

Camera History 1900 to 1940

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Introduction

The photographic process, announced in 1839 by the Frenchman Louis Jacques Mandé Daguerre, captured and fixed the images that were viewed through a camera obscura. This was accomplished through a combination of mechanics (the camera), optics (to improve the image), and chemistry (to sensitize and process the image). Over the next forty years, improvements made to all aspects of the process—cameras, shutters, lenses, and chemistry—led to cheaper and simpler image making, generating a growing interest for the nonprofessional photographer.

The technicalities of early photography required the photographer to sensitize media shortly before exposure and then process the image immediately afterward. Although this system was fine for the professional, it was generally too cumbersome and time-consuming for most amateurs. On 13 April 1880, George Eastman of Rochester, New York, patented a machine for coating gelatin dry plates. The following January, with the financial backing of Rochester businessman Henry Strong, he formed the Eastman Dry Plate Company, one of the first commercial producers of light-sensitive photographic emulsions. With reliable plates now available, companies worldwide began manufacturing cameras designed specifically to use them.

Eastman's business expanded five years later with the introduction of his American Film, a paper-supported stripping film intended for the professional market. It was not well received by the professionals, who considered it to be rather difficult to process. Undeterred, Eastman instead used it in a new small box camera he named the Kodak. Introduced in 1888, the Kodak was an easy-to-use “detective camera,” a box-style, point-and-shoot camera meant for the novice photographer. Eastman's camera required no adjustments, which was atypical of the time, but the real innovation was after exposing the film: the camera was shipped back to the company for processing and reloading, marking the beginning of the professional photo-finishing industry. This novel feature was marketed with the advertising slogan “You press the button, we do the rest,” which established the company's business model: the promotion of cameras as the means to selling highly profitable film and processing. Twelve years later, the Brownie camera was added to the camera line; its \$1.00 selling price made photography available to just about everyone.

Brownie

Introduced by Eastman Kodak Company in 1900, the Brownie camera was an immediate public sensation due to its simple-to-use design and inexpensive price. (See Fig. 1.) Now nearly anybody, regardless of age, gender, or race, could afford to be a photographer without the specialized knowledge or cost once associated with the capture and processing of images. An important aspect of the Brownie camera's rapid ascendancy in popular culture as a must-have possession was Eastman Kodak Company's innovative marketing via print advertising. The company took the unusual step of advertising the Brownie in popular magazines instead of specialty photography or trade magazines with limited readership. George Eastman derived the camera's name



▲ Fig. 1. Brownie camera. Eastman Kodak Company, Rochester, New York, ca. 1901. Gift of Ansel Adams, 1974.0037.1963.



▲ Fig. 2. No. 3A Folding Pocket Kodak Model B-4, w/ Zeiss Tessar Lens. Eastman Kodak Company, Rochester, New York, ca. 1908. Gift of Eastman Kodak Company, 2001.1559.0012.

Kodak; it produced $3\frac{1}{4} \times 5\frac{1}{2}$ -in. images on No. 122 film) was especially appealing, as it was available at many price points. Largely determined by its various lens and shutter combinations, the 3A functioned both as a more serious entry-level camera, and also as the company's flagship amateur product. Due to its prominent position in the company product line and long production run, the 3A received numerous upgrades throughout its history.

from a literary character in popular children's books by the Canadian author Palmer Cox. Eastman's astute union of product naming, with a built-in youth appeal, and inventive advertising placement had great consequence for the rise of modern marketing practices and mass consumerism in the twentieth century.

The Brownie was designed and manufactured by Frank A. Brownell, who had produced all of Eastman Kodak's cameras from the beginning. The use of inexpensive materials in the camera's construction and George Eastman's insistence that all distributors sell the camera on consignment enabled the company to control the camera's \$1 price tag and keep it within easy reach of consumers' pocket-books. More than 150,000 Brownies were shipped in the first year of production alone, a staggering success for a company whose largest single-year production to date had been 55,000 cameras (the No. 2 Bullet, in 1896). The Brownie launched a family of nearly 200 camera models and related accessories, which over the next 60 years helped to make Kodak a household name.

