Charles Brandt

Conservation: The American Scene

From May 27 to June 6th, 1981 I did a study-tour of various Archives, Museums, Galleries, vacuum chambers, and conservation laboratories in the Philadelphia and Washington areas. This tour was funded in part by a CMA grant and by assistance from the Provincial Archives of Manitoba where as Chief Conservator I am currently setting up a paper conservation laboratory to care for archival materials, books, and works of art on paper. The purpose of the study-tour was to examine existing conservation laboratories, to study current facilities for fumigating paper artifacts and to dry them in the case of an emergency (flood, fire, etc.); to discuss with various professionals the matter of brittle paper and the best means of preserving it (silking, lamination, encapsulation, microfilming, cold storage); to observe methods of storing maps and works on paper; and finally to examine existing climate controls in various institutions. It was felt that such a study-tour would benefit us in our town building renovations and laboratory planning and that a written account of such a study would assist others in their planning.

Since part of this report will be concerned with mass deacidification of paper materials, I will preface it by pointing out that in North America there have been three major efforts to develop mass-deacidification systems: 1) The Morpholine process developed by the Barrow Institute, Richmond, Virginia which we understand is at present not proceeding; 2) The Wei T'o Process developed by Dr. Richard Smith at the Public Archives of Canada, Ottawa; 3) The Diethyl Zinc Process currently being developed by the Library of Congress and directed by George Kelley, one of their conservation scientists.

The General Electric Company, Valley Forge Space Centre, Valley Forge, Penna.

Richard G. Shoulberg is the Project Manager at G.E. and was my main contact.

In 1972, a fire in Temple University's Klein Law Library, Philadelphia, was quenched by tons of water from fire hoses, soaking nearly 60,000 books. The Library of Congress suggested that they be frozen and stored at low temperatues. (-20°F or -28.8°C). While not killing bacterial spores or vegetative cells, the low temperature does retard the active growth of most micro-organisms. A search then began to determine the means to dry out the damaged books and return them to use. Shoulberg pointed out the amount of water that can be absorbed by paper. Books printed prior to 1840, for example, can absorb up to 80% of their original weight in water; more recent ones, an average of 60%. The normal water content of paper is between 5 and 7% by weight. Shoulberg felt that one of the G.E. company's thermal-vacuum space simulation chambers would make an idea "drying-out" tank, and that many of the techniques developed in spacecraft testing and sterilization could be applied to this problem. Four-wheeled carts were adapted for the handling of the materials with metal shelving and each shelf was equipped with an electric heater (thin sheets of silicone embedded with wire mesh which had been manufactured for waterbeds). In the drying process frozen or wet items are placed on the shelves and the loaded carts are raised to the chamber door by an elevator and then rolled into the 3,000 cu. ft. cylindrical chamber. The chamber will hold from 3-4,000 volumes of books. Once the books are in the chamber the pressure is lowered to achieve a vacuum of a few (5-10)mm Hg. This promotes evaporation of water. To speed up the defrosting of frozen materials and the evaporation of water from these materials, both the chamber and the load are preheated to 125°F. As the water evaporates, the cryogenic panel on the bottom of the chamber recondenses and freezes the moisture. After 24 hours, the vacuum is broken, and heated freon is pumped through the fins inside the chamber in cryopanel.

This melts the ice which has been collecting on the panel. This procedure is repeated at 24 hour intervals until the desired degree of dryness is obtained. Next, the materials are fumigated by the use of 12% ethylene oxide, 88% freon and finally the materials are impregnated with thymo to provide a residual anti-fungal chemical to serve as a buffer. The current cost of drying one chamber is $9,500. The Klein Law Library books were but one of the many collections dryed and sterilized by the G.E. Chamber. They have dried a valuable collection of stamps that had been stuck together and on one occasion 300 file drawers containing blueprints, etc. which had been under water for 14 hours.

