Photography in Law Enforcement

Eastman Kodak Company

PHOTOGRAPHY IN LAW ENFORCEMENT

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INTRODUCTION

LEADING law-enforcement agencies and scientific crime detection laboratories have, for years, found photography a valuable aid in making and preserving records, establishing evidence, and providing positive identification. Photographic records, evidence photographs, and photographic identification already have proved their effectiveness and today are accepted almost universally as legal evidence.

The truth of the ancient Chinese proverb about one picture being worth one thousand words has been demonstrated emphatically by the impressive record of criminal convictions attributed partly or entirely to photographic evidence. Through accurate evidence photographs, the juror carries with him to the jury room a vivid picture of the circumstances involved in or surrounding the crime—a picture that often would be confused by wordy and sometimes tedious description alone. Thus, his mind is free to consider other aspects of the case.

The purpose of this book is to assist large departments already having a photographic section, as well as small departments which are venturing into photography on a modest scale and with relatively little experience. The former group will find the book valuable as a reference and as a source of information on specialized applications and techniques, while the latter group can use it as a textbook to supplement information from other sources dealing with elementary photographic principles. By following the specific and detailed instructions, good results can be obtained.

Some departments probably will find that the amount of work done does not justify the purchase of some of the more complex and specialized equipment mentioned, such as spectroscopes, X-ray machines, and comparison microscopes. For highly technical work which the department cannot handle, the Federal Bureau of Investigation maintains a complete laboratory and a staff of expert technicians. These are at the disposal of any law-enforcement agency.

The scope of evidence photography is so broad that no attempt could be made in a book of this size to cover every possible phase. After the photographer has mastered the techniques covered here, his own ingenuity will often provide the solution to peculiar problems.

The Sales Service Division of the Eastman Kodak Company will give prompt attention to inquiries regarding photographic matters, and Kodak technical representatives will gladly make personal visits, on request, to departments in their area.

Chapter I

EQUIPMENT

CAMERAS and other equipment used in record, evidence, and identification photography are not essentially different from those used in general photography. There are, however, certain kinds of equipment with features which make them especially adaptable for this work.

CAMERA

Because of the great variety of conditions under which the staff photographer must work, his camera should be flexible enough in operation to allow a quick and easy change from one kind of film to another. Cameras using sheet films and film packs permit the photographer to make as many or as few exposures of a given subject as needed on the correct type of film for that subject. If another subject requiring a different type of film presents itself, the photographer can change over immediately without wasting film.

Ground-glass focusing, showing the exact field covered by the lens and permitting critically sharp focusing, is another desirable feature. It is especially helpful in close-up photography and in copying.

The Kodak Master View Camera, 4 x 5; Kodak View Cameras No. 2D, 5 x 7 and 8 x 10; the Kodak Medalist II with Accessory Back; and press-type cameras fulfill these requirements and are recommended.

Amateur roll-film and miniature cameras often are useful as supplementary equipment or for certain specialized applications. Identification photography and fingerprint photography are specialized fields for which complete outfits are manufactured. When a great many specialized pictures are to be made, the purchase of this equipment pays for itself through its greater efficiency. Small organizations, however, can usually make such pictures with as good results, though perhaps not as efficiently, with general equipment.

Camera Lens

Any lens used for evidence, record, or general photography should reproduce all details sharply and without distortion. A lens that will produce clear, sharp pictures is the prime requisite for a camera if it is to produce photographs that will be a credit to the photographer. The lens should have a maximum aperture of at least *f*/6.3, or *f*/7.7 for the larger cameras. For hand-held cameras which require higher shutter

Kodak Master View Camera, 4 x 5.

Kodak View Camera No. 2D.

speeds, the lens should have a maximum aperture of *f*/4.5 or larger.

In the Kodak Ektar Lenses, designers and lens makers have collaborated in making the best lenses that skill, care, and optical research can produce. The astigmatism which normally is present in small amounts in all lenses has been reduced to a minimum in Ektar Lenses. Color correction has been carried out to such a degree that these lenses meet the highest standards demanded for color photography. The Kodak Medalist II Camera has a Kodak Ektar Lens, 100mm *f*/3.5.

The Kodak Commercial Ektar Lenses, *f*/6.3, available in 14-inch, 12-inch, 10-inch, and 8½-inch focal lengths and supplied in flash shutters or barrels, are especially designed for the Kodak View Cameras No. 2D, 5 x 7 and 8 x 10, and studio cameras.

In addition to the regular general-purpose lens, the focal length of which should be at least equal to the diagonal of the negative, two lenses are recommended for special uses: (1) A wide-angle lens for photographing interiors and (2) a telephoto lens for photographing views where it is impossible or inadvisable to approach close to the subject.

Kodak Wide Field Ektar Lenses, *f*/6.3, are ideally suited for law-enforcement photography. They are versatile enough to be used in almost any application, and their wide field of view is especially valuable for photographing interiors, accidents, and similar subjects. These lenses are supplied in focal lengths of 80, 100, 135, 190, and 250 mm. Complete descriptions and optical data on Kodak Wide Field Ektar Lenses, as well as on other Kodak lenses, are contained in the Kodak Data Book, "Kodak Lenses, Shutters, and Portra Lenses."

Camera Shutter

In addition to providing for time (T) and bulb (B) exposures, the shutter should provide for instantaneous exposures ranging from about 1 second to 1/200 second. As the shutter probably will be used for synchronized flash photography, a between-the-lens shutter with built-in flash contacts should be given preference. Although most focal-plane shutters can be synchronized with flashlamps, they require a special lamp with a flash peak of long duration.

The Kodak Flash Supermatic Shutter is the finest between-the-lens shutter available. Besides time (T) and bulb (B), it has speed settings of 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, and 1/400 second. Flash synchronization is built into the shutter and permits the shutter to be used in connection with the Kodak Flasholder, assuring positive synchronization with either Class F (such as SM) Photoflash Lamps or Class M (such as No. 5) Photoflash Lamps.

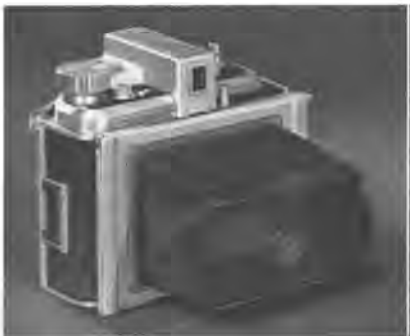
Another convenient feature of the Flash Supermatic Shutter for press, view, and similar cameras is the blade arrester. The blade arrester permits the opening of the shutter blades for focusing while the shutter is set for the speed at which the exposure is to be made.

LIGHTING EQUIPMENT

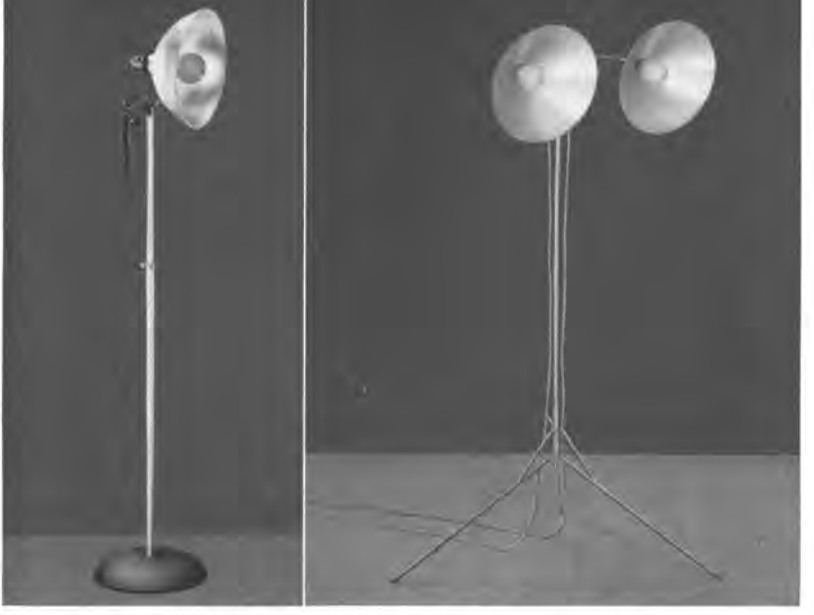
Photoflash Lamps: Photoflash lamps, emitting a short, brilliant flash, are used for making exposures in poor light or at night where the absence of proper electrical outlets or other conditions render the use of photoflood lamps impractical. They can be fired either by battery-operated flashguns in synchronization with the camera shutter, or by hand-held, battery-powered flash holders which are independent of the camera. A third method—firing by ordinary house current—can be used for some photoflash lamps, such as the No. 22 or 50.

If lamps having a bayonet base are used, the combination of Kodak Flash Supermatic Shutter and Kodak Flasholder, previously mentioned, can be relied on for accurate synchronization. This arrangement permits holding the camera in the hand when the exposure is made and allows for attaching extension cords for additional lamps, which can

Kodak Medalist II Camera with Accessory Back.



Kodak Medalist II Camera with Kodak Flasholder.



Left, Kodak Vari-Beam Standlight. Right, Kodaflector.

be placed at different points to illuminate a wide field evenly.

If a hand flash battery holder is desired, a triple reflector which will permit the simultaneous use of three lamps is recommended. This three-lamp reflector is extremely useful for outdoor exposures at night.

Photoflood Lamps: Indoor photography requires strong artificial light so that long exposures will not be necessary. Photoflood lamps provide such a light source. Their efficiency is greatly increased when they are used in suitable reflectors, and their manipulation is facilitated by a movable stand.

The Kodak Vari-Beam Standlight and the Kodak Vari-Beam Clamplight are versatile reflectors which can be adjusted to provide broad floodlight, narrow spotlight, or intermediate lighting effects with an ordinary Photoflood Lamp No. 2. The two-section, telescoping aluminum tube of the Standlight adjusts from 3 to 5½ feet. The Clamplight has a C-type clamp, especially designed to grip firmly tubular objects, such as a tripod leg, as well as flat objects. When these units are set up in the studio, they provide excellent light sources for identification and evidence photography, and for copying. The Kodak Vari-Beam Standlight is easily disassembled for portability.

The Kodaflector also provides reflectors and stand assembly which can be disassembled and carried without adding great bulk to the photographer's equipment. It is lighter in weight than the Kodak Vari-Beam Standlight, and may be preferred for field photography.

PICTURE-TAKING ACCESSORIES

Exposure Guides and Meters: Printed tables, such as those given in this book, provide a reliable guide to correct exposure for ordinary subject matter under the most frequently encountered lighting conditions. Certain types of exposure Kodaguides—each consisting of a rotating, printed dial on a small printed card—enable the photographer to read directly the correct exposure for the type of film being used after he has set the dial to the existing general lighting conditions and subject matter. A measurement of light and calculation of exposure can also be made by the careful use of a photoelectric exposure meter. This type of meter employs a cell which generates electricity in proportion to the amount of light striking it, and has a means of indicating the amount of electricity generated. Exposure meters can be of considerable help with subject types or lighting conditions not covered specifically by tables or guides. While they are almost indispensable in working with complex or unusual artificial lighting, they can be misleading unless used according to a carefully thought out and tested procedure. This subject is discussed in the next chapter.

Color Filters: Color filters are used to increase contrast between colors in many applications of photography described in this book. The Kodak Wratten K2, G, A, B, and C5 Filters are recommended and their applications are discussed later. They can be fitted to the lens by a Kodak Adapter Ring, in which the filters can be interchanged.

Tripod: The use of a tripod is essential in operating a view camera and also when using a hand-held camera at speeds slower than 1/25 second. The studio tripod should be especially sturdy, and the tripod used in the field should be light in weight and portable. Both the studio tripod and the field tripod should have tilting tops. The Crown Compact Stand is suitable for studio use. The Crown Tripod with Crown Tilting Tripod Top, and the Kodak Eye-Level Tripod with Kodak Turn-Tilt Tripod Head, are both suitable for field use.

PHOTOGRAPHIC STUDIO

A special studio should be set up for making identification photographs, for photographing small objects, and for making copies, as well as for filing and storing the accumulated negatives. A room 15 x 30 feet will be ample in most cases. The equipment can consist of a copying stand and a workbench, a small desk, and a filing cabinet. One corner of the studio should be set aside for the making of identification photographs. This corner should not be near a window since variations in daylight will influence the standard exposure which has been established

on the basis of lamp intensity. If necessary, a screen will provide protection. In many cases, the wall against which the identification photograph is made can be painted a neutral gray and serve as a background. (This will be discussed in detail later.)

PHOTOGRAPHIC DARKROOM

The size, arrangement, and equipment of the darkroom may vary with the conditions and requirements of the photographic work. There are, however, certain principles that apply in all cases.

The first requirement is that the room be absolutely dark, with no light leaking in to fog the films and papers. Safelight lamps with recommended safelight filters can be used to supply illumination for handling light-sensitive materials.

The second requirement is that the necessary equipment be arranged to allow the work to progress with a minimum of lost motion. If space is available, two darkrooms are recommended—one for developing films and one for printing.

Location: The location of the darkroom will probably be determined by available space. The ideal arrangement is to have the darkroom near the studio. If space and plumbing and electrical facilities permit, this location is recommended. If lack of space does not permit this arrangement, the darkroom can be set up in the basement. However, dampness is often encountered in basements, and steps must be taken to dehumidify the room. The chemical drying units sold by hardware stores are useful for this purpose.

Light Traps: In small departments, where only one or two persons use the darkroom and where there is no traffic in and out of the room while it is darkened, the extra space required by a light trap might not be justified. However, larger departments may find a light trap desirable to permit entering or leaving the room without admitting any light. This can be built by constructing a vestibule inside the outer entrance to the darkroom and adding a second door or curtain. If two solid doors are used, it will be necessary to place a light-trapped vent in the space between the doors to relieve the changes in air pressure caused by opening and closing the doors.

