) The kind of packing required depends partly on the means of transport used. If the roads are good, and loads don't have to be transhipped, many objects can simply be swathed in soft materials such as blankets, and placed in the vehicle. Otherwise, boxing or some substantial form of covering is advisable; and in the case of small and delicate objects, essential.

(ii) Objects should not be jammed tight with packing material, but should "float" in it. Overtight packing, and such things as braces running from the object direct to the wall of the box, transmit shock and vibration.

(iii) Boxes or containers the size of which is either uniform or a multiple of a standard unit, greatly simplify loading and storage.

(1) Special precautions to be taken for various types of objects are given in the sections of Part II dealing with each type.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL
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(iv) For fastening boxes, screws are preferable to nails. Their use reduces shock and vibration. Screws and nails are better than locks as a protection against theft.

(v) The weight of a packed box or container should not be greater than two men can handle, if possible.

(vi) Be sure that boxes and containers are strong enough to carry their contents.

When in doubt, strengthen the container or reduce the weight of the contents.

(vii) Before packing, cover important exposed surfaces of an object with such things as soft paper, waxed paper, soft cloth, cotton wadding. Don't use harsh materials such as stiff paper or cardboard if there is any risk of abrasion; nor newspaper if there is risk of marking from the ink.

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(viii) For padding, suitable materials include:

(a) Excelsior. This is inflammable and apt to be abrasive. It can, however, be fireproofed. It is best used by being made into pads by wrapping with paper.

(b) Paper. This is best shredded or made into wads. Newspaper is generally suitable.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL
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(c) Mineral wool. Made from asbestos and gypsum. Fireproof, but not always easy to obtain.

(d) Sand, poured in or around an object. This is apt to be abrasive; so the object must have its surface protected.

(e) Sawdust. This can be used in the same way, is less abrasive, but more inflammable.

(f) Cotton wadding and absorbent cotton. Both are very useful, but may not be easily obtainable. As substitutes use

(g) Other soft, compressible materials, such as hay, straw, dried leaves. But be careful of possible abrasion, and either protect the surface of the object, or make the material into pads with paper.

(ix) In the case of small objects, such as coins, seals, miniatures, jewels:

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(a) Wrap each one separately

(b) Put small groups into small boxes

(c) Pack the small boxes into larger ones.

Loss among packing material is almost certain if this is not done.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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VII. OPTIMUM CONDITIONS FOR MONUMENTS AND MATERIALS

When monuments and other material are under adequate guard; when precautions have been taken against immediate damage or disintegration; and when the location of movable objects has been settled, the next step is to establish the best environment possible for the physical welfare of the monuments, etc., in question. This has two aspects;

- (i) Deciding what is best for any particular type of material.

Specific information on this is given in Part II, in the sections dealing with each type.

- (ii) Getting it done, and obtaining help.

This is a matter for your own ingenuity, and of enlisting the services of specialists in various branches of the service.

General rules, which always apply are:

1. Extremes of heat and cold are to be avoided, though either is less dangerous than rapid changes from one to the other. Therefore

- (i) Don't allow heating in a building to be suddenly turned on or off
- (ii) Don't allow sudden rushes of hot or cold air into a building. The temptation to air stuffy rooms quickly should be resisted; stale air won't hurt cultural material.
- (iii) If ventilating fans are used, don't have

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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them near objects.

2. Extremes of dryness or dampness in the air are both dangerous, particularly for organic substances such as wood, paper and textiles⁽¹⁾.

3. Changes in relative humidity are more dangerous still. (For definition of relative humidity, see Section IV.1.iii above.)

(i) These changes are in part influenced by changes in temperature. This makes control of temperature doubly important.

(ii) Various substances, e.g. mixtures of salt hydrates, can be placed about a room, which will absorb moisture from the air, and yield it up again when the relative humidity falls below a certain point. One of the simplest means to this end is to hang up considerable quantities of any absorbent cloth, e.g., blankets. But it should be remembered that the efficiency of such devices depends on a fairly rapid oscillation of the relative humidity. A long spell of humidity will saturate

(1) Experiments in connection with the storage of the paintings belonging to the National Gallery, London, established that in air at c.47° F., and approximately saturated, mold was observed well within a month, and in one case in eighteen days.

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NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIALS IN THE FIELD

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the absorbing material, a long spell of dryness will rob it of all moisture; and in either case its compensatory action will stop.

(iii) In very dry atmosphere, with high temperatures, pans of water placed about a room, or on top of heating apparatus, may be useful; but experiments have proved that their effect is small and very local.

(iv) In the case of comparatively small objects liable to be affected by damp or dryness, control is easier to establish if they are stored in airtight boxes or cabinets in which substances to provide compensatory action can be placed.

4. Strong light, especially strong sunlight, should always be avoided. Quite apart from the action of the light, the alternation of heating and cooling does harm. Complete darkness, however, combined with damp, is apt to favour the growth of mold. Oil paintings (contrary to usual belief) need daylight (or some artificial equivalent, which has not yet been worked out) if they are not to yellow or darken.

5. Smoke and chemical fumes. Complete and elaborate precautions against these. Paste up windows, and seal doors (not forgetting the possible need of these for evacuation in case of fire). Obtain the aid of gas experts among the occupying forces.

NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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6. Insects. Complete and elaborate all precautions.

Make a systematic search for nests. Here again, go to the experts on the subject.

7. Make frequent, periodical inspection of everything under your care, and check over not only the objects, but everything that may affect them. If anything appears to be going wrong, consider whether this is due to something in the environment. If so, you may be able so to change conditions, as at least to retard the evil, until expert assistance can be obtained. Alternatively, moving an object, either within a building, or to another situation, may be necessary.

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Note: Part II of these notes is concerned with material and monuments grouped according to type and material; and deals with the risks to which each is particularly liable, and the special precautions that should be taken in dealing with them.

This will be available shortly.

July 22, 1943.

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NOTES ON
SAFEGUARDING AND CONSERVING
CULTURAL MATERIAL
IN THE FIELD

Part II

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AMERICAN DEFENSE - HARVARD GROUP
Committee on Protection of Monuments
1943

Part IIINTRODUCTION

Part II of the Notes on Safeguarding and Conserving Cultural Material in the Field is an emphasis, an expansion, and an application of what is said in Part I.

After the first steps in safeguarding and conservation have been taken, questions are likely to arise as to whether different kinds of material and objects may not need additional precautions to be taken and further treatment applied; and if so, what these should be. The following pages aim at helping to answer such questions.

Each section is written by an expert on the type of material or object concerned. All are arranged in the same general plan, and include information on:-

1. Special characteristics of the objects or material concerned
2. Special risks to which they are liable
3. Special precautions against these risks
4. "First Aid" treatment
5. Special precautions to be observed in packing or moving
6. Ideal conditions for housing or storage.

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NOTES ON THE SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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- I. BUILDINGS OF ALL KINDS & FIXTURES IN BUILDINGS OF AN ARCHITECTURAL TYPE.
LARGE MONUMENTS AND LARGE SCALE SCULPTURE.
ARCHAEOLOGICAL SITES AND EXCAVATIONS.
BURIAL GROUNDS AND TOMBS.

General Considerations.

In the case of all such monuments, the posting of guards is particularly necessary to prevent looting, vandalism or theft.

Inaugurate a pass system and make periodic inspections.

A. BUILDINGS AND FIXTURES OF AN ARCHITECTURAL TYPE.

1. Establish contact with the local civil and religious authorities. In the case of archives and records in public buildings, vessels in the sacristy of a church, or valuable items among the contents of a house, consult the civil and religious authorities about the possible removal of these.
2. If the building has been damaged, build a fence around it. Make every effort to keep the remains intact until engineers can take over the structure. Shore up any walls that sag or may collapse and, if necessary, strengthen their foundations. Support or reinforce roofs, vaults, and arches, if there is any chance of their falling. A collapse of any part of the building might result in the destruction of the objects within it. However, if the roof and the walls cannot be kept from falling, move any valuable objects from under them. If the roof has been destroyed and the interior of the building and the objects therein are of importance,

NOTES ON SAFEGUARDING AND CONSERVING CULTURAL MATERIAL IN THE FIELD

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make every effort to roof over the structure; likewise, repair or cover any damaged doors and windows.

