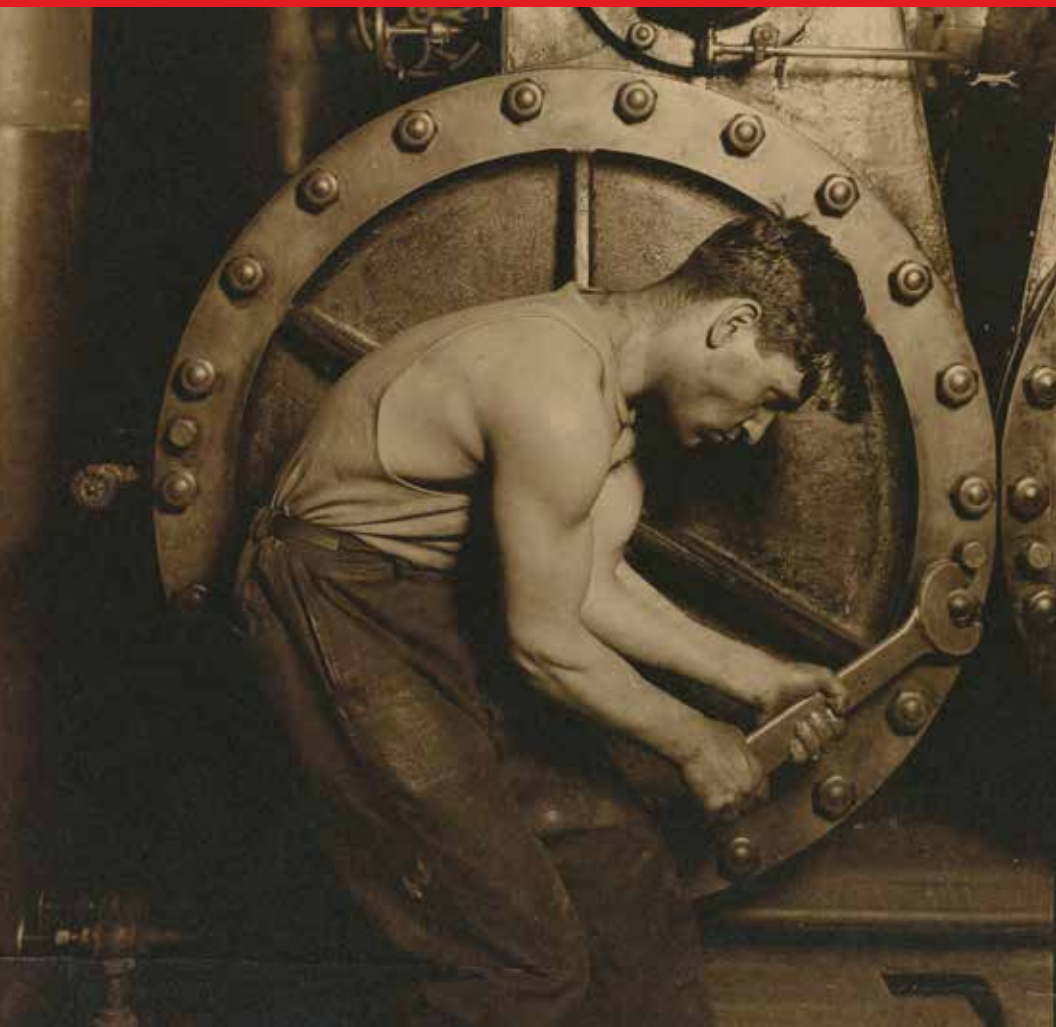
Photographic Processes

# AMON CARTER MUSEUM OF AMERICAN ART



## WHAT IS A PHOTOGRAPH?

A photograph is an image created by the controlled action of light on a light-sensitive surface and the subsequent **processing** of that image to permanently fix the picture on a sheet of metal, glass, film, or paper. The word photograph is derived from the ancient Greek words *photos* (light) and *graphein* (to write). "Light writing" is an apt description of photography because light and a means to record it are essential to make a photographic image.

A photograph can be reproduced by any number of methods, from photogravure (an early photomechanical process) and print-media techniques (as with books, magazines, and posters) to projection and electronic display (as on the Internet, a digital camera viewfinder, or a smart device). The processes in this brochure are primarily concerned with making a *photographic object*, such as a print on paper.

