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Addressing Cellulose Acetate Microfilm from a British Library perspective

by HELEN SHENTON

INTRODUCTION

This paper is about cellulose acetate microfilm from the [British Library](#) perspective. It traces how acetate microfilm became an issue for the British Library and describes cellulose acetate deterioration. This is followed by details of what has already been done about the situation and what action is planned for the future.

THE PROBLEM: CELLULOSE ACETATE DETERIORATION

In order to tackle the issue it was important to be clear about what cellulose acetate deterioration is, and what can be done about it. Cellulose acetate replaced cellulose nitrate in the late 1940s and was called safety film. This was in use until the mid-1980s, when it was replaced by polyester. One definition of cellulose acetate film from the Image Permanence Institute's Storage Guide for Acetate Film has not been bettered: "Cellulose acetate film is a modified form of cellulose, and can slowly decompose under the influence of heat, moisture and acids. Cellulose acetate is subject to a slow form of chemical deterioration known as 'vinegar syndrome'. The main symptoms are a vinegar-like odour, and buckling, shrinking and embrittlement of the film. As well as being temperature and relative humidity dependent, there is another important factor to know about vinegar syndrome: the acid-trapping factor. The process of deterioration generates acetic acid or vinegar inside the plastic film base. Acidity can either leave the film by evaporating into the air, or can become absorbed into storage enclosures, or, it can be trapped, prevented from escaping by the storage container. If trapped, it greatly accelerates the rate of deterioration." ([Reilly, 1993](#))

A major characteristic of cellulose acetate film is that deterioration is not even: it is not linear. The first sign of deterioration is the smell of vinegar, and that is symptomatic of acidity, which gradually builds up. After a certain point this increase in acidity becomes rapid and large amounts of acetic acid are produced. The reaction rate then feeds on itself and speeds up, and this is known as autocatalytic behaviour. The characteristics of cellulose acetate deterioration are shrinking and cracking, embrittlement, bubbles and crystalline deposits or liquid-filled bubbles on the emulsion. Film in such a state cannot be used: it has become an unusable surrogate.

WHAT CAN BE DONE?

Essentially the film has to be prevented from reaching the autocatalytic point and so preclude any autocatalytic behaviour. It is therefore necessary to assess where the cellulose acetate is on the deterioration graph, using acid detector strips (AD strips). Temperature and moisture can be controlled by means of the microenvironment. This refers to the local, small scale, immediate surroundings of the housing, including the enclosures, the can, the tin and so on. Then the macro environment of the larger scale storage conditions can be managed according to appropriate national standards.

The British Library began to examine the condition of its cellulose acetate film holdings in response to internationally expressed concerns about disposal of hard-copy newspapers some years ago. In line with IFLA (the International Federation of Library Associations) guidelines, the British Library had a long-held policy to dispose of foreign newspapers that had been microfilmed. Under the IFLA international agreement each country undertakes to look after its own country's newspapers. For the BL that means not only UK newspapers but Commonwealth newspapers too, for which the British Library has a legal responsibility in perpetuity. In accordance with the guidelines, there is a disposals policy whereby the first step is to offer the non-UK newspapers to other national or major libraries. Newspapers have gone, for example, to the Catholic University in Leuven, who wrote that "Our library has been completely destroyed twice during this century, so these volumes are a more than welcome addition to our collections." There were similar reactions from Italy, the Netherlands, and the former republics of Yugoslavia, for the donation of newspapers to replace those destroyed in the Balkan crisis. So there is a whole system of offering the newspapers to other libraries. Only after that sale will be considered.

In July 2000, an article by Nicholson Baker appeared in the New Yorker expressing concern about the disposal by American libraries of original hard copy American newspapers once the originals had been microfilmed ([Baker, 2000](#)). In an earlier piece of journalism the British Library's disposal of original American newspapers after microfilming had

been brought to public attention. So the disposal of original newspapers became a hot issue and quite an emotive one: the strap line under the title of the New Yorker article read "The author's desperate bid to save America's past."

The British Library is a public institution and is legitimately open to public scrutiny, to public accountability and to press scrutiny. A lot of public debate ensued. There was also some debate and concern amongst the British Library Advisory Board and in the wake of all this, the British Library Board suspended the disposal of foreign newspapers. The Board did not reverse the policy but simply suspended the programme of disposal of foreign newspapers.

THREE SURVEYS

The first action undertaken was a review of the condition of all the British Library's microfilm. Three surveys were eventually carried out: the first was prospective, the second was retrospective and the third was specifically about cellulose acetate. In addition an International Round Table of producers of microfilm was convened, both commercial and institutional. All this activity has been taking place over the last five years.

