CHAPTER 6

Assessing Risk to the Microfilm Collection at Harvard Divinity School

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In the spring of 2021, the Harvard Divinity School Library (HDSL) decided to relocate its onsite microform collection, housed at the time in approximately 45 cabinets. HDSL requested assistance from the Weissman Preservation Center at Harvard Library Preservation Services to survey the collection, provide an assessment of its condition, and assess the suitability of its intended new location. This chapter provides an overview of the survey we conducted, our most important findings, and the recommendations we made to the managers at HDSL.

Goal and Approach

The goal of our project was to assess the condition of the 17,667 boxes of microfilm that are part of the HDSL microform collection. The

collection also contains several cabinets of microfiche materials, but these were excluded from our assessment.

We performed an initial survey over two half-days on May 10 and 17, 2021. In general, we found that the collection was in good condition. A mild smell of acetic acid (vinegar) was present in the room, which is quite common for storage areas that contain acetate film materials. The survey team randomly chose boxes—one to two per drawer (of 366 drawers)—to open and do a quick visual inspection of the first foot or so of the film.

We performed a second survey on the mornings of June 14 and June 16. The primary goal of this additional survey was to evaluate the new space and to place acid detection (AD) strips in 43 reels identified as cellulose acetate microfilm to assess the current state of deterioration of these reels. We placed strips in multiple locations/collections to get a snapshot of the level of deterioration present. The Unitarian Universalist collection had been mentioned as an especially important collection, so 10 reels were selected from this collection for testing with AD strips.

Findings of the Survey

Housings

The films are wound on reels with (in most cases) an exterior paper wrapper held in place by a thread-and-button fastener. Each wound film is housed individually in a box that has a self-adhesive label on the exterior. The films appear to be properly (tightly) wound, and the majority are on various types of plastic spools (some solid, some with openings), though some films are on solid metal spools. Most of the boxes are archival metal-edge clamshell boxes, but there is a wide variety of other styles, including boxes from the manufacturer or printer. It appears that the adhesive on the labels of all boxes at some point loosened or failed, and all had been re-secured using clear plastic pressure-sensitive tape (see Image 6.1, Image 6.2, and Image 6.3).

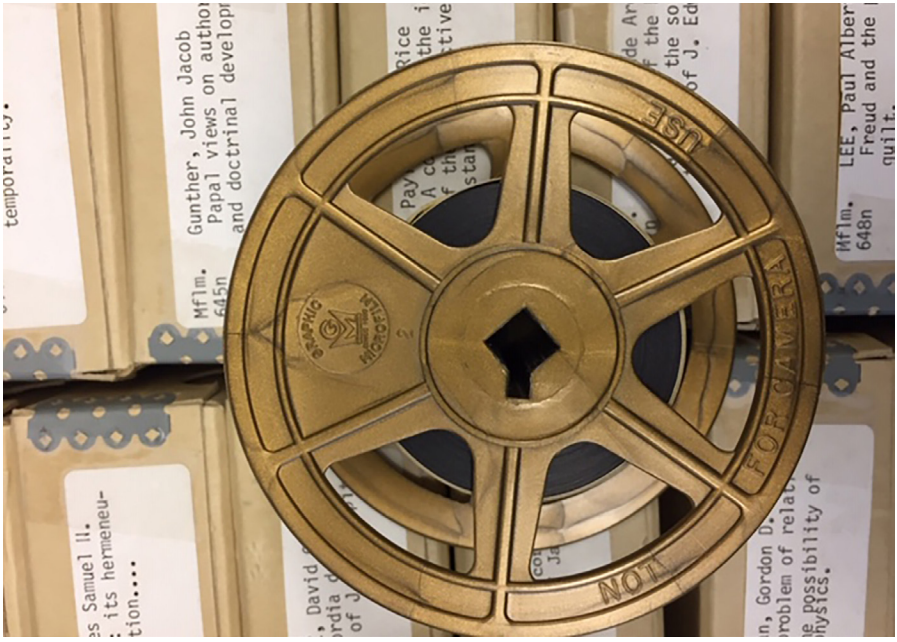

Image 6.1: Plastic reel with open sides

Image 6.2: Standard archival box and metal reel with closed sides

Image 6.3: Original printer's box

We noted with concern the presence of metal spools and the instability of box labels. As cellulose acetate film ages, it releases acids that can cause metal reels to rust, which in turn can cause staining and physical damage to the films. Metal reels are also less porous than plastic and more likely to trap the acids in the film, accelerating its deterioration. The labels may be an issue because the tape used to reattach them could fail.

