1948: Photography

During the forty-five years prior to 1935, a large selection of photographic cameras, lenses, films, apparatus, and chemicals was developed and marketed to assist the amateur in the making of pictures. Popular photographic magazines and advertising were written to attract more amateurs. Consequently, it has been the general impression that the greater proportion of photographic materials, equipment, and accessories is sold to the amateur. Actually, only about 33 per cent of these materials are for amateur use. The other 67 per cent are for professional, industrial, technical, and business applications.

According to estimates, there were some 15,000 commercial and portrait studios and 4,000 photo-finishing plants in the United States in 1948. Industrial and technical applications appeared early in photographic literature, especially following the introduction of the dry-gelatin plate in 1880. The numbers and variety of these applications increased markedly after 1935, particularly since World War II. This expansion was evident from the fact that there were some 3,000 photo departments in industry, 3,500 graphic arts laboratories serving the printing industry, 500 motion picture producing firms, and 600 newspapers having photographic laboratories.

Many of the technical, industrial, scientific, and business applications of photography have been possible because of the continuing progress in the manufacture of photographic materials and equipment, and their increased availability since 1935. It has been stated that the industry in 1948 was approximately three and one-half times its 1939 size in terms of the wholesale goods produced, and that it increased during 1948 over 1947. Small quantities of items were imported from factories in England, France, western Germany, and Japan.

APPLICATIONS

Photography may be applied to new problems simply by the adaptation of known techniques or by the development of new techniques. Quite often photography is the only means available for obtaining scientific data concerning the properties and structure of matter, the performance of experimental devices, and the study of natural phenomena. More often than not, these research methods become production and control tools in industry and business. During 1948 several important new applications were made.

Scientific Applications.

Atomic Physics.

Special photographic plates have been available for studies in atomic physics, for the purpose of studying and identifying various nuclear particles separated from the atom by means of cyclotrons, betatrons, and synchrotrons. The particles are recorded as tracks in special emulsions of high silver halide content and low background fog. The tracks are characteristic for a given particle and are found by tedious examination of many small areas of the plate under a microscope. From the length and curvature of the track and the grain spacing, particle speed and other characteristics are determined. The electron — the lightest of all atomic particles — was first definitely identified in 1948 at the Kodak Research Laboratories in Harrow, England, and Rochester, New York, with new types of photographic plates. Tracks from 30 microns to 250 microns long were found. The latter were recorded on special ultrasensitive plates. The meson, which may have a life as short as one millionth of a second, can be recorded. Gardner and Lattes, at the Radiation Laboratory of the University of California, recorded on special plates mesons which were created artificially by bombarding various materials with helium nuclei in the giant cyclotron. Tracks of atomic fission of uranium and of thorium have also been recorded.

Autoradiography.

Special photographic emulsions, approximately 1/5,000 of an inch thick, were used in 1948 to locate the presence of radioactive substances in biological specimens and plants. Radioactive iodine and phosphorus, when injected into an animal, are selectively absorbed by the thyroid and bone respectively. Microsections of the tissue, when placed in contact with the emulsion, produce a heavy exposure in areas adjacent to the radioactive portions of the specimen. This technique was used in the study of cancer and other diseases.

Gamma Ray Radiography.

Scientists of the Ford Motor Company announced the possible application of radioactive isotopes in the production of automobiles in connection with material processing, radiography, liquid level indication in foundry cupolas, and thickness control in sheet-steel making. Cobalt 60 and selenium 75 are gamma ray emitters. The former proved useful in checking welds in high-pressure steam lines, and is comparable to a 2 million-volt X-ray in penetrating power. The selenium 75 was more suitable for light metal sections.

Astronomy.

Special photographic plates will be used on the 200-in. reflecting telescope on Palomar Mountain in California, which was dedicated May 3, 1948. These plates will have approximately four times the speed of the plates originally designated for this equipment. Specially sensitized emulsions will be used in a spectroscope, to be attached to the telescope, to measure various characteristics of the stars. The California Institute of Technology released a color motion picture, *The Story of Palomar.*

High-Speed Photography.

