Identification and Care of Photographic Materials

Workshop at the State Hermitage Museum 2014

Jens Gold PM 2014

Identification

Categories:
- Negatives
- Positives
- Direct positives
- Printing out – POP
- Developing out – DOP
- Black and White photography
- Color photography
- Instant photography
- Photomechanical
- Digital print outs and Media...

Clues for Identification

- Presentation and mounting technique
- The photographed object itself
- Production date
- Text or company stamp/ trademark on backside
- Surface texture
- Printing patterns
- Image color
- Binder
- Support
- Look in different illumination
- Look under magnification
- Behavior under changing conditions of relative humidity and temperature
- Deterioration signs and damages
- ...
Black and White early direct positive processes

- Daguerreotype
- Ambrotype
- Ferrotype, Pannotype

Daguerreotype

- Inventor: Louis Jacques Mandé Daguerre
- Time of use: 1839 – about 1860’s
- Technology/Support: silver image on silver plate/copper
- Presentation: passe partout frame in Europe; wood-, leather-, early plastic-case in North America
- Format in mm: 216 x 162, 162 x 108, 162 x 144, 162 x 72, 108 x 61, 61 x 72, 51 x 54, 72 x 54, 35 x 35 cm square or rectangular, 90 mm in diameter
- Identification:
  - mirror like image surface
  - negative/positive effect when the light comes from different angles
- Most common deterioration signs:
  - blue brownish oxidation films
  - abrasions on surface
  - exfoliation, flaking
  - oxidation, fading
Daguerreotype

- Inventor: Frederick Scott Archer & Peter Fry, 1851
- Time of use: 1852 – about 1870s
- Technology/support: collodion on glass
- Presentation format: passe-partout frame in Europe; wood, leather, early plastic case (union case) in North America
- Format in mm: ca. 216 x 162, 162 x 108, 162 x 144, 108 x 72, 72 x 54, 31 x 21, 45 x 31, 72 x 54
- Identification: creamy white highlights and neutral blacks, non-reflective image surface, no negative/positive effect when the light comes from different angles
- Most common deterioration signs: glass corrosion, cracked glass support, oxidation, silver mirroring, brownish silver deterioration, background paint flakes often off
Ambrotype

- Inventor: A.A. Martin, 1853 France
- Time of use: 1855 – 1880 – about 1930’s
- Technology/ Support: wet collodion on black varnished metal
- Presentation format: mounted on embossed card or in embossed paper envelope with decorative window cut out; 2 ¼ x 3 ½ both smaller and larger
- Identification:
  - creamy white highlights and neutral blacks
  - cracked and yellowed super coat
  - metal support (magnetic)
  - image not often studio quality
  - bluish color on one or two of the edges (unprocessed silver in collodion)
- Most common deterioration signs:
  - scratches in surface layers
  - flaking of the collodion layer
  - oxidation of the image silver in uncoated areas
  - deformation of the iron support
  - corrosion of the iron support

Tintype/Ferrotype/Melainotype

- Inventor: A.A. Martin, 1853 France
- Time of use: 1855 – 1880 – about 1930’s
- Technology/ Support: wet collodion on black varnished metal
- Presentation format: mounted on embossed card or in embossed paper envelope with decorative window cut out; 2 ¼ x 3 ½ both smaller and larger
- Identification:
  - creamy white highlights and neutral blacks
  - cracked and yellowed super coat
  - metal support (magnetic)
  - image not often studio quality
  - bluish color on one or two of the edges (unprocessed silver in collodion)
- Most common deterioration signs:
  - scratches in surface layers
  - flaking of the collodion layer
  - oxidation of the image silver in uncoated areas
  - deformation of the iron support
  - corrosion of the iron support
Black and White negative processes [1]

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<tr>
<th>Negative type</th>
<th>Time period</th>
<th>Carrier</th>
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<td>paper</td>
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<td>1851 - 1865</td>
<td>waxed paper</td>
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<tr>
<td>Wet collodion negative</td>
<td>1851 - 1900</td>
<td>glass</td>
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</table>
Calotype / Waxed paper negative

- Inventor paper negative: William Henry Fox Talbot 1835 – 1841
- Inventor waxed paper negative: Gustave Le Gray
- Time of use:
  - Paper negative: 1840 – about 1855
  - Wax paper negative: 1851 – about 1865
- Technology/Support: paper negative, image silver on paper; image silver on wax (wax paper negative)
- Identification:
  - red/brown – yellow/brown color
  - matt surface
  - often waxed on backside
  - paper structure
  - dark retouching color (ink) in sky
  - waxed paper negative: waxed trough and trough, back printed can be broken, white marks were it was bent or folded
- Most common deterioration signs:
  - yellowing, image fading from the edge to the center of the negative
  - white marks were it was bent or folded (wax paper negative)

