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PRESERVATION OF BOOKS AND PERIODICALS IN ARAB COUNTRIES

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The Arab countries lie partly in, and partly out, of the tropics but most of them experience for at least a few months of the year a hot tropical climate, the characteristics of which are shade temperatures rising in some places to 120°F during the height of the summer and humidity, in those countries which receive seasonal rainfall, climbing to 100% and dropping during the period of no rain to almost nil. Insects and fungi proliferate in a climate of this kind; in the most desiccated areas the normal durability of paper is greatly diminished; and, adding to the anxiety of librarians and documentalists, haboobs and violent sand-laden winds frequently sweep out of deserts and engulf the cities and populated areas where libraries are situated. Librarians, therefore, have four preservation problems:

1. Protection of library materials against injurious insects.
2. Protection of library materials from mildew.
3. Prevention of damage by dust-storms.
4. Protection of library buildings and equipment in extremes of climate.

Injurious insects

The insects which cause most damage in libraries are termites, cockroaches and silverfish, and 160 species of beetles known collectively as "bookworms". Damage to library materials of various kinds has also been attributed to psocids, firebrats, moths, and other insects; but if measures are taken to combat the major enemies no librarian need worry about the minor pests as they will be simultaneously exterminated.

Termites. There are 1,861 species of termites, and it has been calculated that 95% of all damage done to library buildings and books has been caused by them. Here, we need not consider the wood-dwelling or dry-wood termites, as these do not occur in the Arab countries. It is the earth-dwelling termites which live in the soil, or maintain contact with it by means of long winding tunnels, that have created such havoc in the Arab lands. Their presence in a library may be detected by the mud tunnels which they build on walls, bookcases and furniture and inside which, away from the light, the small grub-like termites move in their search for food. Termites often enter a library by night and even if a thorough daily inspection is made they sometimes do irreparable damage between the time of invasion and the time of discovery only a few hours later. If given the opportunity they will eat wooden window frames, door jambs, and the backs of wooden cupboards, and if they can enter a cupboard undetected and feast for a few days on pamphlets, files, annual reports,

or anything else containing cellulose that may be stored in it, all that will be found afterwards will be fragments of paper and a mass of termite tunnels.

Cockroaches. There are 1,200 species of cockroaches, but only three of them - Periplaneta americana, Blatta orientalis, and Blatella germanica - are likely to be found in libraries. In length the cockroach varies from $\frac{1}{2}$ inch to over $1\frac{1}{4}$ inches. It is nocturnal in its habits, and may never be seen in a library by day, but if the lids of books begin to present a scabrous patchy appearance or are defaced with a dark ink-like liquid, then it is likely that they are being gnawed in the darkness of night by cockroaches. Cockroaches are attracted to books not by the cellulose (which they cannot digest) but by the pastes and glues employed by book-binders, the starch stiffening added to certain binding cloths, and the adhesive used to stick the binding cloth to the board. They generally enter libraries through latrines and drainpipes, and as they are suspected of spreading dysentery, typhoid fever, cholera, poliomyelitis and leprosy, it is highly desirable, quite apart from the damage they do to book covers, that they should be excluded from libraries or quickly killed off if they gain access to them.

Silverfish. This is the small glistening, silvery grey creature, with two antennae, a spike-like "tail", and two terminal filaments, which feeds on starch the sizing in paper, and on glue. It is often found in the drawers of desks where it is attracted by the gum on postage stamps, envelope flaps, and date labels. Since it is a creeping, scuttling insect, it may be controlled in the same way as cockroaches.

Bookworm. Most of the "bookworms" are the larvae of small dark brown or reddish-brown beetles which fly into libraries through open or unscreened windows or crawl in below ill-fitting doors. Those which are thought to do most damage in Arab countries are the powder-post beetle (Lyctus brunneus), the common furniture beetle (Anobium punctatum), and the drugstore beetle (Stegobium paniceum): one female of the last-named species may produce more than 800,000 descendants in a single successful year of egg-laying. It is the larvae of the powder-post beetle which bore long cylindrical holes in books, and it was probably this pest which the French bibliographer, E. G. Peignot, encountered more than 160 years ago when he found "twenty-seven volumes in a row pierced by a bookworm in one continuous devastating journey".

Protection against injurious insects

The best means of ensuring the protection of library materials is to prevent insects gaining access to them. As this is generally impossible owing to the design and construction of buildings, it needs to be made certain that, once inside a library building, insects will quickly die. Modern buildings, constructed of concrete and air-conditioned, provide almost 100% protection against insects, but many librarians have to work in buildings that were designed many years ago, where air-conditioning cannot be provided, and where a daily or nightly infestation by insects is experienced. Thanks to modern chemicals and the scientific study of the habits of the insects concerned, it is now possible to preserve all kinds of library materials and to prevent the heavy losses and destruction that have occurred in libraries all through the past three thousand years.