Safelight Illumination

For efficient work, the darkroom should be as well lighted as possible without danger of fogging uncovered film or paper. Because the eye and sensitized photographic materials are affected differently by the various colors, it is possible in most cases to use colored safelight filters

Kodak Adjustable Safelight Lamp.

Kodak Darkroom Lamp.

which will transmit enough light by which to see, without exposing the film or paper, although some films must be handled in complete darkness. The correct safelight filter for the type of emulsion being handled is an important consideration.

The Kodak Utility Safelight Lamp, Model C, which can be fitted with the correct safelight filter for films or papers and suspended about 2 feet from the ceiling, will supply adequate general safelight illumination. Additional light at certain strategic points can be provided by Brownie Safelight Lamps, Model D. One should be placed at each end of the sink—over the developing tray and over the fixing tray—and another one should be mounted over the workbench.

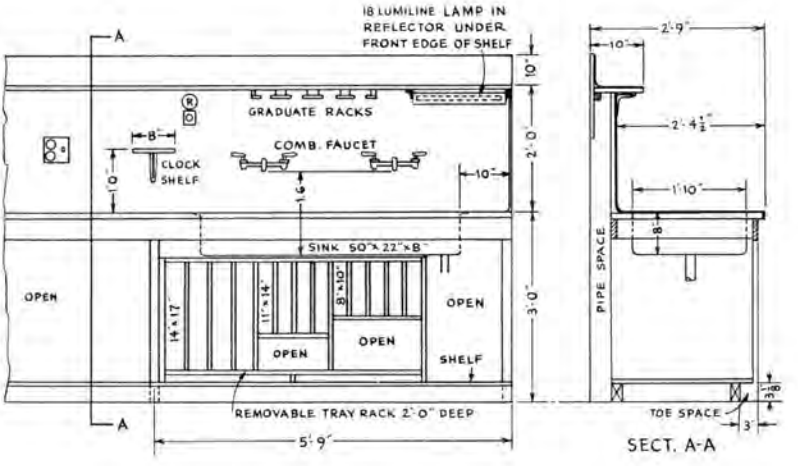
Safelight lamps are so constructed that safelight filters are easily interchangeable. The safelight recommendations given in the Darkroom Chart at the end of this book should be followed carefully.

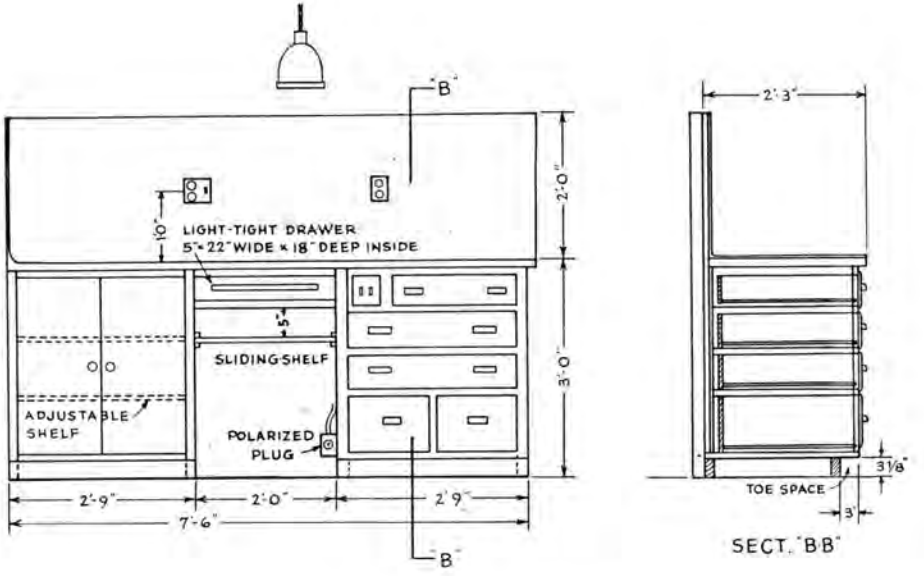
A white light over the sink will aid in the inspection of negatives and prints after development and fixation. A convenient arrangement is a Kodak Adjustable Safelight Lamp fitted with a sheet of flashed opal glass and mounted on the wall or shelf above the sink. A foot switch is suggested for operating the illuminator when the operator's hands are wet.

Ventilation: In order to maintain healthful working conditions in the darkroom, adequate ventilation is necessary. All openings provided for the passage of air must be light-trapped to prevent the entrance of light. Since this increases the resistance to air circulation, some type of blower or fan is desirable to force the air in or out of the darkroom.

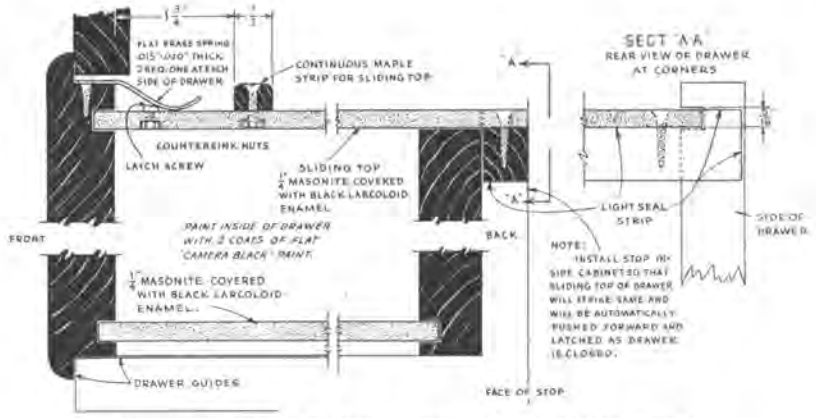
DARKROOM WORKBENCH AND SINK UNITS

Storage cabinets for films and papers should be placed where the materials will be most convenient to the film-loading bench, printer, and enlarger. All benches should be covered with linoleum or other material for protection against chemicals.





Suggested plans for Darkroom Workbench and Sink Unit.



Cross-sectional drawing showing construction of lighttight drawer.

The plans on page 13 for darkroom workbench and sink units were designed to provide versatile accommodations for processing moderate amounts of photographic materials. In most cases, it will be possible to build the units in a woodworking shop and move them to the location where they are used. However, if elevators, stairways, or door openings make it necessary, the units can be produced in the shop in semi-assembled form and then put together in the darkroom.

Dry Bench: The dry bench is intended as the place where sensitized goods are handled and where enlargers and printers are located. Since storage space for supplies and accessories is very important here, the combination of drawers and a cupboard is recommended. A lighttight drawer can be built according to the plan illustrated. Beneath the drawer, a sliding shelf is provided for a trimmer. If desired, the trimmer can be used without being removed from the shelf.

It should be noted that the wiring is an integral part of the dry-bench unit. Three separate circuits are found in this bench. The convenience outlet with a switch above the bench provides an outlet for electrical devices which may be used in the darkroom. The other convenience outlet is controlled by the right-hand switch in the front of the bench, or by the foot switch in the outlet in the center space. The snap switch on the face of the bench controls the safelights; it is easier to focus an enlarger without the safelight shining down on the easel.

Wet Unit: The wet unit was designed for a darkroom in which the door was on the same wall as the dry unit previously described. If the width of the room permits, a 30-inch sink is preferred to the 22-inch sink. Where color work is intended, an additional 10 or 12 inches on the

sink length is desirable. It is suggested that, with the additional length, the sink be moved nearer the end wall on the right.

Linoleum Covering: The linoleum covering of the workbench is carried up on the splash shield, and a curved junction is achieved by using 1½-inch cove molding where the bench joins the splash rim. Linoleum can be fastened to the bench top by means of waterproof linoleum cement, and it should be tacked in place at the upper edge of the splash shield to relieve the strain on the cement applied to hold the linoleum against the vertical surface.

The shelf above the sink is covered in the same way. This provides a bench top and shelf that are easy to keep clean, and there is no accumulation of chemicals or dirt in the crack that otherwise invariably develops at the back of the bench.

The height of the faucets is very important. The lower surface of the bib should be 16 inches above the level of the platform in the sink. Most platforms are made of slats fastened to two crosspieces, and lumber 1 inch in thickness is commonly used. A 2-inch height of the sink rack can be assumed unless a different type of rack is proposed. This clearance of the bib provides space for filling one-gallon bottles.

The shelf beneath the wet unit is also covered with linoleum, and the tray rack is constructed so as to be easily removable. This makes it possible to move everything from the shelf at frequent intervals and to clean it with a mop.

Darkroom Sinks

Since the sink is one of the most important fittings in the darkroom, careful consideration should be given to its design, placement, and construction. It should be large enough to take at least three trays of the largest size normally used (11 x 14 inches) and deep enough to avoid any danger of solutions splashing onto workbenches or floor.

While enameled iron sinks are very satisfactory from the standpoint of both cost and durability, they are often difficult to obtain in sufficiently large sizes. Therefore, it will often be necessary to build the sink, and several methods of construction are possible. Alberene stone is probably the most durable from the standpoint of resistance to the usual photographic solutions, but it is expensive and requires a carefully designed, rigid support to avoid danger of cracking. Monel metal, Inconel, and the 18-8 Mo stainless steels are also durable but expensive. Lead-lined wood is somewhat less expensive and is very durable, provided the joints are lead-burned rather than soldered.

Plain wooden construction of cypress is quite satisfactory for a sink in

regular use, except that it requires frequent scrubbing to remove the growth of slime which tends to accumulate, particularly in warm weather. Tongue-and-groove joints should be used, and the sides of the sink should be held in position by steel tie rods.

For greatest convenience, it is desirable to have hot- and cold-water faucets, preferably with a mixer, near the center of the sink, and extra cold-water faucets for wash water, etc., near each end.

Tanks and Trays: The containers in which photographic solutions are handled, used, and stored not only should be resistant to corrosion by the solutions but also must have no harmful action on the solutions.

Enameled steel, hard rubber, glass, and other corrosion-resistant materials are suitable for tanks and trays. Kodak Hard Rubber Tanks, for the tank processing of sheet film or film packs, and Kodak Enameled or Hard Rubber Trays, for tray development, are recommended.

The control of the temperature of solutions used in processing is especially important. A water jacket, built to hold all developing tanks, is a valuable aid in maintaining proper temperature. Temperature is controlled by mixing hot and cold tap water until the desired temperature is reached and running this mixture through a hose into the water jacket surrounding the tanks.

Any light metal or cypress can be used in the construction of the jacket, but it should be made waterproof and chemicalproof with an application of asphaltic protective paint. The water jacket should be as high as the tanks and large enough to allow approximately 2 inches between all tanks and between the tanks and the sides of the jacket. A water intake connection should be placed about one inch from the bottom, and several draining holes one inch from the top. Thermostatic mixing valves are available and are useful when there are fluctuations in the pressures and temperatures of the hot- and cold-water supplies.

FILM DEVELOPING DARKROOM

If space is available, it is advantageous to have a room separate from the printing darkroom for the development of films. This room should be lighttight and equipped with a sink large enough to accommodate three 8 x 10-inch Kodak Hard Rubber Tanks, hot- and cold-water faucets with a mixer, safelights, adequate ventilation, and temperature control. A film dryer can be made, using a box large enough to accommodate two film- and plate-drying racks and incorporating a means of filtering air which is forced into the box by an electric fan. Cheesecloth can be used to filter the air, but the regular filters sold for hot-air heating plants are much more effective.

Kodak Auto-Focus Enlarger, Model E, 5 x 7.

Kodak Precision Enlarger, B Assembly.

PRINTING AND ENLARGING EQUIPMENT

The selection of a printer will depend on the size of the negatives from which prints are to be made. The No. 5 Eastman Printer, Model 2, accommodating negatives up to 5 x 7 inches, and the No. 8 Eastman Printer, handling negatives up to 8 x 10 inches, are recommended.

The Kodak Precision Enlarger, B Assembly, is recommended for enlarging negatives up to 4 x 5½ inches. Being extremely versatile, the Kodak Precision Enlarger covers many fields in evidence photography. Besides enlarging, the Kodak Precision Enlarger can be adapted for copying, photographing small objects, slide making, making color-separation negatives, photomicrography, and use as an independent camera. The A Assembly is designed to take negatives up to 2¼ x 3¼ inches. A variety of lenses and accessories is available.

A lens which produces excellent results in a camera may not perform as well in an enlarger, especially at low degrees of magnification. Kodak Enlarging Ektar Lenses are corrected to cover the short distances and flat fields encountered in enlarging and are suitable for the most exacting work. Kodak Enlarging Ektar Lenses *f*/4.5 are supplied in 2-inch, 3-inch, and 4-inch focal lengths.

Kodak Enlarging Ektanon Lenses *f*/4.5 are highly corrected for enlarging and are available in focal lengths of 2, 3, 4, 5⅜, 6⅜, and 10 inches. The Kodak Enlarging Ektanon Lens, 2-inch *f*/6.3, is supplied in either a lens board or a lens tube for the Kodak Portable Miniature Enlarger.

If 5 x 7-inch film is used, the Kodak Auto-Focus Enlarger, Model E, 5 x 7, is recommended. This enlarger offers the advantage of automatically setting its own focus throughout its full enlargement range.

Chapter II

EXPOSING BLACK-AND-WHITE FILMS

BECAUSE IT is the intention of portrait, salon, and commercial photographers to make a print that is flattering to the subject, or one that strives to emphasize certain features and minimize others, these photographers often alter their negatives or prints by retouching. By the same means, they sometimes correct errors in lighting or exposure. The photographer of record, evidence, and identification subjects cannot resort to this device because his photographs must tell the true and impartial story of conditions that existed at the time the pictures were taken and must do so by themselves without deletion or addition. The burden of telling this story is borne, first, by the photographic negative. Good negatives which will produce good prints should be the primary goal of the photographer, and, to this end, the various factors that enter into the making of a good negative must be studied and understood.