High-speed photographic techniques were used in several hydrodynamic research problems. At the Naval Ordnance Test Station in Inyokern, Calif., spinning submerged bodies were photographed at 1/500,000-second exposure to study wake form. Also, the behavior of models of underwater missiles was studied with high-speed motion pictures. It was thought that this study might lead to the accurate prediction of design. The General Electric Company described a new water table which was used with models to simulate two-dimensional air flow at speeds up to 10,000 mi. per hour. The slow-speed surface waves in water act much the same way as high-speed airwaves. These studies were made in connection with supersonic flight research possibilities. Dr. Charles M. Slack, Director of Research for the Westinghouse Lamp Division, described the development of super-speed X-ray motion pictures before the American Physical Society. The movies were obtained without blur by using X-ray exposures of 1/100,000 of a second and a shutterless camera shooting movies at 100 frames a second. The X-ray exposures repeated at 1/100-second intervals were recorded on a continuously moving strip of regular movie film. Movies made of the reaction between iron oxide and aluminum in a metal crucible lined with refractory material revealed the actual melting phenomenon inside the crucible and the subsequent bursting of molten metal through the steel plate. A regular movie showed only a shower of sparks and molten metal gushing out of the bottom of the crucible.

The Zarem camera, named after Dr. A. M. Zarem, who designed it for the United States Navy, is an all-electric camera that has the fastest shutter yet devised and is capable of exposures made at 100 millionths of a second. The camera shutter is based on the well-known principle of the Kerr cell, which consists of a glass tube filled with nitrobenzene with two immersed electrodes. The cell is mounted between crossed polarizing filters. When a high voltage is applied to the electrodes of the Kerr cell, the fluid rotates the light so that it passes through the second polarizer to make an exposure. Normally, light passed through the first polarizer is blocked by the second filter. Applications of this camera for ultra high-speed photography were being investigated as 1948 came to an end.

Rocket Photography.

In 1948 additional progress was made in the various aspects of rocket photography. Special cameras were installed in rockets and were operated automatically. The equipment was released automatically from the rocket and then lowered by parachute. Composite photographs made from these records showed a 2,700-mi. arc of horizon when the V-2 rocket was at a height of 60 mi. The mosaic of seven exposures made at $1\frac{1}{2}$-sec. intervals showed an extent of country from Mazatlán, Mex., to Hyannis, Neb. Another sequence, taken from a navy Aerobee rocket at a height of 70 mi., showed an hourglass-shaped panorama 1,400 mi. long. Both rockets were fired from launching sites near White Sands, N. Mex.

Under-Sea Photography.

Dr. Maurice Ewing has used photography extensively in his studies of life and geology under the sea. In 1948, he made successful flash shots as far down as $3\frac{1}{2}$ mi. below the ocean surface where sponge-like formations were recorded. The camera and flash apparatus were placed in water-tight containers and lowered to the ocean bottom where a trigger released the flash.

Technical Applications.

Ultrafax.

During 1947 a communication system known as Ultrafax was disclosed. The system was demonstrated effectively on Oct. 21, 1948, at the Library of Congress in Washington, D.C., when the entire 1,047-page novel, *Gone with the Wind,* was transmitted a distance of three mi. in about two minutes. The original material is copied page by page on 35 mm. film which, after processing, is fed into the Ultrafax television system at 30 messages per second or 1,800 pages a minute. The transmitted messages are recorded on 16 mm. movie film, which is processed rapidly at temperatures up to 130ø F. ready for immediate projection or multiple-copy prints. This system was developed by the Radio Corporation of America with the co-operation of the Eastman Kodak Company and the National Broadcasting Company. Its possible application to the transmission of messages, printed matter, charts, documents, and other material was being investigated at the close of 1948.

Aerial Photography.

The tri-metrogon system of aerial photography was used in 1948 by the United States Navy in a survey of 30,000 sq. mi. of Alaskan territory in co-operation with the Department of the Interior and other government agencies. The same system was used on September 1 by the United States Air Force in a nonstop flight of 2,700 mi. from Santa Barbara, Calif., to New York City to test aerial cameras and photographic techniques under extended flight conditions. At 40,000 ft., each of three cameras made 390 exposures on one film at 50-sec. intervals with

a tri-metrogon installation using three K-17 type cameras fitted with 6-in. lenses. Three hundred twenty-six ft. of film were used from each of three 400-ft. rolls. This first continuous photographic record covered an area about 490 mi. wide by 2,700 mi., and showed clearly the location of cities and landmarks. The plane traveled at 375 mi. per hr. and made the flight in 6 hrs. 55 min., including take-off and landing time.