Film Base and Format

We emphasized reviewing materials with publication/creation dates before 1960 to focus on items that might be on the more vulnerable bases of cellulose nitrate (manufactured from ca. 1889 to ca. 1950) and cellulose acetate (manufactured from ca. 1925 to the present). Cellulose nitrate was not manufactured specifically as a microfilm support, but early films with sprocket holes could be nitrate. A few films with sprocket holes were noted, but these appear to be acetate (see Image 6.4 and Image 6.5). No microfilms on cellulose nitrate support were seen during the survey. Of the films sampled, slightly over

half were acetate. Because we focused on earlier dates, however, the actual percentage likely favors polyester (manufactured from 1955 as sheet film and from the 1980s as roll film). Some of the more recent collections that are housed in boxes from the manufacturer/printer all appear to be on polyester film.

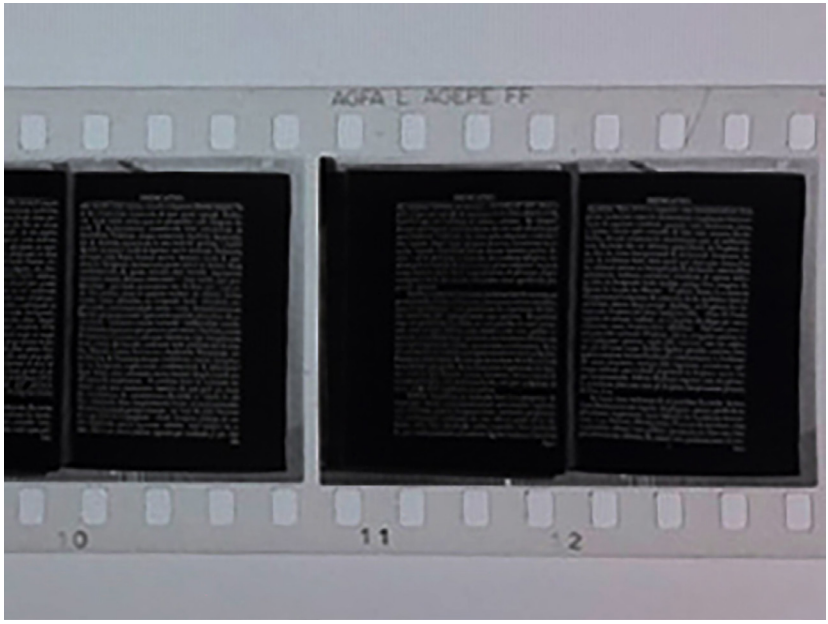

Image 6.4: Negative film with sprocket holes

Image 6.5: Positive film without sprocket holes

We noted that several reels contain both polyester and cellulose acetate films together (see Image 6.6). It was only possible to detect this, however, in the case of films that had open reels to let light through, so this was not included as a category in the survey. A very small percentage of films are 16 mm, and the remainder are 35 mm. We identified one series of journals as vesicular prints by their distinctive blue color (see Image 6.7). The rest of the collection surveyed appeared to be gelatin silver prints and some gelatin silver negatives.