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Carlotta M. Corpron (1901–1988), *Eggs Encircled*, 1948, gelatin silver print, © 1988 Amon Carter Museum of American Art, Fort Worth, Texas, gift of the artist, P1987.5.3

# DATES OF COMMON USE

| | |
|---|---|
| Daguerreotype<br>Salted paper print | 1840–60s |
| **Cyanotype** | **1842–48 and 1885–1920s** |
| Ambrotype | 1854–70 |
| **Tintype** | **1854–1920s** |
| Albumen silver print | 1850–1900 |
| **Platinum print** | **1873–1915** |
| Gelatin silver print | 1890–2005 |
| **Autochrome** | **1907–34** |
| Tricolor carbro print | 1920–50s |
| **Dye imbibition print** | **1945–93** |
| Dye coupler print | 1960–2015 |
| **Dye diffusion print** | **1963–2008** |
| Dye destruction print | 1960–2012 |
| **Inkjet print** | **1990–Present** |

# DAGUERREOTYPE

Named for its inventor, Louis-Jacques-Mandé Daguerre (1787–1851), the daguerreotype is a sharply defined, **one-of-a-kind image**. Made on a highly polished, silver-coated copper plate, daguerreotype images are extremely fragile and can vanish with the swipe of a finger. To protect them, the plates are covered with a sheet of glass and sealed with tape, which also helps prevent tarnishing. Typically housed in cases, daguerreotype images are **laterally reversed**, as in a mirror.

Making a daguerreotype involves working with toxic chemicals such as iodine and mercury. The plate is polished to a mirrorlike brilliance, **sensitized** by fumes from iodine and bromide crystals, then placed inside a **camera**. In the early years of daguerreotypy, **exposure** times could last from several seconds (in bright light) to more than a minute.

After exposure, the plate is removed from the camera and positioned over a dish of heated mercury until the image appears and is then stabilized with a **fixer**. The final chemical step involves gilding the plate with a gold-chloride solution to improve tonal range and permanence. Colored pigments and gold paint are sometimes applied by hand to the image to enhance details, such as eyes, skin tones, and clothing.

The luminous, diminutive daguerreotype was widely popular into the late 1850s, when it was supplanted by the albumen silver process.

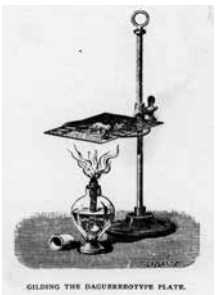
**CHARACTERISTICS**

- Made on metal
- Typically small (up to 6 x 8 in.)
- Mirrorlike in appearance
- Usually housed in a booklike case
- Highly detailed and sometimes hand-tinted with color and gold paint

**COMMONLY USED**

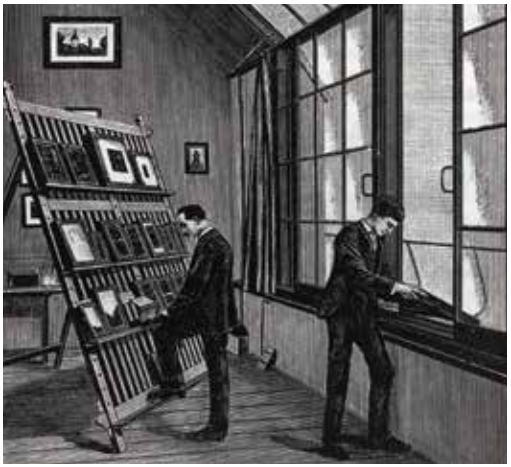
1840–60s

Making a daguerreotype is a challenging, hazardous process that involves working with toxic chemicals. Some of the apparatus involved are illustrated at right.



GILDING THE DAGUERREOTYPE PLATE.

**Top:** Jeremiah Gurney (1812–1895), *[Mother seated with three children]*, ca. 1852–58, daguerreotype with applied color, Amon Carter Museum of American Art, Fort Worth, Texas, P1992.6



# SALTED PAPER PRINT

Salted paper prints are a modification of William Henry Fox Talbot's (1800–1877) earlier process called "photogenic drawing." Introduced shortly after the daguerreotype, they were the first successful photographs on paper printed from paper **negatives** (also invented by Talbot).

To make a salted paper print, high-quality paper is soaked in a solution of sodium chloride and dried. Silver nitrate is then brushed onto the sheet, making it light sensitive. After it dries, the paper is exposed in bright sunlight while in contact with a negative until the image appears (the sunlight darkens the exposed areas, while the shaded areas remain light). After **fixing**, the print is bathed in water to remove chemical residues. Toning with a gold chloride solution increases the permanence of the image and modifies its final **tone**.

Talbot's salted paper method would foretell all modern photographic processes as it made possible the creation of multiple prints from a single negative. However, the salted paper print produces a much less brilliant image than the daguerreotype, and it fell out of use with the introduction, in the mid–1850s, of the albumen print, a paper-based photograph that provides a much sharper image.

**CHARACTERISTICS**

- Matte surface, reddish brown in color
- May appear purplish brown or yellowish brown

**COMMONLY USED**

1840–60s

A salted paper print is made by exposing light-sensitive paper, in contact with a negative, to bright sunlight. Large windows ensured plentiful light in this nineteenth-century studio (upper left).