Folding Pocket Kodak

The Kodak marketing plan was to sell new customers interested in photography an affordable Brownie camera, then move them up to better, more expensive models. The company catalogs were full of such model lines priced in incremental steps. From the basic box camera, the next logical step was the Folding Pocket Kodak. (See Fig. 2.) Introduced in 1897 (at the time it was an upgrade from the Pocket Kodak, the model replaced by the Brownie), the FPK, as it was commonly known, became the first of a long line of folding bellows cameras in common use for the next half century. These cameras were a popular travel accessory because they produced the large negative desired by photographers, yet upon folding became small enough to fit into a carrying case or coat pocket. At that time of undependable light sources and a cumbersome enlargement process, the physical size of the camera usually determined the finished picture size. The 3A (3A is a Kodak camera format introduced in 1903 with the No. 3A Folding Pocket

In its early years, most 3A cameras were fitted with Bausch & Lomb (B&L) lenses and shutters. Eastman had first turned to B&L as the supplier of lenses for his original Kodak camera back in 1888, a year after B&L produced its first photographic objective. However, Eastman Kodak offered other options to the more serious photographer, as the 3A was available with the best lenses from Europe, including England's Cooke Anastigmat (1907–1912) and Germany's Georz Dagor (1903–1908), or Zeiss Tessar (1908–1910). Bausch & Lomb signed a licensing agreement with Zeiss to produce the Tessar in Rochester, and of course the 3A was available with those lenses (1906–1912). Eastman Kodak entered into its own agreement with Zeiss, and the 3A was produced with the Zeiss Kodak Anastigmat (1909–1912). Eastman Kodak Company began producing lenses of its own design in 1913; the 3A received the first version of the Kodak Anastigmat in 1914. The 3A was the first production camera to be fitted with the coupled rangefinder, which put Kodak about 15 years ahead of most other manufacturers. Beginning in the 1930s, high-end cameras such as the Contax (by Zeiss Ikon) and the Leica (by E. Leitz) were fitted with coupled rangefinders. Even today, most higher-end digital cameras use a form of this technology.

Institute of Optics

World War I changed the optical landscape in the United States. The industry relied on German manufacturers for the supply of high quality optical glass, optics, and engineers. A number of steps were taken to remedy the situation, the first being establishing The Optical Society (OSA) in 1916. Under the leadership of Perley G. Nutting, and with the support of optical scientists in Rochester, the optical center of the United States, the OSA's mission was to promote and disseminate knowledge of optics and photonics. This was accomplished with published journals and by holding conferences, thus establishing a network of information exchange. The University of Rochester, with financial support from B&L and Eastman Kodak Company, established the Institute of Applied Optics (now known as the Institute of Optics) in 1929. The president of the University, Reverend Benjamin Rush Rhees, hired Rudolf Kingslake, graduate of the Imperial College of Science and Technology in London, where he studied under Alexander Eugen Conrady, to teach at the new school. Kingslake became the head of Eastman Kodak Company's Optical Design Department in 1937, a position he held until retiring in 1968. Kingslake continued to teach at the University of Rochester during his "Kodak years"; he continued teaching at the university into the 1980s.

Kodak Research Labs/Color Photography

The advancement of photography is about more than cameras and lenses; improvements in sensitized materials has always played an extremely important role. The founding of the Kodak Research Laboratories may be George Eastman's greatest contribution to photography. Established expressly for the empirical study of sensitized materials, the Kodak Labs were among the first of their kind in the United States. Impressed with the laboratories he saw while visiting Germany in 1911, Eastman realized that the future of the industry would be color photography. He knew from his own early experimentation in emulsion making that it would take more than lone individuals experimenting on their own in home-brew labs to facilitate the future. For the founding director of the Kodak Labs, Eastman hired C. E. K. (Charles Edward Kenneth) Mees, managing director and a partner at Wratten & Wainwright, a dry plate manufacturer in England best known for introducing panchromatic dry plates. To acquire Mees's services, Eastman bought his employer.