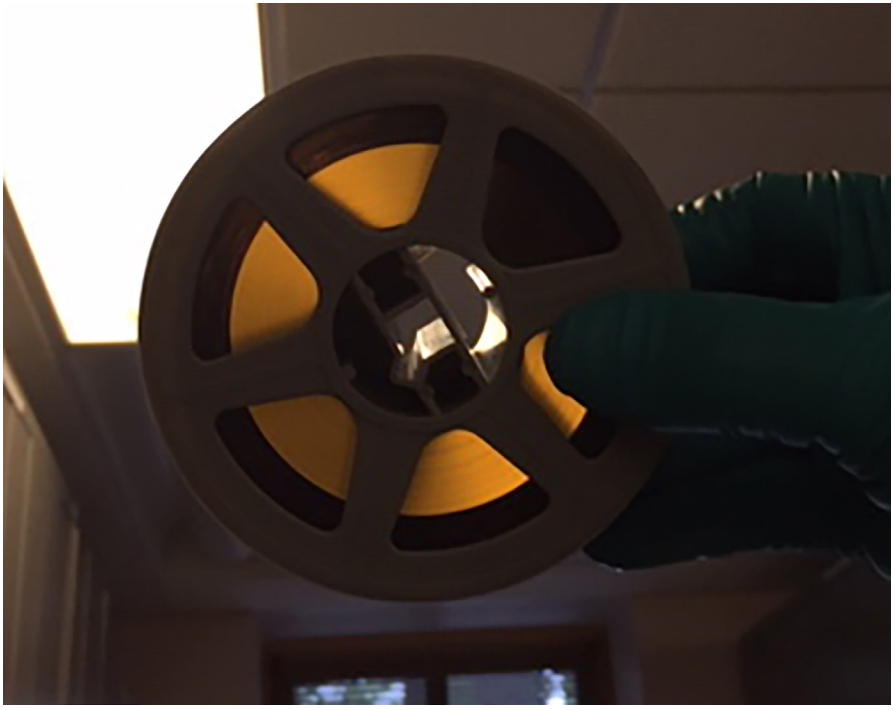

Image 6.6: Light passes through the polyester film on the interior of the roll and is blocked by the opaque acetate film on the exterior of the roll.

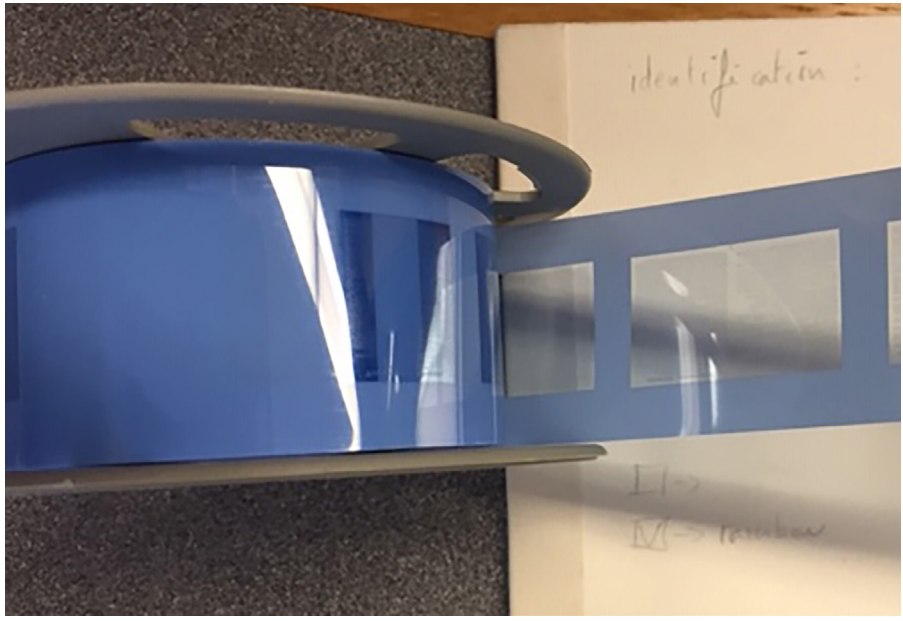

Image 6.7: Vesicular film

Acidity

AD strips detect the amount of acetic acid that acetate film is off-gassing, which provides a qualitative assessment of the progression of deterioration. The scale of AD strips is from 0 (no deterioration) to 3 (shrinkage and warping imminent, possible handling hazard) as defined by the Image Permanence Institute. The value 1.5 marks the point where deterioration will proceed autocatalytically (also known as "vinegar syndrome" due to the scent). For example, fresh acetate films with an AD strip reading of 0 in a storage condition of 68 degrees Fahrenheit (20 degrees Celsius) and 50 percent relative humidity (RH) have an estimated 50 years before they reach the onset of vinegar syndrome, but once an AD value of 1.5 is reached, they only have six years before reaching critical condition. Item-specific manufacturing, processing, storage, environmental fluctuations, and other factors may cause deterioration to happen at different rates with different films.