3. Do not tear down any walls, for all evidence as to the placement of doors, windows, and architectural detail will be lost, and accurate restoration at some future time will be impossible.

4. If any walls have fallen, the material is to be left in place. Allow no debris to be moved, for it contains all of the architectural evidence, however small, of the fallen portions. It is to be left intact and on the spot for examination at some future time. However, if the moving and piling of debris is essential, keep related portions of the structure together. If the debris contains fragments of wall paintings, cover it over with tarpaulin or canvas.

5. Fragments of objects within a building, such as statues, shrines, fireplaces, and other architectural fixtures, should be carefully collected and put in boxes, keeping related pieces together, and labeled as to what the objects are and where the fragments were found; even the smallest pieces are essential to any future restoration.

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6. Bear in mind that the essential thing is the protection and preservation of the monument and keeping its remains intact. No attempt whatever should be made at restoration; this can be done by specialists at some future time.

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make every effort to roof over the structure; likewise, repair or cover any damaged doors and windows.

3. Do not tear down any walls, for all evidence as to the placement of doors, windows, and architectural detail will be lost, and accurate restoration at some future time will be impossible.

4. If any walls have fallen, the material is to be left in place. Allow no debris to be moved, for it contains all of the architectural evidence, however small, of the fallen portions. It is to be left intact and on the spot for examination at some future time. However, if the moving and piling of debris is essential, keep related portions of the structure together. If the debris contains fragments of wall paintings, cover it over with tarpaulin or canvas.

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B. LARGE MONUMENTS, INCLUDING LARGE SCALE SCULPTURE.

1. Establish contact with the civil authorities. Statues of a national character are often pulled down or mutilated by local political factions in times of strife.
2. If a monument has been damaged or destroyed, build a fence around it, and protect the remains, along with any inscriptions.

C. ARCHAEOLOGICAL SITES AND EXCAVATIONS.

1. Establish contact with the local inspector of antiquities or the superintendent of public instruction; if possible, locate the former guards.
2. Ascertain the local antiquity dealers; some of them might be unscrupulous enough to steal objects from the site. In times of strife many objects have been stolen from archaeological sites, only to turn up later in some dealer's hands.
3. In cases where excavation has been in progress, post a guard also over the field-house or expedition headquarters, for this contains the offices and store-rooms; it may also include the quarters occupied by the staff. The offices contain the records of the excavations, catalogues of the objects found, and other written material for future publication; these are to be protected and kept intact. The store-rooms contain objects from the excavations and great care is to be taken that the labels are not separated from the objects. There will probably be baskets (or boxes) filled with shards or

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pieces of pottery which may seem to be of no value, but they are of primary archaeological importance in dating the levels and areas of the excavations. Labels are usually attached to the baskets, but sometimes the labels are only pieces of paper with numbers thereon placed in the baskets themselves; these labels are not to be removed, nor are the shards in any way to be mixed. The same holds true with groups of coins that may be contained in boxes or in the drawers of a cabinet.

4. Every stone and object in an archaeological site is important, otherwise it would not be there. Above all, see that nothing is carried away from the site, for even the smallest architectural fragment, lying loosely about, may represent an important part of the design of an ancient monument and has been left there on purpose. Permit no stones to be moved, for their position is of primary archaeological importance, even though they be only isolated and fragmentary remains of some foundation. 6577
No walls are to be climbed, nor are they to be walked upon; this is especially true of walls made of mud brick. Take especial care in protecting any portions of the excavations that have been restored. Permit no one to enter any subterranean passage without a pass; such passages may collapse and some have open pits within them. Things which are found by chance in the excavations, such as coins, pieces of vases, and other small isolated objects, are to be turned in with a full report.

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5. Permit no one to enter excavated areas at night, for important archaeological evidence might be trampled on. Moreover, it is unsafe, for the excavated areas are often at different levels, while wells and pits in these areas may be only temporarily covered and sometimes are not covered at all.

6. Under no circumstances permit any illicit digging. However, if antiquities are found through the digging of trenches or if they are uncovered by bomb explosions, whether in archaeological sites or elsewhere, they are to be carefully collected and put in boxes, keeping related pieces together, and labeled as to what the objects are and where the fragments were found. Notify the local inspector of antiquities.

D. BURIAL GROUNDS, TOMBS.

1. All of the directions given under Archaeological Sites and Excavations (Section C above) apply in detail also to burial grounds and tombs. In general: establish contact with the local inspector of antiquities or the superintendent of public instruction; ascertain the local antiquity dealers, for some of them might be unscrupulous enough to rifle the graves or tombs by night; post a guard over the field-house or expedition headquarters; permit no one to enter the burial ground at night, for the tomb shafts may be only temporarily covered and sometimes are not covered at all; and, under no circumstances, permit any illicit digging.

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2. Tombs may be either above or below ground, and the walls of their one or more rooms are often decorated with paintings or with relief sculptures. These may be in a ruinous state and even fragmentary, but each portion of them is of primary archaeological importance. Judged by modern standards, some may seem to be crude and badly executed, but this in no way detracts from their significance. Permit no one to touch the walls. The paintings are usually on a thin coat of plaster that is fragile and saturated with water; portions of them will easily fall from the walls if touched. Do not permit any tracings of the paintings to be made, nor any flash-light photographs to be taken, for the shock of the explosion, however slight, may dislodge the paintings. If gun emplacements are nearby, if artillery is to be brought up, or if the tombs are in an area that may be bombed, cover the painted walls with padded blankets, or some soft material that will absorb the moisture, and pile sandbags against them; otherwise, the paintings will surely be destroyed by the vibration. Permit no one to enter any subterranean tomb without a pass; these and their passages may collapse and some have open shafts within them.

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3. If tombs or graves are found through the digging of trenches, or if they are uncovered by bomb explosions, whether in archaeological sites or elsewhere, notify the local inspector of antiquities. If there are skeletons

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or any bones therein, notify also the local civil and religious authorities. Make every effort to show respect for the religious beliefs of the people and for their sepulchral monuments; assist in having the bones reburied.

II. PAINTINGS

Most paintings are combinations, often complex, of materials that respond unevenly and unequally to changing external conditions. The paint is likely to respond less actively than the support (wood panel, canvas, etc.). Therefore, the commonest point of weakness is in the attachment of paint to support.

Safety precautions must, therefore, concentrate

- (a) On preserving the attachment of the paint, and
- (b) On keeping the support intact and as inert as possible.

1. SPECIAL DANGERS TO PAINTINGS

<u>Condition</u>	<u>Effects</u>
Heat	Melting (encaustic, or wax paintings), blistering, charring, combustion of paint; weakening, warping, charring, combustion of support.
Dryness	Warping, shrinking, cracking of panels; weakening of paint attachment; embrittlement of aqueous adhesive.
Water	Swelling and weakening of wood and canvas; destruction of aqueous adhesive; possible swelling and distortion of oil paint films; blanching of varnish; destruction of gesso ground in panel paintings.

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Dampness	Weekening of aqueous bonds under tension; warping of wood panels; fostering of mold growth if prolonged.
Blast	Rupture of canvas; dislodging of poorly attached paint; other obvious hazards.
Mechanical violence	Obvious hazards, depending on the nature of the violence and of the objects.
Light (direct sun)	Possible bleaching of certain pigments; secondary effects of excessive heat and dryness.
Darkness	Discoloration and darkening of oil and varnish.
Mold	Weekening of canvas and aqueous adhesives; slow discoloration and destruction of paint.
Insects	Weekening and gradual destruction of wood; of other materials in contact with wood, such as paint itself and canvas under stretcher rails.

