

Phased Conservation

Some personal reflections on the origins and influences underlying its concept; its relevance as a strategy for conserving paperbacks and other material deemed rare and of permanent research value in original form, and for such material exposed to electronic forms of capture.

ABSTRACT

How and in what way did the term phased conservation come about? Study of early book structures are at the very source of the concept and practical implementation of this form of conservation with the Florence Flood of 1966 becoming the initial springboard for later developments. Other factors such as the use of damaging restoration techniques in libraries and archives and programs based solely on single item conservation led to a search for non-invasive conservation strategies which are now generally described as "preventive conservation."

Phased conservation programs may vary from one institution to another but it is hoped that all of them are based upon the need to control and improve environments. These include protective collection housing for books and non-book material, and greatly limiting the amount of material to be given single item treatments. Such measures will increase the resources needed for a more global approach to collections preservation.

Phased conservation strategies will become vital during this era of digital capture where the item must be preserved but may seldom be accessed in original format. Modular custom environmental systems may eventually become a natural outgrowth and a cost-effective addition to the many forms of protective housings in use today.

The term *phased conservation* was first introduced by the Conservation Office of the Library of Congress during the mid-seventies. Throughout this period the word *phased* was being used throughout the library—to *phase in and out*,

a phased plan for this and that, phased managements strategies, and so forth.

PHASED CONSERVATION PHILOSOPHY

Phased conservation advocates use of longer time-frames for planning purposes and organizes sequences of non-invasive treatment. It also stimulates the creation of priority rating systems to ensure continued survival of collections for the longest possible time. It is a concept which recognizes that organic material cannot last forever, but defines preservation as the art and science of delaying the inevitable time when original material will have perished. It identifies the degree of deterioration and seeks to provide projections of future decay rates for a variety of bound and unbound material. It promotes response to these factors in a planned logical sequence of phases within the constraints of available resources. It protects material from unnecessary and sometimes damaging restoration treatments (shown to be one of the major factors in deterioration rates of certain book and paper materials that then require expensive corrective treatment), and from physical abuse and neglect on library shelves. Phased conservation provides an opportunity for long-term planning wherein present and future preservation technologies are evaluated as possible alternatives to standard conservation and restoration treatments. Above all, phased conservation can stimulate a new realism in assessing the current state of deterioration and can provide conservative alternatives to hasty or short-term actions which might otherwise be taken.

BACKGROUND: A BRIEF ACCOUNT OF CONSERVATION OFFICE HISTORY

Soon after my appointment as Restoration Officer in 1971, (later changed to Conservation Officer), I worked with the Preservation Director, Frazer Poole, to create a professional GS promotional series for book and paper

conservators that we would hire and train, to replace grades associated with Government Printing Office worker grades and similar grades that were not recognized as professional in the library or conservation communities. The GS Conservator positions were written to support the creation of the Book and Paper Sections of the Conservation Office. Donald Etherington was able to arrive several months before my appointment could begin, and played a key role in his position as Training Specialist for the next ten years. In this he was assisted by Christopher Clarkson, who during his five year tenure, was appointed Section Head of the Book Section of the Conservation Office.

WHAT WAS THE RESTORATION OFFICE LIKE BEFORE OUR ARRIVAL?

Prior to my appointment, the Restoration Office staff were engaged in a host of "invasive" treatments, including cellulose acetate lamination of manuscripts and atlases (with and without deacidification), and the lining of maps and posters with cotton cloth stuck with *Yes* paste. The latter unwise treatment would, with age, induce brittleness and acidic brownish brush stains showing through the backing supports. In-house binding repair of little used material and many other treatments were carried out without control or standards. Some of the staff were assigned to a small room above the Rare Book and Special collections reading rooms, to carry out the kind of repairs to bindings that can best be described as book butchery. One staff person spent his time oiling leather volumes, and several staff were working in the Law Library mending books by using magic mending tape. All was done without adequate supervision or adherence to treatment standards. There was also a guillotine within the Restoration Office Workshop for the purpose of preparing brittle books by cutting their spines off for the Preservation Microfilming Office. These are but a few examples of practices which had to be curtailed. The following story illustrates that serious problems could result unless the system was radically changed and administered.