Wet collodion negative

- Inventor: Frederick Scott Archer
- Time of use: 1852 – about 1900
- Technology/Support: collodion on glass
- Identification:
  - creamy white image
  - hand cut glass support of different sizes
  - often round corners
  - sometimes finger print in collodion layer
  - sometimes uneven coating especially in corners
  - often varnished and retouched with pencil in one corner
  - glass corrosion
  - cracked glass support
  - flaking off / exfoliation of the emulsion
  - silver mirroring, silver deterioration

Wet collodion negative
Photographic prints on paper without emulsion

- Salted paper prints / Calotype positives
- Cyanotype
- Platinum prints
- Kallitype

Salted paper prints

- Invention: William Henry Fox Talbot and Hippolyte Bayard for the direct positive process
- Time of use: 1839 – about 1865
- Technology/Support: image silver on sized or unsized paper positive, POP
- Formats: larger and smaller sizes depending on negative size, carte de visite
- Identification:
  - black/brown; yellow/brown color
  - sometimes hand colored; inpainted and retouched
  - matt surface
  - paper structure good visible
- Most common deterioration signs:
  - very often faded
  - yellowing, image fading from the edge to the center
  - tears in paper support
  - yellowed paper support

Photogenic drawing
Salted paper prints

Roger Fenton, A quiet day in the mortar battery c. 1855
GEH-C

Blanquart Evrard, Cvatier #2, GEH-C.

W.H.F. Talbot, The pencil of nature, PM-C.

Cyanotype

- **Inventor:** Sir John Herschel, 1841 – 42
- **Time of use:** 1842 – about 1960
- **Technology/Support:** Blue iron salt complex (Prussian blue) on paper used for halftone images and copy work of technical drawings (blue print)
- **Identification:**
  - Blue color (can be toned)
  - Matt surface
  - Paper structure good visible
  - Almost no image fading
  - Often mistaken as Diazotype/Ozalidkopie which are based on Azodyes
- **Most common deterioration signs:**
  - Tears in paper support
  - Foxing of paper support
  - Fading of the blue color when stored in alkaline environment
Cyanotype

Henri Le Secq, rustic scene ..., 1852, GEH-C

Platinum prints

- Inventor: Sir John Herschel, William Willis; pat. 1873
- Time of use: 1877 – about 1930 (still in use in art photography)
- Technology/Support: platinum on paper
- Identification:
  - color: neutral gray bluish black or warm brownish black
  - matt surface
  - paper structure good visible
  - almost no image fading
  - catalytic effect, copy images on neighboring papers possible
  - Often mistaken with the Kallitype process (silver on paper)
- Most common deterioration signs:
  - tears in paper support
  - yellow brown paper support
  - whole paper fibers over time (brittle paper support)

Dorothy Truz, GEH-C

William Willis jr., 1877, GEH-C.

Dick Arentz, Black bush and Minsonite, Ca. 1984, GEH-C
Photographic and photomechanical prints with emulsion but without baryta layer

- Albumen prints
- Carbon prints
- Ozobrome process / Trichrome Carbro Process
- Gum prints
- Oil prints

Albumen prints

- Inventor: Louis Desiré Blanquart-Evrard
- Time of use: 1850 – about 1920
- Technology: albumen on paper, POP
- Formats: carte de visite (1851), cabinet card (late 1850s), larger and smaller sizes
- Identification:
  - dark/brown - yellow/brown color
  - sometimes hand colored/ inpainted and retouched
  - glossy surface with tiny cracks
  - paper structure visible through the albumen layer
  - mostly faded, loss of highlight detail
  - albumen layer yellowed
  - rolls to small pipes if not mounted
  - Most common deterioration signs:
    - image fading from the edge to the center
    - color running
    - yellowing
Albumen prints

- Inventor: Alphonse Louis Poitevin, pat. 1855.
- J.W. Swan, 1844 pat. on carbon transfer paper.
- Autotype Co. 1868 double transfer process.
- Time of use: 1850 – about 1940.
- Technology/Support: Pigmented gelatin on paper.
- Formats: all formats possible.
- Identification:
  - All colors possible.
  - Often mistaken as Woodburytype.
  - Almost impossible to distinguish from Woodburytype.
  - Paper structure visible in the light areas of the gelatin.
  - No folding at all.
  - Relief effect between light and dark areas in the image.
  - Sometimes large cracks in dark/high density areas.
  - Some yellowing of the gelatin.
  - Can be larger than 11 x 14 inches = 28.6 cm x 36.2 cm.
  - Often impossible to distinguish from a Woodburytype.
- Most common deterioration signs:
  - Cracks in shadow areas.
  - Tendency to curl when not mounted on rigid support.

