History of Photography 10

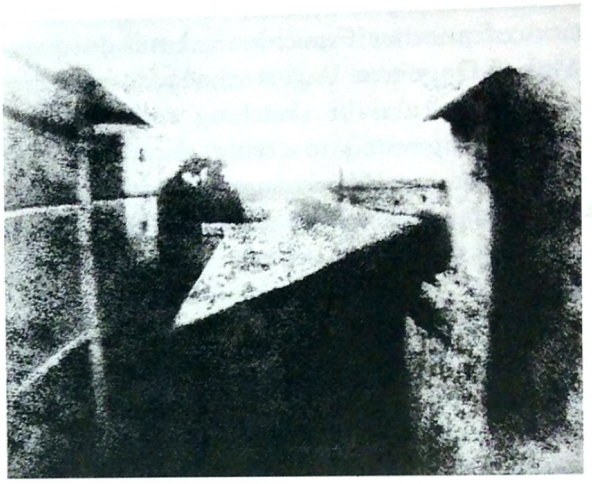
Photography was one of many inventions in the 19th century—the electric light, the safety pin, dynamite, and the automobile are just a few others—and of all of them, photography probably created the most astonishment and delight. Today, most people take photographs for granted, but early viewers were awed and amazed by the objective records the camera made.

Photography took over what previously had been one of the main functions of art—the recording of factual visual information, such as the shape of an object, its size, and its relation to other objects. Instead of having a portrait painted, people had "Sun Drawn Miniatures" made. Instead of forming romantic notions of battles and faraway places from paintings, people began to see firsthand visual reports. And soon photography became an art in its own right.

The camera obscura was the forerunner of the modern camera. It was known that rays of light passing through a pinhole formed an image. The 10th-century Arabian scholar Alhazen described the effect and told how to view an eclipse of the sun in a camera obscura (literally, "dark chamber"), a darkened room with a pinhole opening to the outside. By the time of the Renaissance, a lens had been fitted into the hole to improve the image, and the room-sized device had been reduced to the size of a small box that could easily be carried about. The camera obscura became a drawing aid that enabled an artist to trace an image reflected onto a sheet of drawing paper.

What remained to be discovered was a way to fix the camera obscura image permanently. The darkening of certain silver compounds by exposure to light had been observed as early as the 17th century, but the unsolved and difficult problem was how to halt this reaction so that the image would not darken completely.

The first permanent picture was made by Joseph Nicéphore Niépce, a gentleman inventor living in central France. He first experimented with silver chloride, which he knew darkened on exposure to light, but then he turned to bitumen of Judea, a kind of asphalt that hardened when exposed to light. Niépce dissolved the bitumen in lavender oil, a solvent used in varnishes, then coated a sheet of pewter with the mixture. He placed the sheet in a camera obscura aimed through an open window at his courtyard and exposed it for eight hours. The light forming the image on the plate hardened the bitumen in bright areas and left it soft and soluble in dark areas. Niépce then washed the plate with lavender oil. This removed the still-soft bitumen that had not been struck by light, leaving a permanent image of the scene (right). Niépce named the process heliography (from the Greek *helios*, "sun," and *graphos*, "drawing").



Joseph Nicéphore Niépce. *View from His Window at Gras, c. 1826. Heliograph.* ***Niépce produced the world's first photographic image****—a view of the courtyard buildings on his estate in about 1826. It was made on a sheet of pewter covered with bitumen of Judea, a kind of asphalt that hardened when exposed to light. The unexposed, still-soft bitumen was then dissolved, leaving a permanent image. The exposure time was so long (eight hours) that the sun moved across the sky and illuminated both sides of the courtyard.*

Daguerreotype

"DESIGNS ON SILVER BRIGHT"

News of Niépce's work came to the attention of another Frenchman, Louis Jacques Mandé Daguerre. Daguerre had been using the camera obscura for sketching and had also become interested in trying to preserve its images. He wrote Niépce suggesting an exchange of information, and by 1829 had become his partner.

