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# DECAY AND DAMAGE

The forms of degradation that afflict prints are characteristics and diagnostic of the single process. Decay can affect the image, the binder or the base and arise out of a specific mechanical, biological or physicochemical process.

The forms of degradation that mainly affect colour photographic production are related to the stability of the dyes, determined by the intrinsic properties of each printing process. Dyes show the decay of the saturation level which leads to a progressive process of image fading. This process causes the loss of density and contrast, especially in the highlights. The result is the appearance of a dominant made by the degradation of the dye, with the production of the complementary tone [1, 2].

Chromogenic colour photographs are composed of organic dyes, in the form of spherical dye clouds with a micrometrical diameter. The uncontrolled exposure to light can cause the fading of dye over time. The rate of fading varies, depending on the chemical structure of the dyes. The azomethine dyes characteristic of chromogenic processes deteriorate faster in darker than those used in the dye transfer process or the azo dyes used in the silver dye bleach process. The rate of dye deterioration is even linked to environmental conditions. Generally, dye fading is accompanied by a shift in the colour balance: dyes do not fade at the same rate, which creates an imbalance in the colour rendering to which the eye is particularly sensitive [3]. Storage in the dark can cause the formation of yellowish stain caused by residual couplers or the yellowing of edges and highlights [1].

The hygroscopic nature of gelatin makes it vulnerable to microorganisms. This occurs with water and/or relative humidity and temperature values such as to promote the growth of microorganisms. These attacks can cause the liquefaction of gelatine and the appearance of spots of different aspects, colours and intensities. Powdery or fluffy substances can be also developed, consisting of high concentrations of hyphae

and fungal spores. The damage can spread to the entire surface until the photograph, binder, and base are destroyed [4, 3]. Furthermore, insects such as lepidoptera ("silverfish") and cockroaches produce surface erosions characterized by an irregular outline [4].

The mechanic processes can affect the photographic surface, the support or the entire object. Can occur: scratches, dents, surface abrasions, cracks, tears, curling, fingerprints and pressure marks caused by intense pressure writing on the back. These forms of damage can be attributed to incorrect print handling, improper storage or improper exposure, as well as accidental events [5].

- [1] H. Wilhelm, *The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures*, Grinnell: Preservation publishing company, 1993.
- [2] *Atelier de Restauration et de conservation des photographies de la Ville de Paris.*, Lingua Franca: A Common Language for Conservators of Photographic Materials, Ottawa: Library and Archives Canada, 2018.
- [3] B. Lavedrine, *A guide to the Preventive Conservation of Photograph Collections*, Los Angeles: The Getty Conservation Institute, 2003.
- [4] V. Lisino, «Fotografia e fotografie - Identificazione delle tecniche, archiviazione, conservazione, catalogazione,» in *13° Seminario del circuito BiblioCAI*, Torino, 2013.
- [5] National Film Preservation Foundation, *The film preservation guide - The basics for archives, libraries, and museums*, San Francisco: National Film Preservation Foundation, 2004.

## FORMS OF DEGRADATION OF PROCESSES

<b>DYE COUPLER PRINT</b>	<p>Dyes are inherently unstable, fading occurs whether the print is exposed to light or stored in the dark. Cyan dyes tend to fade in the dark, so the photo appears too red; magenta dyes, on the other hand, tend to fade causing a blue or green tint. Unreacted residual couplers are also unstable, especially magenta ones that cause yellowish discolouration of highlights and edges.</p> <p>Fibre-based papers produced before the 60s and resin-coated papers produced in the 70s can show:</p> <ul style="list-style-type: none"> <li>• shift in the colour balance</li> <li>• overall loss of density</li> <li>• coupler spots</li> <li>• yellow toning of highlights and edges</li> </ul> <p>Photographs produced after the 80s can show fading, coupler spots. Kodachrome prints present excellent stability of dyes.</p>
<b>DYE DESTRUCTION PRINT</b>	<ul style="list-style-type: none"> <li>• Azo dyes are more stable than chromogenic dyes and fade at the same rate. This phenomenon causes an overall loss of density.</li> <li>• Until the 80s, the most used support was in cellulose triacetate. This material can undergo chemical deterioration: vinegar syndrome and yellowing.</li> <li>• An improper handling or incorrect storage can cause abrasions, dents, traces and loss of binder along the edges.</li> <li>• A prolonged exposure to an aqueous environment can cause dyes migration and delamination.</li> </ul>
<b>DYE DIFFUSION TRANSFER PRINT</b>	<p>The common forms of alteration and degradation are:</p> <ul style="list-style-type: none"> <li>• fingerprints</li> <li>• pressure marks caused by intense pressure writing on the back</li> <li>• delaminations</li> <li>• surface abrasions</li> <li>• presence of dirt and dust</li> <li>• receiving layer microcracking</li> </ul> <p>Some products show characteristic forms of degradation:</p> <ul style="list-style-type: none"> <li>• Polacolor: yellow and magenta dyes fading</li> <li>• Polacolor 2: different rate of fading</li> <li>• Polacolor ER: uniform fading</li> <li>• Kodak Ektaflex print: magenta toning</li> <li>• Agfachrome Speed print: poor light stability</li> </ul>
<b>INTERNAL DYE DIFFUSION TRANSFER PRINT</b>	<ul style="list-style-type: none"> <li>• Generally polaroids stored in conditions of darkness can be characterized by a yellowing, caused by dyes migration in highlight areas.</li> <li>• SX-70 materials show dyes fading and microcracking, caused by relative humidity fluctuation.</li> <li>• Occasionally, Kodak Prints will show yellow spots on white borders caused by exposure to heat and light during the drying process.</li> <li>• Fujifilm materials are less inclined to fade than Polaroid and Kodak materials.</li> <li>• Coating layer is susceptible to scratches, abrasions and fingerprints.</li> <li>• Some prints can show pigment aggregations, with a characteristic snowflake form.</li> </ul>