In this survey, we placed AD strips with 43 films in sealed plastic bags for approximately 48 hours. The total of 43 out of 17,667 is

not enough to be statistically significant, but it does point out some important trends. Of the films tested at HDSL, thirteen had a value of 0.0, nine had a value of 0.5, eleven had a value of 0.75, and ten had a value of 1.0. While none of these are currently at the autocatalytic point, they will likely reach it sometime soon. The only effective way to slow deterioration is by placing the films in low-temperature storage with controlled RH. Low temperature is defined here as anything below standard room temperature, usually identified as 68 degrees Fahrenheit (20 degrees Celsius). In specialized storage vaults, this may mean maintaining a temperature of 50 degrees Fahrenheit (10 degrees Celsius), 40 degrees Fahrenheit (4 degrees Celsius), or below freezing. The colder the temperature, the better for the film, but it is important to consider the economic and environmental costs of maintaining these temperatures through mechanical means. The most important factor is keeping the RH in the 30 to 50 percent range regardless of temperature.

While climate control is critical for acetate film, polyester film is considered stable at room temperature, so special consideration needs to be given only to the image material. In general, gelatin silver image material will remain readable. It may show silver mirroring due to high RH or staining due to poor processing or exposure to pollutants, but, when viewed in transmitted light, these forms of deterioration are often minimized. Dye-based image material, such as in chromogenic color or diazotypes, will benefit from low-temperature storage because they can shift color and fade over time. Diazotypes can also off-gas and accelerate deterioration of adjacent materials.

General Condition

Most microfilms we examined appeared to be in good condition. A few had issues such as silver mirroring, overall pink discoloration due to the reformation of the antihalation layer, and/or orange oxidative staining. These issues are likely due to chemical instabilities introduced during processing, airborne pollutants, and/or aging at room temperature. One microfilm had severe scratching, which caused partial losses to the image. This damage likely occurred from misuse. Another reel did not have a paper wrapper but was secured with a piece of pressure-sensitive tape. The mirroring and reformation of the antihalation layers are indicators that the humidity levels are higher than appropriate for these materials. Humidity is

a powerful driver of the autocatalytic reaction that causes vinegar syndrome.

Storage Space/Furniture

The initial location of the surveyed materials on the second floor of the HDSL building was adjacent to an area under major renovation and was very dusty. The room had a section of audio and video material on the interior wall and several cabinets of microfiche, neither of which was included in this survey. The microfilms were stored in specially designed metal cabinets. These cabinets were moved and reused in a new storage area on the first floor. This area is used as a mail sorting area and has four doors that lead to the main circulation desk and several private offices. It is kept at temperatures for human comfort and has no specialized humidity controls. Unfortunately, this will accelerate the deterioration of the acetate film. The fact that the space will frequently be occupied by staff also poses a risk that the acetic acid could become an irritant to any staff in or near this room.

Intellectual Control

Most microfilms in this collection appear to be unique copies. Only a few are labeled "print copy" or "duplicate negative." In general, if a roll of microfilm is unique to the collection, it should serve as the preservation/storage copy, and a new physical use copy or "work copy" (or a digital copy) should be made for access. According to the Photographic and Imaging Manufacturers Association (1998, 11), "the use of storage copies must be infrequent. If the film is expected to be handled more than 10 times, work copies should be printed from the storage copies." During the height of microfilm use, most collections would have three copies, one that was the original preservation copy, one (usually a negative) that was used for making duplicates, and one that was used for access.

Microfilm is typically seen as secondary material because, historically, it served as an access copy for the primary material that was imaged on it. In some cases, however, that primary material may have been deaccessioned, damaged, or otherwise made inaccessible, leaving the microfilm as the only surviving copy. Ensuring

the long-term preservation of such an item is vital to the mission of the Harvard Library. On the other hand, certain microfilm may be a copy of material that is widely and freely available at various public and private institutions, and the time and expense spent on its preservation could be better allocated. Determining these priorities is a crucial step in developing a preservation plan.