CAMERA COMPONENTS AND THEIR FUNCTIONS

All cameras, from the simplest box camera to the most complex scientific camera, have four points of similarity: (1) A lighttight compartment with provision at one end for holding film or other light-sensitive material in place; (2) a lens, placed at the opposite end of the lighttight compartment, through which rays of light may be admitted and focused on the film plane; (3) a shutter, or means of allowing light to enter through the lens and reach the film for a predetermined time interval, after which the light is again blocked off from the film; and (4) a finder, or means of knowing what the picture will include.

EFFECT OF LIGHT ON FILM

Photographic film has, on one side, a light-sensitive emulsion to record the picture. An antihalation backing is applied to the reverse side during manufacture to prevent blurring around bright spots in the image of the scene being photographed. The light that is admitted through the lens by the shutter causes a chemical change in the emulsion. Although this change is not apparent to the eye when the film is examined in the darkroom under a safelight, an invisible or latent image is there, to be revealed when the film is processed. How this latent image is converted to a visible image and how prints are made from the resulting negative will be described in a later chapter.

DIAPHRAGM AND SHUTTER-SPEED SETTINGS

Adjustments of lens opening and shutter time are provided not only to compensate for various light conditions, but also to permit taking the best possible pictures of a wide variety of subjects. The size of the lens opening or "stop" is indicated by a diaphragm scale, usually marked in *f*-numbers. Each *f*-number equals the focal length, or distance from a point in the lens to the film plane when the lens is focused for distant objects, divided by the effective diameter of the diaphragm opening. The lens openings represented by *f*-numbers are directly related to the intensity of light reaching the image plane, and the *f*-system permits common exposure recommendations for all lenses. Here is a series of *f*-numbers familiar to experienced photographers: *f*/2, 2.8, 4, 5.6, 8, 11, 16, 32, 45, 64. Starting with the first stop, *f*/2, each succeeding larger number represents a *smaller* lens opening which reduces, by one half, the intensity of light admitted by the preceding stop. For intermediate values, the indicator can be set between those marked. Furthermore, as a lens is stopped down, the "depth of field" increases; objects closer to and farther away from the camera than the point being focused upon become increasingly sharp.

Equivalent exposures can be obtained by using different combinations of lens opening and shutter time. For the relatively motionless scenes of great depth often encountered in evidence photography, a shutter speed not longer than 1/25 second and the corresponding lens opening for existing light conditions should be used if the camera is hand-held. If the camera is on a tripod, still longer exposure time is practicable and a smaller opening can be used for greater depth. Although rapid-action pictures are rare in this type of photography, such photographs should be taken at a fast shutter speed—1/200 second or faster.

FOCUSING AIDS

The purpose of the lens is to form, on the sensitive film, a sharp image of the subject or scene being photographed. When this image is clear and sharp, the lens is said to be in focus. Modern cameras are equipped with one, two, or all of the following focusing arrangements:

Coupled Range Finder: Basically, range finders measure the angle of convergence between two beams of light coming from the same subject point and separated at the camera by the distance between two apertures in the range finder. The range finder operates by changing the direction of one beam to bring the two beams into alignment in the eyepiece. In coupled range finders, the movable prism, or other means of deflecting the one beam of light, is linked with the focusing mechanism in such a manner that the lens is focused, at all times, for the point of convergence of the two beams forming the aligned image.

Kodak range finders are of the split-field, military type in which the image of the subject, when the lens is out of focus, appears split in half. By manipulating the focusing mechanism in coupled range finders, the two halves of the image are brought into alignment, at which time the lens is in focus for all objects in that plane. The Kodak Medalist II Camera is equipped with a coupled range finder.

Simple Focusing Scale: Many amateur cameras are equipped with a simple focusing scale located—in the case of folding Kodaks—on the lens mount or—in the case of press-type cameras—adjacent to the track along which the lens board and bellows slide. Focusing is accomplished by aligning the indicator and distance scale at the number representing the distance from the camera to the subject. A Kodak Service Range Finder or a tape measure should be used to measure this distance.

Ground-Glass Focusing: With a ground glass in the position to be occupied by the film when the exposure is made, the most critical and reliable focus can be obtained. For greatest accuracy, the camera should be placed on a tripod. The focus is adjusted with the shutter open and the lens at its greatest aperture. A black focusing cloth or hood should be used to reduce the amount of light striking the back of the ground glass. After a sharp focus is obtained, the lens should be stopped down to give the desired depth, and the shutter should be closed.

Under extremely unfavorable light conditions it may be impossible to see the image on the ground glass. In this event, a match or flashlight held near the center of interest in the area being photographed will facilitate focusing. By moving the light left and right, and up and down, the width and height of the area being covered can be ascertained. By moving it toward and away from the camera, the depth of field to be covered can be calculated by referring to the distance scale setting after the light is brought into sharp focus at its nearest and farthest points. After determining the depth to be covered, the correct lens opening to obtain depth of field over that range can be selected. Depth-of-field tables for all Kodak camera lenses are available.

TYPES OF BLACK-AND-WHITE FILM

It is especially important to select the correct film for any particular type of work, since the characteristics which make a certain film ideal for one type of subject or exposure condition may make it undesirable for other uses. Kodak films are supplied in many emulsions for a variety of purposes. So-called "fast" films, requiring relatively short exposures, are supplied for general daylight and night photography; slower and slightly more contrasty films are available for photographing certain types of evidence; high-contrast films which reproduce clear blacks and whites are used for copy work and fingerprint photography. The table at the end of this book provides a guide to the proper films for various types of subjects.

EXPOSING BLACK-AND-WHITE FILM IN DAYLIGHT

Exposure calculators such as Kodaguides are inexpensive and very useful aids in determining correct exposure for different types of film under various standard light conditions. For average picture taking, the following table provides a reliable guide and, by referring to it, good pictures can be taken outdoors in daylight from one hour after sunrise until one hour before sunset.

Daylight Exposure Table: for Kodak Super Panchro-Press, Type B, Film. Lens Apertures at 1/100 Second.

Subject Type	Bright Sun	Hazy Sun	Cloudy-Bright	Cloudy-Dull
Brilliant	*f*/22	*f*/16	*f*/11	*f*/8
Bright	*f*/16	*f*/11	*f*/8	*f*/5.6
Average	*f*/11	*f*/8	*f*/5.6	*f*/4
Shaded	*f*/8	*f*/5.6	*f*/4	*f*/2.8

Brilliant Subjects: Beach, marine, and snow scenes; distant landscapes and mountains without prominent dark objects in the foreground.
Bright Subjects: People in marine, beach, or snow scenes; scenics with foreground objects.
Average Subjects: Near-by people, gardens, houses, and scenes **not in the shade**.
Shaded Subjects: Subjects in **open shade** (not under trees, porch, roof, etc.).

Unfortunately, the staff photographer's work does not always fall into the "average picture-taking" category. When working in twilight, in cities where tall buildings block off a large percentage of light, or in other unfavorable light, he may often be in doubt as to the correct exposure. When this occurs, the following is a safe procedure: From the instructions which most closely approximate existing conditions, make a guess as to the correct exposure. After making that exposure, make two more, giving one-eighth the original exposure to one and eight times the original exposure to the other. This method is very reliable, although some film is wasted.

A well-exposed negative will produce a picture with clear detail and an accurate reproduction of the tones in the original subject or scene. If a film has been underexposed, the final picture will be dark or gray, and it will be difficult, or even impossible, to distinguish the necessary detail in the shadows or dark areas of the scene. Overexposed negatives result in prints lacking in contrast and with little detail in the highlights or light-colored areas.

PHOTOELECTRIC EXPOSURE METERS

For taking photographs under unusual lighting conditions, a photoelectric exposure meter can be helpful *if properly used.* For correct readings, they should be used as recommended by their manufacturers. Due to differences in construction, all meters cannot be used according to a hard-and-fast formula. Also, the technique of taking a reading from a subject varies according to the subject type and the effect desired in the final print. An important consideration is the exclusion, from the light-sensitive cell, of extraneous light which will not be included in the picture. For this reason, many manufacturers recommend that the meter be tilted down slightly when taking a reading from an outdoor scene to eliminate the influence of sky light. The photographer should be on the lookout for incidental bright portions of a scene which might cause the meter to register a high total of light reflection, leading to underexposure of important detail in the less brightly illuminated parts. Whenever possible, meter readings should be taken close to the important individual elements of the scene. Such close-up readings should be taken from the direction of the camera and at a distance from the object roughly equal to the diameter of the object. Care must be taken not to cast a shadow on the subject while holding the meter near it. By following the recommendations of the manufacturer, experience with the meter will develop skill in its proper use.

Some exposure meters measure incident light, rather than light reflected from the subject. Such meters require a different method of handling, and the manufacturer's directions should be followed.

EXPOSING BLACK-AND-WHITE FILM AT NIGHT

Photoflash Illumination: To take pictures with photoflash lamps in a hand-held flash holder, the camera should be placed on a tripod, the shutter set for Time or Bulb, and the flash holder held above the camera level in such a manner that no light from the lamps will strike the lens directly. The exposure is made on a "1-2-3" count: (1) open shutter, (2) flash lamp, and (3) close shutter.

Accident scene photographed by the "open flash" technique. Several photographs should be made from various positions. Courtesy Pittsburgh, Pa., Police Department.

Cameras equipped with an external synchronizer, or the Kodak Flasholder and a flash shutter combination, can be held in the hand while making a flash exposure. A shutter speed of 1/100 second is satisfactory. External synchronizers should be checked frequently for accurate synchronization. Kodak flash shutters have built-in synchronization. A supply of fresh batteries should be kept on hand.

A simple method of determining the correct exposure for photoflash photography is provided by the Photoflash Exposure Guide Numbers for each type of Kodak film. The following table lists the Exposure Guide Numbers for Kodak Super Panchro-Press, Type B, Film:

Photoflash Exposure Guide Numbers *for average synchronizer reflectors.* To obtain *f*-number, divide exposure guide number by distance in feet from lamp to subject. Numbers under **"I" (indoors)** are for average subjects in a room with light-colored walls and ceiling. Numbers under **"O" (outdoors)** are for use outdoors at night, or in dark-colored surroundings.

Between-Lens Shutters	SM		No. 5		No. 11		No. 22		Focal-Plane Shutters	No. 31	
	I	O	I	O	I	O	I	O		I	O
Open*	160	80	300	150	330	165	490	245	1/50	245	125
1/100	160	80	250	125	285	145	425	215	1/100	175	90
1/200	125	65	215	110	235	120	345	175	1/250	125	65

*Use these values when shutter is set for 1/50 second or slower, including Time or Bulb.

Caution: The use of a suitable screen over the reflector when making pictures of people is recommended, as flashlamps may shatter. Do not flash in an explosive atmosphere.

Here is an example of how the Exposure Guide Numbers are used:

Suppose an outdoor subject, such as an automobile wreck at night, is to be photographed from a distance of 30 feet, using Kodak Super Panchro-Press, Type B, Film and one Photoflash Lamp No. 22, fired by the "open flash" method. Under No. 22, "O" opposite "open," the Exposure Guide Number is 245. Dividing this number by 30, the distance between lamp and subject, gives a quotient of 8. The lens diaphragm should therefore be set at *f*/8.

If two or three photoflash lamps are used in the hand-held flash holder, the lens diaphragm should be set about one-half stop smaller than for a single lamp.

A very convenient Flash Kodaguide, based on the Exposure Guide Number principle, is available. By simply setting the dial to the Exposure Guide Number for the film being used, the correct lens opening can be read directly against the distance from lamp to subject.

When it is necessary to cover a large area in a traffic accident at night or in some similar situation, the use of a special pistol-type flashgun, using a flash-powder cartridge manufactured by the Kilgore Manufacturing Company, Westerville, Ohio, will be most helpful.

A short time exposure before and after the flash produced light spots in background, showing location of street lamps. The light streaks in the background were caused by headlights of moving cars during the time exposure. Courtesy Pittsburgh, Pa., Police Department.

Photoflood Illumination: When pictures are to be taken indoors or in the studio, the use of photoflood lamps in reflectors is recommended. Besides being more economical than photoflash, photoflood lamps have the added advantage of flexibility in lighting arrangement. With photoflood lamps in reflectors, light can be directed easily to the principal points of interest, and the lighting effect can be observed and adjusted, if necessary, before the exposure is made.

A single light source, especially when positioned close to the camera, causes harsh, contrasty tones and heavy shadows behind the subject. These shadows should be illuminated by a reflector of some light material, such as a white cloth or white cardboard, held outside the picture area so that light is reflected into the shadow areas.

A better way to lighten the shadows is by using a second photoflood lamp in a reflector as a side light. This additional lamp can be moved toward or away from the subject until the proper balance between front and side lighting is obtained. The Snapshot Kodaguide provides a quick reference for correct exposure under various photoflood lighting arrangements indoors, as well as exposure data for outdoor pictures.

Some points to keep in mind when using photoflood illumination are:

1. Avoid multiple, hard shadows cast by furniture or other objects in the scene. A cheesecloth diffuser in front of the lamps will help reduce hard shadows.
2. Avoid reflections from the lights in windows, glass, or polished surfaces.
3. Make certain the lighting is even over the area being photographed, with no "hot spots" of intense light.

To conserve the life of the photoflood lamps, most of the focusing and arranging of the subject can be done by ordinary light, with the photoflood lamps used only for a final checkup before the picture is made, and for the actual exposure.

With the camera lens set at *f*/22 for good depth of field, and using two Photoflood Lamps No. 2 in average reflectors, or two Photoflood Lamps No. RFL2 with Kodak Super Panchro-Press, Type B, Film, the following exposure times should be used at the given lamp-to-subject distances:

Lamp-to-Subject Distance	*Exposure Time at f/22*
20 feet	3 seconds
17 feet	2 seconds
11½ feet	1 second
8½ feet	1/2 second
5½ feet	1/5 second
3½ feet	1/10 second

COLOR FILTERS

The purpose of color filters in black-and-white evidence photography is mainly to add contrast so that two colors which would otherwise photograph as approximately the same shade of gray will have decidedly different brightnesses in the picture.

