Adhesives in photographic archives

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When an archive acquires photographs, the photographs are usually not alone. They may be attached to mounts, set in frames, or contained in scrapbooks or albums. When considering the environment for storage and the enclosures needed to surround the artifacts, archivists must consider not just the photographs themselves, but the pieces attached to them. This also includes the materials used to stick them together. There are some adhesives that do not show any noticeable damage to a photograph when stored in typical environments. However, some adhesives either cause significant damage to a photograph or deteriorate rapidly, unsticking and changing the layout the original artist intended to show. Some adhesives may not deteriorate or cause damage to a photograph in typical indoor environments but can exacerbate damage caused by high temperature and humidity levels. This paper will explore some of the most common adhesives used with photographs and some of the considerations to make when storing photos with these adhesives attached.

Use of Adhesives on Photographs

Adhesives may be attached to photographs for many different reasons. They can include:

Mounting on cards

Many 19th century prints were mounted on stiff cards because the photographs themselves were on thin paper that was vulnerable to bending and tearing. Cannon (2012) found that most of the time, these photographs were mounted when wet to avoid cockling.

Framing

Photos are attached to a backing board (also called a mounting board) before the mat (if used) and frame are added. The backing board is cut to a size that will fit to the frame to prevent the photograph from sliding around.

Scrapbooks or Albums

Photos are glued or attached with photo corners onto pages that are bound together. Sometimes, especially in the case of modern photobooks, the photographic prints *are* the pages, rather than being attached to the pages.

Book Binding

Binding can be done by sewing or other methods, but adhesive may be used to add strength to the binding. Adhesive may also be the only thing holding the pages together.

Repairs

Tape and glue may be used to repair tears or cracks in photos.

The adhesives, the papers, and other materials used in these actions can all contribute to the deterioration or stability of the photograph. Some of the materials may deteriorate faster than the photograph, and archivists and conservators will need to consider whether they need to be replaced and what to replace them with.

Types of Adhesives

In *The Grove Encyclopedia of Materials and Techniques in Art*, Gerald Ward (2008) groups adhesives into two types: natural and synthetic. Natural adhesives are grouped into three categories: animal-derived, plant-derived and mineral-derived. Animal-derived adhesives are made from materials such as collagen (connective tissue), egg whites, or casein, a protein found in milk. Plant-derived adhesives are made from starches in plants, or gums and resins from trees. Mineral-derived adhesives are derived from crude oil, such as bitumen and paraffin wax.

Synthetic adhesives did not exist until the second half of the 20th century, but today many of these are more convenient and widely used than natural adhesives. Synthetic adhesives can come in many different forms, but some that are commonly used with photographs are

solvent-based adhesives, water-based adhesives, and heat-sealed adhesives. Heat-sealed adhesives include "dry-mount" adhesive tissue used by framers today. The adhesive tissue can be cut to size, stuck between the photo and the mount, and then heated to melt the adhesive and make it stick.

Recipes for adhesives and instructions for mounting have been published in various photographic literature throughout the history of photography. Different types of glues could be mixed or layered on top of each other. Cannon (2012) analyzed the types of adhesives recommended in photographic literature during the 19th and early 20th centuries. She states that most of the adhesives recommended during that time period were "based on gelatine or starch, dextrin, plant gums or rubber." Alcohol or water were commonly mixed together with these ingredients.

Adhesives and Conservation

Adhesives can complicate conservation procedures: they can cause deterioration to the photograph or its mount, attract mold, or deteriorate and separate the photograph from its mount, which can be especially problematic for items like scrapbooks or collages. A better understanding of different types of adhesives, how they deteriorate, and how they affect photographs will help archivists better evaluate the needs of their collections and determine when they need to get help from a conservator.

Ward (2008) states that adhesives used for conservation purposes should not be stronger than the items they are holding together. A conservator should also be able to reverse the adhesive without much trouble. It is better that the adhesive bond be broken than that more damage is caused to the original.

The temperature and relative humidity of the storage area can affect the deterioration of adhesives and the effect they have on the photographs. An ideal range of relative humidity levels will help slow down the processes of biological, chemical and mechanical decay that can be caused by adhesives. The ideal is different depending on the type of photograph. The Image Permanence Institute's recommendations for photograph storage will help archivists determine the ideal range for their collection (Adelstein, 2009).

This paper will now examine three common types of adhesives in more detail: flour and starch adhesives, gelatin and animal glue adhesives, and rubber cement adhesives.

Flour and Starch Adhesives

Production

Flour and starch adhesives can be made with any type of starch or flour mixed with water. Wheat flour, corn starch, or rice starch are commonly used. There are various recipes, and other ingredients may be added (Creasy, 1985). Pure starch paste (i.e. just starch powder and water) has generally not been available commercially as it spoils quickly but is easy to make at home. Some adhesives were made with "condemned" flour that was not considered suitable for eating and may have had other contaminants in it. Starch is a more purified ingredient than flour, requiring a higher level of processing.

Usage

Starch has been used as an adhesive for centuries. It was very popular for photographic mounting during the 19th and early 20th centuries. It is still used today in archives for mounting and repairing papers. Because it is water based, this kind of glue can cause warping or cockling of the paper, but a skilled craftsman knows how to mix the glue and apply it in such a way as to

avoid this problem. Photographic literature from the 19th and 20th centuries explains techniques and recipes for starch-based glues (Creasy, 1985; Daniels, 1995; Cannon, 2012;).