**Bottom:** Mathew Brady Studio, *James Brooks (Editor, New York Express)*, ca. 1858, salted paper print, Amon Carter Museum of American Art, Fort Worth, Texas, P1990.23

# CYANOTYPE

Though it did not become popular until the late nineteenth century, the cyanotype was invented in 1842 by Sir John Frederick Herschel (1792–1871), making it one of the oldest photographic processes. After **fixing** an exposed sheet of paper with water, the iron salts that **sensitize** the sheet's surface turn blue (or cyan), which gives the process its name.

Because the cyanotype's blue color is not well suited for portraiture—by far photography's principal application during its early decades—the process did not gain wide popularity and, soon after its introduction, passed into disuse. Around the turn of the twentieth century, however, the process enjoyed a resurgence: it was easy to perform and cost little money.

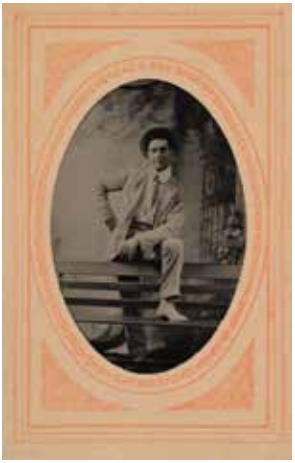
To make a cyanotype, the sensitized sheet of paper is typically exposed to sunlight under a **negative** in a **contact frame**. Exposure in bright sunlight takes about fifteen minutes, and the prints are considered reasonably permanent. The "sunprint kits" found in toy stores today produce cyanotypes. A variant of the process was used for many years to duplicate architectural drawings, resulting in blueprints.

**CHARACTERISTICS**
- Blue color

**COMMONLY USED**
1842–48 and 1885–1920s

The cyanotype renders its subject in shades of blue and was therefore seldom used for portraiture.

**Top:** Charles F. Lummis (1859–1928), [*Two Indian women*], ca. 1890, cyanotype, Amon Carter Museum of American Art, Fort Worth, Texas, P1991.3.1
**Bottom:** Henry P. Bosse (1844–1903), *Raftboat "Ten Brook,"* 1885, cyanotype, Amon Carter Museum of American Art, Fort Worth, Texas, P1997.49



**AMBROTYPE (TOP)**

**CHARACTERISTICS**
- Typically small
- Made on glass
- Usually housed in a booklike case
- Milky highlights

**COMMONLY USED**
1854–70

**TINTYPE (BOTTOM)**

**CHARACTERISTICS**
- Typically small
- Made on thin enamel-coated metal plate
- Often low in contrast and somewhat dark

**COMMONLY USED**
1854–1920s

**Top:** Unknown photographer, *[Soldiers in staged fight]*, ca. 1863, ambrotype with applied color, Amon Carter Museum of American Art, Fort Worth, Texas, P1989.7.1 **Bottom:** J. S. Milstein (dates unknown), *[Man standing with foot on bench, full-length]*, ca. 1900–10, tintype, Amon Carter Museum of American Art, Fort Worth, Texas, P1976.22.49

# AMBROTYPE AND TINTYPE

Ambrotypes and tintypes are similar photographic processes that both use the wet-collodion process to create an image.

In 1851, Frederick Scott Archer (1813–1857) introduced the wet-collodion process, which changed the face of photography by making it possible to produce finely detailed negatives. Processes that use collodion, a molasses-like mixture, are called wet-plate processes because photographers must coat, sensitize, expose, and develop their plates while the collodion is still wet. Like daguerreotypes, ambrotypes and tintypes are **one-of-a-kind images** that are **laterally reversed**.

An ambrotype is made on glass, and the image produced is a **negative** (in which values that are light in the actual subject photographed are dark on the exposed surface, and vice versa). After **processing**, the glass plate is backed with an opaque black material (such as dark cloth) to reverse the **tones** and make the image appear as a **positive**.

The tintype (also known as a ferrotype) produces a **negative** image as well. The name is a misnomer: there is no tin in a tintype, which is made on a thin sheet of iron coated with dark enamel, again, to make the image appear as a **positive**. Tintypes are sometimes cased but are more often found loose, in paper mats, or in albums. Predominantly used for portraiture, they were often made by street vendors and carry little of the detail found in the daguerreotype.

**CHARACTERISTICS**

- Generally mounted on stiff board to prevent curling
- Fine detail and a moderately shiny surface
- Typically reddish to purplish brown in the shadows
- With deterioration, highlights are yellowish

**COMMONLY USED**

1850–1900

The manufacture of albumen paper required thousands of eggs. An enormous industry flourished around it, employing many workers who broke eggs, beat the whites, and floated the paper on the albumen solution one sheet at a time.