To obtain contrast between two colors, the filter should hold back, or absorb, one color so that it makes little or no exposure on the film and, at the same time, should transmit the other color freely. For example, if it were desired to show writing in blue ink on a yellow paper, the Kodak Wratten A Filter (red) with a panchromatic film would reproduce the ink as a heavy black against a light background, because this filter absorbs the blue of the ink and transmits the yellow of the paper.

Since a filter absorbs some of the light which normally would affect the film, the exposure ordinarily must be increased. The "filter factor" represents the number of times the exposure must be increased for a given film, when a filter is used, over the exposure required without the filter. This factor varies with the color sensitivity of the film. As reference sources for filter factors and the reproduction of colors by different filters, the Kodak Data Book, "Filters and Pola-Screens," the Film and Filter Kodaguide, and the Contrast Viewing Kodaguide are extremely valuable. These are on sale at all Kodak dealers. *Important:* Never use a filter of a color to which the film is not sensitive, such as a red filter with orthochromatic film.

EFFECT OF VARIOUS KODAK WRATTEN FILTERS ON CONTRAST

Color of Subject	To reproduce lighter, use:	To reproduce darker, use:
Red	F, A, or G	C5 or B
Green	B, G, X1, or X2	C5 or A
Blue	C5	F, A, G, or B
Blue-Green	C5 or B	F or A
Magenta, Pink	F or A	B
Purple	C5 or F	B
Yellow	G or A	C5
Orange	G or A	C5

NOTES ON USING THE CAMERA

Selecting the Viewpoint: In making a picture, care should be taken that no distracting, large object is near the center of the field close to the camera lens lest it detract attention from the main subject; otherwise, the distracting object will appear unduly large in comparison with objects that are farther away. Every effort should be made to reproduce the scene in exactly the same proportions as it appears to the

eye. Careful study of the image on the ground glass will enable the photographer to select the best vantage point for his camera.

Leveling the Camera on the Tripod: When the camera is placed on a tripod, the tripod legs should be drawn out and spread sufficiently to allow for extreme rigidity. One leg should point forward in the same direction as the camera. The camera can be leveled by shifting the position of the front leg. In close areas where this front position is impossible, the leveling leg can be behind the camera. A camera should never be left on a tripod unattended; it may fall or be knocked over.

The Correction of Vertical and Horizontal Lines: When a camera is tilted or turned so that the plane of the film is not parallel with the plane of the subject focused upon, any vertical or horizontal parallel lines will be distorted (that is, wedged rather than parallel) unless correction is made in the camera. This correction is often necessary for true reproduction of such subjects as buildings and houses.

By means of the rising and falling front on the Kodak Master View Camera, and the Kodak View Camera No. 2D, tilting the camera up or down can be avoided to some extent. If it is still found necessary to tilt the camera, further correction can be made by using the tilting back to keep the plane of the film parallel to the subject. When this is done, the lens should be stopped down to keep the entire image perfectly sharp. Similar correction for horizontal lines is possible by using the sliding front and the swing back on these cameras.

The Film-Holder Slide: The metal tops of the film-holder slides are black on one side and silver on the other. When the holder is first loaded, the silver side should face away from the holder; after the film has been exposed, the slide should be replaced so that the black top appears and the silver side faces toward the holder. Double exposure of the film can be prevented in this manner, since the position of the silver side indicates whether or not the film has been exposed.

Pre-Exposure Checkup: To assure that the necessary settings for the making of a good negative have been made, a quick checkup before making the exposure is strongly recommended. Such a habit, following a fixed sequence, is most helpful.

1. Check the focusing scale or mentally check over any changes since focusing on the ground glass.

The Flash Kodaguide, left, and the Snapshot Kodaguide, right, are handy exposure calculators.

2. Make sure that the shutter speed selected is sufficiently fast to stop subject and camera motion and that the index mark lines up exactly with the speed number. In the case of a presetting shutter, see that it is set or cocked.
3. If a press-type camera having both focal-plane and between-the-lens shutters is being used, make certain that the shutter not in use for the exposure is open. If the front or between-the-lens shutter is being used, turn the focal-plane shutter to "O." If the latter shutter is being used, set the front shutter on Time, and open.
4. Ascertain that no changes in diaphragm setting or light conditions have occurred since the correct exposure was determined.
5. Make sure that the proper type of unexposed film is in the camera and that the slide of the film holder or film-pack adapter has been withdrawn.
6. Look through the view finder or otherwise check to see that no camera or subject change has taken place.

Precautions: Never let the sun or any strong light shine directly into the lens when the picture is taken. If the photograph must be made against the sun, the lens should be shielded by a Kodak Lens Hood or similar sunshade, or by the film-holder slide.

Dust, fingerprints, smudges, rain drops, etc., on the lens tend to blur the image on the film; therefore, the lens should be cleaned frequently with Kodak Lens Cleaner, Kodak Lens Cleaning Paper, or a soft, lintless cloth, in order to assure the best pictures.

If the subject in a picture appears blurred but the fixed surroundings are sharp, the subject has moved during the exposure. This can be corrected by using a faster shutter speed. If the entire picture is blurred, the camera has been moved. The use of a sturdy tripod and a cable release will prevent camera movement during exposure.

Chapter III

DARKROOM PROCEDURE

WHEN THE film is exposed in the camera, a chemical change occurs in the light-sensitive emulsion layer, producing an invisible or latent image. It is then necessary to treat the film in a developer to convert this latent image to a visible image made up of minute silver particles. The film must next be treated in a fixing bath to dissolve and remove the silver compounds which were not used in producing the image. Following this, the film is thoroughly washed with clean water.

The silver image produced in this manner on the film is dark where the subject was light and light where the subject was dark—in other words, it is a negative image. To obtain a positive image with tones in the same relation as in the subject, the negative is placed in contact with a light-sensitive photographic printing paper and the two are exposed to a controlled amount of light. The exposed paper is then developed, fixed, and washed to produce the positive contact print. If a larger print or picture is desired, the negative is placed in an enlarger which projects an enlarged image onto the paper.

Since these operations of developing, printing, and enlarging require the handling of light-sensitive materials, they are the operations which are carried out in the photographic darkroom. In the case of sheet films, an additional darkroom operation is required in loading the film into the holders used in the camera.

A small but efficient darkroom. Dry bench for loading film is at left.

Safelights

During the handling and processing operations, the photographic films and papers must be protected from any light to which they are sensitive. Panchromatic films and plates are sensitive to light of all colors and must be handled in total darkness, but a very dim green light, from a safelight lamp with a Kodak Safelight Filter, Wratten Series 3, can be directed onto the clock or timer. Orthochromatic materials and non-color-sensitized negative materials are not sensitive to red light and can be handled under the deep red Safelight Filter, Wratten Series 2. Contact and enlarging papers are much less sensitive than negative films, and can be handled with the comparatively bright illumination from the greenish-yellow filter, Wratten Series 0A. Always take care that the safelight filter in use is suitable for the material being handled.

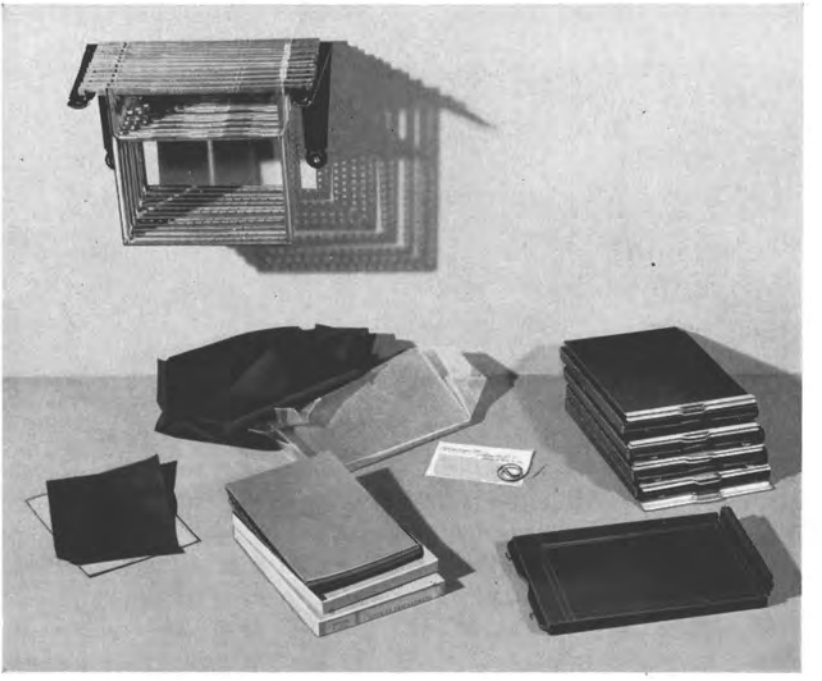
With direct illumination, where the light from the bulb shines directly through the safelight to the working space, a ten-watt bulb should be used in the safelight lamp. With indirect illumination, where the light is reflected from a matte white surface either inside or outside the safelight lamp, a twenty-five-watt bulb can be used for all except panchromatic negative materials. For panchromatic negative materials, the bulb should not be stronger than ten watts.

HOW TO HANDLE KODAK SHEET FILM

Kodak sheet films remain flat and free from curl when handled. A special notching system is used during manufacture so that the emulsion side can be determined readily. The notches are always made so that when they are in the right side of the top edge, the emulsion side of the film is facing the person who is handling it. The spacing and design of the notches serve to identify the type of film. The handling of film is easy, but it is desirable to organize the work carefully and to follow a definite routine in order to avoid the possibility of any confusion in carrying out the various operations in the darkroom.

Loading Film Holders

The dark slides should be removed from the holders and placed with the bright side of each slide end up; generally two slides are so placed, with the holder on top of them. Then two more slides and a holder are added until a stack of alternate slides and holders results. By doing this, the holder into which the film is to be inserted is at hand first and then the slides. It is wise to practice loading a holder in the light, using a discarded sheet of film; the same operations will then be easy when good films are being handled in the dark.



Step 1. Film supply, holders, and hangers arranged for efficient operation.

Step 2. Film holders and dark slides stacked ready for loading.

Step 3. Bottom flap held open with left index finger.

Step 4. Sliding film into channels of holder. Index finger on code notches.

Step 5. Inserting dark slides with bright side out. Left thumb holds flap closed.

The holder is placed on the bench with the bottom of the holder pointing toward the right. The flap at the bottom of the holder can be held open with the index finger of the left hand.

When the film is picked up with the right hand, the notches should be under the index finger. This will make it convenient and natural to hold the film so that the emulsion side is in the proper position, facing the operator. The film is slid under the small channel in the holder. The thumb of the left hand should be held in readiness near the open end of the channel to guide the leading edge of the film. If the film strikes the outside of the end channel, it should be depressed slightly with the thumb of the left hand. The index finger of the right hand is then used to push the film the rest of the distance into the holder. Particular care must be taken to see that the film slides under the channel at the end of the holder.

After the film is inserted into the holder, the slide is placed in its slot and slid firmly into place. The hooks on top of the holder are then turned so that the slide cannot be withdrawn accidentally. Small raised dots are generally present on the bright side of the slide end, so that it is easy to determine in the dark whether or not the bright side of the slide end is facing outward.

It is generally easier at first to load film holders if the holder is laid flat on the top of the workbench. With practice and experience, however, it becomes more convenient to load the holders by holding them edgewise against the chest with the left hand, the forefinger being used as described to hold the end strip open.

Precautions: Sheet film should always be handled carefully by the edges and the holders loaded and unloaded slowly. Careful handling avoids

abrasions caused by the film striking objects and insures that the holders are loaded properly. It also avoids the possibility of discharges of static electricity caused by inserting or withdrawing the dark slide too quickly or by rapidly pulling the separating paper over the film. It is worth repeating that particular care must be taken to be sure that the film is under the channels in the film holder. If it is not, it will be difficult to close the flap on the end of the holder and insert the slide. If it is found that any force is necessary to perform this operation, the position of the film in the holders should be checked.

Unloading Film Holders

Holders can be unloaded in a manner exactly opposite to the loading procedure. When the dark slide has been withdrawn about one-half its length, the flap at the bottom of the holder can be opened and the sheet of film readily removed by grasping it with the index finger and the thumb. The small hooks on the end of the holder should be left in the unlocked position when the holders are empty.

For obvious reasons, extreme care should be exercised to see that the separating paper is removed from the sheet of film before it is placed in the holder. It is advisable to have a separate container handy so that each sheet of separating paper can be disposed of promptly as the sheets of film are removed from the box.

Before the white light is turned on, each holder should be checked to see that all the dark slides have been replaced and that they have been inserted into the slots in the flap at the bottom of the holder. To repeat for emphasis, whenever there is film in the holder, the small hooks on top of the holders should be turned so that the slide cannot be withdrawn accidentally.

FILM DEVELOPING PROCEDURE

Tank development by the time-and-temperature method is highly recommended for roll films, film packs, sheet films, and plates. The use of a tank enables the operator to produce clean and evenly developed negatives, and permits more accurate control of development than is possible any other way. Tank development is the only practical method of handling 35mm films.

While tank development should be used for the regular work, tray development may be more practical in those cases where a special developer must be used for a small number of films. Tray development is also useful with roll films and film-pack films when the special tanks required are not available.

The Developer

Developer recommendations for the various films are given in the Darkroom Film Chart at the back of this book. The specific developers recommended for each film will produce the best results. However, for occasional or limited use, when it may be undesirable to make up special solutions, quite satisfactory results can usually be obtained with Kodak Dektol Developer or Kodak Developer D-72, which will be on hand for developing prints.