Current work includes exploration of other chemicals to augment the treatment by de-acidifying the paper in books and records. The G.E. Centre has been working with the Library of Congress in their development of Diethyl Zinc as a mass deacidifier. The results have been very favourable. George Kelley told me later that the cost would be approximately $5.00 per book. Unfortunately, the use of the chamber at Valley Forge has been curtailed. This is unfortunate in that they have done a good service to many institutions in reclaiming their water-damaged documents. The Library of Congress will continue their experimental deacidification work, hopefully using a NASA chambers. One last point concerning G. Electric's drying process. They are doing vacuum-drying, not freeze drying.

Conservation Centre (For Artistic & Historic Conservaton), 260 South Broad St., Phildelphia, Penna. 19102 Tel. (215) 962-5474
The Director is Marilyn Weidner; Lois Price

This is a private institution that has recently been established. At present the staff consists of approximately 6 members which will gradually increase as their laboratory is completed. Of interest to me was the quality of their water supply used for washing and treating paper materials. There has been concern recently among conservators about the quality of water used in paper treatment. Several years ago the Library of Congress reported that their tap water was more beneficial in the treatment of paper artifacts than the use of high-quality deionized water and they discovered that if they added an amount of calcium to the water after it had gone through the deionizer this would rectify the situation. At the Centre in Philadelphia and in several labs in the Washington area Culligan is supplying the apparatus to provide water that is more beneficial to the paper. After the tap water has gone through the deionizing system it is then passed through a calcifier (cartridge calcium carbonate bed) or a bed of marble chips. Both George Kelley and Dr. Bob McComb of the Library of Congress told me that if one uses deionized water for washing paper documents and then deacidifies them afterwards then the calcifying system is not necessary. Katherin Eirk at the American Museum of Art simply adds an amount of Calcium Hydroxide to her wash water when treating paper.

Another point of interest at the Conservation Centre was the drying rack which they designed. It was on rollers and in construction similar to the type of cart used in restaurants and cafeterias for loading trays. The drying frames themselves utilized a nylon webbing material which is stretched on a wooden frame. The mesh is small enough to support the documents easily and to permit drainage. It is truly a super idea.

American Institute of Conservation: was holding their annual convention in Philadelphia. On demonstration were two Paper Suction Tables manufactured by competing firms.

These tables are of great use to the paper conservator in removing stains from paper artifacts. The vacuum created by the table draws the solvent being used to remove the stain down through the table rapidly and prevents the forming of stain rings which disfigure the artifact. These tables are useful in removing residual stains caused by pressure sensitive tape and they have a certain application in flattening documents and in lining documents and works of art on paper. The two tables on display were:

a) One developed by Nascor Technical Services, Inc. P.O. Box 706 Sag Harbor, New York 11963 (516) 725-0153 Bill Maxwell.
b) One developed by Process Materials. Corporation 301 Veterans Boulevard Rutherford, N.J. 07071 (201) 935-2900 Ned L. Miller, Sales Manager.

Ric Haynes. Photographic Archives of the University Museum of the University of Pennsylvania described a temporary storage method of retard deterioration of cellulose nitrate by freezing. His work draws upon the work of Henry Wilhelm, Klaus Hendricks and Walter Eldridge. The nitrate film is placed in the Kodak envelopes which forms a heat sealable pouch. Approx. 25 negatives can be placed in each envelope. All residual air is forced out. The envelope's ends are then rolled up and taped (or heat sealed) shut with a commercial freezer tape. They are then placed in an acid free box. The entire package of each box containing twenty to fifty envelopes, are then housed in a commercial freezer operating in a relative humidity of close to 45% at 9°F. Later before the envelopes are opened, a two to four day period of thawing is essential to ensure all is at room temperature when unpacked.

Library of Congress: Geography and Map Division: Richard Stephenson

The collection consists of some 3,500,000 maps, 43,000 atlases, the Sanborn Fire Insurance Vols. The Map Division utilizes 2" deep map drawers for storage, either 47 or 54 inches in width. They prefer the 54" width to allow for side by side storage. Documents are placed in acid-free tan bristol board folders the size of the drawers. They are inserted in the drawers with the open end to the back of the drawer and with the identification label on the front right corner, labels that are printed from the computer. There were some oversized 72" drawers for some of the larger maps. They prefer the Hamilton Map Cabinet. They have only a few large rolled maps. In the past maps (large ones) were cut up into small sections to fit into the drawers. No maps are laminated today, instead all maps are incapsulated in Type D, super clear Mylar.