Following suspension of the disposal process the British Library carried out a prospective survey of the 503 titles of newspapers which were due to be disposed. This was followed by a retrospective survey of the microfilm of foreign newspapers that had already been disposed (comprising 1475 titles on 2.6 million feet of film). It was at this point that it began to emerge that there was more cellulose acetate than originally thought. Lastly a third survey was undertaken specifically quantifying the cellulose acetate legacy at the BL. With these results an options appraisal was carried out in 2003 to examine what should be done. Currently in 2005 a reformatting pilot is being carried out together with a review of strategy.

The first survey, in 2000, was prospective. A condition survey of microfilm of foreign newspapers that were due to be disposed was carried out. The 503 titles equated to just over a million feet of film. It was found that 10% met the criteria for the best preservation microfilm and highest visual quality standards. This was a very rigorous assessment, and it encompassed issues about the visual quality of the original newspaper and the usability for readers of the microfilm. It thereby included a subjective element in the assessment of visual quality as well as physical condition assessment. Following this exercise a retrospective survey of the microfilm of foreign newspapers that had already been disposed was carried out. This was nearly 1500 titles which was three times the amount that were due to be disposed, comprising just over two and a half million feet of film. A 10% sample was used, and the survey method refined to the Image Permanence Institute's (IPI) assessment of four categories of stability. This meant that there was much more emphasis on the physical condition and less on the visual quality of the microfilm. The findings about the condition were that just under half were 'good' with no deterioration; just over half were 'fair to good' where deterioration had started; 0.2% were 'actively deteriorating'; and there were none that were 'critical'. The key point here is that 0.2% of 'actively deteriorating' microfilm meant just one film.

The other thing that came out of this survey though was that it was finally established that the library's holdings contained more cellulose acetate microfilm than anticipated. We had continued using cellulose acetate longer than we thought which is a characteristic of larger institutions that has emerged during the Round Tables. So, the third survey was of the British Library's cellulose acetate microfilm holdings specifically. There are about a quarter of a million reels, of which just over 100,000 are of newspapers, and an eighth of a million are for the rest of the BL's collections. We did a 1% sampling, which amounted to just over 2,000 reels between 20 and 40 years old. Relating this to the time when cellulose acetate was in use (1940s to 1980s) the working assumption was that with a 50-year lifespan, there was roughly a 10-year window in which to address the care of the cellulose acetate to prevent it reaching the autocatalytic point as described earlier.

OPTIONS FOR ADDRESSING THE ISSUE

The first two options which were defined were reformatting or duplicating. This meant either some method of transferring the acetates onto another stable medium like polyester or going back to re-film the original hard copy. A third option was digitisation, which would mean digitising the hard copy and then producing computer output microfilm. The fourth possibility was to purchase film again if it was available. This would mean dealing with the fact that some of the microfilm was produced within the BL and some has been bought commercially. Option five was a hybrid combination of reformatting and duplication, or re-filming or digitisation and purchase. The sixth option was to improve the environmental conditions and the seventh was to do nothing - and that was not an option.

We then started to put some financial figures to the whole process and drew up an outline table of costs, which shows that all solutions would have significant cost implications:

	options	Costs
1	reformat/duplicate	£5.6 - 6.73 million
2	re-film original	£29.3 – 34.4 million
3	digitise	£8.37 – 2,800 million
4	purchase	£6.9 – 18.9 million
5	hybrid of 1+2,3,4	£7.7 - 23.1 million
6	environment	£1.5 million +
7	do nothing	£0

Where the newspapers are concerned, it has to be borne in mind that the British Library has been microfilming for 35 years, and in that time has microfilmed roughly about a third of the collection so far. The sheer scale and the cost is a significant issue, and the preferred option in the first instance was a combination of options one and six. This would mean some sort of reformatting or duplicating, entailing transfer from acetate to archival polyester, carried out either internally or externally. Then the conditions both of the microenvironment and the macro environment would be improved. At the same time it was hoped to be able to take up digitisation opportunities as and when they arose for newspapers or other material. The aim was to try to arrive at a balance, or - as Andrew Robb from the Library of Congress at the Second International Round Table elegantly expressed it: “reformatting for the few and cold storage for the many.”. What was under consideration was a combination of those two.

In terms of the macro environment, there is a major storage programme at the British Library. A proposed new building will house between 260 and 270 kilometres of storage for the printed collections. It has a very challenging timescale and challenging funding. The decision was taken early on that the building would have one climatic zone. Right at the beginning of the project all the storage needs for the British Library had been looked at, including having different climates within a storage programme. It is going to be high density, high bay, fully automated storage, with one environmental specification of essentially British Standard 5454:2000. This storage programme is a major project, which is addressing many of the storage issues of the printed material at the British Library, but it is not the solution for the cold storage of the cellulose acetate microfilm. The options for cold storage, both internally and externally, are being investigated.