Of the many developments by the Kodak Labs, the most important was color film. The search for color in photography dates back to the medium's earliest days. For the most part, colored photographs were exactly that, photographs with hand-applied color. There was a so-called color version of the daguerreotype known as the Hillotype, though it is up for debate as to whether these plates had color or not. Color photography largely remained a hand-applied art or rather complicated "laboratory experiment" based on James Clerk Maxwell's three-color experiments until 1903 with the introduction

of Autochrome plates by France's Lumière brothers. Autochrome used the additive color process, with the plates first coated with a mosaic screen made of microscopic potato starch grains, randomly dyed red, green, and blue; the empty spaces between the starch grains were filled with black and then coated with a panchromatic photographic emulsion. This rather odd-sounding system did work, but due to the filtering nature of the plates, exposure times were quite long.

Kodachrome is usually considered to be the first practical color film. Two musician-scientists, Leopold Godowsky, Jr., and Leopold Mannes, began investigating color photography, filing their first patent application in 1921. (Godowsky and Mannes were boyhood friends who shared a common interest in music and photography. Mannes earned a bachelor's degree in physics at Harvard College but worked as a musical composer at the New York Institute of Art. Godowsky studied physics and chemistry as well as the violin at the University of California at Los Angeles. He was a soloist and first violinist with the Los Angeles and the San Francisco Symphony Orchestras.) C. E. K. Mees was informed of their research by a friend, Robert Wood, the next year, prompting Mees to travel to meet with Mannes at New York City's Chemist's Club. Impressed with Mannes, Mees decided to assist the two young scientists in their work, first by supplying them with evenly coated plates, and then as ad hoc members of the Kodak Research Labs. By 1930, Godowsky and Mannes had become regular members of the company and moved to Rochester. The result was Kodachrome film, first introduced in 1935 as a 16-mm ciné film and the next year for still photography as a 35-mm transparency film. The first multi-layered film, Kodachrome consisted of three separate black-and-white layers (with a yellow filtering layer), for recording cyan, yellow, magenta, the subtractive color primary colors. When exposed, these black-and-white layers acted as "placeholders" to which color dyes were added during processing. Kodachrome is still considered to be the most permanent color film.

35-mm Precision Cameras

George Eastman's easy-to-use Kodak camera, introduced in 1888, marks the beginning of point-and-shoot photography. Since using it required no special knowledge, it was an ideal camera for the newly conceived market of amateur novice photographers. Thomas Edison used film from the Kodak, slit to 35 mm and then perforated on both edges, in his 1890s experiments perfecting the Kinetoscope, the first motion picture film viewer. 35-mm film became the standard film size of the motion picture industry. As film quality improved over the next couple of decades, a number of companies around the world began to experiment with the format for still photography. The Multi Speed Shutter Company of New York City (a company that also manufactured motion picture projectors) introduced the Simplex camera in 1914, the first still camera to use the now standard 24×36 -mm image size on 35-mm-wide film; this was twice that used for motion picture's 18×24 mm. Soon after, other companies—such as Jules Richard of Paris, France, with the Homéos (the first 35-mm stereo camera) and New Ideas Manufacturing of New York City with the Tourist Multiple—would market cameras using 35-mm film. These cameras used film acquired as leftover ends from the motion picture industry. It was a novel idea, but none were very successful, as most snapshot photographers preferred using the well-established box or folding cameras. Still, a successful precision 35-mm camera was on the horizon.