2. EMERGENCY PRECAUTIONS.

In general, follow directions in Part I, Section V,B.

- i. Blast. When in danger of exposure to violent explosions, paintings on canvas should be placed in such a way that the paint side is directly against a firm, solid surface, such as a substantial table top. Avoid making a "drum-head" of such paintings by hanging or storing them with a closed air-space behind the canvas.
- ii. Light (and Darkness). If possible, allow for moderate daylight in storage places, without direct sunlight. Otherwise, provide limited artificial light.
- iii. Mold. General directions for controlling atmospheric conditions indicate methods for preventing mold growth in dangerous amount. Avoid sealing paintings in

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small air-tight containers except for short periods during transportation.

iv. Insects. Emergency treatment is not likely to be necessary. If there is much fresh, clean-looking 'saw-dust' dropping from the openings of worm-tunnels, the panel may be sprayed or brushed on the back with kerosene, carbon tetrachloride or gasoline, or exposed to concentrated vapors of some such solvent. Any standard insect fumigant may be used.

3. FIRST AID TO PAINTINGS

i. Movable paintings (not permanently attached to walls or other objects.

(a) Poorly attached or flaking paint on wood or canvas:

Keep painting horizontal, face up, until it can be treated. Do not try to reattach paint by varnishing or by injection of adhesive.

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Apply a temporary facing of tissue-paper over affected paint. Use a thin, boiled flour-and-water paste, not a thick, or brittle, or hard-to-dissolve adhesive. If possible, apply the paste to the paint surface and lay the paper over it with a soft, dry brush.

Always use a minimum amount of paste; there should be no apparent thickness of clear paste between paint and paper.

If paint is powdery or otherwise too fragile to be touched at all, store painting horizontally,

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face up. Support it with cushioning material, and protect from drafts and dirt with a box-type cover, properly labeled.

(b) Dull, blached, dirty or otherwise disfigured surfaces:

No emergency treatment required.

(c) Slack or wrinkled canvas:

This may be the result of unusual dampness. If that is suspected, do not treat. Drying will tighten it. If edges are weakened or torn, reinforce them with surgical tape (face loose paint first as in Section (a) above.) Ordinarily, gently tap in the corner wedges (keys) of stretcher. Do not make canvas too taut. Do not try to flatten stiff, curled or buckled areas. Cracking and flaking will result.

(d) Torn or punctured canvas:

Apply facing to all loose paint. Small holes need no further first aid treatment. Patch large tears with surgical tape on the canvas side. Further support very large paintings, after removing frames, by lashing them, face down, to ply-wood or composition boards, covered with clean, smooth-surfaced paper. 657⁴

(e) Partly burned, charred, or otherwise badly damaged paintings on fabric:

Lay face down on ply-wood or composition .

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board covered with smooth paper. Remove stretcher by carefully pulling tacks. Fasten margins and all torn, burned or charred edges to the paper with "Scotch" or surgical tape. Form a "sandwich" by lashing another board to the back. Reinforce both boards with cross-battens to prevent separation at center. Label fully. Preserve stretcher with frame.

(f) Paintings on panels that are split, broken, damaged or weakened:

Face all loose paint. Pack all parts securely on cushioning material having a firm support. Do not try to glue or fasten together partly or completely separated pieces.

(g) Water-saturated panels:

Dry out as slowly as possible. Watch for warping. If convex on paint side, retard drying by resting back on non-absorbent surface. If concave, accelerate drying by better air circulation at the back. Keep face up. Apply necessary facings to secure paint after the surface has become fairly dry.

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(h) Water-saturated canvas paintings:

Dry face down on a smooth board which has been covered with oiled or waxed paper. Turn over when dry by laying another board on top of the canvas and turning over the whole "sandwich".

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Remove paper cautiously to avoid lifting loose paint, and face where necessary.

If painting has rolled up, it will need expert attention as soon as possible. If that can be secured within a day or two, do nothing. Do not even let the painting become entirely dry. If expert advice cannot be secured, dry the painting, unrolling it with great care when it is nearly dry but still flexible. Watch for flaked or loose paint while unrolling. Face wherever necessary. When thoroughly dry, it can be re-rolled if tests show that it is not too brittle, and that flexure does not dislodge the paint. Otherwise it must be left flat and attached to a plywood or composition board as described above.

ii. Frescoes and other paintings permanently attached to walls.

(a) Poorly attached or flaking paint:

Apply facings as described for movable paintings. If flakes are large and heavy, or if general disintegration seems likely, try to cover with soft cushioning material and shore up firmly. 6569

(b) Other conditions:

Follow directions for the preservation of the wall itself.

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4. PACKING AND MOVING PAINTINGSi. Preparations;

(a) Before moving, be sure to carry out all necessary first aid treatments (see above). These precautions will be enough to make paintings reasonably safe for emergency transportation.

(b) Paintings in too fragile condition for safe first aid treatment should not be scheduled for transportation, except as a last resort to prevent certain destruction, until they have been treated by experts. If transportation is absolutely necessary, such paintings should be assigned to the equivalent of stretcher-bearers. Careful human hands are better than any packing to guard against mechanical shock.

ii. Packing and Moving

Follow the general directions in Part I, Section IV D. Special dangers to be avoided are (a) extremes of temperature and humidity, and sudden changes of either one; (b) mechanical violence.

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(a) Temperature and Humidity.

Pack panel-paintings in generous amounts of soft insulating material. Whenever possible enclose in double "cells" of air-tight and water-proof material to reduce changes and extremes of internal air conditions. Do not store

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paintings permanently in such containers.

(b) Mechanical violence.

Employ the "floating" principle in all packing (see general directions in Part I, Section VI B7). Canvases should be kept in a vertical plane, the long side parallel to the ground.

(c) Rolling up for transportation

Paintings on canvas are sometimes taken from their stretchers and rolled up for storage or shipment. This is not good practice at any time, and sometimes it is ruinous. It should be done only when a painting is too large and awkward to be handled in any other way under existing conditions. If it cannot be avoided, the paint surface should be faced, and the painting should be wrapped, face outward, on a smooth drum of the largest practicable diameter. Paintings that have a thick, stiff relining canvas attached to the reverse are almost impossible to roll safely, and every effort should be made to avoid the necessity.

5. IDEAL STORAGE CONDITIONS FOR PAINTINGS

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1. Atmospheric conditions

Temperature should be kept at a constant level, approximately that to which the objects are accustomed.

Relative humidity should be kept at a constant level which is above about 40% and below 60%.

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High or low extremes and sudden changes of either temperature or humidity should be guarded against.

Free circulation of air within the storage space should be maintained. Except in special emergencies, sealed, air-tight containers should be avoided.

"Fresh air" is unnecessary. Outside ventilation should be used only to regulate temperature or humidity.

ii. Lighting

Moderate light is ideal. Absolute darkness and direct sunlight should be avoided.

iii. Accessibility.

Each object should be readily accessible for systematic checking and inspection. Each should be strongly and separately hung or supported, not in contact with others. Space should be adequate without disturbing the others.

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III. PRINTS, DRAWINGS, WATERCOLORS; ILLUMINATED MANUSCRIPTS, PASTELS, BOOKS, RECORDS, MANUSCRIPTS, MINIATURESGENERAL CONSIDERATIONS

A fundamental characteristic of this group of objects is that damage or deterioration of the support is the most serious type of injury to which the group is liable. (1) The relation of the support to the paint or ink which has been placed upon it is a decisive factor in the appearance of the picture or page; and a change in either modifies the combined effect. Common forms of damage or deterioration are holes, tears, stains, spots or change in original color. In most other kinds of pictures, when the support is damaged or weakened, the picture can be saved by transferring it to a new one or the original support can be reinforced without affecting the appearance or durability of the picture; but this is not possible with the group of objects under discussion

1. SPECIAL DANGERS

- (i) Those arising from the nature of the support.

