

History of Photography and its Technologies Compiled by John Larkin

5th-4th Centuries B.C.

Chinese and Greek philosophers describe the basic principles of optics and the camera.

The Chinese were among the first to discover the idea of the basic pinhole camera. Around 5th Century B.C. they wrote about how an image was formed upside down from a "pinhole" on the opposite wall.

1021

The invention of the camera obscura is attributed to the Iraqi scientist Alhazen and described in his book of optics. Lots of ideas followed for it's use and adding a lens to improve the brightness especially when used to trace a scene.

1664-1666

Isaac Newton discovers that white light is composed of different colours.

1685

The vision of a box form of a Camera that was portable and small was envisioned by Johann Zahn, THOUGH it would be nearly 150 years before technology was able to bring his vision to life.

1727

Johann Heinrich Schulze discovered that silver nitrate darkened upon exposure to light.

1814 - 1826

Joseph Niepce achieves first photographic image using an early device for projecting real-life imagery using a camera obscura. However, the image required eight hours of light exposure and later faded. The oldest surviving photograph of the image formed in a camera – View from the Window at Le Gras, he used a polished pewter plate coated with light-sensitive bitumen of Judea (asphalt). We can only assume he used a camera obscura.

1834

Fox Talbot began serious chemical experiments on light-sensitive paper in England.

August 1835

Fox Talbot produced his first successful camera negative of a latticed window at Lacock Abbey. He used his 'mousetrap' camera, a box fitted with a microscope lens, more about his process shortly.

1838

In 1837 Louis Daguerre starts his experiments and in 1838 produces his first official Daguerreotype, an image that was fixed and did not fade and needed under thirty minutes of light exposure. This was a significant breakthrough on the history of photography timeline. Formally announced in January 1839 which prompted Fox Talbot to patent his own process. The Daguerreotype was a sharp one-off image whereas Fox Talbot was a negative process which could produce repeated copies. Both processes rely on variants of silver halides which are only sensitive to blue and UV light. This is why early photographs have very bright skies and darker skin tones.

Steps in the Daguerreotype Process

Polishing: A copper sheet plated with a thin layer of silver is cleaned and buffed until it shines like a mirror. Quite expensive base material and labour intensive.

Sensitising: The plate is exposed to chemical vapours (such as iodine and bromine) in a dark box to make the silver light-sensitive.

Exposure: The plate is placed in a camera and exposed to light for anywhere from a few seconds to several minutes, forming a hidden (latent) image.

Development: The exposed plate is held over hot mercury fumes, which react with the exposed areas to bring out the visible picture.

Fixing: The image is rinsed in a sodium thiosulphate or salt solution to stop any further reaction to light.

Gilding and Sealing: A gold chloride solution is often applied to tone and protect the surface, a small amount of gold coats the silver grains intensifying the image and adding a warm tint. The finished plate is sealed under glass inside a protective case.

These were one-off photographs and had to be viewed at the right angle to see the positive image.

1839

The Giroux daguerreotype camera made by Maison Susse Frères, with a lens by Charles Chevalier, was the first camera to be commercially produced. Chevalier created an achromatic lens (a two-element lens made from crown glass and flint glass) to cut down on chromatic aberration for Daguerre's experiments. Chevalier reversed the lens (originally designed as a telescope objective) to produce a much flatter image plane and modified the achromat to bring the blue end of the spectrum to a sharper focus. However reversing the lens caused severe spherical aberration so a narrow aperture stop was necessary in front of the lens.

1841

William Henry Talbot patents the Calotype process, the first negative-positive process making possible the first multiple copies.

The process is as follows:

Set up: In a tent with red safelight make up a solution of silver nitrate, potassium bromide and a few drops of gallic acid (phenolic acid)

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Sensitising: This is then painted with brush on some fine paper to coat an emulsion.

Exposure: About a 3 minute exposure in bright sunlight.