Carbon prints

- Inventor: Alphonse Louis Poitevin, pat. 1855.
- J.W. Swan, 1844 pat. on carbon transfer paper.
- Autotype Co. 1868 double transfer process.
- Time of use: 1850 – about 1940.
- Technology/Support: Pigmented gelatin on paper.
- Formats: all formats possible.
- Identification:
  - All colors possible.
  - Often mistaken as Woodburytype.
  - Almost impossible to distinguish from Woodburytype.
  - Paper structure visible in the light areas of the gelatin.
  - No folding at all.
  - Relief effect between light and dark areas in the image.
  - Sometimes large cracks in dark/high density areas.
  - Some yellowing of the gelatin.
  - Can be larger than 11 x 14 inches = 28.6 cm x 36.2 cm.
  - Often impossible to distinguish from a Woodburytype.
- Most common deterioration signs:
  - Cracks in shadow areas.
  - Tendency to curl when not mounted on rigid support.
  - Margins of gelatin areas.
  - Often impossible to distinguish from a Woodburytype.
Carbon prints

- **Inventor:** Alphonse Louis Poitevin (1850s)
- **Time of use:** Late 19th - early 20th century
- **Technology/Support:** Pigmented gum arabic on paper (bichromate process)
  (Combination with platinum process possible)
- **Format:** All formats possible but mostly larger
- **Identification:**
  - All colors possible
  - Paper structure visible in the light areas of the binder
  - Pigment specks in binder
  - High density areas differ in gloss, sometimes the emulsion is overprinted with gum arabic
  - Almost exclusively used by the fine art photographers at the time period (pictorial photography)
- **Most common deterioration signs:**
  - Very seldom fading or cracking of the emulsion

Gum prints

- **Inventor:** Gertrude Käsebier, Motherhood, 1916, GEH-C.
- **Time of use:** Late 19th - early 20th century
- **Technology/Support:** Pigmented gum arabic on paper (bichromate process)
  (Combination with platinum process possible)
- **Format:** All formats possible but mostly larger
- **Identification:**
  - All colors possible
  - Paper structure visible in the light areas of the binder
  - Pigment specks in binder
  - High density areas differ in gloss, sometimes the emulsion is overprinted with gum arabic
  - Almost exclusively used by the fine art photographers at the time period (pictorial photography)
- **Most common deterioration signs:**
  - Very seldom fading or cracking of the emulsion

Elias Goldensky, Mädchenportrait, GEH-C.

Heinrich Kühn, Stillleben, PM-C.
Oilprints

- **Inventor:** Emanuel Mariot, introduced by G.E.H. Rawlings in 1904
- **Time of use:** 1904 – about 1930
- **Technology/Support:** oil and pigment on gelatin relief (hardened gelatin on paper support; bromormate process)
- **Identification:**
  - all colors possible
  - has no baryta layer
  - paper fibers visible in areas without ink
  - to some degree glossy gelatin relief
  - almost exclusively used by the fine art photographer at the time period (pictorial photography)
- **Most common deterioration signs:**
  - no image fading
  - paper deterioration signs

Photographic printing out paper (POP) with an emulsion and a baryta layer

- **Collodion paper**
- **Gelatin printing out paper**

Collodion paper

- **Inventor:** Frederick Scott Archer / George W. Simpson
- **Time of use:** 1865 – about 1920
- **Technology/Support:** collodion on baryta paper, Collodion-POP also called Aristopaper
- **Formats:** carte de visite, cabinet card, larger and smaller sizes
- **Identification:**
  - dark brown – reddish brown – purple color
  - glossy and matt surfaces
  - matt surface prints have often a near neutral image color and image appearance (retains its fading or silver mirroring)
  - very little yellowing in the white areas
  - glossy surface with shiny and smooth surface colors
  - baryta layer (paper structure not visible through binder (to a degree of the white areas paper))
  - very thin paper layer (baryta layer visible after small surface damages)
  - binder does not absorb water
  - often in good condition because of the use of gold and platinum toners
  - very difficult to distinguish from gelatin-POP
- **Most common deterioration signs:**
  - scratches/abrasion and other damages of the collodion binder (baryta layer visible)
  - silver mirroring
  - color shift from purple to warm brown
  - green/yellow staining in non image areas
Collodion paper