Aerial strip cameras, such as the S-7, have been used for reconnaissance flights at low altitudes, but, at the greatly increased speeds of airplanes, photographs without image motion have been difficult to obtain. An experiment was made to simulate a speed of 1,000 mi. per hour by the Photographic Laboratory, Engineering Division, Air Material Command, of the United States Air Force. Two P-80 jet planes were equipped with strip cameras with lenses of 6-in. and 24-in. focal length; and, with the movement of the film past the slit, was synchronized to record a plane speed of 1,000 mi. per hour. The plane speed was obtained by having each jet plane travel at 500 mi. per hour in opposite directions with a separation of 500 ft. A dimensional accuracy within 2 per cent in the direction of the flight was obtained in the pictures.

Photography replaced the pilot in some flight tests. A P-80 jet drone plane was used, equipped with four motion picture cameras operated by remote control from either the ground or a mother plane. The cameras were located to record the instrument panel, each wing tip, and a television camera in the nose. A fifth camera photographed the television receiver screen in the ground control truck.

A major problem in the study of plane take-offs and landings was solved by the Lockheed Aircraft Corporation. The planes were photographed with a motion picture camera through a special wire grid, 9 ft. high and 64 ft. long. Vertical wires marked off 100-ft. runway sections, and horizontal wires indicated increasing altitude.

The United States Army Corps of Engineers employed an automatic focus rectifier in mosaic-map making, which was built by the Bausch & Lomb Optical Company. It was possible to enlarge, reduce, or correct for tilt when printing aerial negatives. It has possible application in mapping national highways and in soil erosion studies and flood control work.

Radar Photography.

During early spring the first radar navigation chart of over 300 mi. of the Ohio River was completed from a mosaic of photographs of the radar-scope images. The Mirar camera, with a capacity of 100 ft. of 35 mm. film, made by the Fairchild Camera and Instrument Corporation, was said to be suitable for use with ship-borne radar equipment.

Sports Photography.

A special moving-film slit-camera was used in several of the running, hurdling, and walking events at the Olympic Games at Wembley, England. The moving film speed was adjusted to the estimated speed of the contestants at the finish line, and the prints were delivered to the judges within 60-90 sec. after the finish of the race. Rapid processing equipment was used.

Industrial Applications.

Photometric System.

The announcement of the photometric system introduced photography into men's tailoring. The photometric camera was specially designed to be foolproof and to take automatically the pictures required. The customer was fitted with a tapemeasure harness and then placed in an exact location before nine mirrors. The final pictures were projected in half-scale onto a screen, and accurate measurements were obtained by means of calculating scales on the screen and a geometric calculator.

Area Integrator.

The estimation of the volume of pulpwood in stock piles, in flat cars, and elsewhere is an important operation in the pulpwood industry. The success of a photographic method was dependent upon a photoelectric area integrator, which determined the volume directly from the photographic negative. It was indicated that the area integrator had possible applications in other fields.

Autopositive Paper.

In October 1947 the Eastman Kodak Company announced Kodagraph autopositive paper. An important application of this material has been its use as an intermediate in the field of engineering drawing reproduction. The adaptation of blueprint processing equipment to the continuous processing of autopositive paper for large volume production was described during 1948.

Motion Pictures and Television.

It was apparently recognized in 1948 that motion pictures would be required for some years to come to augment live-talent shows in television. This was evidenced by the fact that film producers, such as Jerry Fairbanks, signed contracts to make several hundred feature television films yearly. Several subjects of the "Public Prosecutor" series were completed for television.

Theatre Television.

Theatre television was demonstrated using a film-recording system at the Paramount Theatre in New York City. On April 14 a boxing bout at the Navy Y.M.C.A. in Brooklyn was televised to the theatre where the image on a 15-in. cathode-ray tube was photographed on 35 mm. film and processed ready for projection within 66 sec. This processing time was subsequently reduced to 22 sec. An alternative method, involving direct instantaneous projection of the televised image, was demonstrated on an 18-ft. screen in the Shrine Auditorium in Los Angeles on January 1. It was said that probably both methods would be used in the theatre, but certain advantages were claimed for the film-recording method.

Amateur Motion Pictures.