A WORST-CASE SCENARIO

During my second consultancy visit to LC (before my appointment), while in Frazer Poole's office for a planning session, he received a phone call from the Chief of the Music Division. I could tell that this was serious for Mr. Poole's face rapidly changed color. He put the phone down and asked me to accompany him to the Music Division. We were shown a very rare music manuscript score that had been laminated by the Restoration Office. It had (originally) editorial markings in red ink by the great conductor Kousavitski. Page after page of this manuscript was literally a dark pink color with much of the editorial markings

smearred, vertical red streaks on many pages (caused as the sheets were removed from aqueous solutions), and with other editorial markings completely dissolved. An explanation was called for. Mr. Poole summoned the acting Restoration Officer to report back by the end of that business day with a full and detailed report of why this manuscript had been destroyed by his staff. No explanation was forthcoming since none of the staff "remembered" anything about the manuscript! It was obvious what had occurred. The whole manuscript must have been dunked into baths of calcium hydroxide and calcium bicarbonate, whereupon the solutions turned red. It was drained in a vertical position, dried and laminated, then returned to the Music Division where it remained unnoticed until requested by a reader.

Unfortunately deacidification and lamination processes were considered routine, and there was no system for prior testing of inks and related media. Later I was to learn that the lamination of maps and atlases was also considered routine and those treated in the Geography and Map Division were performed without deacidification. The temperature of the Barrow laminator was judged to be high, each working day, if the material darkened!

CREATING A BALANCED CONSERVATION OFFICE MANAGEMENT STRUCTURE

Once we had established the promotional GS series for book and paper conservators and formed two sections for Paper and Book conservation, we began hiring mostly untrained staff. I remember a particularly sleepless night spent in thinking about the consequences in the future which would result from the creation of professional book and paper conservators who would eventually reach the top of their grade, trained basically in single item conservation. The end result would be that the Conservation Office staff would only be able to deal with a microcosm of the enormous variety and condition of the library's collections that we were mandated to treat at that time, and our whole operation would soon cost one million dollars a year. What made the situation even more worrying was that our door was always open to receive anything that the Custodial Divisions chose to send us to treat, without any form of selection priority, or control on our part.

Faced with the overwhelming task of conserving the immense collections of rare and intrinsically valuable material in a great library such as the Library of Congress, with a maximum staff of twenty eight members, is like looking through a tunnel which has no end. A fully trained library conservator working in such conditions needs to have knowledge and experience of materials and an innate sense of the intrinsic nature and value of each item. The problem is that the single item conservation treatment approach, while important, is expensive and time-consuming and

does not provide attention to the vast majority of the collections. So we developed the concept of phased treatment, a concept that is a departure from single item treatment, but encompasses it, as and when future priorities are established.

It was also clear that we needed to establish a new philosophy, guidelines and a practical method for allocating our meager staff resources and additional staff position grades to respond to collections on a more global scale. To do this we had to augment the treatment of individual items with a response mechanism that addressed the conservation of whole collections most at risk. Above all we needed a system that would equitably govern the Custodial Divisions' selections. This need gave birth to the Point System. But first we had to demonstrate that phased conservation would work.

A basic Preservation Directorate policy called for all items being exhibited to be fully restored before they were displayed. To many of us in the Conservation Office this policy was flawed, if only because it would give a false perspective to the public about the real conditions of collections at LC, and that items chosen for exhibit were not those necessarily in the greatest need, therefore we should be spending our time on more important items. We achieved a breakthrough by proposing and developing the book cradle, where such materials could be displayed without need for prior major surgery or repair. The approach was to strengthen our ideas on phasing treatments over the course of time, as and when priorities were established for their full conservation.

One of the first collections responded to by our phased approach was the European Law collection consisting of thousands of volumes bound mostly in vellum and leather. Most were in such a dilapidated state that every morning one could move along the rows of volumes and sweep up fragments. This was a condition caused by neglect and physical wear-and-tear on the shelves. We eventually boxed this entire collection and made some attempt to estimate and record future treatments. The box design used became known as the *phased box*. These are not really boxes but wrapper cases which were designed to be used on dormant, rare and fragile collections only. Its utilitarian design is based on the traditional Japanese/Chinese wrapper cases where book volumes have "Oriental" stab-sewn bindings without stiff covers.

NEW CONSERVATION OFFICE MISSION AND THE POINT SYSTEM

Having successfully established and demonstrated that phased conservation was viable, and hired staff, initially as conservator aids, there were two major obstacles to overcome. We could not possibly respond to the total library collections, both rare and those described as "General col-

lections," so we needed a system that would provide the Curatorial Divisions and the Conservation Office the means to select and prioritize work on an equitable basis amongst the divisions we served, and also to limit our mission to the rare and special collections.

By 1986 we had achieved both goals. Our mission was officially changed - to respond specifically to the rare and Special collections only. We had a competent staff and added one more section, namely the Phased Conservation Section. I also introduced the Point System, a system whereby we carefully determine the actual amount of hours available to work on Custodial Divisions Book, Paper and Phased conservation projects and apportion this time as divisional budgets of time (one point equals one hour), equitably amongst the divisions and the exhibits program on an annual basis. This system forces the Custodial Divisions to make their selections with great care, and within their allotted annual points budget, knowing that there is limited resource in the Conservation Office, and it exposes the Conservation Office to meet its annual budget of time spent on treatments. This system has proven itself and established good working relationships between the Divisions and the Conservation Office.