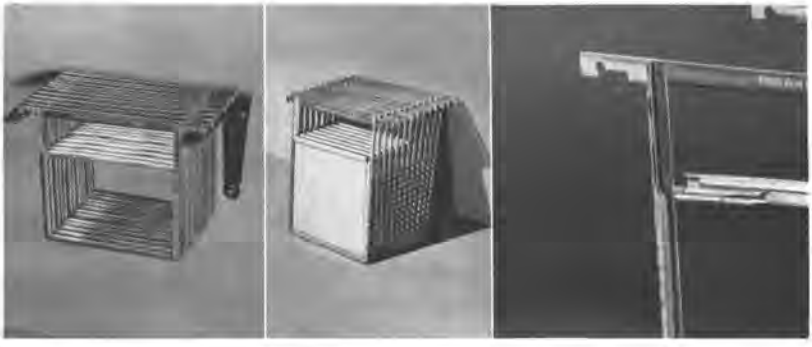
A normal-contrast developer, such as Kodak Developer DK-60a, is recommended for evidence negatives of accidents, homicides, etc. A high-contrast developer, such as Kodak Developer D-8 or D-11, will usually produce better negatives of handwriting in lead pencil, fingerprints, skid marks, and similar subjects when it is desired to increase the contrast of the subject. When it is necessary to use Kodak Super-XX or Kodak Verichrome Film for photographing latent fingerprints, these films should be developed in Kodak Developer D-8.

Most of the developers listed in the Darkroom Film Chart are available in prepared form, in quantities to make one gallon or more of stock solution. The developer solutions can be stored in bottles, and will keep for a considerable time if the bottles are tightly stoppered.

Loading Film Developing Hangers

Consideration should be given to the arrangement of the darkroom for accommodating the unloaded and loaded hangers, since loading the film hangers must be done in darkness. The hangers should be placed on a special bracket within easy reach of the operator. A place should be provided so that the hangers can be stacked upright conveniently

Empty film hangers stored on wall brackets. **Loaded hangers stacked against wall.** **Top channel in open position for loading.**



after they are loaded and before they are placed in the developing tank. Small numbers of loaded film holders are generally stacked against the wall. A coved bench top may interfere with leaning the hangers against the wall, but a small piece of corrugated rubber stair tread tacked on the bench helps to prevent the stack of hangers from slipping. An alternate procedure is to remove the hangers from the wall brackets, replacing them on the brackets as they are loaded.

The hinged top channel of the hanger is sprung back for loading, so that the side channels are exposed. The hanger is held in the left hand and the film picked up with the right hand. The film is then inserted into the hanger so that the edges slide into the channel; at this stage it may be necessary to tap the back of the film lightly with the fingers of the left hand to see that it falls firmly into the bottom channel. The movable top is then sprung back into place.

It is good practice to handle the film and hangers so that the emulsion side faces in one direction at all times. Generally, the emulsion side is kept toward the operator during loading; this helps to prevent scratching the film and also makes it unnecessary to open the hanger for examining the film to determine whether or not the emulsion side is toward the viewer. After loading, the hangers should be stacked against the wall (or hung on the brackets) with the emulsion side away from the operator. This prevents emulsion scratches if the next holder accidentally strikes the film.

Precautions: The hangers must not be stacked so that they stand at too great an angle; it is better to make several rows than to take a chance on the hangers sliding and falling on the bench top. The group of hangers should be handled with both hands, with the forefingers evenly supporting the outer ends of the film-hanger bars. This prevents trouble in

Loading film into developing hanger.

Handling stack of loaded hangers.

placing the group of hangers into the various tanks, and tends to prevent scratches on the film from the edges of the hangers.

Handling Sheet Films in Hangers in Small Tanks

No more film should be developed than can be accommodated with at least one-half-inch separation between the hangers. With the processing solutions at 68°F and the room darkened, load the developing hangers and proceed as follows:

1. Start the timer. Assemble the hangers and lower them, as a unit, smoothly and carefully into the developer and immediately tap the crossbars of the hangers two or three times on the upper edge of the tank to dislodge any air bells clinging to the film. Then separate the hangers to leave approximately equal spacings of at least one-half inch between them.
2. Leave the hangers undisturbed for one minute. Then lift them clear of the solution, drain for not more than one to two seconds from one corner, and replace smoothly into the solution. Repeat at one-minute intervals during development, separating the hangers after each immersion.
3. When development is completed, lift the hangers from the developer, drain, and transfer to the rinse water or stop bath. Lift, drain, and reimmerse the hangers several times before transferring them to the fixing bath.
4. Agitate the hangers vertically for about ten seconds and again at the end of the first minute, to insure uniform and rapid fixation; allow them to remain until fixing is completed. Frequent agitation will shorten the fixing time.
5. Wash the negatives thoroughly in running water for at least 30 minutes, emptying the tank at five-minute intervals.

Tray Development of Sheet Films and Film-Pack Films

When tank development is undesirable for any reason, the following method of developing two to six films in a tray is capable of producing good negatives. It should be used with great care to prevent digs or finger marks, and the temperature of the developer should not be above 68°F. Provide four trays larger than the films, preferably large enough to accommodate two films side by side. Half-fill the trays with each solution (water, developer, stop bath, and fixing bath, respectively) at 68°F. Turn out the lights and proceed as follows:

1. Immerse the exposed films one at a time and emulsion side up in a tray of water (not above 70°F). In order to maintain the timing

sequence, it is helpful to identify the first film by notching or cutting off one corner. The topmost film must be completely covered with water before the next film is placed over it. Avoid touching with wet hands any but the extreme edges of the emulsion surface. When all the films are in the tray, carefully draw one film from the bottom and place it on top. Handle the film only by the extreme edges and take care to prevent a corner of the film from digging into the emulsion of the film on the top of the pile. Repeat this rotation from bottom to top until the films have been leafed through twice. This procedure will prevent films from sticking together and also dislodge any air bells which may have formed. The addition of Kodak Photo-Flo to the water (1 ounce of stock solution to 1 gallon of water) helps to prevent the formation of air bells.

2. Start the timer and transfer the films in sequence, one at a time, from the bottom of the pile into the developer tray. Continue the leafing of films from bottom to top throughout the period of development. At intervals turn the films end for end, emulsion side up, as they are placed on the top of the pile. The greatest uniformity is obtained if, during the leafing, the films are withdrawn first from the end of the tray and then, during the next sequence, from the side of the tray, repeating the cycle during the course of development.
3. When development is complete, transfer the films, one at a time, to the Kodak Stop Bath SB-1, and leaf through the pile twice. Contamination of the developer with the stop bath can be avoided by using one hand for removing the films from the developer and the other hand for immersing them in the stop bath.
4. Place the films, one at a time, in the fixing bath and continue the replacement from bottom to top two or three times immediately and then at intervals until the negatives are completely fixed.
5. Wash the negatives in running water for at least 30 minutes by continuing the leafing method or by placing the negatives in developing hangers and using a washing tank.

Control of Development

Time: Recommended development times should be followed carefully in order to produce good negatives. For this reason films should be removed from the developer in the same order in which they were immersed. Underdeveloped negatives, lacking detail and contrast, usually are caused by removing the films from the developer too soon

or by using solutions that are too dilute or exhausted. Overdevelopment is caused by leaving the film in the developer too long or using a too concentrated solution. In such cases the negative is likely to be "blocked up" (highlight densities too great to be printed for detail) and will require a long time to print.

Temperature: The temperature of the developer also influences development. In general, 65° to 70°F is recommended. At high temperatures the emulsion may become swollen, and in this condition it may become easily scratched; or the film may "reticulate" and assume a leather-grained lacework surface; or, finally, the emulsion may even melt off the film base. At low temperatures some developers become so slow in their action that it is impossible to produce good results. Considerable care should therefore be exercised to keep the developer at the recommended temperature.

Agitation: If a film is placed in the developer and allowed to develop without any movement of the film or solution, the action of the developer slows down because the developing power of the solution in contact with the surface of the film becomes weakened or exhausted. Some agitation of the film or developer is necessary so that fresh solution is continually brought to the film. In this manner the rate of development is kept up, and uneven development or mottle is prevented. Agitation also prevents the formation of air bells, i.e., bubbles of air on the film surface. Air bells prevent developer from reaching the film and usually cause round, transparent spots on negatives.

Stop Bath

After the negative has been developed for the correct time, it should be immersed for several seconds in an acid stop bath, such as Kodak Stop Bath SB-1a or, preferably, the nonswelling Kodak Stop Bath SB-5. This stops the development evenly, and it also prevents any developer from being carried over to the fixing solution, thus helping to prolong the life of the fixer. The temperature of the solution should be as near 68°F as possible. In warm weather the nonswelling bath is particularly desirable, since it keeps the emulsion from softening until the hardener in the fixing bath can act on it.

Fixing Bath

The negatives are then placed in the fixing solution, which removes the undeveloped silver bromide grains by dissolving them. The main chemical in this solution is sodium thiosulfate, generally called "hypo," and the bath itself is frequently referred to as "hypo bath."

When the negative is placed in the fixing bath, the milky portions (or undeveloped silver bromide) gradually clear, and all that remains is the silver image. Since the fixing bath not only dissolves the silver bromide grains but also removes them from the emulsion, fixing should be continued for several minutes after the milky portion has cleared. A good rule is to let the bath act for twice the time it takes to clear the emulsion. In a fresh bath of the normal type such as is made from Kodak Acid Fixer or the formula for Kodak Fixing Bath F-5 the total fixing time is usually about 10 minutes. If fixing takes more than 20 minutes, the bath should be discarded and replaced with fresh solution. Films should be kept separated and agitated from time to time.

Kodak Rapid Liquid Fixer with Hardener, supplied in concentrated liquid form, fixes much more rapidly than ordinary hypo baths. The total fixing time is only three to five minutes. This is valuable when negatives are needed in a hurry. The solution made according to the formula for Kodak Fixing Bath F-7 fixes much more rapidly than ordinary baths, but not so quickly as Kodak Rapid Liquid Fixer.

Washing

After the negative has been thoroughly fixed, the emulsion is still saturated with chemicals which will cause discoloration and fading unless they are washed out. Thorough washing can be accomplished by leaving the films in running water at 65° to 75°F for about thirty minutes. (When colder wash water is used it slows the rate of washing and a longer washing time is required.) Films can be washed conveniently in a tank such as the Kodak Sheet Film Washing Tank, in which the water flows in at the bottom and rises evenly to run out at the top. If films are washed in a tray, the use of a Kodak Automatic Tray Siphon will assure good water circulation without the danger of films floating out of the tray. After washing, grit and scum should be swabbed from the emulsion with a tuft of cotton, applied under water.

Drying

Finally the negative is ready for drying, which, while probably the simplest step, has an important bearing on the quality of the finished print. Care must be taken that no physical damage is done to the negative. Drying marks due to dust, fingerprints, or water are almost impossible to remove. Excessive heat may melt the gelatin emulsion.

Negatives can be dried by one of the following four methods:

1. Allow the negatives to remain in the hangers, and place the hangers in a plate-drying rack.

2. Allow the negatives to remain in the hangers. Suspend the hangers from a wire line stretched above either the sink or a tray.
3. Remove the negatives from the hangers. Clip one corner of each negative to a wire line. Kodak Junior Film Clips or spring clothespins can be used.
4. Place the film (either in or out of hangers) in a film drier designed to pass a stream of warm, filtered air over the films.

Water spots, which appear as small teardrops on the finished negative, can be prevented by immersing the film in a solution of Kodak Photo-Flo after washing. If this solution is not used, it is necessary to remove all excess water from the negatives very carefully with a damp Kodak Photo Chamois, a fine-pore viscose sponge, or a tuft of wet cotton.

Clean-Up Operations

Holders: The slides should be replaced in the empty holders with the black part of the slide end out, leaving the small hooks in the open position. The empty holders should then be stored in a place provided for that purpose. By following this procedure, holders with the bright side of the slide end out and the small hooks locked will be immediately recognized as those loaded with unexposed film.

Keep the holders free from dust and dirt. If pinholes are noticed on the negatives, the holders should be wiped off with a damp cloth and any dust under the channels should be removed with a camel's-hair brush. It is good practice occasionally to tap the holders gently on the bench. This shakes out any accumulated loose material.

Hangers: Most washing tanks are arranged so that the water flows over the top bar of the hanger. This insures complete removal of any residual processing chemicals. In case the wash water has not flowed over the top bar of the hangers, it is necessary to wash the hangers thoroughly in clean water and hang them up to dry. After drying, they are replaced in the rack and are again ready for use.

DEVELOPING ROLL FILM

Roll film can be developed by following, with certain variations, the foregoing directions for developing sheet film by the tray method.

The unwound film is held by means of film clips, one in each hand. The film should not be allowed to coil but should be bent into a "U" with the emulsion side out. It is then passed slowly back and forth through the various solutions by alternately raising and lowering each of the film clips in turn. Complete instructions on developing roll films will be supplied upon request.

CONTACT PRINTING

A contact print, in which the image is the same size as in the negative, is made by placing the negative in contact with the sensitive surface of the printing paper and exposing to light. This produces a latent image which must be developed to a visible image, just as in the case of film. Also as in the case of film, the more light that reaches the paper, the darker the image will be.