Termites. When a new library building is erected correct methods of termite proofing should be insisted upon. Preliminary treatment of the site with poison, provision of a continuous concrete floor, metal strips inserted in joints, metal

collars on pipes, and metal caps on concrete piles, will all help to prevent infestation. Several well-known poisons are suitable for treatment of the site; sodium arsenite, trichlorobenzene, pentachlorophenol, and dieldrin, are some. The manufacturers of dieldrin recommend that a diluted emulsion consisting of one gallon 20% Emulsion Concentrate to 80-100 gallons of water should be applied to building foundations at the rate of one gallon to every two feet of open trench, and that the emulsion should be sprayed, one gallon to five square feet of surface area, before floors are laid. Some libraries that have been occupied for many years seem to have been built on top of termitaries, and in these cases the only sure way to prevent termites gaining access to the building is to impregnate the site itself with a chemical poison. Five years ago the library of the Institute for Medical Research in Kuala Lumpur, Malaya, suffered a bad invasion by termites, but there the Public Works Department removed parquet flooring, bored holes two feet deep at five feet intervals both outside and inside the library walls, and soaked three gallons of dieldrex emulsion into each of over 90 holes - since when there has not been a termite in the building. Some libraries may not be able to afford such complete protection; in those cases the occasional pouring of a little sodium arsenite into any cracks in the library floor may be sufficient to keep termites at bay. Many existing buildings are full of small cracks and are therefore naturally attractive to termites; in them, bookcases and cupboards may be stood upon metal sheets - since termites will not cross metal - and provided they stand well away from walls their contents should be perfectly safe, as far as termites are concerned. It is worth adding, perhaps, that in libraries which use poison, the bottles of poison should be kept locked up when not in use. Even in 1962, it may be possible for some unfortunate farash or murasla to decide that sodium arsenite is a medicine to be sampled; and it can, of course, be used to get rid of enemies in a very decisive way.

Cockroaches and silverfish. It is helpful if half a pint of dieldrin 20% Emulsion Concentrate diluted with one gallon of water may be sprayed upon the inside walls, and perhaps the woodwork of libraries, to the point of run-off. Every insect that settles or crawls upon the walls will then die before it can do any damage to the books; and this includes mosquitoes, sand-flies and bed-bugs which are a nuisance in some libraries. An alternative solution for application to walls may be made with one part by weight of mercuric chloride, one part by weight of phenol, and 16 parts of methylated spirit. Cockroaches and silverfish are no longer a menace in libraries provided librarians know what chemicals to use for their extermination. To kill them, it is unnecessary to apply poisons to the books themselves. If "Insecta-Lac", which contains dieldrin, or another similar proprietary brand of insecticide, is sprayed or painted on to the rear of all book shelves behind the books, and on to the undersides of shelves, and on window-sills and skirting-boards, and is also squirted into all crevices and corners where insects of crawling habits are likely to hide, then cockroaches and silverfish will be eradicated. This preparation has a good residual effect; when an insect walks across a surface treated with it, a minute portion of the poison is picked up on the legs of the insect, and a "blooming" effect ensures that fresh poison rises to the surface ready for the next victim. It is effective for at least two years. "Insecta-Lac" has been used successfully in ships carrying pilgrims to Jeddah as well as in many hospitals and libraries. It may be bought in aerosols and applied competently and safely by an untrained library attendant who, while carrying out the spraying, should wear a handkerchief over his nose and mouth in order to prevent inhalation of the spray. It will kill bookworms in the adult (i.e. beetle) stage, but if larvae are already deep in a bookcase, eating it, they will not be killed until they emerge and cross the poisonous exterior. If there is any evidence that cockroaches and silverfish are present in a library, it is advisable to leave the dust-jackets on all new

books, especially if they may be covered with a cellulose acetate plastic, as they constitute an additional barrier between cockroach and glue, and they do seem to be a definite deterrent.