The mid-19th century was ripe for an invention like photography. Interest in a new invention might have spread simply by a growing interest in science, but photography was more. In Western countries a rising middle class with money to spend wanted pictures, especially family portraits, which, until then, only the rich had been able to afford. In addition, people were interested in faraway places; they traveled to them when they could and bought travel books and pictures when they could not.

Niépce did not live to see the impact that photography was to have. He died in 1833, several years before Daguerre perfected a process that he considered different enough from Niépce's to be announced to the world as the daguerreotype (right and opposite).

The response to the daguerreotype was sensational. After experimenting for many years, both with Niépce and alone, Daguerre was finally satisfied with his process, and it was announced before the French Academy of Sciences on January 7, 1839. A French newspaper rhapsodized: "What fineness in the strokes! What knowledge of chiaroscuro! What delicacy! What exquisite finish! . . . How admirably are the foreshortenings given: this is Nature itself!"

Almost immediately after the process was announced, daguerreotype studios were opened to provide "Sun Drawn Miniatures" to a very willing public. By 1853 an estimated three million daguerreotypes per year were being produced in the United States alone—mostly portraits but also scenic views.

Louis Jacques Mandé Daguerre. *Boulevard du Temple, Paris, 1839.* ***The busy streets of a Parisian boulevard appear depopulated*** *because of the long exposure this daguerreotype required. Only a person getting a shoeshine near the corner of the sidewalk stood still long enough to be recorded; all the other people, horses, and carriages had blurred so much that no image of them appeared on the plate. The shutter was probably open for several minutes, much less than the eight hours required by Niépce's heliograph, and the results were far superior—rich in detail and tonality. The enthusiastic reception of Daguerre's process extended to poetry: "Light is that silent artist / Which without the aid of man / Designs on silver bright /Daguerre's immortal plan."*

Photographer Unknown. *Emily Dickinson at Seventeen, c. 1847. Daguerreotype.* ***The daguerreotype reached the height of its popularity in America.*** *Millions of Americans, famous and obscure, had their portraits made. Although the exposure time was reduced to less than a minute, it was still long enough to demand a quiet dignity on the part of the subject.*

This portrait, taken by an itinerant daguerreotypist, is the only known photograph of the 19th-century poet Emily Dickinson. Just like her poems, it seems direct on the surface but elusive on more intimate levels. Dickinson later described herself as "small, like the wren; and my hair is bold, like the chestnut burr; and my eyes, like the sherry in the glass that the guest leaves."

The daguerreotype was made on a highly polished surface of silver that was plated on a copper sheet. It was sensitized by being placed, silver side down, over a container of iodine crystals inside a box. Rising vapor from the iodine reacted with the silver, producing the light-sensitive compound silver iodide. During exposure in the camera, the plate recorded a latent image: a chemical change had taken place, but no evidence of it was visible. To develop the image the plate was placed, silver side down, in another box containing a dish of heated mercury at the bottom. Vapor from the mercury reacted with the exposed areas of the plate. Wherever light had struck the plate, mercury formed a frostlike amalgam, or alloy, with the silver. This amalgam made up the bright areas of the image. Where no light had struck, no amalgam was formed; the unchanged silver iodide was dissolved in sodium thiosulfate fixer, leaving the bare metal plate, which looked black, to form the dark areas of the picture.

The daguerreotype was very popular in its time, but it was a technological dead end. There were complaints about the difficulty of viewing, for the highly reflective image could be seen clearly only from certain angles. The mercury vapor used in the process was highly poisonous and probably shortened the life of more than one daguerreotypist. But the most serious drawback was that each plate was unique; there was no way of producing copies except by rephotographing the original. The beautiful daguerreotype was rapidly—and easily—eclipsed by a negative-positive process that allowed any number of positive images to be made from a single negative.