Processing: Return to the darkroom tent and develop the paper in gallic acid until the image is dark enough.

Fixing: Wash the paper to remove any unprocessed silver nitrate and rinse in a bath of Sodium thiosulphate (Hypo).

This is now a negative.

To produce a positive the same process is done with the negative in contact with a sensitised paper held in a printing frame with glass top and exposed to sunlight for several minutes to a couple of hours exposure.

This is processed in the same way.

There were no exposure meters so photographers had to rely on charts.

1851

Frederick Scott Archer invented the Wet Collodion process for coating plates, this was more sensitive to light meaning images required only two or three seconds of light exposure.

Copper plates were expensive to produce Daguerreotypes and a cheaper process using thin sheets of iron known as Tintype could be made using the same process.

The core Steps of the Wet-Plate and Tintype Process:

Preparation: For Tintypes a thin sheet of iron or aluminium is thoroughly cleaned and is coated with black or dark brown lacquer. For glass just polished with a lint free cloth.

Coating: Liquid collodion (a solution of nitrocellulose in alcohol and ether) mixed together with a soluble iodide is poured evenly across the metal plate and allowed to set slightly.

Sensitisation: In a darkroom or under a red safelight, the plate is submerged in a 9% silver nitrate bath for 3 to 5 minutes to make it light-sensitive (ISO ~1).

Exposure: The wet, sensitised plate is loaded into a light-safe plate holder, placed in a large-format camera, and exposed to light for anywhere from 1 to 20 seconds while the subject remains completely still.

Development: The plate is immediately brought back to the darkroom and treated with an acidic developer (pyrogalllic acid) for about 20 seconds to bring out the image.

Fixing: The plate is placed in a fixer solution (historically potassium cyanide or sodium thiosulphate) to dissolve unexposed silver halides, causing a milky-negative to turn into a visible positive against the black metal background.

Varnishing: After washing and drying, a protective sandarac or lavender-oil varnish is applied and heated to seal and preserve the delicate silver image for generations.

A modification of the process, in which an underexposed negative was backed with black paper or velvet to form what was called an ambrotype, became trendy.

Glass plates enabled copies to be produced but Tintypes were still popular due to their durability especially photographing war scenes!

1857

Also around this time we saw the 'Dry Collodion' process. Invented by Louis Desire Blanquart-Evrard it utilises albumen or egg whites mixed with a little salt to coat the paper first before floating it on a silver halide solution. The paper was allowed to dry and could be stored and used before taken back to process. Another big advantage was that the emulsion was on the surface of the paper and not soaked in which gave a more crisp and sharp print. Albumin used in the form of egg whites were used as a carrier for the silver nitrate, biggest problem was often small bubbles formed on the surface which were difficult to totally remove.

The process can be applied to glass plates with a further coating of albumin over the top to prevent cracking as the plate dried. Some old images have bubbles showing where the albumen has not coated evenly and often the photographers fingerprints visible in the corners. Plates were not very sensitive and though they were exported they lost sensitivity with storage so needed to be used within a few weeks of preparation. Big advantage is not dragging a processing tent around. It was an important step in the right direction.

1865

Photographs and photographic negatives are added to protected works under copyright law.

1871

Richard Leach Maddox invented the gelatine 'Dry Plate' silver bromide process, which means negatives no longer had to be developed immediately. First made available in 1873, dry plate negatives were the first economically successful durable photographic medium. Dry plate negatives are typically on thinner glass plates, with a more evenly coated emulsion. Dry plate glass negatives were in common use between the 1880s and the late 1920s. These were had a more sensitive emulsion.

1873

Orthochromatic film was introduced by German chemist Hermann Wilhelm Vogel who discovered how the silver halides can be made sensitive to green light by using dyes. Incidentally recently new black & white films have been introduced and gaining popularity as Ortho Plus emulsions by Ilford and Rollei.