Bookworms. If the treatment already described can be carefully applied, infestation by bookworms, on a large scale, is very unlikely to occur since most of the adult beetles from which an infestation derives will die from dieldrin or other poisoning very soon after entering the library. But if, before this treatment can be carried out, a library already contains bookworms, then some form of fumigation, depending upon the location of the infestation, becomes essential. If the larvae are already present in the woodwork of the building and in wooden shelving, as well as in the books, the whole library will need to be sealed up and thoroughly fumigated with hydrogen cyanide, carbon disulphide, methyl bromide, or some equally deadly gas which can be used safely only by a masked and experienced fumigator. If only books are infested, they can be removed from the shelves and placed in a fumigation chamber, which may be a special chamber built separately from the library, or in a vacuum chamber, i.e. a movable gas-tight steel chamber, which can be set up within the library. Many libraries varnish the covers of books to protect them from bookworms. Countless thousands of books have been disfigured in this way in the past, but the present writer believes that librarians may now put away their bottles of book varnish, together with the brushes and feathers used for its application, and rely instead upon spraying and perhaps lacquering of book shelves and library woodwork; even though some of the prophylactics applied to books in the past are known to have been effective. For librarians who still wish to varnish their books, the following two formulae for book varnish have proved effective and may be recommended:

1. Ethyl cellulose (Type N-7) 10 ozs.
 Shirilan Extra 1/2 oz.
 Xylol 3 1/2 quarts
 Butanol 6 ozs.
 (This is used in the library of the University of Florida, and it is said to give complete protection from cockroaches and mildew.)

2. Mercuric chloride 16.7 grams
 Creosote 10 c.c.
 Alcohol (made up to) 2,000 c.c.
 (This is used in the library of the Imperial College of Tropical Agriculture, Trinidad, which is now part of the University College of the West Indies.)

In addition, wax 212, which has been developed by the Centre National de la Recherche Scientifique, 13 Quai Anatole France, Paris VIIe, as a combined insecticide and fungicide, may also be recommended.

Protection from mildew

Micro-fungi generally grow on book covers if the air temperature exceeds 65°F and the relative humidity is 75% or more. Spores of fungi, however, will grow at almost any temperature from freezing point upwards, and it is not a high temperature alone that induces their growth. A few libraries in Arab countries experience indoor temperatures of over 90°F, and occasionally over 100°F, but it is not always during the hot season that micro-fungi appear on their book covers; it

is during the period of rainfall when the temperature is much lower but the humidity is high. To combat fungi in libraries, therefore, it is necessary to control the humidity. In air-conditioned libraries this is simple - it has been found that with a temperature of 70°-75°F, which is about right for human comfort, and satisfactory for paper, micro-fungi do not grow if the relative humidity is kept below 55%. Libraries where too little water is available to permit air-conditioning by water-cooling methods, and libraries which, in any case, cannot afford the cost of orthodox air-conditioning, may reduce humidity either by installing de-humidification units or by making "home-made" de-humidifiers, using calcium chloride. A "home-made" unit, about one foot high, may be constructed from a piece of ordinary mosquito-wire, such as is used to screen windows, fitted, in the form of a cylinder, into a wooden base with a hole in its centre, the whole contraption then being stood in a small enamel bowl or any non-porous pan. The wire cylinder needs to be filled with fresh calcium chloride, about once a week, the actual frequency of re-filling being determined by the degree of de-humidification required. It has been found that the spent calcium chloride may be regenerated by heating it in an oven to a temperature of 260°C; this helps to reduce the cost. (Further information may be found by reference to items 3 and 13 of the Bibliography appended to this working paper.) If calcium chloride is used, it is important to keep windows permanently closed for the wet season; and doors must be opened as little as possible so that too much moist air is not admitted. Rotating glass entrance doors are probably the best form of door for use under these conditions. If neither mechanical air-conditioning nor calcium chloride units are possible, then a mildew inhibitor, such as those produced by the Library Binding Institute in the United States of America, or the CNRS in France, or that described by Dr. D. C. Hetherington (see Bibliography), may be applied to the books and bound volumes of journals. The inhibitor used by Dr. Hetherington was a solution of:

Thymol crystals	10 grams
Mercuric chloride	4 grams
Ether	200 c.c.
Benzene	400 c.c.

This may be applied to bindings with a sponge in such a manner that none of it gets upon the fingers. Much may be done, also, to keep a library free of fungi by scrupulous cleanliness, vigorous circulation of air by means of ceiling fans, regular manual and vacuum dusting, or systematic periodical fumigation with methyl bromide or some other fumigant.

What publishers could do

Chinese paper-makers added an insecticide - manufactured from seeds of the Amur cork tree - to paper as early as the Fifth century A.D., but in spite of this good example the great majority of publishers in western countries are still exporting books to tropical areas without first treating them with an insecticide and fungicide, at the present time. This indictment applies only in part to the U.S.A. where a great deal of research into book preservation has been carried out and practical use has been made of the results. Many American publishers use highly calendered board, that is not easily penetrated by insects, for the book covers, and the various glues and pastes employed for case-making and other processes either do not contain substances attractive to insects and conducive to the growth of mildew, or they are given the necessary chemical additives. In England research has been carried out by the Printing, Packaging and Allied Trades Research Association (PATRA), the Department of Scientific and Industrial Research, the Imperial College of Science and Technology, and the Crown Agents for Oversea Governments and

Administrations. A report was made to PATRA in 1949 which quoted a statement from the U.S. Government Printing Office that hand-made books would be reasonably free from mould and insect attack if the following were used in manufacture:

- (a) Book cloth coated or impregnated with pyroxylin or vinyl;
- (b) Nylon sewing thread;
- (c) Polyvinyl acetate emulsion type resinous adhesives for case-making, gluing-off, lining-up, and casing in;
- (d) Book papers which did not contain starch, casein, etc.