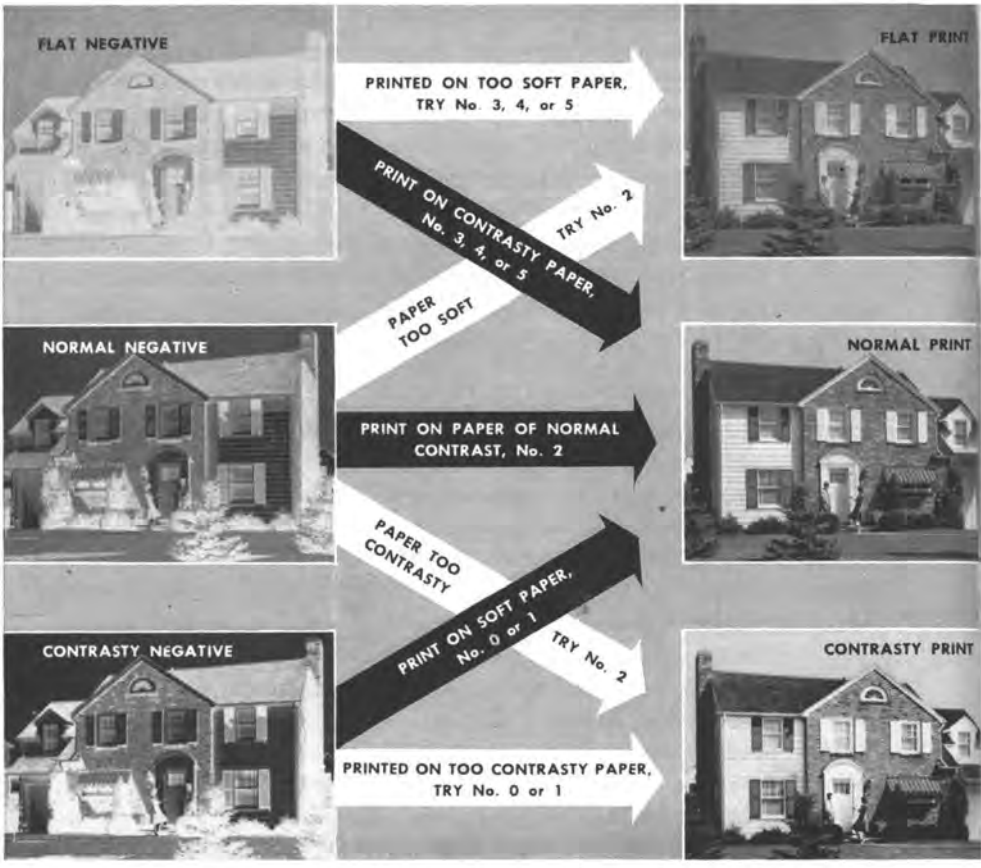
Safelight for Printing Papers: Since printing papers are much less sensitive than negative films, a much brighter safelight can be used. In general practice a Kodak Safelight Filter, Wratten Series 0A, greenish-yellow in color, will prove most practical.

Judging Negatives and Selecting Paper

Ideally, the contrast between the highlight and shadow portions of all negatives would represent accurately the contrast between the light and dark portions of the photographed subject. If this were the case, only one grade of paper would be needed for all negatives to reproduce the greatest amount of detail and the widest tonal range possible. However, due to the many variables involved in making the negative, contrast is not always normal. Sometimes negatives have greater than normal contrast and sometimes less. Within certain limitations, it still is possible to produce useful prints by using a paper that compensates for excessive contrast or excessive flatness.

The appearance of different negative contrasts may be described as follows: A normal negative is one in which there is a clearly defined difference between the density of the shadows and highlights, with clean-cut detail visible in both portions, and the image free from any appearance of veiling or fog. Flat negatives show very little difference between their highlight and shadow densities. Contrasty negatives show an extreme difference. Negatives differ in their over-all density, but not all dense negatives are contrasty, and not all thin negatives are flat. The comparison must be between the darkest parts (highlights) and the lightest parts (shadows) in the negative.

Ability to judge the required contrast grade of paper can be gained by systematic trial and careful observation. To select the correct contrast grade of paper, decide which of the negatives illustrated on the next page most nearly matches the contrast of the one to be printed. The directions in the black arrow leading from that negative should be followed. Thus, a normal negative should be printed on No. 2 paper. The proper choice of paper contrast makes it possible to compensate for high or low negative contrast, while the use of the wrong paper



The above illustration can be used as a guide in judging negative contrast and in selecting the proper contrast grade of paper for making prints.

contrast results in prints that are too gray and flat or too harsh and contrasty. In judging a wet print, it should be remembered that prints dry slightly less contrasty and apparently darker than they seem when wet.

The choice of paper surface and type of paper depends on the purpose of the prints. Kodak Azo F and Velox F Papers are recommended for contact prints of photographs such as identification shots. Both are white papers with a glossy surface which shows great detail and reproduces a wide brightness range. Prints that must be folded for mailing can be made on Kodak Ad-Type Paper, which has a smooth surface and can be folded without cracking the emulsion.

Making the Printing Exposure

In making the exposure, the masking blades of the printer should be set so that they cover the clear edges of the negative and prevent stray light from coming through the clear portion to fog the paper. The negative is placed on the printer with the emulsion or dull side up, and the emulsion or face of the paper is laid against it. The cover is then closed and the light turned on. The exposure time depends on the density of the negative and the contrast of the paper. Dense negatives naturally require more time than thin ones. Also, a contrasty paper requires more exposure than a normal or low-contrast paper for the same negative. Test strips should be made until exposure times can be judged easily. These tests are made by placing a small strip of paper over the most important part of the negative, exposing it to light, and developing it for the recommended time.

A well-exposed print shows good detail throughout the entire scene. Prints which have been overexposed develop too quickly and do not show detail in shadow areas. Underexposed prints are too light and have very little detail in the highlights.

The printing time should be accurate enough to allow the print to develop fully in the time recommended for the paper, and no attempt should be made to compensate for error in exposure time by overdeveloping or underdeveloping the print.

Contact Printing from Wet Negatives: Occasionally it is necessary to take a picture, develop the negative, and make a print in a very short time. In such cases, several minutes can be saved by printing from a wet negative. The following method is recommended:

After the negative has been developed and fixed in the normal manner, it is rinsed for a few seconds in running water. The surface water is then wiped off with a Kodak Photo Chamois and the negative is placed on the printer and covered with a Kodapak Sheet, .003 in., Clear, on sale at Kodak dealers. The Kodapak Sheet is squeegeed into contact with the emulsion, leaving no air space between them. The print is then made in the usual way. When printing is completed, the Kodapak Sheet is removed and the negative washed for the normal time. Wet negatives should not be subjected to heat any longer than is absolutely necessary. If the negative is used in an enlarger, the use of a special wet negative holder, such as the 4 x 5 Eastman Wet Film Holder for the Eastman Auto-Focus Enlarger, is recommended. The negative should be removed from the holder as soon as the exposure is made and then washed for the normal time.

If prints must be delivered with minimum delay, the use of Kodak Resisto N Paper for contact prints and Resisto Rapid N Paper for enlargements is recommended. These papers are made on a special water-resistant base which permits rapid fixing, washing, and drying. Prints on these papers can be completely processed in 7 to 8 minutes, and will dry quickly when hung by clips on the drying line.

Developing the Print

The exposed paper is removed from the printer and slid edgewise, face up, into the developer. The paper should be immersed quickly to insure even and uniform development. During development, the print should be kept completely immersed and the solution should be agitated by gently rocking the developing tray. The recommended development time for Kodak Azo Paper in Kodak Dektol Developer or Kodak Developer D-72 is 60 seconds at 68°F. Some leeway in developing time is permitted, but in no case should development take less than 45 seconds or more than 120 seconds. If the print does not develop to proper density within this time range, a second print should be made with corrected exposure. Correct developer temperature is important. Temperatures higher than 70°F may fog the prints or soften the emulsion; lower temperatures retard the chemical action, resulting in flat, weak prints.

Rinsing: After development the print should be immersed in a stop bath, which stops development instantly by neutralizing the developer. Prints should be left in this stop bath for 30 seconds. The life of the fixing solution is prolonged by the use of this bath, as it removes developer chemicals which would contaminate the fixing bath.

KODAK STOP BATH SB-1

	U.S. Liquid	*Metric*
Water	32 ounces	1.0 liter
*Kodak Acetic Acid, 28%	1½ ounces	48.0 cc

*To make approximately 28% acetic acid from glacial acetic acid dilute three parts of glacial acetic acid with eight parts of water.

Fixing

The print should then be transferred to the fixing bath. Prints should be separated, agitated, and kept well immersed in the fixing bath, so that the unexposed silver and developer residue are quickly and evenly dissolved and removed. The fixing bath should be maintained at 68°F. Too warm a solution prevents the prints from becoming properly hardened, and might cause the bath to turn milky and leave a deposit on the prints. The room light may be turned on and the print examined

after it has been immersed in the fixing bath for 30 seconds. Prints should be fixed for 5 to 10 minutes in a fresh bath. The baths should be discarded when exhaustion is indicated by the Kodak Testing Outfit for Stop Baths and Fixing Baths.

Washing

Thorough washing prevents fading and discoloration and is necessary to assure permanence of the photographs. Prints must be washed for at least one hour in a tray into which water is running at a rate sufficient to change the water in the tray completely ten to twelve times an hour. A Kodak Automatic Tray Siphon is particularly helpful. Prints are washed more slowly in cold water than in warm water, but in water above 90°F there is danger of swelling and softening of the emulsion. For safest washing, the temperature should be kept between 65° and 75°F.

Hypo Eliminator Solution: An even more certain procedure to assure the elimination of hypo and the satisfactory permanence of photographic prints is the use of Hypo Eliminator HE-1.

After the prints have been washed for about 30 minutes in running water at 65° to 70°F, or longer for lower temperatures, each print should be immersed for about 6 minutes at 68°F in the Hypo Eliminator solution. The print is then washed for 10 minutes before it is dried. The capacity of the solution is about fifty 8 x 10-inch prints or their equivalent per gallon (4 liters).

HYPO ELIMINATOR HE-1

	U. S. Liquid	*Metric*
Water	16 ounces	500.0 cc
Hydrogen Peroxide (3% solution)	4 ounces	125.0 cc
Ammonia (3% solution)	3¼ ounces	100.0 cc
Water to make	32 ounces	1.0 liter

Caution: Prepare the solution immediately before use and keep in an open container during use. Do not store the mixed solution in a stoppered bottle, or the gas evolved may break the bottle.

Drying

When washing is completed, the prints should be placed on a clean glass or oilcloth-covered board, and the excess water swabbed off. Glossy prints should be placed face down on a clean and well-polished ferrotype plate, such as the Kodak Heavy Duty Ferrotype Plate, and the surplus water forced out with a squeegee. The prints should then be left to dry on the ferrotype plate. When dry, the prints will separate from the plate. An electric fan can be used to hasten the drying. (Ferrotype plates must be cleaned and polished from time to time with Kodak

Ferrotype Plate Polish.) Non-glossy prints can be placed in a Kodak Photo Blotter Roll, on clean cheesecloth stretchers, or between clean photographic blotters. Putting weight or pressure on the blotters helps to keep the prints flat.

It is recommended that glossy or matte-surface prints of handwriting, fingerprints, firearms identification, etc., which may be presented to the court by superimposing one print over another, be dried in the Kodak Photo Blotter Roll, or placed face down on cheesecloth, to prevent the slight distortion which sometimes results from ferrotyping.

Precautions

Careful attention to details in printing pays off in crisp, clean prints, but carelessness in any one operation can nullify all the good work that has been accomplished. Some common pitfalls are mentioned here.

Equipment should be kept clean and free of dust. Chemicals should never be allowed to spill or splash over working surfaces. It should become a habit with the operator to rinse his hands in water when moving from one solution to another and to make sure that his hands are clean and dry when handling film or paper.

Proper exposure and careful handling of the film and paper during processing produces crisp, sharp record and evidence photographs such as this night accident scene by the Pittsburgh, Pa., Police Department.

Spots on the glass of the printing frame or printer will obstruct light and cause white spots on the developed print. Dust or dirt on the negative can cause the same trouble.

Finger marks appearing in the print indicate that the hands were dirty, greasy, or had traces of chemicals adhering to them while the paper was being handled.

Fog, which may vary in intensity from a very light veiling effect to solid black on the print, may be due to any one of several causes which can be corrected or avoided. Excessive exposure to the safelight at close range can cause fogging of the paper, as can the use of a safelight that is too bright. Prolonged development also can cause fog.

Blurred prints sometimes result from sharp negatives when the emulsion side of the negative faces away from the printing paper in the printing frame or printer. This causes the image on the paper to be reversed from left to right. If only a portion of the print is blurred and the entire negative is sharp, the difficulty is probably due to lack of perfect contact between the negative and paper.

Yellow stains on a print may be caused by any one or a combination of the following:

Failure to rinse the print in the stop bath between the developer and fixer; weak developer and forced development, resulting in oxidation stains; or exposure of the print to light too soon after being placed in the fixing bath.

If satisfactory results are not obtained, every step in the printing procedure should be reviewed and analyzed critically, using this section on Contact Printing as a guide.

ENLARGING

Enlarging differs from contact printing in that rays of light pass through the negative and are focused by the lens on the sensitive paper. The size of the projected image depends on the distances which separate the negative, the lens, and the paper.

Enlarging Papers

Since the intensity of the light forming the projected image is not as great as that forming the contact image, a faster or more light-sensitive paper must be used. Enlarging papers are supplied in a variety of surfaces with different contrast grades from which the operator can make a choice. For evidence purposes, Kodabromide F Paper is recommended. This is a glossy paper and will reproduce the greatest amount of detail. When it is necessary to write on the photographs, Kodabro-

mide N Paper, which has a smooth surface, is recommended. Kodabromide A Paper, with surface and weight similar to those of Kodak Ad-Type Paper, can be used for circulars or other prints which are to be folded.

The selection of the correct paper contrast involves the same considerations as those described in the section on Contact Printing. These contrasts are as follows:

Contrast Grade	*Purpose*
No. 1	For very contrasty negatives
No. 2	For average negatives
No. 3	For flat negatives
No. 4	For very flat negatives
No. 5	For extremely flat negatives

Safelight: The Kodak Safelight Filter, Wratten Series 0A, which is recommended for contact printing, is also recommended for all enlarging papers.

Focusing

The negative is placed in a masking negative carrier, such as the Kodak Glassless Negative Carrier A or the Kodak Combination Negative Carrier A or B, with masks for the Kodak Precision Enlarger, and inserted in the enlarger with the emulsion side (dull side) facing the paper board. A mask is applied to eliminate stray light around the edges of the negative which might cause fogging of the paper. In the absence of a masking negative carrier, a suitable mask can be cut from black paper.