Library of Congress: Research Laboratory: Dr. Bob McComb and George Kelley.

I spent an afternoon with these two scientists. George Kelley is proceeding with his experimentation with Diethyl Zinc for mass-deacidification purposes. With the closing of the chamber at Valley Forge they will approach NASA for the use of one of their chambers to continue their testing. George Kelley discussed such things as high quality water supply; titration procedures; aging of paper materials. They have a climate controlled room where they do their paper testing. Dr. McComb gave me additional advice on the fumigation - freeze - drying chamber we will be installing at the Provincial Archives of Manitoba. He stressed the importance of freeze-drying over vacuum-drying to prevent bleeding of inks.

Library of Congress: Restoration Office. Peter Waters, Restoration Officer

The collections of the Library of Con-

gress now include approximately six million volumes so brittle that they can only be preseved through microfilming. Some 60,000 of these have been specifically identified and are being filmed at the rate of 20,000 volumes per year. Peter Waters stated that they are not able to keep ahead. At the present time, there is no fully tested, feasible method for mass conservation treatment. Even if such a process did exist it would benefit no more than 65% of the brittle boks in library collections, since deacidification does not restore strength to paper already embrittled. There appears to be only two feasible preservation procedures for such brittle documents:

1) low temperature storage, and 2) microfilming to preserve the intellectual content.

Low Temperature Storage: They are thinking of storage at low temperature in ware-house-type structures or in underground caves where optimum temperature and humidity can be maintained. Paper scientists generally agree that for every 10 degrees C. the storage temperature can be reduced, the life of the paper can be approximately doubled.

Microfilming to preserve the intellectual content: Microfilming is far less expensive than restoring a book. Microfilming is more expensive than low temperature storage. There is, as I shall discuss later under National Archives, the question of the life expectancy of microfilm. Our experience with microfilm is limited to some fifty years or less, while our experience with paper goes back nearly 2,000 years. Ideally, then, the solution to the problem of perserving brittle and deteriorating books and documents would be to provide low temperature storage for all such materials. The Newberry Research Library's new storage facility will be at a temperature between 55-60°F. PAM is considering a temperature of 60°F for archival storage in its present renovation planning.

Flatpaper Division of the L.C. Restoration Division: Marion Peck Dirda was my guide. Of interest to me was their *Humidifier.* This consisted of a stainless steel tray (about 3x5 feet). A sheet of egg-crate was placed on the bottom and water was added to a shallow depth. Blotters were placed on top of the egg-crate and the document to be humidified on top of the blotters. A sheet of plexiglass is placed over the top of the tray. It is a very effective system.

Ultrasonic Welder: This is used for mylar encapsulation and was developed by Bill Minter and Malosh. One can quickly and effectively seal the edges of the mylar sheets with this device, and in addition one can work closely around a small document or documents encapsulated in larger mylar to hold them in place. The welder is expensive, costing c.$10,000.

Wool Felts for Flattening Documents: They use pure wool papermaker's felt for flattening documents after washing. The felts are expensive but effective.

*Calcified Water:*They also use the Culligan calcified water system.

Book Section of the Preservation Division of L.C. Tom Albro is the head of the book section. They utilize the accordian fold in sewing books so that no adhesive touches the backbone of the book. Tom likes to glue up to the backbone with starch paste and Robert Espinosa likes methylcellulose. They prefer alum-tawed leather, especially pig. They are using some sorroco leather (English tanned). The section will be doing less training in the future and more production.

NATIONAL GALLERY OF ART: 6th Street & Constitution Ave., N.W. Wash. D.C. Tel (202) 737-4215. Victor Covey, Chief Conservator; Ross Merrill, paintings; Shelly Fletcher and Kitty Nicholson, paper.