1878

Eadweard Muybridge successfully captured the sequence of movement. It was this ground breaking discovery and technique that helped invent motion pictures. He set up a dozen cameras with trip wires to each camera. Strength of the negatives were often weak and needed to be enhanced with a retouching pencil.

1879

Agfa break into the market with a gelation-coated emulsion paper drastically simplifying the printing process.

Alfred Hugh Harman founds Britannia Works in Ilford, Essex, making gelatine dry plates in his basement. Various branding changes but became officially Ilford Ltd around 1901.

1880

Sepia toning of prints gets popular. In the 1840s the first photographs faded in a few years because the silver in the paper oxidised or the silver image faded. By the 1850s Photographers discovered using gold chloride made it permanent but left the image a warm brown.

A better method became popular from around 1880 called Sepia toning. Here the silver is bleached in a black-and-white print, then re-developed in sodium sulphide. Image comes back brown, but will last 100+ years. Thorough washing of the paper was crucial to remove traces of chemicals. For the next 50 years it was commonplace to sepia tone portraits as it was more flattering. Kodak sold paper that came out brown automatically but was not as permanent.

1881

George Eastman forms the Eastman Dry Plate Company, percolating plates ready to expose.

1884

George Eastman invents flexible, paper-based photographic film. Sheets of calotype paper gummed together and put on rolls. Apart from the images having the grain of the paper the rolls of film were unreliable.

First Leica camera produced at the Leitz factory in Germany using paper based film.

1885

Louis Gandolfi establishes camera making business in Westminster later expanding to workshop in Peckham. Thomas, Fred, and Arthur take over the family workshop, renaming it Gandolfi & Sons. They continued to make cameras into the 21st Century even though they well into their 80's.

1887

Flash powder invented. A historical, highly combustible mixture of metallic fuel (like magnesium or aluminium) and an oxidiser (like potassium chlorate) used during the late 19th and early 20th centuries to produce an intense burst of light for indoor or nighttime photography. Introduced in 1887 by German chemists Adolf Miethe and Johannes Gaedicke, who mixed fine magnesium powder with potassium chlorate.

1888

Eastman patents Kodak roll-film camera. The largest lawsuit would come from rival film producer Ansco. Inventor Hannibal Goodwin had filed a patent for nitrocellulose film in 1887, before Eastman and Reichenbach's, but it was not granted until 1898. Ansco purchased the patent in 1900 and sued Kodak for infringement. Kodak ultimately lost the suit, which lasted over a decade and cost the company \$5 Million.

His first camera, which he called the "Kodak," was a very simple box camera with a fixed-focus lens and single shutter speed, which along with its relatively low price appealed to the average consumer.

The Kodak came pre-loaded with enough film for 100 exposures and needed to be sent back to the factory for processing and reloading when the roll was finished. The roll is all paper coated and sensitised with the Dry Collodion process. By the end of the 19th century Eastman had expanded his lineup to several models including both box and folding cameras. Photography could now reach the masses.

The modern paper backed roll film was developed by Samuel N. Turner for the Boston Manufacturing Company. Turner had obtained a patent for this film - including the red window, applied for in 1892 and became general use.

Agfa launches Rodinal, a highly concentrated, liquid aminophenol-based film developer. Thanks to its exceptional shelf life and adaptability, it became the longest-lived commercial chemical product in photographic history.

1890

Actinometers introduced to aid determining exposures. This was a gadget that contained a small strip of light sensitive paper. The photographer timed how many seconds it took for the paper to darken enough to match a painted reference tint.

1898

Reverend Hannibal Goodwin patents celluloid photographic film.

1900

Graflex (New York) founded in 1897 produce excellent studio cameras.

First mass-marketed camera, called the Brownie, goes on sale.

Extinction meters were the new method of determining exposures. The photographer peered through progressively darker neutral filters till the scene disappeared.

The start of the Golden Era 1900 - 1915 for photographs as postcards.