Calotype

PICTURES ON PAPER

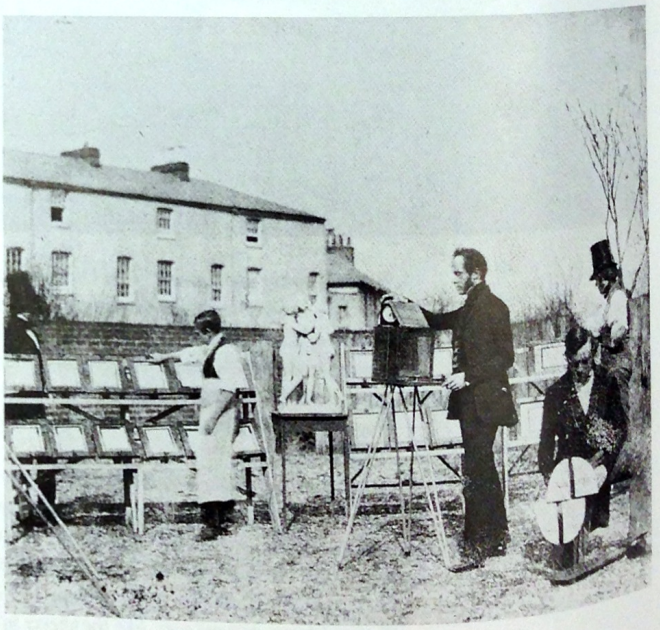
Another photographic process was announced almost at once. On January 25, 1839, less than three weeks after the announcement of Daguerre's process to the French Academy, an English amateur scientist, William Henry Fox Talbot, appeared before the Royal Institution of Great Britain to announce that he too had invented a way to permanently fix the image of the camera obscura.

Talbot made his images on paper. His first experiments had been with negative silhouettes made by placing objects on paper sensitized with silver chloride and exposing them to light. Then he experimented with images formed by a camera obscura, exposing the light-sensitive coating long enough for the image to become visible during the exposure.

In June 1840 Talbot announced a technique that became the basis of modern photography: the sensitized paper was exposed only long enough to produce a latent image, which then was chemically developed. To make the latent negative image visible, Talbot used silver iodide (the light-sensitive element of the daguerreotype) treated with gallo nitrate of silver. He called his invention a calotype (after the Greek *kalos,* "beautiful," and *typos,* "impression").

Talbot realized the value of photographs on paper rather than on metal: reproducibility. He placed the fully developed paper negative in contact with another sheet of sensitized paper and exposed both to light, a procedure now known as contact printing. The dark areas of the negative blocked the light from the other sheet of paper, while the clear areas allowed light through. The result was a positive image on paper resembling the tones of the original scene.

Because the print was made through the paper of a negative, the calotype lacked the sharp detail of the daguerreotype. Calotypes are beautiful—the fibers in the paper producing a soft, slightly textured image that has been compared to a charcoal drawing. But the process didn't displace the one-of-a-kind daguerreotype until the transparent negative appeared.



William Henry Fox Talbot. *Talbot's Photographic Establishment, c. 1844.* ***The activities at Talbot's establishment near London*** *are shown in this early calotype taken in two parts and pieced together. At left, an assistant copies a painting. In the center, possibly Talbot himself prepares a camera to take a portrait. At right, the man at the racks makes contact prints while another photographs a statue. At far right, the kneeling man holds a target for the maker of this photograph to focus on. Talbot gave assurance that "the plates of the present work are impressed by the agency of light alone."*

Collodion Wet-Plate

SHARP AND REPRODUCIBLE

The collodion wet-plate process combined the best feature of the daguerreotype—sharpness—and the best of the calotype—reproducibility. And it was more light sensitive than either of them, with exposures as short as five seconds. It combined so many advantages that despite its drawbacks virtually all photographers used it from its introduction in 1851 until the commercial availability of the gelatin dry plate almost three decades later.

For some time, workers had been looking for a substance that would bind light-sensitive salts to a glass plate. Glass was better than paper or metal as a support for silver chloride because it was textureless, transparent, and chemically inert. One binding material was the newly invented collodion (nitrocellulose dissolved in ether and alcohol), which is sticky when wet, but soon dries into a tough, transparent skin.