Focusing should be done with the lens at its widest aperture for maximum image brilliance. A piece of plain white paper or cardboard in the paper board will facilitate adjustment of image size and focusing. The longer the focal length of the lens, the greater the lens-to-paper distance will be for a given degree of enlargement. As a rule, the enlarger lens should have a focal length approximately equal to the diagonal of the negative. Kodak Enlarging Ektanon Lenses and Kodak Enlarging Ektar Lenses, described in Chapter I, are supplied in normal focal lengths and are ideally suited for the most exacting work.

Set the height of the enlarger head to give an image of desired size, and then focus the lens for sharpness. After the desired image size and sharp focus are obtained, the lens is stopped down to an aperture that will give a convenient printing time; the enlarger light is turned off; and the paper is inserted in the paper holder.

Exposure

As in contact printing, negative density and paper contrast are factors relating to exposure time. In addition, two other factors must be considered in determining exposure for enlargements—lens aperture and the degree of enlargement. Lens aperture, of course, controls the amount of light transmitted by the lens. As the degree of enlargement increases, the distance from the light source to the paper increases, and the light passing through the lens is spread over a larger area, resulting in a reduction of light intensity at the paper. Most Kodak enlarging lenses have diaphragms which can be used for exposure control. If the correct exposure time at a given lens setting is too short to be controlled accurately, a smaller aperture can be used and the time increased accordingly. The Kodak Electric Time-Control turns printers or enlargers off automatically after a predetermined exposure interval.

Test strips of enlarging paper can be exposed and developed to determine the correct contrast grade and exposure time. Even more convenient is the use of the Kodak Projection Print Scale, consisting of a transparency with ten sectors, varying in density, each indicating a different printing time in seconds. Exposure is made through the Print Scale onto a piece of enlarging paper, which is then given the recommended development. The correctly exposed sector is determined by inspection and the enlargement exposed accordingly.

Developing, Fixing, and Washing

The procedure for processing enlargements is identical with that previously described for contact prints. Kodak Dektol Developer, diluted 1 part of stock solution to 2 parts of water, is recommended for Kodabromide and similar enlarging papers. Exposure time for Kodabromide Paper should be such that the print develops to the desired density in one minute at 68°F, although a range of 45 to 120 seconds is permissible. Print defects can be traced to the causes described previously.

Precautions: The precautions mentioned for printing should also be observed in enlarging. Because of the difference in the two types of equipment, a few additional suggestions are given.

Care must be taken that the enlarger and the paper easel are not moved during exposure, since this will cause a blurred picture. The enlarging easel must hold the paper absolutely flat to prevent part of the picture from being out of focus.

Spots on the enlargement can be avoided by cleaning the negative holder glasses carefully after each use. Likewise, the negative should be examined, and any dust or dirt removed with a camel's-hair brush.

Chapter IV

HEADQUARTERS PHOTOGRAPHY

HEADQUARTERS PHOTOGRAPHY comprises those phases of the staff photographer's work which can be carried out under the flexible and controllable conditions afforded by the permanent studio or darkroom. Included in this category are: making identification portraits of prisoners; photographing pieces of evidence; copying; and using specialized detection methods, such as radiography and spectrography.

IDENTIFICATION PHOTOGRAPHY

Prisoners are probably the only persons in a criminal case who do not want a good likeness of themselves produced. Identification photographs of a prisoner are made for record purposes, to be kept on file with his fingerprints. They form one of the best means of personal identification. A true likeness photograph, sharp in every detail and showing scars, blemishes, freckles, and other facial characteristics, is invaluable to detective and uniformed divisions in helping to make a "pickup" of a suspect. Victims of crimes, or persons who have seen or have had personal contact with the perpetrators, find photographs a fairly positive means of identifying the guilty person. If a prisoner has escaped, or a man is wanted who has been photographed previously, the photographs can be circularized immediately in neighboring cities and states.

It is important that the identification photograph be a true likeness of the subject, and the same careful technique should be used that is employed in photographing homicides, traffic accidents, and the various other aspects of evidence photography.

The photographs should be filed in such a manner as to render maximum aid to the greatest number of persons in making identification. Copies should be filed with the original record form, on the fingerprint card, according to the *modus operandi*, and according to height, weight, and deformities, so that a "lead" along any of these lines may be traced easily to the proper person. All possible methods of classification should be applied for identification purposes.

Identification pictures should be copied on Kodak Panatomic-X Film, 35mm, and small prints mounted in pocket notebooks which the detectives can carry with them. Albums should be prepared according to the method of operation so that victims may leisurely examine, in their own home or office, the photographs of suspects.

"Mugging"

The taking of front and profile views of the prisoner's head and shoulders for record purposes is called "mugging." The front view should show clearly any lines, wrinkles, or scars on the prisoner's face, while the profile view is made to show the general contour as well as any distinguishing marks on the side of the face. Each exposure should be made from the eye level of the subject, with the camera kept at a fixed distance. This distance should be such that, when a subject of average height is placed before the camera, only his head and shoulders are included in the image. The background should be plain white, and each exposure should include the small identification numbers and data in the lower right corner.

Equipment

The Kodak View Camera No. 2D, 5 x 7, when equipped with a 5 x 7-4 x 5 sliding ground-glass carriage, will take two mugging views on one sheet of 4 x 5-inch film. This can also be accomplished by press-type cameras having the Graflex back, which accepts the Graflex dividing back. Lenses of 8½-inch focal length, normal for the No. 2D, 5 x 7, camera, are well suited to identification photography.

An improvised arrangement utilizing economical roll-film cameras can also be used. A permanent white background should be mounted on a wall or in a frame and provision made for including the identification number in the picture. The camera should be set up at a predetermined distance from the subject so that only the head and shoulders will be included in the picture. If the camera does not permit focusing at sufficiently short distances, the use of a Kodak Close-up Attachment is recommended. The Kodak Close-up Attachment is an auxiliary lens which can be slipped over the regular camera lens and permits focusing at shorter distances than is possible with the camera lens alone. When taking pictures at close range with cameras other than single-lens reflex cameras or those having ground-glass focusing, the view finder does not always show accurately which portions of the subject will be included in the picture. This condition, called parallax, makes it necessary to do some experimenting to find where the view finder should be aimed in order to include all the desired portions of the subject in the picture.

Exposure

Kodak Ortho-X Film is recommended because of its ability to record any blemishes on the face. Illumination can be supplied by four Photoflood Lamps No. 2 in Kodaflectors, Kodak Vari-Beam Stand-

Photograph of model, demonstrating the usual right-profile and full-face identification views. Note that lighting is slightly unbalanced for improved modeling.

lights, Kodak Vari-Beam Clamplights, or comparable reflectors. Two lights at each side of the camera are recommended. With four Photoflood Lamps No. 2 thus arranged eight feet from the subject, the exposure is 1/25 second at *f*/8. If reflectors are not available, Reflector Photoflood Lamps (RFL2) may be used. The above recommendations apply only if the electric power line is fused for more than 20 amperes. No more than three Photoflood Lamps No. 2 can be used safely on an ordinary house circuit. If it is impossible to have the circuit changed to accommodate the greater load, only one lamp should be used on each side of the camera. The correct exposure for this arrangement would be 1/25 second at *f*/5.6.

Full-View Photographs

In addition to the customary identification pictures, it is suggested that full-view, or "stand-up," photographs be made of individuals or groups. (These pictures are recommended in New York State by the Department of Correction.) The exposures are made with the subject in a natural stance and in normal street attire. Persons are often identified more readily from this type of photograph than from the "mug" type. The background should be plain white and should include a scale to show the height of the subject. The camera should always be placed at a fixed distance from the subject so that, when pictures of several different prisoners are compared, their relative heights are readily apparent. This also permits individual photographs of members of a gang who are picked up at different times to be placed together in the

files in such a manner that it will appear that all were photographed at one time. The same lighting arrangement and exposure as are used for mugging apply. The standard back should be used on the Kodak View Camera No. 2D, 5 x 7, to obtain a full-size negative.

Electronic Flashlamps

Occasionally, an unco-operative prisoner attempts to blur a picture by moving during the exposure. In such cases, for both "mug" and full-view photographs, use of a high-speed, electronic flashlamp, such as the Kodatron Studio Speedlamp, obviates any possibility of blurred pictures due to subject motion. Producing an extremely high volume of mild light, well balanced for photographic purposes, at an effective flash speed of about 1/10,000 second, these lamps can be synchronized with the camera shutter. Built-in synchronizing contacts are incorporated in Kodak Flash Supermatic Shutters for use with such units.

PHOTOGRAPHING WOUNDS AND BRUISES

It is often necessary to make a record of wounds or bruises so that the effect of an assault can be illustrated before the court. Frequently, the effects disappear during the interval before a case goes to court.

In photographing bruises, temporary skin abrasions, and burns, unusual care should be exercised in selecting the type of film and filter which will produce the best results. Kodak Super Panchro-Press, Type B, Film with a Kodak Wratten XI Filter (No. 11) will give correct rendition of tone in tungsten light, and this combination should be tried before any of the contrast filters are tried. Slight abrasions or bruises can be recorded with an orthochromatic film without a filter.

Red discoloration on forehead is brought out by the use of panchromatic film without a filter.

The same subject as at left, but the use of a red filter over the lens prevents red stain from showing.

At least one general shot must be made at a distance great enough to include the face of the subject, so that the affected areas are identified with the person involved. Only in this way can the photograph stand up as evidence in court.

PHOTOGRAPHIC COPYING

Much of the photography done at headquarters involves the making of copies of fingerprint records, circulars, fraudulent or forged checks, stains, handwriting, etc., and demands accurate work with the proper combination of film, filter, correct exposure, and development.

Equipment

For most copy work, the Kodak Master View Camera, 4 x 5, and the Kodak View Camera No. 2D, 5 x 7, recommended for many other applications, are suitable. For greatly enlarged copies, special short-focal-length lenses can be fitted to these cameras.

Another popular copying device is the Kodak Precision Enlarger, equipped with the Camera Back Adapter, Ground-Glass Focusing Back, and Copying Lights. The regular enlarging lens can be used with very satisfactory results. The Kodak Precision Enlarger Stand Assembly also can be used as a support for the Kodak Medalist Camera with Extension Ground-Glass Back, or for press-type cameras. The enlarger baseboard will serve to hold the material to be copied.

If considerable copying is to be done, a permanent arrangement of apparatus is desirable. A flat surface (called a "copyboard"*), to hold the original from which the copy is to be made, should be mounted on the workbench, perpendicular to the workbench surface, or on the wall. Some departments use a large (at least 11 x 14-inch) printing frame for this purpose, since the printing frame holds the original flat without the use of tape or tacks. If a printing frame is used, the lights must be adjusted carefully to avoid reflections from the glass. The horizontal arrangement of equipment lends itself to easier focusing and framing than the vertical arrangement, especially at long lens-to-subject distances. Wood strips along the top of the workbench are desirable, to serve as guides for the camera and to keep the camera lens axis aligned with the center of the copyboard.

The copyboard should be evenly illuminated by having a light source on each side. Photoflood Lamps No. 2 in reflectors should be

*Photomechanical workers refer to all originals from which copies are to be made as "copy" and the mounting board for the original is called the "copyboard." To avoid confusion, this book uses the term "original," the word "copy" being used only as a verb or when referring to the final product of the copying process.

placed, one on each side of the camera, so that the light beams strike the copyboard at about a 45-degree angle. This arrangement will provide brilliant, efficient lighting over the entire field, while shielding the lens. The lamps should be placed about 40 inches from the copyboard unless, in rare cases, the size of the original requires the camera to be drawn back so far that the lights are included in the camera's field of view. With a plain card covering the copyboard, an exposure meter can be used to check the evenness of illumination.

Determining Effective *f*-Number

In making copies, the exposure problem is complicated somewhat by changes in the effective *f*-number of the lens at a given setting. This change occurs when the bellows is extended to a distance much greater than the normal focal length of the lens. Even if standard illumination is always used and the lens diaphragm is always set at the same indicated aperture for a given type of original, the correct exposure will vary according to the amount of bellows extension, and this, in turn, is related to the degree of magnification in the image. In making an actual-size copy, the lens must be extended to a distance equal to twice its focal length, and the effective *f*-value is numerically twice the indicated value. For example, if the diaphragm is stopped down to *f*/16, the actual working aperture is *f*/32, and it is necessary to give four times the exposure which would be required if the lens were really working at *f*/16.

The effective *f*-value for all copy work can be computed from the following formula:

$$\text{Effective } f\text{-value} = \frac{\text{Indicated } f\text{-value} \times \text{lens-to-film distance}}{\text{Focal length}}$$

The simplest means of determining the effective *f*-number and the exposure compensation required is through the use of the Effective Aperture Kodaguide. This Kodaguide is of the familiar dial type and gives direct readings of effective *f*-number, degree of magnification or reduction, and exposure factor for subjects closer than eight times the focal length of the lens. It applies to all lenses from 1 to 30 inches in focal length.

Suggestions for Copying Various Types of Originals

Circulars: When it is necessary to copy circulars bearing fingerprints and typed information only, Kodak Contrast Process Ortho Film is recommended for obtaining high contrast.

Circulars which contain a photograph, as well as printed matter and possibly fingerprints or specimens of the subject's handwriting, are difficult to copy on one film, although acceptable results can be obtained with Kodak Commercial Film. This film has a moderate contrast range which is suitable for the photograph and will give a fair reproduction of the line subject.

Handwriting: Handwriting-identification cases require comparison of a sample of the handwriting in question with several specimens of the suspect's known writing. Similarities in the formation of various letters can often be detected when specimens of different words are compared. Kodak Contrast Process Ortho, Contrast Process Panchromatic, or Panatomic-X Film is desirable for such copies.

Since it is considered impossible for anyone to exactly duplicate his signature in free-hand writing, duplicates of signatures can sometimes be disclosed as tracings. In such cases, photographs should be made of each sample of the suspected forged signature.

A tracing can be identified occasionally by unevenness of ink distribution in the forged signature. If the normal copying methods do not disclose this, the sheet bearing the suspected tracing should be placed on the glass of the darkroom printer, and an exposure attempted by means of the transmitted illumination from the printing lamps. All stray light should be eliminated by using masking paper around the specimen to be copied. An exposure meter can be used to obtain accurate information by taking the readings from the face of the sheet with the transmitted light supplying the illumination.