Statistics were published showing the growth of interest in amateur motion pictures. These were of considerable interest since 1948 was the twenty-fifth anniversary of the 16 mm. reversal process. Approximately 825,000 families owned 8 mm. cameras; 275,000 families owned 16 mm. cameras and 950,000 families owned projectors. There was an increased interest in the use of magnetic-tape sound-recording among owners of 8 mm. equipment.

Improved techniques, cameras, and films were believed responsible for improved quality and an extended use of 16 mm. movies in the instructional, industrial, medical, and scientific fields. It was predicted by the United States Office of Education that more than 8,000 different industrial and educational films would be available by 1950.

Color Photography.

The demand for both amateur and professional color films exceeded available supplies despite the fact that manufacturers had increased production. It was stated by one analyst that more than 25 per cent of the 35 mm. still photography in the United States and 85 per cent of the amateur movie market was in color. Between 50 and 100 concerns were engaged in processing exposed color film.

Films.

Improvements were noted in the quality of several older color materials such as Ansco color films and Printon, Ektachrome, and Kodachrome films. Some of this improvement was due to improved techniques used by professional photographers, especially in regard to the retouching of transparencies and prints, lighting control, and multiple exposures. Kodachrome and Kodacolor prints were made available in larger sizes up to 11 by 14 in.

Developers.

New chemicals and processing formulas and techniques were described in the literature. Coppin and Spencer reported the details of the Vivex process, July-August 1948. It was thought that this information would be of help to photographers using the Carbro process, since the basic principles were believed to be an improvement over the Carbro process. May and Baker Limited in England announced a reducing agent known as "Genochrome" for use in color developers. Both Kodak and Ansco featured nontoxic color developers.

Color Reproductions.

More effort was apparently directed towards improving the quality of color reproductions in magazines and books. Some printing shops accepted the new techniques of masking color transparencies and employed better quality paper for the reproductions. *Life* magazine published some very excellent reproductions in color including the following: a full-page spot news picture of a big fire in Montreal; the first published color photograph of the planet Mars; and a series of color photomicrographs of sludge in blood cells made by F. W. Goro. *The New York Times,* on September 12, reproduced by color rotogravure thirteen color pictures of the national political conventions in Philadelphia.

Color Motion Pictures.

In the field of color motion pictures, the program expansion of the Technicolor Motion Picture Corporation was noteworthy. More than a 50-percent increased capacity was accomplished by midyear 1948 in a program which called for an increase from 160 million ft. per year print-manufacturing volume to a goal of 320 million ft. by the end of 1948. Cinecolor predicted an increased capacity. They expected to have completed 45 feature pictures at the end of 1948. In the Trucolor process of Republic Pictures color couplers are used to form a red dye image on one side and a blue dye image on the other side of the film.

New Color Processes.

Some new color motion picture processes were announced. The Polaroid Corporation announced the Polacolor process, which was said to produce three separate color images in a single layer from three color-separation negatives. Standard processing and projection apparatus were used. Gevaert announced "Gevacolor," said to be a version of the German Agfacolor process. The color couplers are contained in the emulsion layers of an integral tripack, and orthodox reversal color processing was employed. Rouxcolor, an additive system of color photography, was described. It employs a lens system forming four images in the areas usually filled by one image on a standard negative. Deep red, yellow, green, and violet color filters over each lens component are used in both the camera and projector. The four images are superimposed on projection.

MATERIALS AND EQUIPMENT

Materials.

Each year, particularly since World War II, a considerable number of new sensitized materials, chemicals, cameras, and processing equipment have been announced. The new products introduced during 1948 are summarized below:

Sensitized Materials.

Probably the most important announcement in the field of film manufacture was made by C. R. Fordyce, who described an improved safety motion picture film support. The product was said to be a highly acetylated cellulose acetate having improved physical properties and better aging characteristics than commercial safety film in professional use. It was predicted that the new safety film would probably replace nitrate film support within a few years.

A few of the new sensitized products announced during the year are the following: improved Anscocolor Printon, Ansco strip paper No. 55 in 1,000-ft. rolls, Ansco Cykora paper, Remington Rand Rembrandt Chlorobromide projection and contact paper, Rapid F Velox unicontrast paper in sheets and in 1,000-ft. rolls for strip printing, Kodagraph contact duplitized paper, Kodak separation negative plates Type I, Kodak highlight masking film, Kodak super-X and super-XX blue base reversal films, and Weimet reversal safety color film. Special photographic plates for the 48-in. Schmidt-type telescope on Mount Palomar were supplied on very thin (0.040 in.) glass which could be bent into a section of a sphere.