Most of the objects concerned are executed on paper. Vellum, ivory and silk act as the support-

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(1) The word support is used in the following pages to refer to the material, such as paper, silk, ivory or vellum, on which the artist has made his picture, the scribe has recorded his information, or the printing ink has been impressed.

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ing material for only a small percentage.

(a) Paper. An artificially prepared sheet chiefly composed of vegetable fibres. Sizing materials, pigments and fillers are sometimes present in small quantities to produce surface quality or color.

Deteriorated paper generally turns to the same dark rusty tones; and brittleness and breakdown of the fibres generally accompanies discoloration. In many cases the discoloration can be corrected, but no way is now known to regain the original strong flexible character of the sheet. Nor at present is it known how to isolate all the specific chemical factors which lead to brittleness and discoloration. However, there are some controllable causes which are known to bring about the change.

(1) Prolonged exposure to light, especially strong sunlight.

(2) Exposure to certain gases.

The atmosphere in industrial areas contains certain harmful gases, notably sulphur dioxide and chlorine. The fumes of sulphur dioxide will cause paper to discolor and to become brittle. Chlorine will attack wet or damp paper, bleach and weaken it. No data is available, but it is pro-

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bable that all toxic war gases are deleterious.

(3) Exposure to temperatures above 350°F.

(4) Prolonged contact with discolored papers. Papers made of ground-wood fibers or other unpurified fibers such as newspapers, low grade wrapping papers and boards, will discolor even under the most favorable circumstances. Many irreplaceable Old Master drawings which might have survived in good condition have become discolored and brittle as a result of their attachment to mats of poor quality cardboard or to newspaper paddings used in their framing.

(5) Prolonged contact with wood.

This produces discoloration on the paper in a pattern identical with that of the grain of the wood.

(6) Fumes or solutions which are strongly acid.

(7) Imbibed oil or varnish.

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(8) Mold or mildew, probably the greatest hazard to paper.

Mold spores are universally present in the atmosphere. They will develop whenever they find conditions which are favorable for their growth. Moisture and food are

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their only requirements. Cellulose which is the chief component of paper-making fibers is an adequate food for many kinds of mold. Different papers offer an unequal resistance in regard to fungus infection. Chemical wood-pulp and groundwood fibers are more easily attacked than rag or the Oriental paper-making fibers. The adhesives commonly used on paper, such as glue and paste, are excellent food for mycelium growth.

Foxing is the technical term for a brown discoloration in the form of spots, which vary in size and in distribution. Mold also causes a spot-like pattern of black, grey, green, red, purple, or yellow stains. This may be the color of the mycelium (the threadlike elements forming the growing structure of the fungus) or may be a staining material emitted by the fungus as it develops. This kind of staining is the most stubborn discoloration with which the restorer of these objects has to contend.

(9) Insects.

Kinds of insects which feed on materials in this group:

- a. Larvae of various kinds of beetles and moths

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- b. Silverfish insect
- c. Cockroach
- d. White ants
- e. Boring insects, "bookworms".

A damp humid atmosphere is favorable to insect life, but some of the destructive offenders survive even in conditions of extreme dryness.

Presence of the danger is indicated by the appearance of insects, larvae or chrysalises in the storage area; by the presence of small holes in the objects; or by the presence of insect excrement.

(b) Vellum or parchment. For practical purposes these terms are used interchangeably. They refer to any moderately good animal skin which has been prepared for writing or painting.

Vellum is a tougher material than paper. It is more resistant to discoloration and brittleness than paper, but it is vulnerable to the same agents. Often the discoloration is purple in color. Vellum is more vulnerable than paper to high temperatures and to extreme dryness.

(c) Silk. Made of woven threads which are the natural product of the larvae of certain moths known as silk worms.

Subject to discoloration and brittleness from the same agents which attack paper. Par-

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ticularly vulnerable to strong acids and alkalis.

(d) Ivory. The solid portion of the tusk of an elephant. Other animal tusks or bones are sometimes substituted. A dense white laminated material which in cross section presents a pattern of intersecting curved layers resembling engine-turning. When cut into thin slices, it provides a suitable material for miniature painting.

A very durable material, but has several weaknesses:

- (1) Exposure to high temperatures will cause it to turn brown. It becomes black when fired.
- (2) It is sensitive to changes in humidity. Prolonged dryness causes it to become brittle and, in extreme cases, powderlike. When its flexibility has gone, a high humidity will cause it to crack. If the ivory has not been properly sliced, or if it was cut in curved sheets which were subsequently flattened with presses, humidity changes will cause it to curl.

- (3) Some gases cause it to discolor.

(e) Leather. Animal skin which has been tanned for use. This material is relevant here because of its use in the bindings of books.

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Deterioration is evidenced by the leather becoming cracked and powdery on the surface, and very brittle. If it has been exposed to excessive dampness, the skin may become weak but remain flexible as long as the leather is not allowed to dry.

Causes of deterioration are:

- (1) Putrefaction.
- (2) Prolonged exposure to sunlight.
- (3) The action of certain acids
 - a. Sulphuric acid, commonly present in the atmosphere.
 - b. Acid remaining in the skin as a residue of some part of the tanning process.
 - c. Acid remaining from the dyes or mordants (a material which serves to make leather absorb a dye or color.
- (4) Tension on the leather.
- (5) The skins may have been split, artificially grained, or stretched too tightly. This is a common cause for decay in bookbindings.
- (6) Heat. Wet leather will deteriorate at a temperature of 120°F.

(ii) Those arising from the nature of the design materials. Design materials fall into four groups.

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- (a) Printing inks. These are durable and require no special comment.
- (b) Watercolors and other paints which are mixed

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with water for use, writing inks. These are usually affected by water and are faded by prolonged exposure to light.

(c) Pastel, pencil, chalk, and charcoal. These differ from the preceding groups because they do not form a film on the support. Small separate particles adhere mechanically to the paper and to each other; consequently any slight abrasion will disturb them.

(d) Metal point. In using this technique, the support, usually paper or parchment, is coated with a thin film of paint that has an abrasive character. This film is usually soluble in water. When the metal point is drawn over the paint, which may be white or colored, a pale grey mark is made. In time this mark corrodes somewhat to a darker and a warmer tone. Water, dampness, and changes in humidity are dangerous to this group. Humidity variations promote a loosening of the bond between the support and the coating of paint. This develops into flaking and losses in the paint film. As the drawing is an integral part of the paint film, losses in it are accompanied by parallel losses in the drawing.

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2. PRECAUTIONS AGAINST DANGERS

The listing of hazards in the preceding section has

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implied some of the precautions to be observed.

(1) Mold. Be certain that materials are dry.

(a) Store objects in a dry well aired space, as a high humidity permits the development of spores pre-existing in the paper and favors new infections. Try to have the relative humidity somewhere between 40% and 60%. A relative above 70% is dangerous.

(b) Employ a fungicide. Paradichlorobenzene crystals (commonly used as a protection against moths) or thymol crystals are suitable. Sprinkle the crystals in the boxes, in the containers, or on the shelves where the objects are stored. It is the vapors from these substances which inhibit the growth of mold; and both paradichlorobenzene and thymol pass from a solid to a gaseous state without becoming a liquid. Contact of the crystals with valuable paper, vellum or silk will produce no ill effects. But thymol vapors will attack a varnish film; so if this fungicide is used, be careful to protect panel and canvas paintings from the fumes.

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If thymol is available only in a liquid form (it will go into solution in an alcohol), soak a piece of good quality paper with the thymol solution. Allow the paper to be exposed to the air long enough for the alcohol to evaporate.

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This will leave a deposit of thymol crystals adhering to the paper. Such a sheet is often referred to as a piece of "thymolized paper".

(ii) Insects.

- (a) Storage areas should be clean. Care should be taken to make certain that they are free from animal or vegetable deposits.
- (b) Storage areas should be at a suitable distance from places where food is prepared or stored.
- (c) Insecticides should be employed.
 - (1) The storage area should be thoroughly sprayed with a liquid insecticide or an insecticide in the form of a powder should be sprinkled on the walls, floor and shelves of the storage space before the objects are put away.