- Inventor: Sir William Abney
- Time of use: 1886 – about 1920
- Technology/Support: gelatin on baryta paper, gelatin-POP also called Aristo or Solio -paper
- Formats: carte de visite, cabinet card, 4 x 5 inch amateur prints, larger and smaller sizes
- Identification:
  - dark /brown – red/brown color
  - glossy and matt surfaces also other surfaces possible
  - very little yellowing in the white areas
  - binder structures not visible through binder (thick baryta paper absorbs water)
- Most common deterioration signs:
  - silver mirroring
  - fading of highlight detail
  - color shift from purple to warm brown to yellow
  - all over fading

Gelatin printing out paper

- Inventor: Sir William Abney
- Time of use: 1886 – about 1920
- Technology/Support: gelatin on baryta paper, gelatin-POP also called Aristo or Solio -paper
- Formats: carte de visite, cabinet card, 4 x 5 inch amateur prints, larger and smaller sizes
- Identification:
  - dark /brown – red/brown color
  - glossy and matt surfaces also other surfaces possible
  - very little yellowing in the white areas
  - binder structures not visible through binder (thick baryta paper absorbs water)
- Most common deterioration signs:
  - silver mirroring
  - fading of highlight detail
  - color shift from purple to warm brown to yellow
  - all over fading
Gelatin printing out paper

Black and White negative processes [2]

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<th>Negative type</th>
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<th>Carrier</th>
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<tbody>
<tr>
<td>Gelatin dry plate</td>
<td>1870 – today</td>
<td>glass</td>
</tr>
<tr>
<td>Cellulose nitrate</td>
<td>1889 – Kodak 1950, – Agfa 1955</td>
<td>plastic</td>
</tr>
<tr>
<td>Cellulose acetate or triacetate (safety film)</td>
<td>1920 – today</td>
<td>plastic</td>
</tr>
<tr>
<td>Polyester base</td>
<td>1950 – today</td>
<td>plastic</td>
</tr>
</tbody>
</table>

Gelatin dry plate

- **Inventor:** Richard Leach Maddox 1871
- **Time of use:** 1878 – today
- **Technology/Support:** gelatin on glass
- **Identification:**
  - neutral grey/black image
  - machine cut glass support in standard sizes
  - mostly thinner glass support than wet collodion negatives
  - emulsion lies against the cut line
  - even coating
  - sometimes matt varnished and retouched with pencil, red varnish or paint
- **Most common deterioration signs:**
  - glass corrosion
  - cracked glass support
  - flaking off / exfoliation of the emulsion
  - silver mirroring, silver deterioration
  - mold attacked areas
  - finger print with silver mirroring
Gelatin dry plate

- Inventor: Hannibal Goodwin pat. US 1857
- Time of use: 1889 – 1955
- Technology/Support: gelatin on cellulose nitrate base
- Formats: Large Format, Medium Format, 35 mm
- Identification:
  - known production date before 1920
  - strongly oxidized image, smell of nitric acid and camphor
  - yellowed base
  - burns easily in burn test
  - turns deep blue in diphenylamine test
  - sinks in trichloroethylene test
  - edge codes (sometimes used double?)
- Most common deterioration signs:
  - deformation of plastic base
  - yellowed plastic base
  - strongly oxidized image
  - silver mirroring, silver deterioration
  - mold attacked areas on gelatin emulsion
  - rapid deterioration if stored in closed, air tight enclosures (plastic, metal, glass, etc.)

Cellulose nitrate negatives and positives

- Inventor: Hannibal Goodwin pat. US 1857
- Time of use: 1889 – 1955
- Technology/Support: gelatin on cellulose nitrate base
- Formats: Large Format, Medium Format, 35 mm
- Identification:
  - known production date before 1920
  - strongly oxidized image, smell of nitric acid and camphor
  - yellowed base
  - burns easily in burn test
  - turns deep blue in diphenylamine test
  - sinks in trichloroethylene test
  - edge codes (sometimes used double?)
- Most common deterioration signs:
  - deformation of plastic base
  - yellowed plastic base
  - strongly oxidized image
  - silver mirroring, silver deterioration
  - mold attacked areas on gelatin emulsion
  - rapid deterioration if stored in closed, air tight enclosures (plastic, metal, glass, etc.)