At an international preservation conference held at the Biblioteca Nazionale in 1969 I met Professor Nordstrand, a distinguished scholar of paper history, who worked at the Royal Library of Denmark. He briefly described to me a system for allocating conservation resources at the Library and one that worked well to prioritize material sent for treatments in the labs. The Restoration system we had set up at the Biblioteca Nazionale also had a priority ranking system for treatment of the damaged collections. Initially there were five categories of value. Each of the damaged collection items was assigned one of these values, based on the age and condition of the material. This in turn set in motion various treatment schedules and methods to treat the material.

A few years after Don Etherington's appointment as training specialist in the Conservation Office, I supported an initiative for Don to undertake a European tour of conservation centers. I wanted to know more about the Danish system so he brought back some general information that eventually led to the creation of the Point System. But LC's Point System that I developed with the aid of a Macintosh computer was very different from the Danish model and is, I believe, a significant improvement on the value system we had used in Florence and the system used at the Royal Library of Denmark, because time spent on treatments is recorded as a percentage of staff paid hours with all other time recorded against specific "non-divisional" categories, with no room for hiding time! From 1988 to the present day the management of this system has been designed to work on a Macintosh computer using Microsoft Excel™ with its capabilities for relational databases, macros, and spreadsheets.

During my fifteen years in private practice as a partner of Roger Powell in commissioned designer binding and book & manuscript conservation (we were not good business colleagues), we had one employee for a year who recorded his actual time on work, and re-calculated it if he thought too much time was spent. This, when added up, was only a portion of his paid hours. Our business suffered simply because we had not calculated the overheads correctly to account for time not recorded between jobs or when more time had been spent and only a proportion of that time had been recorded. Therefore, at LC, I was determined that time recorded by the Conservation staff be accurately documented as a percentage of their paid hours so that every hour be recorded against a specific category or activity, avoiding any miscellaneous ways to hide time. Briefly explained, this means that every staff person and supervisor must record their time on ten pre-determined categories, equal to a full 40 hour week. These categories are: Divisional Points; Annual Leave, Sick Leave; Administrative Leave; On-site Administration; Observed Government holidays/LWP/Jury duty; Supervisors Administration; Research and Development; Continuing Education and Reserve Points. Each year the point system is calculated on the existing staffs paid hours and what is allocated as Divisional Points works out to be approximately 66% of the total staff hours.

INFLUENCES BEHIND THE CONCEPT OF PHASED CONSERVATION

Donald Etherington, Christopher Clarkson, Anthony Cains and I, in different ways, were schooled in what is now generally referred to as conservation binding, reversible book structures and the preservation of unique original book artifacts. It was not by chance that three of us were hired by the Library of Congress. We had all served the Biblioteca Nazionale in Florence, following the devastating flood of 1966, as conservation consultant specialists, I as technical director for the Restoration System for the first nine months and Etherington, Clarkson and Cains playing key roles in training staff and developing the methods and standards for treating the flood damaged material. All of us in one way or another were influenced initially by working with Roger Powell and Sandy Cockerell in the two foremost book conservation workshops in England. There were many other colleagues from the US and Europe who spent quality time assisting in this effort and I dare say at least three of them, Marilyn Kemp Weidner, Norvell Jones and Paul Banks, are with us today participating in this AIC program.

In late 1967, Anthony Cains agreed to move to Italy with his family and then directed with distinction the Restoration System at the Biblioteca Nazionale for the following three years. Thereafter, he was appointed Head of

Conservation at Trinity College Library, Dublin, Ireland. I rejoined Roger Powell and also became joint director of a research program with James Lewis at Imperial College of Science, London, sponsored by The Council on Library Resources.

It was the Florence experience that clearly formed the basis of much of our thinking concerning strategies and methodologies for conserving rare collections as non-invasively as possible.

We were somewhat surprised to find that the binding structures that survived in the best condition after immersion in the Florence flood waters were those constructed with little or no adhesive. These were mostly utilitarian limp vellum and paper bindings. Christopher Clarkson made a special study of these and many other unique early book structures, supported by grants from the Library of Congress and the Council on Library Resources.

Many innovative binding structures emanating from such studies, retaining the essence of earlier models, are now to be found not only at the Biblioteca Nazionale in Florence but also in many institutions world-wide. These and other studies have been the basis of the term "conservation binding," a term that was not widely recognized in the late sixties and early seventies. But it should be noted that such practices were being carried out well before the Florence flood by both Roger Powell and Sandy Cockerell. Roger Powell's conservation carried out on the Book of Kells, in 1953 was followed by my participation with him, restoring and rebinding the Books of Durrow, Armagh, Dimma, the Litchfield Gospels, and the Icelandic Scardensis and many other seventh, eighth century and later vellum manuscripts. All were constructed without adhesives to join text block to outer binding.