Storage and Matting Framing: Their paper conservation laboratory is nicely set up. I was interested in the storage of their works on paper. They mat in standard sizes, store in standard size solander boxes and frame in standard size frames. So there is a direct transfer from the solander box to the frame and back to storage in the solander box. Of particular interest was their method of matting. To lessen the degree of handling of prints and drawings and watercolours, they hang the work of art on a mounting material larger than the work of art and then hang this mounting material to the back of the mat. In this way the work of art remains permanently on the original mounting material, but this mounting material can be removed and then hung again on another mat without touching the hinging on the work of art itself. In their storage areas they have visual, heat and smoke monitoring and have a halon fire-extinguisher installation.

Air-Conditioning and Moisture Controls: Mr. Michaels, one of their engineers gave me a tour of their climate controls. It was a series of rather large rooms with particulate filters and air-wash rooms where the air is passed through a room with a system of sprays. This removes some gasses from the air, but its principle purpose is to humidify the air. They have 40 of these systems in the two sections of the National Gallery.

The Freer Gallery of Art: A museum of the Smithsonian Institution, National Mall at Jefferson Drive & 12th Street, S.W. Wash. D.C. Tel. (202) 357-2104. Tom Chase, Chief Conservator; Martha Smith, paper.

Here I had the privilege of visiting their oriental conservation studio. The famous Takashi Sugiura has retired and Ryo Nishiumi, a young Japanese, has replaced him. Since I use some of the oriental techniques learned from David Dudley and Bob McCarroll it was of interest to me to observe his work and techniques. He often leaves materials on the drying board to cure from 1 1/2 to 3 months. He works with a series of bamboo spatulas and oriental paste brushes. Their tables are quite low (c. 1 1/2 ft.) so that they work in a kneeling position.

The National Archives, Washington, D.C. Tel. (202) 523-3300. Dr. Shahani: Director of their Conservation Laboratory. Mario Lopez, foreman.

Lamination: They are still laminating according to the Barrow technique at the National Archives, whereas they have discontinued this practice at the Library of Congress. Although they are still using cellulose acetate plus a supporting material, they are also experimenting with a material called cerex. Dr. Shahani is not convinced that lamination as practiced by them is a bad practice. He showed me samples of laminated materials from 1938 which looked acceptable. Peter Waters told me that he and Dr. Shahani plan to do a lamination study and to go into the matter in depth. Silking was one of the first methods of strengthening weak and fragile materials. It was discovered that silked materials lasted for 30-35 years and then the silk would begin to degrade. Then this was abandoned and Barrow's method became

popular. Lately conservators are taking a second look at silking. There is some material that was silked 85 years ago at the Philosophical Society Library in Philadelphia that is in excellent shape. The feeling is that if the silk were washed first, and alum was not added to the paste, then silking could be a viable operation. Peter Waters pointed out that one of the laminators used by the National Archives laminated at a lower temperature than that used at the Library of Congress and that could account for the better condition of the laminated materials at the National Archives. The laminator used is a Wood, steam heated, begins the whole operation each time with a cold platten, is under 500 p.s.i. for approximately 4-5 minutes, partly heating and partly cooling. They also use the R.B. Laminator witha temperature of 375°F. for 20 seconds. The document moves through on rollers. They have another laminator which they now seldom use. It was designed for maps, is steam heated, but does not heat uniformly. This can be seen on the finished documents by the different graduations of colour. They deacidify with Magnesium Hydroxide and use a derivation of Methylmagnesium carbonate when they do non-aqueous deacidification. The National Archives is purchasing a V nyector Leaf-casting machine.

Storage of Maps and Documents: Mr. Taylor was my guide. In general they prefer the Hamilton Map Cabinets, but the 1" deep rather than the 2" deep drawers, which they feel makes for better handling; ine., one can pull out a bristol folder containing a map from the bottom of the drawer with ease because there is less accumulated weight from additional folders. They also had a great number of 72" map cabinets for their larger maps. They are doing some encapsulation, mainly I think because of the difficulty they have had with the large laminator.