Cellulose nitrate negatives and positives

- Inventor: Hannibal Goodwin pat. US 1857
- Time of use: 1889 – 1955
- Technology/Support: gelatin on cellulose nitrate base
- Formats: Large Format, Medium Format, 35 mm
- Identification:
  - known production date before 1920
  - strongly oxidized image, smell of nitric acid and camphor
  - yellowed base
  - burns easily in burn test
  - turns deep blue in diphenylamine test
  - sinks in trichloroethylene test
  - edge codes (sometimes used double?)
- Most common deterioration signs:
  - deformation of plastic base
  - yellowed plastic base
  - strongly oxidized image
  - silver mirroring, silver deterioration
  - mold attacked areas on gelatin emulsion
  - rapid deterioration if stored in closed, air tight enclosures (plastic, metal, glass, etc.)
Cellulose nitrate negatives and positives

- Invention: France 1901
- Time of use: 1923 – today
- Technology/Support:
  - gelatin on cellulose acetate nitrate 1923
  - gelatin on cellulose acetate butyrate 1930
  - gelatin on cellulose acetate triacetate 1948
- Formats: all formats: large format, medium format, 35 mm, 16 mm, 8 mm, technical film
- Identification:
  - known production date after 1955
  - edge marking: “safety film” or “safety” can be copied on nitrate!
  - smell of vinegar
  - burns very slowly and stops burning when flame goes out
  - floats in trichloroethylene test
  - turns not deep blue in diphenylamine test
  - Most common deterioration signs:
    - deformation of plastic base, wrinkles (spider web pattern)
    - vinegar odor (vinegar syndrome)
    - silver mirroring, silver deterioration
    - mold attacked areas on gelatin emulsion

Cellulose acetate negatives and positives

- Invention: France 1901
- Time of use: 1923 – today
- Technology/Support:
  - gelatin on cellulose acetate nitrate 1923
  - gelatin on cellulose acetate butyrate 1930
  - gelatin on cellulose acetate triacetate 1948
- Formats: all formats: large format, medium format, 35 mm, 16 mm, 8 mm, technical film
- Identification:
  - known production date after 1955
  - edge marking: “safety film” or “safety” can be copied on nitrate!
  - smell of vinegar
  - burns very slowly and stops burning when flame goes out
  - floats in trichloroethylene test
  - turns not deep blue in diphenylamine test
  - Most common deterioration signs:
    - deformation of plastic base, wrinkles (spider web pattern)
    - vinegar odor (vinegar syndrome)
    - silver mirroring, silver deterioration
    - mold attacked areas on gelatin emulsion
Negatives and Positives on polyester base

- **Introduced:** 1941
- **Time of use:** 1952 - today
- **Technology/Support:**
  - gelatin on polyester base
  - formats: special formats, micro film, 35 mm, technical film, APS-film, CIBA/fuchsine positives and slides, Kodak /Duochrome /flex-chrome
- **Identification:**
  - Kodak edge marking: "Estar"
  - polarization test: birefringence / "rainbow color effect"
  - micro-optic effect
  - difficult to tear apart
  - no delamination of the base
  - burn test: burns very slow and stops burning when flame goes out
  - floats in trichloroethylene test
  - turns not deep blue in diphenylamine test
- **Most common deterioration signs:**
  - silver deterioration, silver mirroring
  - colloidal silver spots (micro film)
  - mold attacked areas on gelatin emulsion
Photographic developing out paper (DOP) with gelatin emulsion

- Gelatin DOP with baryta layer
- Gelatin DOP without baryta layer
- Gelatin DOP resin coated / RC paper
- Bromoil prints

Gelatin DOP with and without baryta layer

- **Inventor:** Leo Baekeland
- **Time of use:** about 1885 - today
- **Technology/Support:** gelatin emulsion on baryta coated paper, gelatin emulsion on paper
- **Formats:** all formats are possible
- **Identification:**
  - neutral black color, if toned different kinds of colors are possible (warm and cold black, blue, red, brown, ...)
  - often silver mirroring in the dark image parts
  - thick baryta layer no traces of paper fibres visible
  - sometimes hand colored, repaired and retouched
  - glossy or matt surface with many types of surface textures
  - paper structure visible through the gelatin if no baryta layer is used
  - single and double weight paper
  - can display no deterioration at all if treated in toner (sulfur-, selenium-, platinum-, gold-toner...)
- **Most common deterioration signs:**
  - image fading of the lighter image tones
  - yellowing and fading all over
  - silver mirroring
Gelatin DOP with and without baryta layer

Time of use: end 1960’s until today
Technology/Support: gelatin emulsion on polyethylene coated paper
Formats: all sizes
Identification:
- neutral black color, if toned different kinds of colors are possible (warm and cold black, blue, red, brown, …)
- often silver mirroring in the dark image parts
- unprocessed colloidal silver spots in the dark image areas and on the borders to the brighter image parts
- polyethylene film on both sides of the paper support (waxy feeling)
- glossy or matt surface
- paper structure not visible through the gelatin
- can display no deterioration at all if treated in toner (sulfur-, selenium-, platinum-, gold-toner…)