Leica A

Starting about 1905, when he worked at the firm of Carl Zeiss in Jena, Germany, Oskar Barnack (1879–1936), an asthmatic who hiked to improve his health, tried to create a small pocketable camera to take on his outings. At the time, cameras using the most common format of 13×18 cm (5×7 in.) were quite large and not well suited for hiking. Around 1913, Barnack, by then an employee in charge of the experimental department of the microscope maker Ernst Leitz Optical Works in Wetzlar, designed and hand built several prototypes of a small precision camera that produced 24×36 -mm images on leftover ends of 35-mm motion picture film. Three of these prototypes survive. The most

complete one has been dubbed the “Ur-Leica,” meaning the first or “Original Leica,” and is in the museum of today’s firm of Leica Camera AG in Solms, Germany.

Barnack used one of his cameras in 1914 to take reportage-type pictures of a local flood and of the mobilization for World War I. That same year, his boss, Ernst Leitz II, used one on a trip to the United States. However, no further development of the small camera took place until 1924, when Leitz decided to make a pilot run of 25 cameras, serial numbered 101 through 125. Still referred to as the Barnack camera, these prototypes were loaned to Leitz managers, distributors, and professional photographers for field testing. Interestingly, the evaluations were not enthusiastic, as the testers thought the format too small and the controls too fiddly, which they were. For instance, the shutter speeds were listed as the various distances between the curtains, instead of the fraction of a second it would allow light to pass. In spite of its reviews, Leitz authorized the camera’s production, basing his decision largely on a desire to keep his workers employed during the post-World-War-I economic depression. An improved version of the “O-Series Leica,” the Leica I, or Model A, with a non-interchangeable lens was introduced to the market at the 1925 Spring Fair in Leipzig, Germany. (See Fig. 3.) The name “Leica,” which derives from Leitz Camera, appeared only on the lens cap.



▲ Fig. 3. O-Series Leica. Ernst Leitz GmbH, Wetzlar, Germany, 1923. George Eastman House collection, 1974.0084.0111.

Contax I (540/24)

The successful introduction of the Leica camera was not lost on Zeiss Ikon AG of Dresden, Germany. Formed in 1926 as the merger of Contessa-Nettel, Goerz, Ernemann and Ica, Zeiss Ikon was the largest camera manufacturer in Europe. Zeiss was one of the leading manufacturers of optical devices, with its roots dating back to optician Carl Zeiss. Zeiss began as a lens and microscope manufacturer in 1847. He hired physicist Ernst Abbe in 1866 as research director; Abbe designed the first refractometer in 1868, a device used to measure the index of refraction of optical glass. Abbe hired Otto Schott in 1883 to develop new types of glass necessary for reducing reflection in microscope objectives, then hired Paul Rudolph to design photographic lenses with glass developed by Schott. After the passing of Carl Zeiss in 1888, Abbe bought out Zeiss’s son Roderich and established the Carl Zeiss Foundation. Unusual in its day, the Zeiss foundation was partially owned by its workers. Many of the classic lenses used in photography, such as the Anastigmat (1890), Planar (1895), Unar (1899), and Tessar (1902), originated at Zeiss, under the direction of Paul Rudolph.

The Zeiss Ikon catalog of 1927 listed over 100 camera models from the small pocket-sized Piccolette roll film camera to the Universal Jewel professional folding dry plate camera (Ansel Adams used one). Its camera line included the Deckrullo focal plane shutter models and the Miroflex reflex. And like Eastman Kodak Company, along with cameras Zeiss Ikon sold a complete line of photography equipment for darkroom and motion picture projection. With the introduction and success of the Leica from one of its smaller competitors, Zeiss—considered to be the gold standard of camera makers—needed to come up with a better version of the precision 35-mm camera. The answer was the Contax, introduced in 1932. (See Fig. 4.) On paper it was exactly that, a better Leica. The Contax used a built-in coupled rangefinder, with a longer base than the Leica’s, for more accurate focusing, vertical-traveling focal plane shutter, with speeds to 1/1250 s, which was more than twice as fast as the Leica’s 1/500. The Contax had a removable back for easy loading, in contrast to the Leica, which rather awkwardly loaded through its removable bottom plate. And most important, the Contax used Zeiss lenses, which were far superior to those used by the Leica. But there was one problem: the Contax was an unreliable picture taker, with most of the problems relating to its shutter.