Recommendations

Based on our findings, we made several recommendations to HDSL managers:

1. Given the likelihood that the film base of a large percentage of the microfilms in this collection is acetate, move the collection to a location with better climate control. As acetate films deteriorate and release acetic acid, they pose a risk of accelerating the deterioration of adjacent collection materials and can be an irritant to people who may be in proximity to the film for a length of time.
2. Collect more information about the collection, identifying copies that are unique and/or important to the collection so that action can be prioritized.
3. Identify acetate films and conduct additional AD strip readings. Staff from the Weissman Preservation Center (WPC) can offer a half-day training for staff at HDSL on how to identify acetate film and how to gather information from AD strips. It is not necessary to test every acetate film, but more samples would enable better-informed decisions for the collection. Information on when and where films were printed could help streamline this process because it is likely that batches with the same provenance will be in a similar condition.
4. Determine what to send to the Harvard Depository (HD), which has low-temperature storage, with the following options in mind (in order of preference):
    a. Send all the acetate and polyester film. This option offers the most expedient way to ensure the preservation of the collection and allow more time for gathering information while the items are at HD. It has the most

upfront cost in terms of storage at HD but is the least intensive in terms of staff time. Once items on polyester bases are identified, they could be returned to HDSL for room-temperature storage. Acetate materials could be reformatted (digitized) based on intellectual importance and uniqueness or could be deaccessioned if it is determined that they are of no continuing value to the collection.

   b. Send only the acetate film. This option will require significant staff time from HDSL and guidance from WPC staff. Identifying the film base is a quick procedure, but, given the large size of the collection (17,667 boxes), this could be a lengthy process and should be prioritized for completion in a maximum of one to two years. The benefit would be less cost for storage at HD because items on polyester film are stable at room temperature and can remain at HDSL.
   c. Send only those acetate films that are determined to have high value for the collection. This option would be the least costly in terms of storage at HD, but the additional assessment of value would require even more time and resources to complete the project in one to two years.

5. Determine what to reformat. In addition to ensuring the preservation of these materials, it may be desirable to reformat high-value films that are on an acetate base to reduce the negative impacts of time out of storage and possible damages from use. Reformatting to a digital copy will also increase accessibility and provide more information about the condition of the film than was possible to collect during the brief survey where only the first foot or so of the film could be safely examined. It is possible that the film toward the interior of the reel may be in a different condition than that of the exterior.

Beyond our observations and recommendations regarding the priority of getting the films into a better storage environment, we noted other issues with individual items that could affect their long-term preservation: the presence of metal reels, the use of pressure-sensitive labels on boxes, and the use of pressure-sensitive tape

on films. Therefore, we made the following additional recommendations for action when a film is pulled for access or reformatting:

6. Replace the metal reels with new archival plastic reels.
7. Duplicate the label information in a way that will ensure it is not lost if the exterior label falls off. For example, one might label the paper wrapper or the reel or place a tag inside the box to make sure intellectual control of the collection is not disrupted if the exterior label fails.
8. Remove pressure-sensitive tape from films, reducing any adhesive residues, and wrap with a standard exterior paper wrapper.

Lastly, we noted that other issues may become apparent during access or reformatting, which would need to be addressed case by case.

References

Association for Information and Image Management. 1990. "ANSI/AIIM MS45-1990: Recommended Practice for Inspection of Stored Silver-Gelatin Microforms for Evidence of Deterioration." New York: American National Standards Institute. *https://law.resource.org/pub/us/cfr/ibr/001/aimm.ms45.1990.pdf*.

Association for Information and Image Management. 1998. "ANSI/AIIM TR13-1998: Preservation of Microforms in an Active Environment—Guideline." New York: American National Standards Institute. *https://webstore.ansi.org/standards/aiim/ansiaiimtr131998*.

NEDCC. 2017. "Microfilm and Microfiche." Preservation Leaflet 6.1. Revised Edition. Andover, MA: Northeast Document Conservation Center. *https://www.nedcc.org/free-resources/preservation-leaflets/6.-reformatting/6.1-microfilm-and-microfiche*.

Photographic and Imaging Manufacturers Association. 1998. "ANSI/PIMA IT9.11-1998: Imaging Materials—Processed Safety Photographic Film—Storage." New York: American National

Standards Institute. *https://law.resource.org/pub/us/cfr/ibr/001/aimm.it9.11.1998.pdf*.

Reilly, James M. 1996. “IPI Storage Guide for Acetate Film.” Revised edition. Rochester, NY: Image Permanence Institute. *https://filmcare.org/pdf/acetate_guide.pdf*.