My earliest influence while a student at the Royal College of Art, London, before I became his partner, was the study with Roger Powell of the seventh century Stonyhurst Gospel according to St. John. This remarkable tiny volume, still in its original binding, measuring 13.5 x 10 x 2 cms., is the only remaining artifact in original condition in the Western world of the Coptic tradition of book making. It is remarkable because it has avoided the ravages of restorers. It also gave me my very first look at an original seventh century binding. It too was constructed without the use of adhesive to join the text block to its outer binding.

Because of this background experience I arrived at LC determined to find ways in which we could avoid adhesives as much as possible in the treatment of bound and un-bound material. I was also determined to avoid unnecessary restorations, especially for material that could be preserved by a series of phased treatments. That is why, at LC, we abandoned lamination, the lining of posters and related processes and replaced them with polyester film

encapsulation and other non-invasive methods, and created Phased Conservation as a viable specialty subject.

Phased conservation has been an unqualified success at the Library of Congress made possible only by the highly creative, imaginative and skilled staff we were fortunate to hire and train over the years. Collectively and individually they have developed many ingenious methods for addressing the needs of collections at risk and they have shown great insight into the practical meaning of phased conservation and what their role is in helping to address a more global response to the deteriorating collections at LC. I hope that at a future AIC conference one of the gifted staff from the Phased Section will present a detailed illustrative paper of their work and its impact on LC's Preservation Mission.

PHASED CONSERVATION IN THE ELECTRONIC AGE

A phased approach to preserve collections at risk has now been adopted around the world and we have begun to see greater emphasis on non-invasive treatments and understanding of the importance of prevention. Total environmental conditions and storage are now considered the first line of defense to retard the rate of deterioration, at least amongst the conservation professions. Unfortunately most of these obvious solutions are not exactly new and are mostly low-tech. They may not be given the administrative and funding support they deserve because they have to compete with the seductive attractiveness of new technologies, such as electronic and digital capture and retrieval systems, which can provide greater access to library collections, world-wide, whether or not there is reader demand for them. But to expose rare and historically important items, particularly bound items, to these forms of alternate formatting is very expensive, and can cause great harm to original material. We must remain vigilant in seeing to it that such original rare materials of permanent research value are not discarded, or left to rot in poor environments, and that funds are made available for their safe-keeping.

Many phased conservation programs have been established where no previous preservation program existed. Most of the practices are based on the physical protection of items in appropriate quality housing formats because they can provide a better protection and microclimate for each item, or collection of items, than would be possible in existing conditions. This approach has been very successful for the protection of many artifacts, including works of art on paper.

To design protective enclosures for fragile books and material in sheet format is the principle upon which the Conservation Office of LC has acted to protect many large collections at risk, in normal environmental conditions.

The Dime Novel and Armed Services collections are examples. They represent the most severely brittle of all collections in the Library which are now preserved in individual protective enclosures after they were microfilmed. Yet the practice of boxing books has not been universally accepted, if compared with the storage of archives, prints and drawings. Why is this? It may be that librarians worry about space or instant access to the visual reference of individual book spines. But book boxing has been a long and very successful practice in traditional Japanese and Chinese library history. Whatever the reason, perhaps the biggest stumbling block has been the amount of space needed to box a book. Until recently, this may have been a justified concern.

PRESERVATION OF FIRE-DAMAGED MATERIAL.

In 1988, the Library of the Academy of Sciences (BAN), in St. Petersburg, Russia, suffered the most devastating library fire of this century. One of the rare book collections severely damaged was the Carl Baer collection of approximately 180,000 17th, 18th and 19th century volumes. For the first five years following this disaster, the Library of Congress was involved, (with help from funding from the Readers Digest), with the work of recovery. During the reclamation and assessment stage, it was estimated that the work of restoring each item would require fifty restorers over forty years to complete. And, what would happen to the main body of the damaged volumes waiting to be restored and arranged on the shelves in such a dilapidated condition? Such a prospect was daunting, to say the least, and so the idea of phasing the work over a long period of time, based on priority need, especially reader demand, became the only viable option for this severely damaged collection. Prior to the fire, this historically significant collection had a history of low reader demand.