▲ Fig. 4. Contax I (f). Zeiss Ikon AG, Dresden, Germany, ca. 1932. Gift of 3M; ex-collection Louis Walton Siple. 1977.0415.0004.



▲ Fig. 5. Super Kodak Six-20 Eastman Kodak Company, Rochester, New York, 1938. Gift of Eastman Kodak Company, 001.0636.0001.

Six-20. These days, automatic exposure is a standard feature on almost all cameras, so it is not much of a stretch to call the Super Kodak Six-20 the first “smart camera.”

But auto exposure was not the only cutting-edge feature of the Super Six-20. It was also the first Kodak camera to use a common window for both the rangefinder and the viewfinder. The film advances with a single-stroke lever, which also cocks the shutter at the end of the stroke, thus preventing double exposures. And like auto exposure, these features would not become common on cameras for many

Over the years Zeiss tried to remedy this, but it could never match the durability of the Leica’s rubberized cloth shutter.

Kodak Retina

August Nagel, of Contessa Nettel, dissatisfied with his company’s merger with Zeiss Ikon, left and formed a new company, Nagel Werke in 1928. Eastman Kodak Company purchased Nagel Werke in 1932, becoming Kodak AG, the company’s German manufacturing arm. In 1934, Eastman Kodak Company introduced the Retina, its first precision 35-mm camera, designed to compete with the Leica. Unlike the Leica and Contax, the Retina was a folding 35-mm camera with a permanently mounted lens. Introduced with the Retina was the Kodak 35-mm daylight loading film magazine, which became the standard used on just about every 35-mm camera. The Kodak film magazine used a built-in heat-sealed velvet light trap still in use today. Prior to this, the other 35-mm cameras used their own unique film magazines, fitted with some type of light trap mechanism connected in some way to the bottom of the camera (Leica) or with separate supply and take-up housing (Contax).

Kodak AG went on to produce some 50 different models of the Retina camera through the mid-1960s.

Super Kodak Six-20

The Super Kodak Six-20 was the first production camera to feature automatic exposure (AE) control. (See Fig. 5.) Aimed at removing the exposure guesswork for photographers, the camera’s shutter-preferred AE control meant that the photographer chose the shutter speed and the camera would then “choose” the correct lens opening. Kodak’s engineers accomplished this feat by mechanically coupling a selenium photocell light meter, located just above the lens, to the lens aperture.

This advancement, though groundbreaking, was not picked up by most camera manufacturers for some 20 years after the debut of the Super

years. Features aside, the Super Kodak Six-20 is one of the most attractive cameras ever marketed. Its lovely clamshell exterior design was styled by legendary industrial designer Walter Dorwin Teague.

All this innovation came at a rather high cost, in both money and performance. The Super Kodak Six-20, which in 1938 retailed for \$225 (more than \$2,000 today), had a reputation for being somewhat unreliable—the built-in self-timer was known to lock up the shutter. Since few units were manufactured, just 719, it is one of the rarest of Kodak production cameras.

Conclusion

Camera research and development largely went on hold during World War II. Much of the German photo manufacturing industry was destroyed by the end of the war. The post-war era also saw the division of the Zeiss factories, split between East and West Germany. The low cost of post-World-War-II German labor had a direct impact on American manufacturing, causing most U.S. makers to concentrate on inexpensive point-and-shoot cameras only. And the U.S., in trying to strengthen Japan, helped re-establish the fledgling camera manufacturing there, laying the seeds for what became the premier camera manufacturing power for the rest of the century.