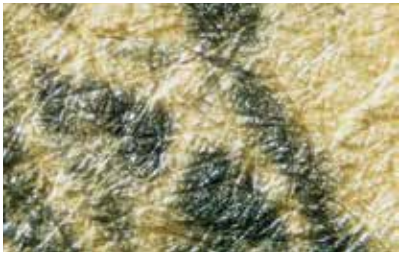
William Bell (1830–1910), *Grand Cañon, Colorado River, near Paria Creek, Looking West*, 1872, from the album *U.S. Geographical Explorations and Surveys West of the 100th Meridian—Wheeler Photographs*, albumen silver print, Amon Carter Museum of American Art, Fort Worth, Texas, P1982.27.22

# ALBUMEN SILVER PRINT

Albumen printing dominated the second half of the nineteenth century. Invented in 1850 by Louis-Désiré Blanquart-Evrard (1802–1872), the albumen process was the first commercially viable method of producing a photographic print on paper from a **negative**.

The process involves floating a thin sheet of paper over a salted solution of egg whites (or albumen), which, once dried, produces a smooth, sealed surface. The paper is then **sensitized** with silver nitrate. To capture an image, the sheet is placed in a **contact frame** under a negative (most often a collodion glass plate). Once exposed, it is **fixed** and washed. Since the image emerges as a direct result of **exposure** to light, without the aid of a **developer**, an albumen print may be said to be a printed out, rather than a developed out, photograph. Most albumen prints are treated with a gold chloride toner that enriches their tonal range and increases their permanence. Over time it is not unusual for small surface cracks, caused by the natural aging of the albumen, to appear in albumen prints.

Albumen prints readily superseded salted paper prints with their much clearer images. They spelled the demise of the daguerreotype's popularity as well, for finally a process had been developed to make multiple prints on paper with relative ease and with an image resolution marked by fine detail.



**CHARACTERISTICS**

- Usually exhibit a broad tonal range with fine details and luminous highlights
- Typically low in contrast
- Paper texture often visible in the image

**COMMONLY USED** 1873–1915

Under magnification, paper color and fibers can be seen through the image of a platinum print (bottom image).

**Top:** Karl Struss (1886–1981), *Brooklyn Bridge from Ferry Slip, Late Afternoon*, 1912, platinum print, © 1983 Amon Carter Museum of American Art, Fort Worth, Texas, P1983.23.82

# PLATINUM PRINT

William Willis (1841–1923) invented the platinum printing process in 1873, and within five years he had established a company that supplied commercially coated papers. Platinum printing is one of the finest printing processes, and because platinum is a precious metal, it is also one of the most expensive. The process fell into disuse during World War I, when the price of platinum soared.

Platinum is highly resistant to corrosion and tarnishing; as a result, platinum prints are very stable. To make a platinum print, paper is **sensitized** with a mixture of two iron salt solutions and a platinum salt solution. Once dry, the paper is usually placed beneath a **negative** in a **contact frame** and exposed to light. The tone of platinum prints can be altered in a variety of ways, including brushing the print with gold chloride or altering the temperature or composition of the **developer**. Pure platinum images tend to range from neutral brown to black.

Palladium, palladium-platinum, silver-platinum, and gum-platinum prints are all variations of the platinum print. Palladium, a silver-white metal of the platinum group, produces images of lower contrast and warmer **tone**, ranging from brown to brown black. Silver-platinum prints are developed with silver nitrate. A gum-platinum print is actually made from a finished platinum print, which is coated with sensitized and pigmented gum arabic (a water-soluble gum made from acacia trees) that adds texture and sometimes lends a painterly effect to the image.

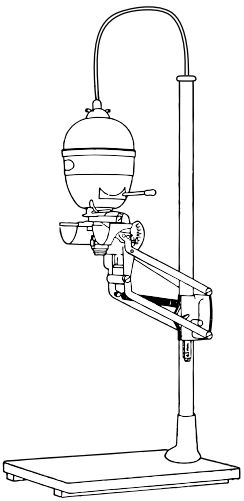
# GELATIN SILVER PRINT

The gelatin silver process revolutionized photography. The process's improved light sensitivity made it possible to **enlarge** a small **negative** by projecting it onto a piece of paper in a darkroom. By the end of the century, this innovation had led to the manufacture of smaller film formats and smaller **cameras**, opening photography to a much broader amateur market.

Gelatin silver printing paper has been industrially manufactured and commercially available since the late 1880s. Its **emulsion** consists of light-sensitive silver salts suspended in a gelatin coating on paper. After **exposure**, the paper is immersed in a **developer** bath, which makes the image appear. Subsequent baths stabilize the image.

Although gelatin silver prints generally have neutral black tones, chemical bath treatments known as **toners** can alter the overall color of the final image, during or after processing. Toners are also used to increase the long-term preservation of gelatin silver prints, as they make silver more resistant to oxidation. Although well-processed gelatin silver prints are relatively stable, high humidity and air pollutants can lead to tarnishing of the silver, sometimes causing a bluish cast on the surface.

The dominant photographic process of the twentieth century, gelatin silver printing remained largely unchanged over time.