The phased program at BAN was originally conceived to provide individual, protective, hand-made, phased wrapper containers for each volume. The majority of these volumes lost their spines and covers but have been organized in shelf order. Providing individual physical protection with an improved micro-climate housing in an otherwise less than satisfactory macro climate, seemed at first to be a straight-forward task. Unfortunately the damaged collection was shelved in a room that had no possibility for expanding shelf space needed for the addition of traditional book boxes, including phased wrapper cases. Analysis of the first 10,000 books measured at BAN showed that there was no consistency in standard book sizes and this ruled out making die stamped boxes, for there would have been a need for over 8,000 individual dies, costing in excess of \$100 per piece!

Finding a way to make 180,000 individual custom fitting book boxes, in order not to require additional shelf space, seemed an impossible task. Even LC's hand-made phased wrapper cases strong enough to support the volumes would require in excess of 100 meters of additional shelving. In any case, I decided that the wrapper phased case would not support the volumes from twisting out of shape on the shelves and that a clam-shell box design would be the best choice, but there was no technology at the time to make custom fitting boxes, and hand-made boxes of this type would require even greater amounts of shelf space.

The answer to this apparently unsolvable problem came with the understanding that because the volumes had been substantially soaked with water, dried and cleaned, their original thickness had increased. So we re-measured 60 volumes, chosen at random from the 10,000 list of measurements, with the addition of a 1.5 kilogram of weight resting on each volume, and found that the average compression between the measurements with and without a weight was 4.5mm. All that remained was to find a technology for making clam-shell boxes that would not increase the thickness of each volume more than 4mm!

To solve BAN's problem, a new computer-controlled boxing manufacturing system was invented by my son Michael and daughter-in-law Carmen, now known to most of you as Custom Manufacturing Inc. (CMI). (Now that I am retired from LC I can talk about their involvement and am very proud of their efforts!). Each book box is produced automatically, using high quality E-flute corrugated board stock which adds no more than 3 to 4mm to the thickness of each book volume, custom fitting each book to within 1mm of tolerance. 11,500 book containers were made by them with this technology in the United States and delivered to BAN for quick assembly in shelf order. The result of this work showed that less than *one meter* of additional shelf space was needed to house 11,500 damaged volumes. This technology can produce at least 200 individual and infinitely variable sized book containers per day, about 50,000 per year, inexpensively, with one dedicated operator. BAN now has a CMI boxing machine, provided by a grant from the Getty Grants Program Office, so that the work of boxing continues on site.

During the measurement and boxing phases of this operation, bibliographic data, condition reports, and future treatment priorities are recorded in a unique database system devised by a computer specialist at BAN and administered by the curator of the Baer collection, Dr. Irina Belyaeva. This systems phased approach to the challenging problem presented at BAN has prompted the Library Director, Dr. Valerii P. Leonov, to propose that phased conservation be included as a subject of Russian Library Science.

PRESERVATION AND ACCESS, VERSUS PRESERVATION ON DEMAND

The development and use of "new" technologies need not and should not, be restricted to electronic systems. We need to consider the appropriateness and cost-effectiveness of custom-modular-environmental storage systems, where the rate of deterioration of original material can be controlled more efficiently. If we design storage sites to provide electronic access to and from main facilities and at the same time provide the best environmental protection for the material, we would have the opportunity to use known and yet-to-be-tested technologies for achieving this.

A variety of conditions to suit the requirements of diverse materials could be provided by *self-contained modular custom environmental units within a storage site*. We could look at a number of systems that might be useful and compare them to obtain the best return for the dollar, including, for example, those having low temperature and humidity, controlled low moisture content, non-toxic chemical modifications, inert gas, and oxygen-free environments. These, and other ideas are all worth revisiting with a fresh mind.

Methodologies such as these if based on preventive preservation and cost-effective approaches, can be part of a long-term strategy if additional preservation treatment of format conversions is administered within the concept of *preservation on demand*. Significant demand for access to items or collections would trigger expenditure of preservation funds to make them available, but money would be saved, in the long-run, because a preservation response would be *controlled by user demand and not by pre-set programs administered by fixed annual operating budgets*. An example might be the large number of brittle book materials to be found in most American research libraries. To reformat such material onto microfilm has been the standard practice but the scale and high cost has defeated those who staked their reputations on this demand for alternate re-formatting.

What is this demand? It is perhaps based on the mistaken notion that brittle material will not survive in original format, are "endangered," "at risk," "will not survive," "a race against time," "loss though acidic decay"? I think it fair to say that these statements are designed to dramatize a situation, which can lead to funding support, rather than depict an accurate reflection of the state, and rate of collections deterioration. There is very little hard scientific evidence in support of such statements. For brittle book material, and other fragile collections, can be maintained *for an indefinite period of time* so long as they are provided with appropriate close-fitting enclosures, undisturbed in a controlled environment, and reader access to them is limited. Reader demand for brittle book material is probably low in most libraries because publication dates would be over forty years old.