Paradichlorobenzene, thymol, naphthalene, camphor crystals will give a limited amount of protection. These substances are highly volatile and must be replaced as they evaporate. Any commercial insecticidal powder may also be used. For spraying, use carbon tetrachloride, benzine, petrol, or a commercial spray.

- (2) Infected material should be fumigated.
 - a. In a fumigation chamber or cabinet.

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The Quartermaster's Corps is probably equipped with one for use with clothing and bedding which would be suitable for this purpose.

b. With improvised equipment. Construct an airtight cabinet of a suitable size for the objects to be treated. A suitable fungicide should be placed in a receptacle in the upper part (the fumes of the insecticide are heavier than air) of the cabinet.

Materials suitable for use as fumigants.

The following are effective when objects are exposed for twenty-four hours. If improvised sterilization chambers are used in which a vacuum cannot be made before the gas is released, a longer exposure should be allowed for books and bound manuscripts. Objectionable odors clinging to objects after fumigation will disappear in a few days.

Hydrocyanic gas, 1 lb. of sodium cyanide per 1000 cu.ft.

Ethylene chloride (3 parts by volume); carbon tetrachloride (1 part by volume). 14 lb. per 1000 cu. ft.

Carbon disulphide. 6lb. per 1000 cu.ft.

Ethylene oxide - carbon dioxide. 30 lb. per 1000 cu. ft.

Methyl formate - carbon dioxide. 28 lb. per 1000 cu. ft.

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Material unsuitable for use as fumigants are

Arsenic compounds

Copper compounds.

3. "FIRST AID" TREATMENT

(1) Except for books which are bound with leather, drying is the only treatment which anyone but an expert ought to employ. Immediate steps to dry objects should be taken.

(a) Dangers to be noted

- (1) Prolonged exposure to strong sunlight
- (2) Prolonged exposure to high temperatures
- (3) The felt-like character of paper.

When paper is wet the fibers absorb water, swell and separate easily. A sheet which is strong and tough when dry, is weak and fragile when wet or even very damp. Extreme care and nimble fingers must be employed when handling papers in this condition. Always support the wet sheets on a tray, a sheet of glass, or another piece of clean, stiff, dry, uncolored paper. Clean, white, dry blotters are excellent for this purpose.

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(b) Cautions to be kept in mind

- (1) Do not try to mend torn pages. Assemble and pack the fragments together.
- (2) Avoid the use of glue or paste. If the use of an adhesive is unavoidable, use

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"Scotch tape" or an available commercial adhesive cement. These are not suitable for permanent attachments, but simplify problems of the expert when he deals with the situation.

(3) If pages adhere to each other or to the glass of their frames, do not try to separate them.

(4) Take care that all of the pages of damaged books are thoroughly dried. Open the book carefully and spread its covers flat on a table or shelf so that the pages will be exposed to the air for drying. Slender glass rods will help to keep the pages separated so that the air can circulate between them.

(ii) Leather bindings of books.

Decay in leather can usually be prevented or delayed by the regular use of a suitable dressing. Any oil or fat which does not become rancid, such as vaseline, lanoline or castor oil may be used. A good leather dressing will lubricate the leather and form a film on it which will exclude the atmosphere. Finer, lighter leathers demand the use of purified products which will not cause staining and which can be applied without strain to the material.

(a) Dressings for leather bookbindings.

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- (1) Lanoline 7 oz. (avoir)
Cedarwood oil 1 oz. (fluid)
beeswax 1/2 oz. (avoir)
hexane 11 oz. (fluid)

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(2) Lanoline
Paraffin wax

Make a preparation of melted paraffin.
Add enough lanoline to it to produce a
grease which will become liquid at
hand temperature.

Either dressing may be applied to the leather with
the fingers or with a clean soft cloth.

(b) Treatment. First wipe books with a cloth
which is slightly damp with water, containing if
possible 10% formalin to kill bacterial action.
When this is dry (allow at least a day's exposure
to the air in a well ventilated clean area), rub
the dressing carefully on the leather surface of
the book, especially along the hinges. Only a
small amount is needed, and experience is necess-
ary to determine the amount to use. The quantity
depends on the porosity of the leather. The leath-
er surfaces should be left exposed to the air for
a few days, then the excess dressing should be wip-
ed off with a clean cloth, and the leather polished
with another.

If it is necessary to fasten loose pieces of
leather, do not use glue or paste. A suitable ad-
hesive can be made from a mixture of beeswax, resin,
and Venice turpentine.

Beeswax	5 parts by weight
Resin	3 parts by weight
Venice turpentine	1 part by weight

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4. PACKING AND MOVING

No special precautions are needed.

(i) Objects should be dry before packing.

(ii) As these objects are obviously fragile, they should be packed in protecting containers.

(iii) If the objects are likely to remain in the packing containers for any length of time, the containers should be lined with good quality paper. Rag or Bond typewriter paper will do. A fungicide should be put in the container. It is advisable to put a waterproof wrapping on the outside of each container as a precaution against water and dampness during the journey.

5. IDEAL CONDITIONS FOR HOUSING AND STORAGE

(i) Storage in a room where

(a) The air is free from dust particles

(b) The circulation of the air is good

(c) The air is free from deleterious gases

(d) The temperature remains an even 70 degrees

(e) The relative humidity remains a constant 50%

(ii) Prints, drawings, pastels, and detached pages of illuminated manuscripts should be

(a) Free from deposits of paste and glue

(b) Attached only by small paper hinges to boards of all rag composition and covered by two windowed mats also made of rag composition.

(c) Protected from abrasion and dirt by having a thin sheet of rag or mulberry-fiber paper placed

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between the two windowed mats.

(111) Matted objects should be placed in a protecting box.

(a) Groups of objects, each encased in a mat of uniform size should fit into the protecting box without risk of sliding or abrasion.

(b) A sheet of thymolized rag paper should be placed in each container.

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IV. SCULPTURE, METALWORK, COIN AND MEDALS, GLASS AND CERAMICS

Stones used in the arts are of many different varieties, and can be classified into

- (a) Soft and porous stones
- (b) Hard and non-porous stones.

Examples of the first group are marble, alabaster, limestone and sandstone; of the second group, basalt, diorite, and granite. The softer the stone the greater the risk of damage, and added precautions must be taken in moving, packing and protection. A test of hardness is that a thumb nail will scratch only very soft stone; a penknife will scratch in varying degrees up to the hardness of glass.

1. SPECIAL RISKS

(i) Humidity. Metals and alloys used in the art contain many corroding agents, especially ancient bronze, and are affected by humidity in the atmosphere. Ancient bronze, for example, is affected by an atmosphere in which the relative humidity is greater than 72%, with the risk of rapid disintegration from disease.

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Ancient glass and pottery often contain salts that have been absorbed by the object during burial, and are also affected by humidity.

(ii) Chemical war gases. Most chemical war gases are, in varying degrees, acid in nature and, therefore,

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have a decided action on stone sculpture and metal work.

(iii) Mechanical shock. Glass and pottery are specially liable to damage from blast.

(iv) Fire. Many metals and alloys found in objects of art, especially in medals, coins and jewellery, have low melting points.

(v) Theft. Small objects such as jewellery, coins, medals, etc., can easily be put into pockets, and their absence is apt not to be noted.

2. SPECIAL PRECAUTIONS

(i) Keep stone and metal objects as dry as possible and in the most stable possible conditions of temperature and humidity. Relative humidity should be well below 72°.

Wood, in contrast, should not be in too dry an atmosphere.

Free-standing or immovable objects should be protected by covering with tarpaulin or by building a wooden case around the object.

(ii) For protection against mechanical shock caused by bomb blasts, etc., build wooden cases around immovable objects against which sand or sandbags should be piled.