1901

Kodak introduces the 120 format of roll film which has a strip of celluloid photographic film glued to paper protection allowing for photographers to load the roll into the cameras themselves in subdued light.

1902

The first true zoom lens, which retained near-sharp focus while the effective focal length of the lens assembly changed, was patented in 1902 by Clile C. Allen, however the quality was not there for still cameras but became acceptable with movies in the late 1920's.

1903

Eastman Kodak released the No.3A Folding Pocket Kodak camera which let amateur and professional photographers take images to the postcard format ready to be contact printed.

1904

The discovery of adding cyanide derivatives to the emulsion increased light sensitivity into the red spectrum and led to the development of panchromatic films two years later.

1906

Kinemacolor, a two-colour process known as the first commercial "natural colour" system for movies, is introduced. Alternate black & white frames captured through alternate colour filters at 32 fps played back through these filters gave some perceived colour. Used between 1909 - 1915.

1907

In 1904 the autochrome process was discovered by the brothers Auguste and Louis Lumiere of Lyons in France. In 1907 it becomes available the first commercially successful colour photography product. It is also the first colour transparency.

Creating the Plate

1. To create the plates:
 - a) miniscule grains of potato starch were died, some green, some red-orange, and some blue violet, then all three colours were well mixed.
 - b) the glass slide was coated with varnish, then a thin layer of the mixed coloured starch was added.
 - c) a further coat of varnish was added.
 - d) the slide was then coated with a layer of orthochromatic gelatine bromide emulsion.

Exposing the Plate

2. The slide was exposed in the camera, with the emulsion side furthest from the lens, so that the light had to pass through the starch before reaching the film. [The starch acted as a filter and so recorded the intensity of light in each of the three colours.

Processing the Plate

3. The plate was then processed in the darkroom to produce a slide with a positive image (i.e. developed, washed, bleached, exposed, re-developed, washed and fixed).

1911

Leica experimental camera. This was the brainchild of Oskar Barnack, who joined Leitz in 1911 as Director of Research. He soon began work on a movie camera, for use with 35mm film, the standard movie gauge of the time. Because emulsion speeds of then current films were unreliable and accurate metering was all but impossible, Barnack built a small device intended to test small batches of movie film. It became apparent, however, that what he had actually created was a miniature still camera, known today as the Ur-Leica. The Great War held up developments.

1912

In April 1912 Eastman Kodak Ltd produced a new folding camera, the Vest Pocket Kodak, which used a new 127 format roll film on a metal spool, specifically designed to be a handy, compact alternative to larger folding cameras using 120 film. Over 2 million units were sold making this one of the most successful cameras of all time.

1913/1914

Kodak makes panchromatic 35 mm motion picture film and introduces the Autographic film system which allowed the photographer to write notes through the back of the camera onto the ortho film.

First 35mm still camera is developed by Leica, progress halted due to World War 1.

1923

Kodak introduces 16 mm amateur motion picture film.

1925

First 35 mm roll film camera produced by Ernst Leitz named Leica. The Leica was by no means the first 35mm camera, but it was the first to make 35mm truly viable, leading to the most popular film format ever.

They continued to perfect this with their rangefinder cameras for decades to come and they still make very fine collectors cameras. It was very compact with the lens pulling out of the body enabling the pursuit of discreet street photography.

1927

General Electric invents the modern flash bulb. By 1930 other companies joined the flash bulb industry, for example Philips with its Photoflux lamps. The bulbs gave light by burning a mesh of thinnest crumpled aluminium wires and foils in an instant, ignited by the power of a simple battery. The bulbs could be used only once, and at first they were too expensive for most amateurs. But professional press cameras with big reflector around the top of the attached flash bulb holder became a common sight.

1929

The major step forward to mass marketing of the TLR (twin-lens reflex) came with the Rollicord and then rollieflex, developed by Franke & Heidecke in Germany. This style of camera became the favourite of professionals and serious amateurs alike for decades.