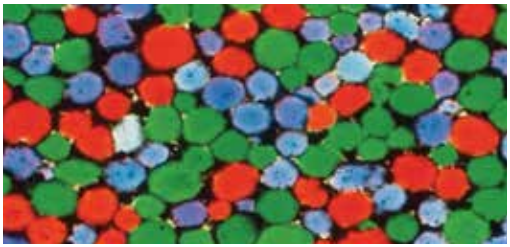
**CHARACTERISTICS**

- Monochrome image, generally gray in tone
- Usually a smooth, glossy surface
- Paper base is usually white or cream colored

**COMMONLY USED**
1890–2005

An enlarger (left) projects a negative image at a larger size onto a sheet of sensitized film or paper.

Walker Evans (1903–1975), *Berenice Abbott*, ca. 1930, gelatin silver print, © The Metropolitan Museum of Art, New York, New York, Amon Carter Museum of American Art, Fort Worth, Texas, P1978.71.1



**CHARACTERISTICS**
- Made on glass
- Appear dark and grainy
- Often have a reddish cast

**COMMONLY USED** 1907–34

To make an Autochrome, a glass plate is coated with a fine mosaic of dyed potato starches (above).

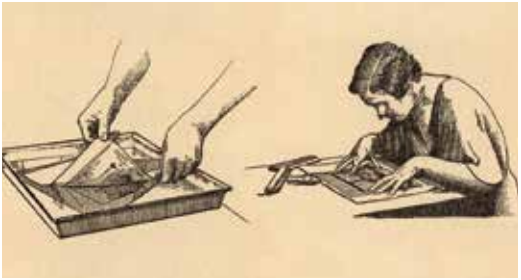
# AUTOCHROME

The quest for color in photography is as old as the medium itself. In 1869, Louis Ducos du Hauron (1837–1920) proposed a method of making color photographs that would foretell the introduction of additive color-screen processes at the end of the nineteenth century.

The most successful additive color-screen process was the Lumière Autochrome, introduced in 1907 by the brothers Auguste (1862–1954) and Louis Lumière (1864–1948). The process was acclaimed as the greatest discovery in photography since the daguerreotype and remained in wide use until Kodachrome became available in the 1930s.

Autochromes are **one-of-a-kind images** that are color **positives** on glass. To make an Autochrome, a glass plate is coated with a fine mosaic of potato starches dyed red, green, and blue, and then coated with a gelatin silver emulsion. These starch particles act as colored filters over the light-sensitive **emulsion**. After **exposure** the plate is **developed** into a positive image that can then be projected or held up to light, like a color slide or **transparency**. If unfaded, Autochromes are deeply luminous in color.

**Bottom:** Laura Gilpin (1891–1979), [*Emma Miller Gilpin*], ca. 1912, Autochrome, © 1979 Amon Carter Museum of American Art, Fort Worth, Texas, bequest of the artist, P1979.146.45



**CHARACTERISTICS**

- Slightly raised appearance in dark areas of image
- Vibrant colors, almost unnatural
- Known for excellent image permanence

**COMMONLY USED** 1920–50s

Through chemical action and development in water, three colored, pigment-relief images are obtained (above left). These images are then stacked onto a support (above right). The combined three-color image is then transferred, using a roller, to a final paper support to produce a single full-color photograph.

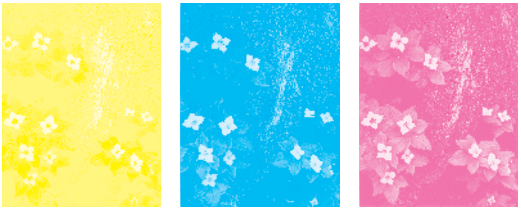
# TRICOLOR CARBRO PRINT

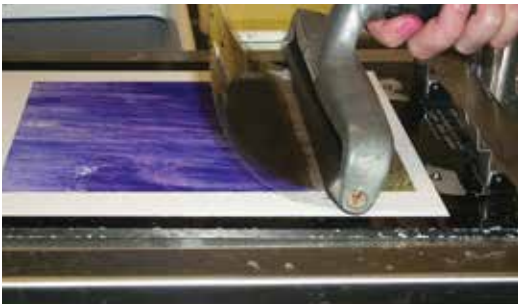
Tricolor carbro was introduced commercially in 1919 by the Autotype Company of London and was based on an earlier carbon process called ozobrome. The name carbro is derived from the main components of the process: carbon tissue and bromide print.

The process begins with three **separation negatives**, created either with three successive camera exposures through red, green, and blue filters or in a darkroom from a color **transparency**. From these negatives, three black-and-white **positive** enlargements (called bromides) are printed. The bromides, still wet, are placed in close contact with three **sensitized** and colored gelatin tissues (cyan, magenta, yellow) containing bleaching agents. Through chemical action and development in warm water, three colored, pigment-relief images are obtained. These images are then stacked in **registration** onto a temporary support. The combined three-color image is then transferred, using a roller, to a final paper support to produce a single full-color photograph.