(iii) For protection against chemical war gases, immovable objects should be cased in with wood, the wood covered with roofing paper to make as airtight as possible. Cover the whole with sand. An ideal would be to case in the object with wood, cover this wooden case with roofing paper, and then enclose with a second wooden case over which sand is stacked.

3. "FIRST AID" TREATMENT

(1) Stone that has been exposed to the weather must be thoroughly

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dried in the sun, except when color is present, and then drying should be done in the shade. The softer the stone, the greater amount of drying time is needed.

(ii) Objects that have been exposed to chemical war gases should be washed with organic solvents such as benzene, etc. If nothing else is available, wash with a strong solution of soap and water; but preferably, consult an expert.

(iii) Broken objects. Fragments become easily mislaid or lost. Fractures in stone work can be repaired or strengthened with plaster of Paris mixed with water and used in a consistency of thin cream.

4. PACKING AND STORAGE

(i) Pack all objects in wooden cases. Wood affords a greater amount of insulation against heat and fire in close vicinity. Metal cases transmit heat to objects inside. The ideal method would be to encase the wooden boxes, surrounded with packing material, in metal cases. Packing materials must be dry.

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(ii) Small objects such as coins, jewellery, etc., should be wrapped individually in paper and then packed. One large box or case is not as easily mislaid as a number of smaller boxes or cases.

(iii) Do not pack with wooden supports anchored to inside of case, as this transmits all shock and vibration from the outside of the case directly to the object inside.

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(iv) Store objects in a dry place. When object is of wooden construction, relative humidity may be higher.

5. IDEAL STORAGE CONDITIONS

Well ventilated storage with a temperature of 68-72°F., and a relative humidity of 40°.

V. FURNITURE, WOODWORK, MEANS OF TRANSPORT

Wood survives most vicissitudes remarkably well and only a few "first aid" suggestions are needed for war emergency precautions and treatment.

1. SPECIAL DANGERS TO FURNITURE AND WOODWORK

(i) Humidity and temperature.

Most old woodwork, furniture, etc., will not suffer under ordinary fluctuations of humidity and temperature in the climate to which it is accustomed. Roofs should be checked to see there are no leaks and repaired if necessary; and windows and doors arranged so that there will be a constant but gentle flow of air through the rooms for ventilation.

(ii) Heat.

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If the wainscotting, ceiling, choirstall, furniture or other object has been subject to great heat and is dried out, boiled linseed oil or linseed oil cut with a little turpentine should be gently rubbed in with a cloth or painted on with a brush. After allowing time for this to soak in, any surplus remaining on the surface should be wiped off, and after a

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day or two of drying, a coating of good furniture wax should be rubbed on.

(iii) Damp.

Ventilation should be insured in any place containing damp or water-soaked wood. The drying out should be very gradual. No sudden heating and drying of the room should be attempted as splitting, shrinking and warping will inevitably result. If possible, keep the temperature at not more than 65°F., if the air is very dry. Never attempt to hurry the drying. When dry, use the linseed oil and wax treatment described in the previous paragraph.

(iv) Blast or direct hits may have seriously broken interior woodwork, ceilings, panelling, wainscoting, etc.

(a) Get good carpenters and detach any splintered and hanging pieces or beams. If these are in any way decorated, however slightly, number them and make a list of them, and stack them near by, if the room or church is then safe. Shore up or reinforce anything more likely to fall or collapse. But do not attempt repairs. They can wait until experts familiar with the object or decoration are available. Pay most attention to roofing and enclosing any room containing such material.

(b) Inlay. Much woodwork and furniture is inlaid with other woods, bone, ivory, metals, etc.

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In such cases be sure that a thorough search is made in any ruined room for pieces of inlay. Put them in a box and, if possible, store them nearby. Label the box fully, stating what is inside and where it came from.

If inlays are loose but not yet fallen, do not remove them. Procure some parafine wax and melt it. Apply it with a brush gently over the surfaces, repeating the process till a good crust has been formed holding the inlays in place. This will be quite strong and can easily be removed later when restoration can be accomplished.

(v) Abrasion.

This is to be guarded against if objects have to be packed. Make sure things cannot slip about in a packing case and that no two objects touch without cotton, paper, or excelsior between them.

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If a building containing fine woodwork is necessary for billeting or office purposes, have a carpenter sheath any wainscoting, door frames, or panelling with compo-board, plywood, or boarding to prevent damage from backs of chairs tilted, desks shoved about, and people carelessly leaning and moving.

If serious abrasion has taken place, it is advisable to do nothing about it and leave the repair for experts at a later date.

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(vi) Fungi and Insects:

Treatment for these is hardly necessary or practical as a "first aid" measure. Reasonable dryness and ventilation will prevent any sudden and damaging growth of fungi. Fumigation and impregnation against insects is difficult and only an expert is likely to have success.

3. PACKING AND MOVING FURNITURE, ETC.

(i) Furniture, chests, reliquaries, etc. which are in a dangerous place can be lightly crated by carpenters, or boxed, and readily removed to a dry, safe place. Be sure burlap, cotton, or straw-encased-in-paper bumpers are put in at all corners and protruding carved decorations to prevent damage in transit by falls or knocks on the box, or abrasions due to the objects slipping about in it.

(ii) Coaches, carriages, etc. If it is necessary to move old conveyances, make sure that the axles, wheels, springs, and any straps holding them together are in working condition. Otherwise they should be crated or boxed and moved as furniture.

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VI. ARMS AND ARMOR1. SPECIAL DANGERS TO ARMS AND ARMOR: PRECAUTIONS

The principal thing to remember is that dampness (atmospheric moisture) causes iron and steel to rust. It

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is essential, therefore, that arms and armor be kept in a dry place of even temperature, and that they be covered with a thin layer of mineral oil or white vaseline to keep the steel from coming in contact with the atmosphere. They should not be handled with bare hands, which sometimes give off sufficient salt to cause rust. Adhering to these rules will obviate the necessity of frequent cleaning. However, when objects are already rusty, it is necessary to use the most effective method of arresting further deterioration, because corrosion of iron and steel grows.

2. CLEANING AND "FIRST AID"

In cleaning arms and armor, avoid the use of an emery wheel, sandpaper and steel brushes. Acid should under no circumstances be used, for while it acts quickly, it will ruin the object so treated. Acid gives steel a permanent lead-like surface and the fumes injure any metal in the vicinity.

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1. Armor and weapons which retain their original highly polished mirror-like surface or their original color (blue or russet).

Neither of these should be removed. Colored, etched, engraved, embossed, damascened, and gilded objects must be treated with particular care so as not to injure the enriched surface. It is advisable to cover the surface with vaseline or mineral oil and await the opportunity of consulting an expert. The background of etched areas is usually blackened. Care

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must be taken not to use kerosene for this will remove the background.

(ii) If the object is white, that is, not colored such as blue or russet, the following procedure should be followed:

(a) Removal of rust. Soak in kerosene for several days to loosen the rust; most of this when softened yields to a stiff bristle brush. The surface, depending upon the condition of the object, should then be rubbed (in a parallel direction, not in circles) with steel wool or various grades of crocus cloth or fine emery paper moistened from time to time with mineral oil. After the object has been cleaned, the kerosene must be removed, otherwise the object will rust with twofold rapidity. This is done by letting the object dry, rubbing with a cloth, and cleaning the surface with alcohol.

When rust appears as spots (pitting), a little powdered rotten stone may be rubbed in on the point of a stick of soft wood, dipped from time to time in kerosene. 6542

(b) If the surface is only disfigured by grease and paint, alcohol or ammonia will remove this. Ammonia should always be washed off with water, the object thoroughly dried, and covered with oil.

(c) To secure a polish, rub with rotten stone

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(or pumice) applied with a chamois or soft leather.

(d) To prevent rusting, apply an even coating of mineral oil or white vaseline on an absolutely dry surface. Lacquer, also will prevent steel from rusting if properly applied. First, all grease and dirt must be removed (use benzine), and the surface must be absolutely dry. A coating of lacquer applied with a paint brush with fairly short bristles will stand considerable handling.