Microfilming: The National Archives is greatly concerned about the lasting quality of microfilm. On 2-23-81 a press release was issued that stated that at the direction of Dr. Robert M. Warner, Archivist of the United States, the National Archives and Records Service has undertaken a comprehensive reassessment of microfilming as a preservation technique. An 18-member Archives' Committee on Preservation, headed by Dr. Norbert Baer of the New York Institute of Fine Arts, has established a sub-committee to study alternative forms of copying and their durability. Under a National Archives contract, Coulter Systems, of Bedford, Mass., is surveying transparent electro-photography (TEP) as an archival storage medium. A National Archives periodic inspection of a representative sample of its vast microfilm holdings of 750,000 rolls is underway. A small but significant amount was found to have reduction and ozidation blemishes (also known as "redox" blemishes or "measles"). These spots - microscopic in size - are sometimes found on microfilm stored in less-than-ideal environments. Dr. Warner points out that the bulk of our most historically significant documentation has survived under conditions that would jeopardize the life of microfilm. Before placing full reliance on microfilm, or any other non-paper medium, Dr. Warner feels that we need to be certain that it will save money and more important, that it will outlast the paper. It is clear from this that archivists will ponder a long time before they recommend destruction of original records.

Smithsonian: Washington, D.C. Conservation Analytical Laboratory. Dr. Robert Organ, Director

Under the administration of the Assistant Secretary for Museum Programmes, the function of the Conservation Analytical Laboratory is to serve the various museums of the Smithsonian. The Smithsonian is spread all over Washington. They advise on the suitability of environmental conditions, on conservation procedures, treat objects which present special problems, analyze museum objects or their materials, etc. Of special interest to me was their fumigation chamber where they use ethylene oxide (12% ethylene oxide and 88% freon 12). Dr. Organ is concerned with some of this gas passing into the atmosphere and feels that before long regulations for such emissions will be tightened considerably. He pointed out that one of the toxic gases (hydrogen sulphide) is present within museums and galleries themselves and is given off by the human body, and can be especially critical when the same air is re-circulated within a building.

John Hyltoft: 1111 N. Capitol Street, in charge of conservation lab of the Smithsonian Institute. This is primarily a bindery. They do a lot of lamination, using the Ademco laminator and some of the Ademco laminating materials (Crompton tissue). John marbles his own paper which is used on the Smithsonian bindings.

Museum of American Art: Part of the Smithsonian. Katherine Eirk is the paper conservator.

Here I examined the Bill Maxwell paper suction table. This was originally designed for her according to her needs. She uses it infrequently but finds it useful for her purposes.

Assessment and evaluation of the Short Term Study Tour in relationship to my present job and future professional development: As stated in the preface to this report the purpose of the Study Tour was to examine existing conservation laboratories, to study current facilities for fumigating paper artifacts and to dry them through a vacuum-freeze drying process; to discuss with various professionals the matter of brittle paper and the best means of preserving such materials; to observe methods of storing maps and works on paper; and finally to examine existing climate controls in various institutions.

From this report it is clear that these goals were fulfilled. In studying existing conservation laboratories, one important observation was the current approved method of providing high quality water to the paper sinks. On my return to Winnipeg, we have already implemented some changes in our plumbing specifications that will incorporate improvements in our own system. Wehave confirmed our proposed freeze-drying facility to be incorporated into our fumigation system by discussions of competent scientists from the Library of Congress. From speaking with such professionals as Peter Waters and Robert Organ we will stress even more the importance of cold storage for our permanent documents storage and see that such conditions in our storage areas are assured. We will turn over information to our archivist entrusted with the care of maps concerning proper storage of the same. It was disappointing not to discover a system that utilizes activated charcoal for air filtering during our study tour. My future professional development depends greatly, I think, on implementing the above-mentioned operations and techniques, and this study tour has contributed to such a development.

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