Tricolor carbro prints are noted for their brilliance. They are labor intensive and expensive to produce, however, so their use was largely limited to commercial purposes, such as advertising and publishing. One of the most important features of the process is the extreme permanence of the resulting image.

**Left:** Paul Outerbridge Jr. (1896–1958), *Party Mask with Shells*, 1936, tricolor carbro print, © 1996 Estate of Paul Outerbridge Jr., courtesy of G. Ray Hawkins, Amon Carter Museum of American Art, Fort Worth, Texas, P1996.17





**Top:** Eliot Porter (1901–1990), *Bunchberry Flowers, Silver Lake, New Hampshire, June 5, 1953*, 1953, dye imbibition print, © 1990 Amon Carter Museum of American Art, Fort Worth, Texas, bequest of the artist, P1989.19.15

Dye imbibition prints are made by combining dyes from three matrices (middle) that are rolled onto specially prepared paper in exact registration (bottom).

# DYE IMBIBITION PRINT

The dye imbibition process (also known as dye transfer) is a highly complex process that affords precise control of color. Known for their permanence, dye imbibition prints exhibit excellent color saturation and unusual brilliance.

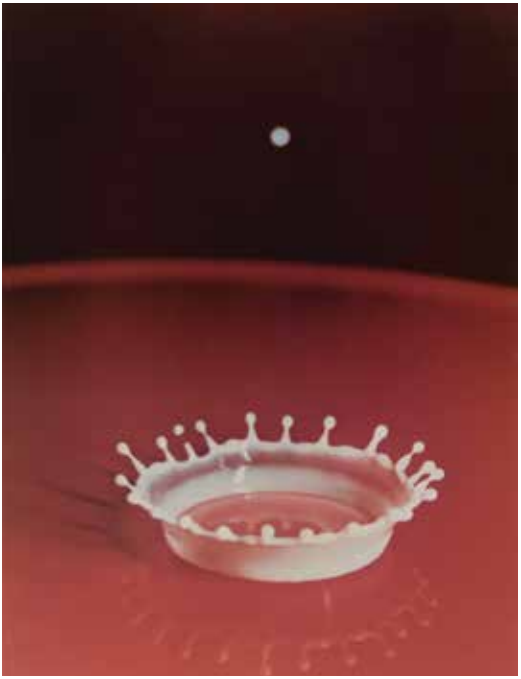
A dye imbibition print is made of dyes transferred from three film matrices onto a sheet of paper coated with gelatin. Generally, three **separation negatives** are created by projecting a color **transparency** onto black-and-white film through red, green, and blue filters. (All the colors of light can be made by combining different proportions of these three primary colors.) These negatives are then used to make three positive relief matrices that absorb cyan, magenta, and yellow dyes—the color complements of red, green, and blue—in proportion to the thickness of each matrix. In exact **registration**, the dye-saturated matrices are then placed successively in contact with a specially prepared paper. The transferred dyes combine in the gelatin layer to create a full-color image. Multiple prints can be made from one set of matrices.

While the dye imbibition process remains exceptional in its ability to reproduce color, it is also labor intensive and expensive. Eastman Kodak stopped making materials for the process in 1993.

**CHARACTERISTICS**

- Saturated, vibrant colors
- Often high in contrast
- Usually glossy surface

**COMMONLY USED** 1945–93



# DYE COUPLER PRINT

From its introduction in the 1940s until the turn of the twenty-first century and the advent of the digital print, the dye coupler print was the most common type of color photograph. It remains an economical method for making prints from color negatives or digital image files. Photographs printed with this process are also known as chromogenic, or Type C, prints.

In conventional dye coupler printing, a color **negative** is **enlarged** onto a sheet of **sensitized** paper. The gelatin silver **emulsion** on the sheet has three layers, each sensitive to only one of the primary colors of light: red, green, and blue. Each layer also contains "dye couplers" (chemical compounds that react with the oxidized silver to form dyes—cyan, magenta, and yellow—in the emulsion layers). After the dyes are formed, the silver is bleached away, leaving a color **positive** image. Due to residual chemicals from **processing**, dye coupler prints are not as stable as other color prints, such as dye imbibition or dye destruction prints.

Today, dye coupler prints are mostly made from digital files with an electronic enlarger that exposes the paper with red, green, and blue lasers. The paper is then processed using conventional dye coupler chemistry.

**CHARACTERISTICS**

- Very common
- Inexpensive to produce
- Moderately vibrant color
- Less stable image
- Printed from a negative
- Uses organic dyes
- Moderately vibrant color
- Overall yellowing with time, especially in prints made before 1960
- Color balance shifts over time

**COMMONLY USED** 1960–2015

Dye coupler prints are often made from color negatives like the one below.