(iii) Armor straps and linings. Sometimes the straps of a suit of armor may have been broken. It is better to tie the elements together rather than to try to restrap the armor, unless an experienced armorer is available. Armor which has been wrongly reassembled will not articulate because the holes which should contain false rivets (purely decorative rivets) have been utilized in riveting the lames together. If armor retains its ancient linings, do not soak in kerosene. If the armor is badly rusted on the inner surface, linings will have to be removed by an experienced armorer.

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(iv) Leather. There is a good deal of leather associated with arms and armor, that is, straps, shields, sword hilts, scabbards, etc. Excessive dryness causes leather to become brittle. To prevent dryness, rub in vaseline of medicinal grade or anhydrous lanolin.

(v) Chain mail. Should be cleaned in a way similar to that employed in the days when it was worn. It

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was rolled in a barrel containing sand and vinegar, or placed in a bag with sand or sawdust, each end of which was taken by a man and worked like a two-man saw. To-day, rusted mail may be soaked in kerosene which will loosen the rust, and then placed in a tumbling machine containing sawdust. The links rubbing against each other give a good burnish -- much better than can be produced by any means of scratch brushing.

(vi) Firearms. The first thing to do when examining any firearm is to be certain that it is not loaded. The firearm should then be taken apart; the iron and steel pieces should be soaked in kerosene oil to soften the rust, which is then removed with steel wool and fine emery paper. Pitting caused by rust may be cleaned by a hard wood pick soaked in kerosene. The original bluing or browning should not be removed.

The bore of a gun should be cleaned with a powder solvent (equal parts of gum spirits of turpentine, refined sperm-oil and acetone), and thoroughly dried with Canton flannel wads attached to the cleaning rod. If gun oil (Cosmoline is used by the United States Army) is not available, a light mineral oil or vaseline may be used to protect the barrel from further rust. All the metal parts, internal as well as external, should have a protective film of oil.

Wood parts of firearms should not be varnished or lacquered. The wood can be cleaned by wiping with

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linseed oil.

Guns should be stored upright, side by side, in racks. Be certain that the hammers are forward so as to take the tension off the springs.

(vii) Blades of watered steel (Japanese blades, Damascus steel and Malay Krisses). If the blade is polished or if it is rusted, it is advisable to merely apply mineral oil or vaseline. Under no circumstances should one not recognized as an expert attempt to remove rust from such blades.

VII. TEXTILES & COSTUMES

1. SPECIAL RISKS

Textiles are among the most perishable of art objects. Many ancient fabrics may be brittle almost to the point of powdering on being touched; all are subject to severe damage from dampness, stale air, strong light or complete darkness, and insects.

2. SPECIAL PRECAUTIONS

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- (i) Textiles should be kept in a subdued light.
- (ii) Unless gases are present, windows should be opened to permit a normal flow of air. Stagnant atmosphere encourages the development of both mold and insects.
- (iii) Insects such as moths, buffalo bugs, book lice, etc., should be looked for. If evidence of insects is found, an expert should be called in if possible.

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If no expert is available, the textiles should be wrapped as soon as possible in a good quality of brown wrapping paper, with paradichlorobenzene crystals plentifully sprinkled in the package. (A paper with high sulphite content, e.g. roofing paper, may affect colours in fabrics.) Waterproof tar paper should never be used. It may melt and stain the textiles beyond repair.

3. FIRST AID TREATMENT

- (i) If the textiles are wet, they should be spread out, without stretching or pulling (which might tear the fabric), not on the floor but on a surface, e.g. a board table, covered with paper, which is completely dry, well ventilated, and shady. Don't store textiles which have been wet until they are entirely dry.
- (ii) Don't brush or shake textiles. Cleaning requires a highly trained expert and should not be attempted by anyone else.
- (iii) If signs of mildew or mold are present, wrap the textiles in as good quality brown wrapping paper as can be secured (never waterproof tar paper) with paradichlorobenzene crystals sprinkled in the package.
- (iv) If vestments and costumes are strong and in good condition, they are best cared for by being suspended on hangers. If they are fragile, they should be spread out as much as possible, and kept flat. If they must be folded, fold with the lining in.

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(v) Tapestries and rugs should be folded. If large rolls are available, tapestries and rugs may be rolled, but only with the greatest care (with lining in) lest creases be pressed into them. Normally, an expert is required for this work.

(vi) Small pieces of textiles should be placed in boxes. If the surface of the textiles is rough, or loose threads project from the surface, sheets of the best quality tissue paper available should be placed between the textiles. Small boxes can be grouped in wooden packing cases. These should be kept flat and not on end.

4. PACKING AND MOVING

In moving textiles, jarring and vibration are to be avoided at all costs.

(i) Small boxes containing small pieces of textiles can be grouped in large wooden packing cases (kept flat), any spaces between the small boxes being filled with crumpled newspaper to absorb shock as much as possible.

(ii) Costumes are best handled by constructing a large wooden packing case, from the top of which hangers can be suspended, with the garments free to swing on the hangers in transit. Such a wooden packing case should be lined with good quality brown wrapping paper before the garments are placed in it. This same case can be used for storage of costumes.

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(iii) Textiles can be packed quite tightly while in transit, but should not be allowed to remain crowded once they have arrived at their destination.

5. IDEAL CONDITIONS

Textiles under ideal conditions should be stored in uncrowded cases and boxes, in subdued light, with the relative humidity as low as possible, preferably below 30, in a room with a normal flow of air passing constantly through it.

VIII. SCIENTIFIC COLLECTIONS AND THEIR INSTALLATIONS

1. SPECIAL CHARACTER OF SCIENTIFIC COLLECTIONS

The treasures preserved in natural history and kindred museums differ in a number of respects from those comprising the collections of art museums.

(i) The outstanding difference is that natural history specimens may have no commercial value and may appear to have no intrinsic value of any sort. To laymen, for example, a case containing unmounted and perhaps unattractive skins of birds, or mammals, a tin or jar holding faded and shrivelled reptiles, fishes or invertebrates, a box of mollusk shells, or another of pinned insects, might seem to be of very trifling significance. It might even appear as a question of slight importance whether such material were preserved or destroyed.

(ii) Hasty conclusions based upon the unattractive-

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ness or shabbiness of natural history specimens may prove exceedingly unfortunate in connection with future scientific studies. This would be true not only as of the institution in which the material is preserved, but equally in other parts of the world.

The literature of systematic zoology is fundamentally based upon preserved specimens of animals, just as the literature of systematic botany is based on herbarium specimens of plants. The permanent repositories of such material are the natural history museums, whether these are independent institutions or particular sections of universities, biological laboratories, stations for experimental research, etc. Such collections are akin to libraries, because specimens represent one part of the data of science, just as published records represent another. In a sense, the specimens are the more fundamental of the two because study, writing and publication necessarily follow acquisition and preservation of the objects themselves. The specimens really constitute a sort of "reference catalogue" of nature.

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The preservation of natural history specimens, properly protected from dampness, mould, decay, dust, light, insect pests or other agencies that might damage or destroy them is, therefore, one of the cultural responsibilities of civilized peoples. The published conclusions of any man of science may be more or less

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incorrect, but if the specimens upon which his conclusions were based are preserved in a museum, they are always available for reexamination by others in the light of new information. The same plant and animal specimens have, in fact, been studied and reported upon at intervals as great as a hundred years.

(iii) Many natural history museums contain among their collections preserved organisms of very great rarity, including plants and animals which have become extinct and which are, therefore, absolutely irreplaceable.

A battered bit of skin and feathers, for example, which looks as though the refuse can or the incinerator would be its only proper destination, may actually be a fragment of a dodo, a great auk, or any one of scores of other species that have been exterminated by man during the historic period.

Even more important, from the strictly scientific point of view, are the so-called "type specimens" of organisms, both plant and animal. A type in this sense means the particular example of a species upon which its original description and scientific name were based. The type remains for all time the standard with which other identical or related organisms are compared. There can never be more than one type specimen of any one species or subspecies, and, hence, if it is destroyed, the loss is irremediable.