THE ROLE OF THE SCIENTIST: MICROBIOLOGY AND DEACIDIFICATION

It may be interesting to comment upon two apparently irreconcilable approaches to preservation science at the Library of Congress and the Russian Library of the Academy of Sciences, St. Petersburg. In Russian libraries there is little concern about acidity and brittle paper. Their focus is on microbiological research which leads to setting set standards for fumigation treatments of both single items material and large collections. (We would not approve of some of these treatments).

Approximately fifteen years ago LC had a policy of treating all incoming material, especially foreign material, with ethylene oxide fumigation systems. This is now banned. LC has been without a fumigation method since that time, yet there has been no serious or uncontrollable problem with mold or insect infestation.

The focus for many years has been on *mass deacidification* at LC and it has dominated the preservation strategy at the Library at the expense of other much needed preservation initiatives. Millions of dollars have been spent on research and development. This program faltered many times but now LC has settled on a commercial system that falls far short of their original goal of treating one million books per year. I believe that a more comprehensive program is now needed in which deacidification plays an important part, but is by no means considered the only effective methodology for retarding the rate of collections deterioration.

The macro and micro environments are very important to consider and are the least studied or understood. They relate to temperature, moisture content within collections, relative humidity, airborne particulate and gaseous pollutants that may emanate out of and into the material from the storage - macro climate. Controlling these environmental conditions is, I believe, far more important than placing ones trust in an invasive treatment such as deacidification, although there is a definite place for deacidification in the overall preservation scheme of things.

In comparison with the focus given to mass deacidification in the USA, I have often wondered why it is that US library preservation scientists are not so interested in microbiological research and why Russian library scientists are not so interested in deacidification! My observation is, that in both cases, the scientists involved with assessing the major problems of library deterioration arrive at conclusions which are directly proportional to their scientific background specialty. In the US it has been the study of the chemistry of paper-based material that has led to the developments of mass deacidification, whereas in Russia the focus has been on microbiological deterioration of paper that has led to chemical fumigation systems. *I think this is a very important comparison to consider when evaluating whether or not we have managed to attract a broad range of sciences to help us*

learn more about our preservation problems and to design systems to help solve them.

MATERIALS SCIENCE

When dealing with book material, we are faced with a three-dimensional object that is comprised of composite materials which combine together to form a moving mechanism, designed to human scale. Undoubtedly there are some laws of physics to apply here, which may be as important, perhaps more important, than limiting our studies to just one part of this mechanism, such as the chemistry of the text block or its vulnerability to microorganisms. Books are objects that are used by human beings and as such are subject to various abuses, careless handling, neglect and being placed in inadequate storage conditions. Scientists specializing in materials science would, I hope, take this background into account when designing laboratory testing programs, that as near as possible, replicate these 'real-time' conditions and abuses.

We need more comprehensive research methods for discovering exactly what the state of the collections really is, and why, rather than limiting tests to laboratory conditions where a limited number of standard test papers are used to study the effects of deterioration and treatment. Such tests rarely come close to replicating the real conditions of a huge variety of book papers in a major research library, many of which are in weak condition, through physical damage and chemical decay.

CHALLENGES TO BE FACED AND DEALT WITH

We must decide what to do with the brittle books that will not be helped by any form of mass deacidification, re-binding, or by existing microfilm and digital capture systems simply because of prohibitive cost of dealing with enormous quantities and also because the majority of this material has extremely low reader demand. If the material is classified as "permanent research collections," meaning that they may not be discarded, then the only cost-effective approach is to greatly improve collections maintenance, physically preserve them in protective enclosures and isolate them in state-of-the-art environmental conditions.

We need to study the advantages of remote controlled storage sites for low use material which could be accessed by electronic means, if the need for access is justified.

AN IMAGINARY PRESERVATION STRATEGY

1. Start by identifying, tagging and physically protecting brittle book material in their existing shelf locations by using precisely fitting archival quality book boxes that provide a sound microclimate, and then re-locate them to a special storage facility. I imagine such a facility could be

named the "The Strategic Preservation Technology and Access Center." Brittle material would be physically protected and therefore preserved in a suitably controlled environment designed to significantly slow the rate of deterioration. They would be accessed only if the demand for access became significant, which is highly unlikely. Re-formatting policies for this type of material would be based on *Preservation on Demand* and not by routine microfilming or electronic re-formatting policies. In that environment these volumes would remain in their original brittle condition but preserved for an indefinite period of time. The expectation is that such material will continue to have lower and lower reader demand.