Deterioration

Starch glue does not contain sulfides or other chemicals that cause visible damage to photographs (Creasy, 1985). It does not dissolve in water and the "stickiness" does not deteriorate easily (Daniels, 1995). Depending on the quality of the ingredients, flour glue may contain contaminants that cause deterioration.

Swan (1981) explains that mounted albumen prints often show mechanical damage over time in the form of extensive cracking as a result of being wet-mounted with water-based starch or gelatin adhesives.

Conservation

Starch adhesives are frequently used in conservation to repair and mount photographs. Once they are dried, these glues cannot be dissolved in water, but they can be dissolved by treating with amylase (Daniels, 1995; Fairbrass, 1995). They also can be removed by physically scraping them with a spatula or similar tool (Phenix, 1995). Such work is best done by an experienced conservator.

Gelatin and Animal Glue Adhesives

Production

Gelatin (also spelled gelatine) and animal glue are made out of collagen from animal body parts (skin, tendons, ligaments, and bones). Gelatin is a more processed, pure form of glue compared to animal glue, which may contain contaminants or added ingredients.

Usage

Gelatin was commonly used as an adhesive in the 19th and early 20th centuries. It required a small amount of glue to create a good bond, which was considered good for preventing deterioration of photographs. Gelatin and starch were both commonly recommended adhesives in photographic literature (Cannon, 2012).

Deterioration

Gelatin and animal glues sometimes had acids added to help lower the temperature required for the glue to gel. Acids used included acetic acid, nitric acid, and oxalic acid (Cannon, 2012). These acids can contribute to fading and discoloration of photographs.

Swan (1981) explains that mounted albumen prints often show extensive cracking over time as a result of being wet-mounted with water-based starch or gelatin adhesives. Gelatin can become soft in high humidity environments, causing the adhesive to loosen or absorb into surrounding materials.

Conservation

Because of the similarity of the materials, any treatment used to dissolve gelatin adhesives can also cause harm to gelatin-silver photographs, so care must be taken in this area.

Rubber Cement Adhesives

Production

Western countries discovered rubber in the 19th century, and it was used in adhesives as early as 1843 (Cannon, 2012). Rubber was mixed with a solvent, a liquid that evaporated quickly such as chloroform, benzol, or naphtha. Rubber cement was commercially available and commonly used in the late 20th century, known as “Cow Gum” in the United Kingdom.

Usage

Rubber cement does not cause warping or buckling of the image like water-based adhesives, which is advantageous for mounting photographs without damaging them. It is easily applied with a brush and sticks instantly with minimal pressure. It is also easily rubbed off a surface and was recommended for arranging layouts (Creasy, 1985). Fairbrass (1995) points out that it is easy to peel and re-stick "Cow Gum," which made it ideal for organizing and rearranging layouts.

Deterioration

Rubber cement often causes yellowing of the connected image because the adhesive produces sulfides. Rubber cement also tends to deteriorate rapidly, causing the photograph to come apart from the mount (Creasy, 1985). Wilhelm (1993) advises against rubber cement for mounting photographs because of its sulfide content. He also states that solvents in the cement can create pink and other colors of stains in the print by transferring dyes from the mount. Deterioration caused by chemicals in rubber-based adhesives can be slowed by keeping prints in an ideal storage environment.

Conservation

Rubber cement that was applied recently can be rubbed or scraped off easily, and it tends to deteriorate quickly compared to other adhesives. Fairbrass (1995) states that the yellow-orange stain from rubber-based adhesives is "impossible to remove" and because the artifacts stuck together with the adhesive have absorbed the rubber, it is difficult to stick them together again with a water-based adhesive.

Cannon (2012) notes that in 1867, *The British Journal of Photography* claimed that a "new" method of using rubber as an adhesive ingredient was superior to other adhesives and would not cause stains. Even today, rubber cement is advertised to be "acid free" and "photo

safe." Wikipedia joins in and states that unlike older formulas, "modern" rubber cement is archival safe because it is acid free. All this confusion means that it is still commonly used. Archivists and conservators should not be swayed by such statements, unless they are combined with a verified Photographic Activity Test. Just because an adhesive does not visibly stain or deteriorate within a few months or years does not mean it will last for decades or centuries.

Other Considerations

Mechanical damage to photographs can depend on how an adhesive was applied. Reilly (1986) points out that gelatin prints can develop localized tears and puckers around the corners or other spots where adhesive was applied to the back of the photograph.

Whenever possible, alternative mounting methods that don't require attaching adhesives to photographs should be used. This can include the use of photo corners, four-flap enclosures, and adhesive-free hinging onto mounting boards for framing. Some of these are described in "Nonadhesive Mounting Methods for Photographic Prints," by J. M. Sexton and J. J. Gutierrez (2017). There are times when adhesive may be necessary, such as when repairing an artifact that had adhesive on it before, or repairing certain kinds of tears. Ideally this should only be done with the help of a skilled conservator, especially when adhesive removal is needed.

Conclusion

Archivists are likely to come across several photographs in the course of their work that have been stuck with different kinds of adhesives. Some of them will show little deterioration, some will show a small amount of deterioration but not enough to justify separating the photo from the mount, and others will show significant deterioration that will require re-mounting. Decisions will need to be made on a case-by-case basis, but knowing more about the types of adhesives and the role they can play in photograph deterioration can help archivists better make

those decisions. Although the materials used to make the photos, mounts, adhesives, and enclosures should all be considered when making preservation decisions, the temperature, relative humidity and presence of air pollutants in the storage environment should be considered first, because it will greatly affect how rapidly the materials deteriorate.

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