(iv) Natural history collections differ from collect-

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ions of artistic objects in that the most valuable specimens are not, as a rule, those placed on public display in museum exhibition halls. There are, of course, exceptions to this rule. If a museum possesses a single skeleton of a dinosaur or a single specimen of the extinct Labrador duck, the chances are that each may be mounted, properly cased, and placed on exhibition. Generally speaking, however, the great rarities, all of the type specimens, most or all of the specimens that have critical importance because of references made to them in scientific literature, the series of specimens that show the changes due to age, growth and geographic variation in the life of the plants or animals, are preserved in "study collections" that are available to accredited students but do not form a part of public displays. The great bulk of natural history museum possessions are, indeed, in the form of study collections, and they are usually the part of highest permanent importance to scientific research.

2. SPECIAL DANGERS TO SCIENTIFIC COLLECTIONS

Museum material of every sort is, of course, labeled and catalogued, with the object that there may always be a connection between the specimen and the pertinent information concerning it. In the case of natural history material, such identifying data are, if possible, of even more importance than in the field of art. A Rembrandt painting, separated from its numbered tag or other record, might still be ident-

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ified as a Rembrandt. As a great work of art, it would at any rate continue to fulfill a part of its purpose, even if the name of its creator should be forever lost. But a natural history specimen, once separated from information about the locality and date of its capture, its sex, the color in life of the parts that change after death, etc. automatically loses a greater or less proportion of its usefulness and may become valueless, or worse than valueless. In many instances, indeed, it would be preferable for such a specimen to be completely destroyed than for it to lose its tag. With specimens of certain kinds, such as bones, fossils and rock samples, the card or paper label in the same container may be fortunately supplemented by a number on the specimen in white or black ink, which corresponds with a number in the catalogue in which all essential information is duplicated.

3. PRECAUTIONS AND "FIRST AID"

(1) Determine whether any damage has been done to the collections and to the rooms in which they are stored. Repair, or boarding up, of broken windows should be taken up immediately. It should be remembered that the study collections of large museums are likely to be of more importance than the exhibition halls.

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The advice of the regular custodians, even if these are members of an enemy population, should be sought. No one knows better than they what care is necessary, and it is certain that no one will be more

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interested.

In the absence of such specialized help and advice, everything should be left as nearly in status quo as circumstances will permit. Wherever containers have been overturned by explosions but not otherwise damaged, it is better that they be left undisturbed until such time as a properly qualified person can examine the contents. Under no circumstances should a rearrangement be attempted by anyone else if specimens and their labels have become separated or mixed up.

(ii) The worst enemies of dried skins, fur, feathers, pressed plants and similar perishable material are dust, light, and insect pests such as moths and dermestid beetles. Wherever cases containing specimens of this kind have been broken, or punctured by bullets, insect pests should be poisoned with carbon dichloride, carbon tetrachloride, paradichlorobenzene, or ordinary naphthaline, after the breaks have been repaired or the holes in the cases covered with tape.

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(iii) Specimens preserved in fluid should not be permitted to dry out if their jars or metal containers have been broken or overturned. They should be covered as soon as possible with 70% alcohol or a 4% aqueous solution of formol (a ten per cent solution of the commercial fluid). Alcohol is practically essential for crustaceans, shells, and

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similar limey organisms, which may be rapidly dissolved by formaldehyde gas.

(iv) Skeletons, fossils, rocks and much other dry material need a minimum of protection, chiefly from water, soot, etc.

XI. ARCHAEOLOGICAL AND ETHNOGRAPHIC COLLECTIONSA. ARCHAEOLOGICAL AND PREHISTORIC COLLECTIONS

These consist mainly of sculpture, metalwork, coins, jewelry, glass, pottery, arms and armor, stone implements, and miscellaneous small objects. For the treatment of most of these, see Sections IV, and VI above.

1. SPECIAL RISKS AND PRECAUTIONS

(1) The chief difference between archaeological objects and others of the same material is that archaeological objects are far older and have been dug up in ancient sites. This means that only fairly durable things have survived, though they may have been reduced to a very fragile condition. It also means that they are often fragmentary, but the fact that they may appear broken in no way detracts from their value. Often whole collections consist of fragments of pottery. Also, many objects, such as pottery, have been found broken and have been restored. Restoration may be hard to detect, but such objects require special care since they are likely to break again if roughly handled or carelessly packed. As a rule, handle and pack objects

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of any size, such as ancient pottery vessels, with special care. Pack all others with reasonable care, wrapping individual objects separately.

(ii) Apart from the categories described above, archaeological collections may include large groups of tools made of flint or other stone. These will withstand almost any condition short of shock or exposure to fire, but they should be protected from wet lest inventory numbers be washed off. When packing, wrap each piece separately, especially flint tools. Otherwise they will rattle against each other and break.

2. PACKING AND MOVING

In dealing with archaeological material, it is vital to remember that, as a rule, the object without information as to whence it came and with what it was found is almost useless. Hence, when moving or packing archaeological material, the following rules should be observed:

(1) Most important, when moving the contents of a museum or private collection that contains archaeological material, send the regular museum catalogue or inventory with it. Most museums keep such inventories, in which are given the inventory numbers that occur on the objects, with information as to where the objects were found. The museum inventory will include the whole contents of the museum, and it will probably not be possible to separate the parts belonging to the different types of collections. But, in any case, the

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whole of the museum catalogue or inventory should be preserved.

(ii) If, as is possible, the contents of the museum or collection has already been packed as a war-time precaution and some or all of it stored in the building, try to find the packing lists that explain what the various boxes contain before moving it.

(iii) In clearing an exhibition case or storage place in a museum, never separate an object from its label. Tie it to the object or put both by themselves in one closed container. If you are adding your own inventory number, put the same number on the object and label. If you cannot find the museum catalogue, preservation of the labels becomes doubly important.

(iv) If a number of objects are kept as a unit in a museum, as, for instance, the contents of a single tomb, do not fail to keep them together or pack them together as a unit, always with their labels. If you do not, you may destroy the value of the objects you are rescuing.

B. ETHNOGRAPHIC AND ANTHROPOLOGICAL COLLECTIONS

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These consist mainly of

(a) Objects decorated with feathers, or made of bird-skins with or without feathers; animal skins, tanned or dried, with or without hair; and all forms of woolen textiles and garments, robes and rugs.

(b) Basketry, matting, objects of wood, bone, horn, stone, glass, pottery and metals.

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1. SPECIAL DANGERS AND PRECAUTIONS

The clothes moth is the most dangerous insect pest for group (a) above. Specimens that have been well cleaned and sterilized with gasoline or benzene before storing or packing will seldom be attacked if a liberal supply of naphthalene flakes, moth balls, camphor or similar things, has been sprinkled among the folds and in layers of such specimens when packing. Careful and frequent inspection is necessary for immunity from this dangerous pest. Obviously, cases or storage boxes for such materials must be as air-tight as is practical in order that the naphthalene flakes, etc., evaporate as little as possible.

2. PACKING AND MOVING

(i) In the case of feathers, skins, textiles, etc., pack in layers separated by any kind of paper, using a plentiful amount of naphthalene flakes and sealing container as tightly as is practical.

(ii) Basketry and matting, which are usually of light materials, may be packed in any type of container available. Should such containers be air-tight enough, add enough naphthalene flakes to discourage any beetles which might otherwise damage contents.

(iii) Objects of wood, bone, horn, may well receive similar treatment.

(iv) Pottery, glass, metals, must be handled with great care. Pottery must be individually wrapped in soft paper and securely tied so that there will be no

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chafing when securely packed in a suitable box or container. Glass may be treated in a like manner to pottery. Metal objects should be separately treated and securely wrapped. Shredded paper or other soft material should be placed round the individually packed pieces. Enough space should be left for each package so that it does not touch others.

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