This imaginary Strategic Preservation Technology and Access Center would be under one management control and would combine all service oriented units, including Research and Testing, Recorded Sound and Digital technologies. Existing technologies, such as microfilming, will almost certainly be replaced by digital capture and retrieval systems with the added advantage of being able to output to the user who could choose a retention preservation format. This could include hard copy, microfilm or online access. The advantage of placing all these technologies together under one roof and management is that as new and improved methods are found and tested they can gradually be incorporated as tools in re-formatting, *providing that the original material is never discarded.*

Re-locating the four million brittle books and service units in the Library of Congress from the main Library to this Strategic Preservation Technologies and Access Center would create approximately *ninety linear miles* of much needed shelf space in the main Library.

2. Use mass deacidification for new book material and selectively treat the strongest papers in the non-rare retrospective collections, to provide the greatest possible benefit and insurance for the future.

3. Greatly reduce the number of re-binds where there is evidence of low reader use. Use archival book boxes for low use and fragile material to provide extra external strength and support of these in their shelf arrangement.

4. *Environmental monitoring section*

Use micro-chip technologies with computer interface to measure temperature, moisture content and gaseous contaminants emanating out of and into book material, books in boxes, cabinets and storage areas. This kind of technology could provide instant and important access to information about what is actually occurring in the collections.

These are but a few basic ideas that I submitted to the Preservation Directorate, prior to my retirement from LC. I still believe that in the long run such approaches could significantly and cost-effectively slow the rate of deterioration to manageable proportions. If even a few of these measures were enacted, we could rightfully claim to have

control of our preservation destiny. Will a strategy similar to the one I have broadly outlined ever come into being at LC, or indeed at any other major library in the United States? I doubt it. In one sense I am somewhat pessimistic because there are other more attractive programs on the horizon and I am sure they will be packaged with a high-tech ring receiving maximum funding support. If this happens it will reduce the amount of administrative support and funding for other low-visibility preventive measures that would provide maximum preservation at the lowest cost.

TECHNOLOGY FOR TECHNOLOGY'S SAKE

The technology revolution is upon us - digital technologies, and powerful networks that can provide universal access to our collections. Just imagine the possibility of carrying in your pocket a micro-computer chip that can access, for instance, the whole of the New York Public Library! Such an idea has been seriously considered in our apparent thirst for information. What will we do with all of this information? Why not wait a few years until there is an option to buy a small micro-chip implant behind the ear, wirelessly connected to the electrical impulses of the brain? We could plug into any information imaginable and become instant experts on any subject! But, we would probably discover that humans would have an increase in suicides, brain tumors and schizophrenia!

We are living in an age where we are being swamped with on-line access to information. But we must be aware that all of this information is machine-readable only. We will therefore be faced with trying to preserve the source of this machine readable data.

The compactness of computer controlled media means that more and more information will be stored on smaller and smaller devices. If we attempt to transfer original rare book material and related non-book material to this form, there will be great and, in many cases, irreversible damage done to the originals, unless ways are found to develop camera systems designed to scan books in a partly- open position, fast and inexpensively.

At the present time capturing original material in machine-readable form is as labor intensive, and therefore as expensive, as preparing material for microfilming. In addition, these digital and computer devices and related technologies are *only* machine-readable. This means that we must prepare ourselves to preserve all hardware, software and up-dates to these machines, the operating manuals and the skill to diagnose hardware and software problems (as these will undoubtedly occur), in order to preserve machine-readable formats. This is already a problem.

How many of us, I wonder, have machine-readable reel-to-reel sound recordings, originally made on half track, or

quarter track at 1.7/8 speed and now have no means to play them, because we have replaced the original recording machine with a much better hi-tech. one? Unfortunately this high tech. recorder does not play at the slower speed. Finding one that does is like looking for a needle in a hay stack!

We are informed that digital technologies are “the only game in town” for the foreseeable future. It provides universal access to our collections and saves us enormous amounts of library space. How much space I wonder? If we are interested in preserving the means to access and to read machine-readable data, then we will need substantial amounts of space, to house and maintain the machines and organizations necessary to key access and prevent them from becoming redundant and unreadable.

I predict that in fifty years time or less, we will discover that we have a preservation problem on our hands that makes our existing paper-based material preservation pale into insignificance. The technocrats would have us believe that anything preserved in digital formats will last forever and that as systems are replaced by newer ones, we can transfer previous digital formats to the new forms. But, this is exactly the claim of those who proposed microfilming as a means to re-format paper-based materials. The means to do this has always been there but it is the enormous amount and cost of re-formatting that has, and will defeat us, because there will never be sufficient funds to constantly transfer information from one storage system to another.