The disadvantage of collodion was that the plate had to be exposed and processed while it was still wet. A mixture of collodion and potassium iodide was poured onto the middle of the plate. The photographer held the glass by the edges and tilted it back and forth and from side to side until the surface was evenly covered. The excess collodion was poured back into its container. Then the plate was sensitized by being dipped in a bath of silver nitrate. It was exposed for a latent image while still damp, developed in pyrogallic acid or iron sulfate, fixed, washed, and dried. All this had to be done right where the photograph was taken, which meant that to take a picture the photographer had to lug a complete darkroom along (below).

Collodion could be used to form either a negative or a positive image. Coated on glass, it produced a negative from which a positive could be printed onto albumen-coated paper. If the glass was backed with a dark material like black velvet, paper, or paint, the image was transformed into a positive, an ambrotype, a kind of imitation daguerreotype. Coated on dark enameled metal it also formed a positive image—the durable, cheap tintype popular in America for portraits to be placed in albums, on campaign buttons, and even on tombs.

By the 1860s the world had millions of photographic images; 25 years earlier there had been none. Photographers were everywhere—taking portraits, going to war, exploring distant places and bringing home pictures to prove it.

A Photographer in the Field, c. 1865.

The collodion wet-plate process had many advantages, but convenience was not among them. *The glass plates on which the emulsion was spread had to be coated, exposed, and developed before the emulsion dried, which required transporting an entire darkroom to wherever the photograph was to be made.*

Gelatin Emulsion/Roll-Film Base

PHOTOGRAPHY FOR EVERYONE

Until the 1880s, few photographs were made by the general public. Almost everyone had been photographed at one time or another, certainly everyone had seen photographs, and probably many people had thought of taking pictures themselves. But the technical skill, the massive effort, and the expense and sheer quantity of equipment needed for the collodion wet-plate process restricted photography to professionals and the most dedicated amateurs. Even they complained of the inconvenience of the process and made many attempts to improve it.

By the 1880s, the perfection of two techniques created a fast, dry plate and eliminated the need for the fragile glass plate itself. The first development was a new gelatin emulsion in which the light-sensitive silver salts could be suspended. It was based on gelatin—a jellylike substance processed from cattle bones and hides. It retained its speed when dry and could be applied on the other invention—film in rolls. Roll film revolutionized photography by making it simple enough for anyone to enjoy.

Much of the credit for popularizing photography goes to George Eastman, who began as a bank clerk in Rochester, New York, and built his Eastman Kodak Company into one of the country's foremost industrial enterprises. Almost from the day Eastman bought his first wet-plate camera in 1877, he searched for a simpler way to take pictures. "It seemed," he said, "that one ought to be able to carry less than a pack-horse load."

Many people had experimented with roll film, but Eastman was the first to market it commercially, with his invention of the equipment to mass-produce film. The result was Eastman's American Film, a roll of paper coated with a thin gelatin emulsion. The emulsion had to be stripped from its paper backing to provide a negative that light could shine through for making prints. Most photographers had trouble with this operation, so the film was usually sent to the company for processing.

Fredrick Church. *George Eastman with a Kodak, 1890.* ***George Eastman, who put the Kodak box camera on the market and thereby put photography into everybody's hands,*** *stands aboard the S.S. Gallia in the act of using his invention. Roll film made the camera small enough to carry easily. Fast gelatin emulsions permitted 1/25-sec exposures so subjects did not have to strain to hold still.*

Roll film made possible a new kind of camera—inexpensive, light, and simple to operate—that made everyone a potential photographer. Eastman introduced the Kodak camera in 1888. It came loaded with enough film for 100 pictures. When the roll was used up, the owner returned the camera with the exposed film still in it to the Eastman company in Rochester. Soon the developed and printed photographs and the camera, reloaded with film, were sent back to the owner. The Kodak slogan was, "You push the button, we do the rest."

The Kodak camera became an international sensation almost overnight. With the invention of a truly modern roll film (a transparent, flexible plastic, coated with a thin emulsion and sturdy enough to be used without a paper support), a new photographic era had begun. The Eastman Kodak Company knew who would be the main users of its products, and it directed its advertising accordingly: "A collection of these pictures may be made to furnish a pictorial history of life as it is lived by the owner, that will grow more valuable every day that passes."