Most common deterioration signs:
- unprocessed colloidal silver spots in the dark image areas and on the borders to the brighter image parts
- silver mirroring
- bends or folds in the polyethylene film
- image fading of the lighter image tones
- yellowing and fading all over

2x Kåre Kivijärvi, PM-C.
Gelatin DOP resin coated / RC paper

Bromoil prints

- Inventor: Edward J. Wall & C. Welborne Piper 1907
- Time of use: 1907 – about 1940
- Technology/Support: oil and pigment on gelatin relief (bleached and hardened gelatin DOP as support)
  
  (Bromoil prints are often used to make transfers on to another paper support)
- Identification:
  - all colors possible
  - has a baryta layer
  - no image fading
  - high degree glossy gelatin relief
  - pigment/ink on surface
  - almost exclusively used by the fine art photographer of the time period (pictorial photography)
- Most common deterioration signs:
  - no image fading
  - paper deterioration

Color photography

Screen processes

- Autochrome
- AGFA-Farbenraster / AGFA Color
- Finlay color
- Dufaycolor
- Omnicolor
- Paget
Autochrome

- **Inventor:** Auguste & Louis Lumière 1904
- **Time of use:** 1907 – 1930’s
- **Technology:** Screen plate
- **Format:** 4.5 cm x 6 cm – 18 cm x 24 cm
- **Identification:**
  - made on a glass support
  - looks like a large color slide which is very dark
  - when looked at on a light table the grainy structure of the starch color screen is visible almost to the bare eye
  - sometimes green and brown spots from dye deterioration along the edges or scattered over the image
  - when seen under magnification: black carbon particles between the color filter elements are visible
- **Most common deterioration signs:**
  - sometimes green and brown spots from dye deterioration along the edges or scattered over the image
  - image fading, silver mirroring
  - color shift to a brownish image tone
  - exfoliation of the emulsion layer

H. Renbjør, selvportrett, Levanger Museum.
Autochrome

- Inventor: I.G. Farbenindustrie/AGFA 1932
- Time of use: 1932 – 1938
- Technology: Screen process
- Formats: 35 mm, medium format – large format
- Identification:
  - made on film support
  - looks like a color slide which is very dark
  - when looked at on a light table the grainy structure of the resin color screen is visible almost to the bare eye
  - when seen under magnification there are no spaces and no carbon particles between the color filter elements visible
- Most common deterioration signs:
  - image fading
  - color shift
  - silver mirroring
  - exfoliation of the emulsion layer

AGFA-Farben-/Komraster / AGFA-Color

- Inventor: I.G. Farbenindustrie/AGFA 1932
- Time of use: 1932 – 1938
- Technology: Screen process
- Formats: 35 mm, medium format – large format
- Identification:
  - made on film support
  - looks like a color slide which is very dark
  - when looked at on a light table the grainy structure of the resin color screen is visible almost to the bare eye
  - when seen under magnification there are no spaces and no carbon particles between the color filter elements visible
- Most common deterioration signs:
  - image fading
  - color shift
  - silver mirroring
  - exfoliation of the emulsion layer
Finlay color/ Thames color screen

- **Inventor:** Clare L. Finley, pat. 1906
- **Time of use:** 1908 (Thames color screen) – about 1914, reintroduction 1929 – 1930’s
- **Technology:** color screen process with separate color screen
- **Format:** plates and film of different formats
- **Identification:**
  - screen pattern
  - separate screen
- **Most common deterioration signs:**
  - image fading, silver mirroring of the silver image
  - color fringing because of screen misalignment

Dufaycolor/ Dioptichrome plate

- **Inventor:** Louis D. Dufay, 1910
- **Time of use:** 1910 – 1940’s
- **Technology:** screen process with integral color screen, from 1920 also possibility of making negatives and printing positives
- **Format:** plates in different sizes
- **Identification:**
  - screen pattern
- **Most common deterioration signs:**
  - image fading
  - silver mirroring
  - delamination of image layers

Chromogenic Color

- Negatives
- Slides (Kodachrome)
- Slides (EKTACHROME, Fuji, AGFA, …)
- Prints (Chromogenic paper)
Chromogenic Color

- Inventor: Rudolph Fischer, pat. 1912/14
- Fischer: Chromogenic = "give birth to color"
- Time of use: 1935/36 - today
- Technology: a dye image is produced simultaneously as a silver image is developed
- Formats: all formats on plates, film and paper
- Identification: - format - color - support - trademark - deterioration - edge code
- Most common deterioration signs: - color fading and color shift - sometimes yellow staining - vinegar syndrome - nitrate deterioration