**Top:** Harold E. Edgerton (1903–1990), *Drop of Milk (Milk Drop Coronet)*, 1957, dye coupler print, © Harold & Esther Edgerton Foundation, 2007, courtesy of Palm Press, Inc., Amon Carter Museum of American Art, Fort Worth, Texas, gift of Mr. and Mrs. Gus Kayafas, Concord, Massachusetts, P1991.32.5

By the mid-1960s, Edwin Land's invention, the instant camera marketed by Polaroid Corporation, was in common use. Below, an amateur photographer times a picture's development before peeling the finished picture away from its processing package.

**CHARACTERISTICS**
- Vibrant colors
- Chemical stains along the edges (20-by-24)
- Excellent stability in dark storage

**COMMONLY USED**
1963–2008 (peel-apart)
1972–2008 (integral)

# DYE DIFFUSION PRINT

Also known as instant photography or by the brand name Polaroid, dye diffusion processes provide a finished color image within a few minutes after exposure of the film in the camera. **Processing** is accomplished in a single step, at ambient conditions; there are no manipulations in a darkroom. Films come in two types: peel-apart (Polacolor) and integral (SX-70).

The film unit is composed of a negative, a positive, and a pod of developing chemicals. During exposure in the camera, a scene is recorded on the negative. When the image is pulled from the camera, the pod breaks and the chemical reagent it contains spreads through the layers of the negative, initiating a series of complex chemical reactions. As a result, cyan, magenta, and yellow dyes diffuse from their original location to an image-receiving layer and produce a unique, one-of-a-kind color image. The entire process takes about a minute. With peel-apart materials, positive and negative are separated, and the negative is discarded.

In 1977, Polaroid built a very large camera that produced 20-by-24-inch peel-apart prints. The large format was an immediate success among artists. Only six of these cameras were built and have been used around the world.

**Top:** Barbara Kasten (b. 1936), *Construct XXI*, 1983, dye diffusion print, © 1983 Barbara Kasten, Amon Carter Museum of American Art, Fort Worth, Texas, P2008.4

# DYE DESTRUCTION PRINT

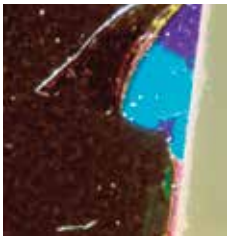
Dye destruction prints are color photographs made from color **positives**. They are also known as silver dye-bleach prints or Cibachrome prints. Dye destruction prints are characterized by their saturated colors, often very glossy surface, and (where visible) black margins. Dye destruction prints can be made from color transparency film or digital image files.

To make a dye destruction print, a **transparency** is projected onto a **sensitized** paper that has three **emulsion** layers, each sensitized to one of the three primary colors of light—red, blue, and green. Each layer also holds a corresponding dye—cyan, magenta, and yellow—complementary to each of the three colors of light. (Unlike the dye coupler process, the dyes in dye destruction are already present in the paper.) After **exposure**, the print is **processed** in a black-and-white **developer** to produce a negative silver image. This **negative** image sets up the next step: the image is immersed in dye bleach, which destroys the dyes proportional to the amount of developed silver present in the layer. The end result is a color positive image.

Because this process uses azo dyes, which are highly stable, dye destruction prints are more permanent than most other color prints, particularly dye coupler prints.

**CHARACTERISTICS**

- Less common
- Expensive to produce
- Highly stable image
- Printed from a positive
- Uses azo dyes
- Saturated colors and high contrast are typical
- Usually high-gloss plastic support (rather than paper)
- Where visible, black borders around image

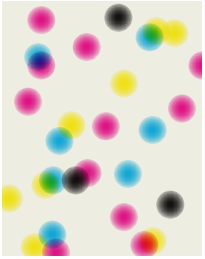


**COMMONLY USED** 1969–2012

Above, damage in a dye destruction print reveals emulsion layers containing primary colored dyes.

A dye bleach bath causes the destruction of dye molecules, forming white dots, illustrated above. The dyes that remain (in this case, magenta dyes) form a positive image.

**Top:** Kathy Suder (b. 1959), *Landscape*, 1998, dye destruction print, 2004, © 1998 Kathy Sherman Suder, Amon Carter Museum of American Art, Fort Worth, Texas, gift of the artist, P2005.1



Inkjet images consist of millions of tiny multi-colored dots (left). They are made using the same type of equipment the Amon Carter uses to produce archival reproductions (above).

# INKJET PRINT

Today most photographs are captured with digital cameras. The image files they store are largely printed using inkjet printers. Sometimes referred to as *giclée* (pronounced zhee-CLAY) prints, inkjet prints are not considered to be true photographs by many authorities because they are not made on light-sensitive paper.