In a Newsweek article July 20, 1992, Robert J. Samuelson gave us some insight into what we are being subjected to in the electronic age. He wrote:

“Technology in reverse: We are finding costly and complex ways to do what was once simple and inexpensive. Let me introduce you to retarded technology. It's the opposite of advanced technology. Advanced technology enables us to do useful things or to do old things more efficiently. By contrast, retarded technology creates new and expensive ways of doing things that were once done simply and inexpensively. Worse, it encourages us to do things that don't need doing at all. It has made waste respectable, elaborate, alluring and even fun.

“Just the other week, Newsweek reported a boom in electronic books. The idea is to put books onto discs that you can plug into your customized book-displaying computer. Here's a swell idea of retarded technology. On the one hand, you can buy a \$900 or \$9,000 book-reading computer that you can feed with 20 discs of your favorite books. Its cumbersome. If you take it to the beach, it gets clogged with sand. You can't use it as a pillow. If it slips off the kitchen table, it smashes. On the other hand, you can buy an old-fashioned book. It's cheaper, more mobile, less fragile and more durable. You can lend it, even to casual friends. If you don't like it, you can stop reading without hating yourself for ever buying it. Losing it is not a traumatizing event.

“The pro-technology comeback is that computers will someday compress entire libraries onto chips or disks and, thereby open vast vistas of information to almost anyone. The trouble with this is arithmetic and common sense. A school library with 2,000 books can theoretically serve 2,000 readers simultaneously. A School library with one computer terminal that can call up 200,000 books can serve only one reader at a time. The computer creates a bottleneck. Sure, the library can buy more computers, but they're costlier and bulkier than books. Finally, there's common sense: Do most people really need access to, say the entire collection of the New York Public Library?

“The survival of stupid technology is ordained by ego and money. New technologies often require a hefty investment. Once investments are made, they can't easily be unmade. To do so would be embarrassing. Old and inexpensive ways of doing things are eliminated to help pay for new and expensive methods. Retarded technology becomes institutionalized and permanent.”.

SUMMARY

I believe that the deterioration of library material is a manageable challenge and not a doomsday inevitability, providing that we make sensible and realistic decisions. These decisions need to be based on a thorough understanding of the complex nature of our collections, how they are used and abused, how often they are used, how they are stored, and how they are being affected by micro as well as macro environmental conditions, at what rate they are deteriorating, and under what conditions and circumstances can this rate be slowed and stabilized by low-cost measures.

The key to all of this is in knowing what proportion of the collections are used heavily, infrequently, or very rarely. Preservation actions should be designed to address these important use factors, rather than seeing all collections alike and treating them all in the same way with a mass treatment technology.

Perhaps the biggest threat we face in the future is from administrative policy decisions that favor new technologies over existing ones, in so far as this may reduce funds and support for preventive preservation of material in original form.

We need to develop a comprehensive and balanced preservation strategy, designed to provide maximum cost-effective preservation to the collections that will remain at risk if we continue to look for miracle solutions or place our destiny only in new and untried technologies.

Preservation is very serious business and should be treated as such by all who have responsibility in this subject. In a democratic society, there should be room and encouragement to raise and debate preservation issues especially those that may be controversial, or provocative, without fear. I believe that such debate is healthy and useful, particularly for those organizations, that, because of national status and

position, are looked up to for preservation guidance and leadership in this country and indeed throughout the world.

It is my personal belief that for far too long, the public has been subjected to partial truth and not the whole truth about the state of our collections and the means to preserve them. We should constantly remind ourselves that the truth is to be found *in the collections* and not in the isolated confines of a laboratory, especially if laboratory studies are not designed to replicate conditions which exist in a population of books on shelves in a global environment. There is still a very great deal we do not know or understand about the deterioration of paper-based material. I hope that we can have the wisdom and honesty to admit this.

What lies ahead in our search for meaningful solutions to the preservation of library and archive material? We might first define what it is that we are struggling to preserve, in what manner and in what time-frame, and then develop new philosophies that might be based on the Bauhaus concept of "fitness for purpose," on policy approaches based on "preservation on demand" and "preventive preservation," including the means to monitor and control environmental conditions automatically.

We have a golden opportunity to begin to recapture the spirit of discovery which has made this country great. There is plenty to discover and rediscover, but we need to be given room and the time to turn discovery and rediscovery into realism. "Fitness for purpose" is a somewhat simple concept. Keeping our preservation challenge simple, is perhaps, the greatest challenge of all. There is still hope and time for us to make the right decisions so that by the turn of the century we can rightfully claim control over our preservation destiny.

As we look to the future with some optimism, let us hope, as a scientist friend of mine once remarked, that we might constantly remind ourselves on a daily basis, to ask questions of each other: "What are we doing? Why are we doing it? Do we need to do it at all? Should we change the way we have been doing it? If it isn't seriously sick and does not have to be used frequently, don't fix it, especially if it can be adequately preserved and maintained by non-invasive means."

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