Chromogenic Color

In chromogenic development a dye image is produced in the emulsion as an exposed silver image (the latent image) is developed. The dyes are formed by color couplers, which are colorless until they react with the developer oxidation products of their associated silver halide crystals to a visible dye. After the dyes are developed the silver image in the emulsion is bleached away so that only the dyes and unused color couplers remain (in the case of Kodachrome, the color couplers are in the color developer instead of in the emulsion). Almost all photographic color materials today use chromogenic development to produce cyan, magenta and yellow dyes in a multilayer emulsion.
Chromogenic color negative

- **Introduction:** 1939 Agfacolor monopack
- 1942 Kodacolor
- **Formats:** all formats from 8 mm, 16 mm, 35 mm, … up to large format 18 cm x 24 cm and films for special purpose
- **Identification:**
  - edge marking
  - negative in colors
- modern color negatives show an all over cast of residual dye densities (masking) to balance the printing effect of the cyan and magenta dyes which do not have good absorption or transmission properties. These dyes are visible over the whole negative as a pinkish or orange/brown color.
- **Most common deterioration signs:**
  - color fading and color shift
  - sometimes yellow staining
  - vinegar syndrome
  - nitrate deterioration
Chromogenic color print

- Introduction: 1942
  - until 1970 on baryta based paper or white acetate after
    1970 on RC-paper
  - in the east until 1990 on baryta based paper and RC-
    paper
- Formats: all formats
- Identification:
  - before 1969 on a baryta base paper or plastic (acetate)
    since the 1969 printed on RC-paper (waxy feel)
  - on the back of the print, the company name or brand
    name is often printed on (Konica, AGFA, Kodak Royal,
    Fuji Crystal Archive…)
  - there are no printing pattern, pigment traces or dye
    spots visible under magnification (like for example:
    inkjet, electrostatic printing, Fuji Pictography, etc.)
  - evenly glossy or matt, sometimes textured (raster)
  - sometimes face mounted on acrylic glass
- Most common deterioration signs:
  - color dark-fading: purple brown prints
  - color light-fading: cyan green prints
  - coupler staining: yellowed white areas and edges
  - typical band or folding damages of polyethylene
    support (RC-paper back)

H. Renbjør, Levanger Museum.

GEH.

Kon-Tiki Museum.
Chromogenic color slides

- **Inventor:** Leopold Godowsky & Leopold Mannes / Kodak 1935/36
  - Kodachrome, Agfa 1936/37 Agfacolor-Neu
- **Time of use:** 1935 - today
- **Technology/Support:**
  - Chromogenic color, gelatin emulsion on plastic film base
- **Formats:** all formats from 8 mm up to large format and films for special purposes
- **Identification:**
  - There is no screen visible under magnification (like in screen processes)
  - There is no printing pattern, pigment traces or dye spots visible under magnification (like for example: inkjet, electrostatic printing, etc.)
  - Evenly glossy surface on emulsion side with film base itself
  - Information impressed from the company with product information like: Chrome or Ektachrome, etc.
  - Color granules/voids visible under high magnification or projection
  - Plastic support
  - Edge code
- **Most common deterioration signs:**
  - Color fading and color shift
  - Vinegar syndrome (mostly motion picture)
  - Nitrate deterioration (mostly motion picture, 35 mm)

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Principle: A slide film also has three layers sensitive to the primary colors RGB. This layer is first developed, resulting in a grey scale image (a,b). A reversal is induced with light or chemical reactions, activating the unexposed components and coupling CMY dyes to these (c). The resulting combinations of CMY in these layers produce a positive image once the exposed silver halides have been removed. Thus a slide film ends up consisting of subtractive colours CMY.

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Emulsion side
Instant Photography

- Polaroid black and white
- Polaroid color
- Kodak instant black & white and color
- Fuji instant black & white and color

Polaroid black and white

Polaroid color

Inventor: Edwin Land (Polaroid Co.)