NEWSPAPERS AS PRIORITY

So what is being done this year with regard to cellulose acetate microfilm at the BL? The response of the British Library in terms of the responsible stewardship of its collections has been to redirect 6% of the external preservation budget. This has been committed over five years to addressing the cellulose acetate legacy, making newspapers the priority. Effort will concentrate on just over 100,000 reels of newspapers, for two reasons: firstly, the external emphasis that was placed on newspapers when all this was catalysed five years ago, and secondly because of the inherent instability of newspapers as a physical medium. A reformatting pilot has been carried out and some micro-environmental improvements have been made. In addition advantage has been taken of a [JISC](#)-funded (Joint Information Systems Committee) digitisation project of newspapers 1800 to 1900. Concurrently the options for improving the environment are being examined.

The Library has also engaged in external-facing awareness-raising and international collaboration. This includes chairing the International Round Tables. A website is being created for the dissemination of all the round table findings. The surveys of all the partners have been collated and anonymised, and the results will be posted on the website, together with advice on how to conduct a survey. Putting up the ‘St Pancras Principles’ (see Editorial) is one of the dissemination mechanisms. The other is obviously the organisation of the CAMF conference and the proceedings published in *LIBER Quarterly*. Another element being contributed to is the prevention of duplication of effort: the Register of Preservation Surrogates ([RPS](#)) and the European Registry of Microform Masters ([EROMM](#)) have key roles to play in this.

UNRESOLVED ISSUES

There remains the unresolved question of retention or de-accessioning of reformatted cellulose acetate. There is a variety of options within the British Library about this, ranging from consideration of any artefactual value of the cellulose acetate, once it has been reformatted, through to a very pragmatic issue of the cost attached to de-accessioning cellulose acetate in terms of bibliographic control costs. Yet another issue is prevention of a repeat loss of incremental versions. Traditionally, preservation activities and conservation treatments focus on the long-term view and the well-intentioned aim is to use state of the art techniques on the collections. However, many examples throughout collections attest that these do not necessarily pass the test of time, and obviously all curators and conservators want to prevent this happening again. So this is one issue not yet resolved collectively.

Another major outstanding issue is the bibliographic issue. This is very big and complex and there is a massive tidying-up exercise to do with regard to item level bibliographic control. All the partners have found a huge legacy of bibliographic control issues.

The third unresolved issue is the straightforward 'opportunity cost'. The opportunity cost of putting resources into transferring acetates or into reformatting could be spent on new filming of vulnerable newspapers, or any of the other preservation needs. This is a very difficult issue in terms of responsible stewardship of the totality of the British Library's magnificent and enormous collections.

The reason why cellulose acetate microfilm become an issue for the British Library is mainly due to the realisation that the library held more of an ephemeral, vulnerable, fragile surrogate medium than was thought, and that nearly half of this was one of the more ephemeral, vulnerable, fragile collection types, namely newspapers. Thus the impetus was a combination of external, press, public and professional focus, and then internal investigations.

IN SUMMARY

Over the last five years the British Library has carried out three surveys, one options appraisal and a reformatting pilot, as well as looking at storage options. The library has put on a conference, convened the Round Tables, and then synthesised the international findings to mount on a website which is currently being created. The sobering reality is that all this accounts for 4,500 person hours - or three people years. A huge amount has been learnt. If the British Library has a problem, it is possible that other institutions do also, hence the impetus for the Round Table. It has become clear that those who have been microfilming longest, and on the biggest scale, have the biggest issue, because cellulose acetate stock continued to be used. There is a window of opportunity. The first step is to assess the issue. There may not be a problem, but if there is, the key thing is to prevent it reaching the autocatalytic point. There is no need to over-react since there is a period, there is a window.

An important point which needs to be made is that the current problem with cellulose acetate microfilm cannot be considered as simply a technical matter. The team tackling the problem at the British Library includes the Director of Scholarship & Collections together with the Head of Collection Care and originally the Head of Collection Development, since there are significant collection development and bibliographic issues, as well as a range of possible collaborative, both internal and external, ventures. These collaborative ventures could perhaps cover reciprocal storage of master negatives between institutions, or follow the lead of, for example, the RPS, or EROMM, or the [DLF/OCLC Registry of Digital Masters](#), as well as sharing information at events such as the recent Round Table.

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WEB SITES REFERRED TO IN THE TEXT

The British Library. <http://www.bl.uk/>

DLF/OCLC Registry of Digital Masters. <http://www.oclc.org/digitalpreservation/why/digitalregistry/default.htm>

EROMM - European Registry of Microform Masters. <http://www.eromm.org/>

IPI - Image Permanence Institute. <http://www.imagepermanenceinstitute.org/index.html>

JISC - Joint Information Systems Committee. <http://www.jisc.ac.uk/>

RPS - Register of Preservation Surrogates. <http://www.bl.uk/about/collectioncare/rpmintr.html>