In the case of machine-made books, technical difficulties existed at that time.

The Crown Agents' Standard Specification No. 40 (1937, revised 1954), recommended for binding, inter alia, that a solution of 1% (weight in volume) of mercuric chloride, and 0.5% (volume in volume) of beechwood creosote, in methylated spirit, should be applied to the backs of books before they were placed in the covers and also to the inside of the leather or cloth, and to both sides of the boards. In addition:

"Copper sulphate in the proportion of 1 oz. to 2 gal. shall be added to the water used in making the paste or glue for binding, and powdered alum in the proportion of 1 oz. to 15 lb. shall be added to the finished adhesive. In addition, there shall be added to the adhesive a solution of mercuric chloride and beechwood creosote in such proportions that the mercuric chloride shall constitute 2% and the beechwood creosote 1% of the total solid ingredients of the adhesive.

A small printed label stating that a poisonous insecticidal solution has been used in binding shall be pasted inside the front cover of each book".

That was in 1937. Although technical difficulties exist, there is no doubt that publishers in England could market books which are resistant to both insects and mildew - as some publishers in America do already - if they were mildly interested in doing so.

Dust-storms

Although it is desirable that libraries in areas adjacent to deserts should possess tight-fitting windows and doors, in actuality imported steel framed windows, and wooden doors that are tight-fitting in the driest part of the year, are rare. The librarian has to submit to the "ajaj", cover his face while it lasts, and clean up after it has passed. Normally, there is sufficient natural warning of the approach of an haboob or simoom for the library staff to precipitate themselves to all windows and doors to see that they are quickly fastened so that as much dust as possible is excluded. Wherever possible, entrance doors to libraries should be completely shuttered or masked so that sand cannot blow straight in from the outside world between the base of the door and the floor of the library. A long narrow sausage-shaped calico sandbag, of the same width as a door, may be kept in readiness for ramming up against the bottom of each door before the start of sand-storms. If there are unglazed vents in addition to windows, there should be some device for shuttering them while a storm is in progress. Cupboards and desks should be closed,

and the lenses of photographic apparatus carefully enclosed in cloth hoods. There is an increased risk of fire during sudden violent storms, owing to papers blowing about, and it is wise to extinguish naked lights, such as cigarette stubs, gas-jets in binderies, and oil lamps and candles if they are in use.

Fine dust has an abrasive and deleterious effect upon paper, and it encourages the growth of mildew. Once a storm has passed, cleaning up should be done, therefore, as carefully and rapidly as possible. Vacuum dusting does less damage to library materials than manual dusting; and vacuum cleaners should therefore be available. The librarian should not disdain to tell cleaners exactly how dusting should be done: otherwise, "book-slapping" and the application of damp cloths to book covers and shelves may do more damage than any dust-storm.

Protection of library buildings and equipment

The best protection any collection of books can have is a concrete building (preferably air-conditioned) carefully designed with regard to:

- (a) temperature control;
- (b) circulation of air;
- (c) roof strength (the roof must not blow off, admit rain or dust, or harbour bats or rats);
- (d) doors and windows (these must exclude insects at all times and dust during sand-storms);
- (e) floor (the floor must give protection from termites).

Although librarians have little control over the materials used when new buildings are erected, we all need to be aware that heat and fungi resistant paints have been developed especially for use on tropical buildings; that the transparency of glass deteriorates rapidly when the relative humidity is high, and the glass therefore needs to be cleaned more often than in a milder climate; that plastic tinting material is available which may be applied to glass windows to reduce glare and heat; and that rapid corrosion of metal surfaces will probably take place unless they are frequently painted and cleaned.

The equipment in the libraries of Arab countries needs the same attention it should get in good libraries elsewhere. In addition, frequent routine inspections of all structural woodwork and wooden book cases to make sure that no infestation by borers or termites has taken place, and similar inspection of all wooden furniture, need to be carried out. Special care needs to be taken of microfilm readers, especially of the lenses and reflectors; and typewriters, dictaphones, duplicating machines, photocopying apparatus, etc., must be kept free from grit when not in use. One must expect to replace rubber rollers on duplicating machines and typewriters, and the tyres on book trolleys, somewhat more often than would be the case in a temperate climate.

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