Time of use:
- black and white since 1947 – today
- color since 1963 – today

Technology: Diffusion transfer process

Format:
- peel apart film 3 ¼ x 4 ¼ inches up to extra large land format
- peel apart film 4 x 5 inch print and negative in on step
- single sheet SX 70 (since 1972), i-zone, … 35 mm film

Identification:
- typical formats of SX 70, i-zone, black backside
- white edge on front side of peel apart with removable (pre perforated) "grip track-penetrated"
- gray back side of the peel apart
- peel apart B&W: highlights are more creamy than in standard black and white prints
- manufacture code and film type printed on reverse
developer: traces on edge of large peel apart print

Most common deterioration signs:
- image fading / color fading
- cracks in image layer if stored very dry, delamination of single sheet film (SX 70, …)

Instant Film
Silver dye bleach process / Dye destruction process

- Utocolor 1910
- Gasparcolor 1934
- CIBA chrome / Ilfochrome

CIBA chrome / Ilfochrome

- Inventor: Ciba-Geigy
- Time of use: 1958 - today
  - black and white since 1947 – today
  - color since 1960’s - today
- Technology: dyes become susceptible to bleaching when a silver image is developed (azo dyes are used)
- Formats:
  - All formats prints and transparencies
  - Identification:
    - mostly very glossy
    - metallic sheen in highlights
    - printed mostly on polyester but also on RC-paper
    - early examples are printed on white pigment coated acetate base
    - typical metallic sound of polyester carrier
- Most common deterioration signs:
  - image fading / color fading
  - indentations and folds in plastic carrier

Indirect printing processes / photo mechanical

- Woodburytype
- Photogravure/ Heliogravüre
- Collotype/ Lichtdruck
### Woodburytype / Photoglyptie
- **Inventor:** Walter Woodbury 1864
- **Time of use:** 1875 – about 1900
- **Technology/Support:** pigmented gelatin on paper, photomechanical
- **Formats:** all formats but never larger than 11 x 14 inches = 28.6 cm x 36.2 cm
- **Identification:**
  - all colors possible but often dark brown
  - often mistaken as carbon prints
  - almost impossible to tell Woodbury types from carbon prints
  - often higher image relief than carbon prints
  - paper structure visible in the light areas of the gelatin binder
  - no fading at all
  - relief effect between light and dark areas in the image
  - sometimes large cracks in dark/high density areas
  - pigment specks in the gelatin
  - often used for book illustrations or other mass-produced purposes
  - never larger than 11 x 14 inches = 28.6 cm x 36.2 cm
- **Most common deterioration signs:**
  - cracks in shadow areas
  - have tendency to curl when not mounted on rigid support

### Photogravure/ Heliogravüre
- **Inventor:** W.H.F. Talbot 1858, Karel Klic 1879 – 1895
- **Time of use:** 1879 – today
- **Technology/Support:** ink on paper, photomechanical
- **Formats:** all formats
- **Identification:**
  - all colors possible / color images possible
  - fine detail, often mistaken as true photographs on matt paper
  - plate marks (Tiefdruckverfahren)
  - aquatint grain
  - random pattern on the hand pulled prints (small editions)
  - grill like screen pattern (white lines) on rotary photogravures (large editions)
  - pigments/ink are visible under magnification, laying on paper surface
  - ink deposit is variable
  - paper structure is visible
  - characteristic rendering of typographic information accompanying the image (not sharp edges)
  - no fading at all
- **Most common deterioration signs:**
  - common sign of paper deterioration: paper yellowing, foxing, …
Photogravure/ Heliogravüre

- Inventor:
  - Alphonse Louis Poitevin (Photolithography) 1855
  - Josef Albert (Albert type) 1868
  - Obernetter, Husnik, Gemoser (Lichtdruck) 1869

- Time of use: 1875 – about 1900

- Technology/Support: printing with lithographic ink on paper with the help of a partly hardened gelatin relief with a reticulate pattern, photomechanical

- Formats: all formats but often smaller book illustrations

- Identification:
  - microscopic small reticulate printing pattern (irregularly shaped cells)
  - all colors possible but often black or brownish
  - many types of paper supports are possible
  - no plate mark
  - often mistaken as true photographic prints
  - no fading at all
  - can be matt or glossy
  - often used for book illustrations, fine art reproduction or other mass-produced purposes

- Most common deterioration signs:
  - stained or yellowed paper support

Colotype / Lichtdruck / Albert type

- Inventor:
  - Alphonse Louis Poitevin (Photolithography) 1855
  - Josef Albert (Albert type) 1868

- Time of use: 1875 – about 1900

- Technology/Support: printing with lithographic ink on paper with the help of a partly hardened gelatin relief with a reticulate pattern, photomechanical

- Formats: all formats but often smaller book illustrations

- Identification:
  - microscopic small reticulate printing pattern (irregularly shaped cells)
  - all colors possible but often black or brownish
  - many types of paper supports are possible
  - no plate mark
  - often mistaken as true photographic prints
  - no fading at all
  - can be matt or glossy
  - often used for book illustrations, fine art reproduction or other mass-produced purposes

- Most common deterioration signs:
  - stained or yellowed paper support