An inkjet print is made with a computer-controlled device (printer) that sprays fine droplets of liquid ink onto the printing support through very small nozzles. The image is formed by a stochastic (or randomized) pattern of tiny dots of color. Inks can be water- or solvent-based, and the colorants in the inks can be dyes or pigments.

The software that runs an inkjet printer converts the color information in a digital image file from numerical values for red, green, and blue (RGB) to the gamut (or range) of colors the printer can produce. Some inkjet printers use up to twelve separate inks to make a full-color or black-and-white image. In addition to the gamut of the printer, the size of the ink dots affects the sharpness and tonal range of the image.

The type of paper on which the print is made will also influence the image's visual effect. The long-term stability of an inkjet print can vary greatly depending on the chosen combination of paper and inks.

**CHARACTERISTICS**
- Made with dots
- Do not have a continuous tone
- Can be printed on any type of support

**COMMONLY USED** 1990–Present

**Bottom:** Terry Evans (b. 1944), *Field Museum, Helianthus, 1905*, 1999, inkjet print, © 2000 Terry Evans, Amon Carter Museum of American Art, Fort Worth, Texas, P2000.65

# GLOSSARY

**aperture:** the opening in a camera, lens, or camera obscura that admits light. Aperture also refers to the diameter in the opening; an aperture is adjusted to control the amount of light passing through it.

**camera:** a device that consists of a light-proof chamber with an opening (see aperture) generally fitted with a lens and a shutter through which an image is projected and recorded on a light-sensitive surface, such as film, glass, metal, or paper. A digital camera records images with a light-sensitive electronic sensor and stores them as digital data files; a digital camera can also record video.

**camera obscura:** a darkened enclosure (from a box to a tent or even a room) having an aperture usually fitted with a lens through which external light enters to form a projected image of the scene outside the camera obscura.

**contact frame:** a hinged-back frame that holds a negative and sensitized sheet of paper in close contact.

**contact print:** a print made by exposing sensitized paper, in direct contact with a negative or other object, to light.

**density:** the degree of opacity in areas of a translucent image (such as a negative or transparency) or the degree of darkness in areas on a reflective surface (such as a print).

**developer:** a chemical solution that causes the image to form in an emulsion that has been exposed to light.

**emulsion:** a light-sensitive coating used to capture images on film, glass, metal, paper, or other surfaces.

**enlarger:** a darkroom apparatus that projects an image (either negative or positive) at a larger size onto a sheet of sensitized film or paper (from a small negative to a larger print, for example).

**exposure:** the act or an instance of subjecting sensitized material (as film) to controlled amounts of light (usually, but not always, through the lens and aperture of a camera); also, the amount of such light or length of time (for example, a three-second exposure).

**fixer:** a chemical solution that arrests development and stabilizes an image. If a developed photographic image is not fixed, it will quickly darken when exposed to light.

**laterally reversed:** an image that is reversed left to right, like a mirror's reflection. Some processes, such as the daguerreotype and ambrotype processes, reverse the subject's image in the final photograph.

**monochrome:** a single-colored photograph; the term is most frequently applied to black-and-white photographs but can also describe toned images (as with the cyanotype, which is only blue in color).

**negative:** any image with inverted tones; that is, the light areas of a subject appear dark and the dark areas appear light—an analogous opposite of the subject as seen by the eye. Negative can also refer to the piece of film, glass, or paper—usually made with a camera—that contains a negative image. Such negatives are used to make positive prints. A color negative has inverted color information as well as inverted tonality. The dyes in the color negative image represent the opposite of a given color; for example, a green subject appears magenta in a color negative.

**one-of-a-kind image:** a photographic image that can only be duplicated by rephotographing the original image (as opposed to making many prints from a single negative). The daguerreotype, ambrotype, and tintype processes, for examples, produce only one-of-a-kind images.

**positive:** a positive, as opposed to a negative, depicts how people normally see light, dark, and color in a scene. The term positive may also refer to a photographic print or transparency film with a positive image.

**processing:** actions taken after exposure in order to produce a visible and stable image, generally consisting of a succession of chemical baths that react with the exposed light-sensitive particles, stop the chemical reaction, and/or eliminate unexposed particles.

**register:** to be "in register" is to be in correct alignment.

**sensitize:** to chemically treat a surface—such as glass, metal, paper, or plastic—with a light-sensitive agent.

**separation negative:** black-and-white photographic negatives exposed through red, green, and blue filters; each negative holds the color information for one of the primary colors.

**tone:** the overall hue of a monochrome image; the tonal range of an image refers to its gradation from darkest shadows to lightest highlights. Toner is a chemical used to alter an image color or increase its permanence.

**transparency:** a positive image, in either black and white or color, produced on transparent film or glass.

**Front cover (detail) and above:** Lewis Wickes Hine (1874–1940), *Steamfitter*, 1921, gelatin silver print, Amon Carter Museum of American Art, Fort Worth, Texas, P1981.80.3

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