The Armstrong Cork Company, with the co-operation of the National Association of Photographic Manufacturers, prepared an especially interesting advertisement on "How Photographic Film Is Made." This appeared in the *Saturday Evening Post,* January 17, and reproduced in color a cutaway drawing of the various stages of film manufacture as symbolically conceived in one large building. Also the Foto-Fab and Phototone methods of sensitizing fabrics were announced.

Chemicals.

Packaged chemicals, in bottles or packets, were generally employed in 1948, and in some instances increased use of these was indicated. One firm supplied processing chemicals in small heat-sealed metal foil units for amateur workers.

A one-bath reversal process was described by H. A. Miller in the *Journal of the Photographic Society of America* (February 1948). The method permitted positive transparencies to be made on film after camera exposure or print duplicates of negatives or positives without the usual intermediate step.

Apparatus or Equipment.

Land Camera.

In 1947, Dr. E. Land of the Polaroid Corporation announced the basic principle for a one-step photographic-process camera. A commercial model of such a camera was demonstrated at the Photographic Society of America convention in Cincinnati, Ohio. With the Land process a finished print can be made in the camera within one minute after the exposure.

Beattie Camera.

The Beattie Portronic camera, recommended for studio portraiture and industrial identification, was introduced. Exposure with electronic synchro-flash, imprinting of an identification number, and advancement of the film are accomplished automatically by push-button control. The camera holds 100 ft. of 70 mm. film.

New Small Cameras.

Several still cameras were added to the small-camera market, including three Ansco models, the Flash Clipper, the standard Speedex, and the Titan; four new Kodak Tourists; the Kodak Duaflex, the Perfex, series 100 camera; the Busch 4 by 5 Pressman; the Kalart camera; and the Bell and Howell Foton camera. The Foton is equipped with a spring-wound motor film-advancing mechanism, a new type focal-plane shutter having two metal leaves behind the lens and two at the film plane, and a Cooke lens marked in the proposed T-stops which had not yet been accepted by the American Standards Association at the close of 1948. The T-stop is determined by measuring the light of known spectral quality (noon sunlight) transmitted through the lens to the image plane. The camera makes double frame pictures on 35 mm. film, and 12 exposures within a second are claimed. The Kalart camera is said to be equipped with safety locks to prevent blank exposures and premature flashing.

Foreign Importations.

The following still cameras were imported: the British Coronet-Cameo; the German Linhof Technika, model III; and the Retina I and II made at the Kodak factory at Stuttgart, Germany.

Motion Picture Accessories.

A considerable number of accessories for 16 mm. cameras and projectors were announced during the year. A few new cameras were marketed. The Cine-Kodak Special Model II had several improvements, including a lens turret. Seven new Cine Ektar lenses were introduced which varied in focal lengths from 15 mm. (f/2.5) to 152 m. (f/4). The fastest lens of this group, the f/1.4 Ektar, was described by C. D. Reid in an article published in the *Journal of the Photographic Society of America* (August 1948). The Revere 16 mm. sound projector model 48

was announced in October. Another accessory was the Craig 8 mm. Projector-Editor with viewing screen. The Cine Raptar f/1.5 was announced by the Wollensak Optical Company.

Continuous Processing.

The need for continuous processing in the photo-finishing business has been increasingly evident. During 1948 several attempts were made to introduce this type of equipment. The Eastman Kodak Company announced its continuous-paper processor machine designed to turn out 2,400 average size enlarged prints per hour. In addition, new roll-paper printing heads for use on two models of semi-automatic printers were also announced.

Miscellaneous.

The following items of miscellaneous equipment were also introduced during the year: Argus PA200 projector for 35 mm. slides; Kodaslide table viewer, holding 75 slides, which can be projected rapidly on a $7\frac{1}{2}$ x $7\frac{1}{2}$-in. self-contained screen in full room light; Federal Store-Away Senior enlarger; Kodak Studio Speedlamp; and Kodak Color Densitometer.

Summary.

It was obvious that many advances and improvements were made during the year 1948 in photographic materials and equipment. Of special interest, of course, were the many new applications of photography, particularly in science and industry.