Fraudulent and Forged Checks: Copies of checks require careful selection of film and filter to reproduce accurately the detail on both the face and back of the check. Generally, the copy should be attempted first on Kodak Contrast Process Panchromatic Film. If the results

Photograph of ink writing, top, and lead-pencil writing, bottom. Panchromatic film was used to reproduce pencil writing accurately. Ink writing is too soft.

Same writing specimen as at left, but photographed with a process-type film to reproduce ink writing accurately. Note unnatural harshness of pencil writing.

obtained do not show the desired detail, a filter may be necessary to increase the contrast between the ink or stamps and the check paper itself. Sometimes, because of an overlapping of stamps on the back of the check, some important detail is obscured. In such cases, a filter is necessary which transmits all the colors but that of the desired ink. The selection of the correct film and filter can be aided greatly by reference to the Film and Filter Kodaguide. Listed here are film and filter recommendations for different color combinations:

Ink or Stamps	Check	Kodak Film	Kodak Wratten Filter
Black, Green, or Red	Blue-green	Contrast Process Ortho	None
Blue	Blue-green	Contrast Process Panchromatic, Commercial Ortho	None
Black, Blue, Green	Yellow	Contrast Process Panchromatic	None
Blue, Green	Yellow	Contrast Process Panchromatic	A (strong contrast)
Purple, Red	Yellow	Contrast Process Panchromatic	B

Printed or written matter in colored ink usually requires a high-contrast panchromatic film and a contrast filter which *does not transmit* the color of the ink used, but which transmits freely the color of the paper stock. The data in the following table should prove useful as a guide to the choice of the correct filter:

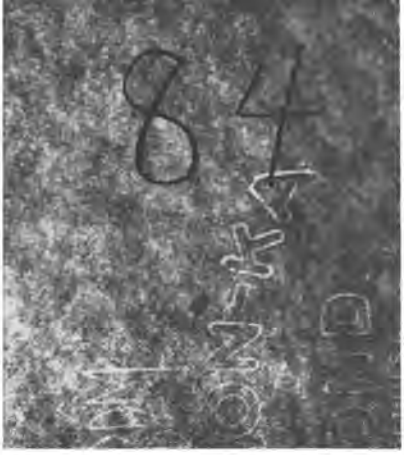
Paper Color	Ink Color	Kodak Wratten Filter
White or Yellow	Blue	A
White	Red	C5
White or Yellow	Blue or Red	B
White or Yellow	Purple	B
Green	Black, Blue, or Red	B
Blue	Black or Red	C5
Pink	Black or Blue	A

Documents on yellowed paper with black or gray ink require a high-contrast panchromatic film and a deep yellow filter such as the Kodak Wratten G Filter. The G filter transmits freely the yellow light reflected from the yellowed paper so that the paper will record white. This produces greatest contrast between paper and printing.

Manuscripts and documents on which the ink has turned yellow or brown ordinarily give best contrast on a non-color-sensitive film. If a panchromatic film is used, it may be desirable to make the exposure through a blue filter.

In making copies of checks, a ruler should be placed alongside the check so that it becomes a part of the photograph, and, for comparison

The numerals, on white stationery, were photographed in the normal manner, with one Photoflood Lamp No. 2 on each side of the copyboard.



To show the texture and watermark of the paper, the specimen was illuminated from behind and photographed, with the above results.

purposes, the photograph should be the same size as the original. If enlargements are made, the ruler will show the degree of enlargement, and the photographic evidence cannot be questioned concerning its size compared with that of the original.

Fraudulent or bogus checks are sometimes drawn on nonexistent accounts, with the names, check form, and bank entirely fictitious. Such a check requires a comparison of the known handwriting of the suspect with that appearing on the check.

Forged checks may have been drawn against the account of a known individual, whose signature has been traced or simulated by someone else. In this case, two comparisons are necessary. Photographs must be made of the genuine signature and the forged signature, as well as of the known handwriting of the suspect and that on the check.

Photographs: Occasionally, it is necessary to copy photographs of people for missing-person notices or circulars. These can generally be copied on Kodak Commercial Film, but if the only photograph available is badly soiled, stained, or faded, special techniques may be required.

In cases of stains or spots where the image has not faded, a filter can often be used successfully. The color of this filter should be similar to, but deeper than, that of the stain, and the copy should be made on a panchromatic film such as Kodak Super Panchro-Press, Type B. Soiled prints can often be cleaned by careful application of an artist's soft eraser or by swabbing with cotton saturated with a 1:1 mixture of water and denatured alcohol. It is well to try the cleaning treatment first on a small corner of the print, and only after an examination has made certain that there is no pencil work or retouching on the print.

Faded prints, in which the image has turned yellow, can usually be copied on Kodak Commercial Film; if a panchromatic film is used, a blue filter, such as the Kodak Wratten C5 Filter, may be necessary. If this method is unsuccessful, an attempt can be made to restore the faded print, but only with the permission of the proper authorities, and *after* the best possible copy negative has been made.

If the print has been placed on a cardboard mount, it should be removed by soaking the print and mount in water and then pulling the mount from the print. There is less danger of tearing the print if the print is placed face down on a flat surface and the mount is peeled off the print—not vice versa. After removal of the mount, the print should be hardened for two or three minutes in a 5% solution of formalin, washed for five minutes, and then bleached in the following stain remover:

KODAK STAIN REMOVER S-6

Stock Solution A

	Avoirdupois U. S. Liquid	*Metric*
Kodak Potassium Permanganate	75 grains	5.2 grams
Water to make	32 ounces	1.0 liter

Stock Solution B

Cold Water	16 ounces	500 cc
Sodium Chloride	2½ ounces	75.0 grams
*Sulfuric Acid (conc.)	½ ounce	16.0 cc
Water to make	32 ounces	1.0 liter

*Caution: Always add the sulfuric acid to the solution slowly, stirring constantly, and never the solution to the acid; otherwise the solution may boil and spatter the acid on the hands or face, causing serious burns.

Use equal parts of A and B. The solutions should not be mixed until ready for immediate use since they do not keep long after mixing. All particles of permanganate should be dissolved completely when preparing Solution A, since undissolved particles are likely to produce spots on the print. Bleaching should be complete in 3 or 4 minutes at 68°F (20°C). The brown stain of manganese dioxide formed in the bleach bath is best removed by immersing the print in 1% sodium bisulfite solution. Then rinse well and develop in strong light, preferably sunlight, with any nonstaining developer such as Kodak Dektol Developer or Kodak Developer D-72 diluted 1 part to 2 parts of water, and wash thoroughly. *Warning:* Developers containing a high concentration of sulfite (such as Kodak Developer D-76, Kodak Microdol Developer, and Kodak Developer DK-20) should not be used for redevelopment because the sulfite tends to dissolve the bleached image before the developing agents act upon it.

Reflex Copying—Kodagraph Contact Papers

Kodagraph Contact Papers, Standard, Thin, and Extra Thin, are high-contrast, orthochromatic materials intended for making same-size copies of fingerprint cards, documents, drawings, and other line originals without the use of a camera.

If the original has printing on both sides, the Kodagraph Contact Paper is placed in contact with the surface to be copied, and the exposure is made by directing light through the back of the sensitive paper. With correct exposure, the light passing through the sensitive paper barely affects it, but the light reflected by the white areas of the subject gives sufficient additional exposure to result in a satisfactory negative. The negative image is reversed left to right; it can be read by transmitted light, or printed by contact on any contact printing paper to obtain a positive print.

For copying originals which have printing, typewriting, or drawing on one side only, Kodagraph Contact Paper can be exposed simply by contact. True images can be obtained, if desired, by placing the back of the originals in contact with the emulsion.

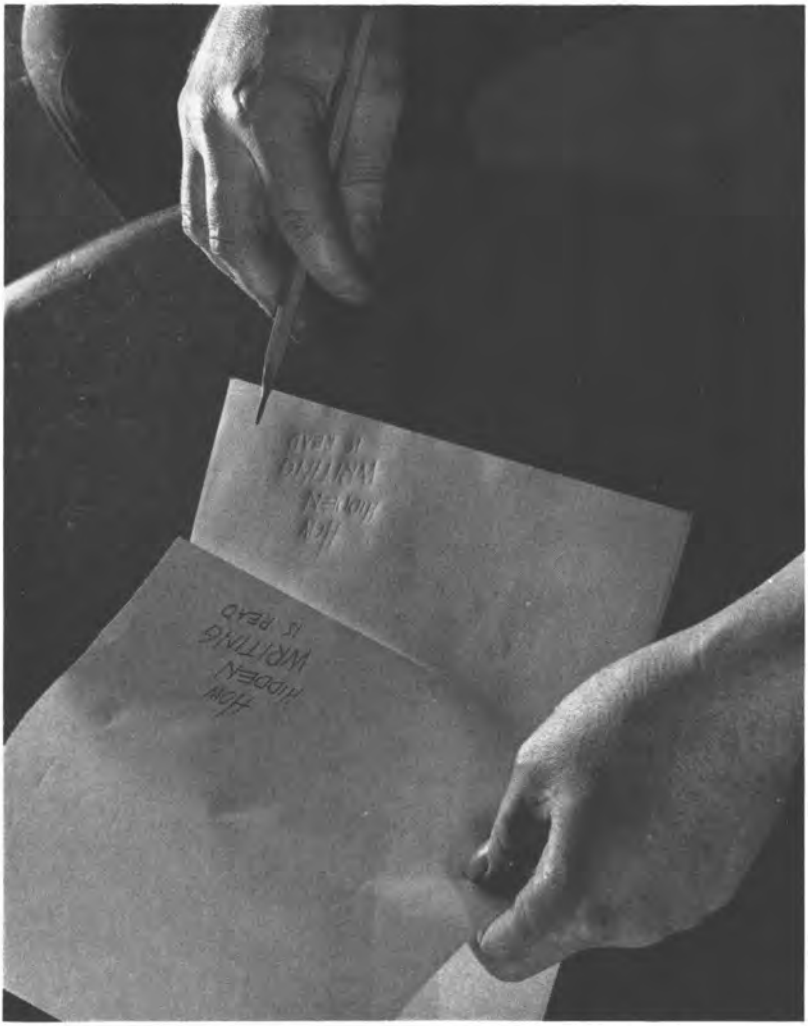
Side Lighting of Pencil Indentations

Indentations or impressions of writing on paper caused by the pressure of a pencil through another sheet of paper sometimes can be seen and photographed by using side lighting to bring the "hills and valleys" in the surface of the paper into relief. This can be done by lighting at an extremely flat angle with a Photoflood Lamp No. 1 in a Kodaflector at a sufficient distance from the indentations so that the intensity of light striking the rear and far portions is nearly equal. The light should be moved until the impressions stand out most effectively. It may be desirable to cover the reflector with a mask having a long narrow slit to provide a confined beam of light. Sometimes the indentations are more evident if a sheet of clear glass is placed over the paper.

The subject can be brought into focus by experimenting with a sheet of newspaper in the copy position. The exposure will vary with the position of the light and its distance from the subject. With Kodak Contrast Process Ortho Film and a Photoflood Lamp No. 1 placed 3½ feet from the subject at an extremely small angle, a trial exposure of approximately four seconds at *f*/22 is suggested.

PHOTOGRAPHING STAINS

In photographing stains, it is desirable to have maximum contrast between the stain and the background. This may entail only the use of



How pen or pencil indentations are made and revealed. This photograph of an exaggerated example was obtained by using a single lamp at one side and close to the plane of the paper. Courtesy Frank San Hamel.

a high-contrast film and a carefully selected filter, or, if the stains and background are of the same color, infrared photography.

Almost colorless stains on a light background and some stains which contrast with the background, such as red against blue, sometimes can be revealed clearly by the use of Kodak Contrast Process Ortho Film.

If the results are unsatisfactory or unrevealing, infrared photography, as described in Chapter VI, should be tried.

If the background is composed of several colors, or if the film is equally sensitive to the stain and background colors, a filter should be used to absorb the stain and transmit the other colors. The selection of the proper filter depends on the colors involved and the color sensitivity of the film. The Contrast Viewing Kodaguide will be helpful in making the selection. The exposure technique involved is the same as that used in making copies.

Whenever photographs of stains are introduced as evidence, they should be accompanied by a photograph of the entire surface or article on which the stain was found, to establish its identity.

PHOTOGRAPHING PIECES OF EVIDENCE

A photograph of every piece of evidence received at headquarters should be made immediately to show its condition when received. These photographs are useful for jury presentation, for protection against the possibility of loss or destruction of the original, and for the elimination of unnecessary and harmful handling of evidence. Such records should be made against a plain background of a contrasting shade in order to outline the edges of the object. Harsh shadows which obscure detail must be avoided so that the object will be clearly identifiable. One lamp in a Kodaflector on each side of the camera, with one slightly closer to the object than the other, will make any ridges or marks on the object stand out. Since strong contrast is not usually desirable, it is recommended that either Kodak Commercial Ortho or Kodak Ortho-X Film be used. With one Photoflood Lamp No. 1 on one side of the camera at 3 feet from the object, and one Photoflood Lamp No. 1 on the other side at 2½ feet, the exposure should be approximately one second at *f*/16 with Kodak Commercial Ortho or 1/10 second at *f*/16 with Kodak Ortho-X Film.

Any evidence photograph should include a scale placed near the object so that the actual size may be visualized regardless of the amount of reduction or enlargement of the image on the negative or print. It should also contain an identification mark so that the photograph can be identified positively as the object in question.

Small objects, such as a portion of a knife blade, a bullet or cartridge case, etc., can be photographed conveniently with any camera having a long-extension bellows, either with the normal lens or with a special short-focus lens. The purpose of this is to obtain the largest possible negative image so that no detail is lost in making enlarged prints.

Chapter V

PHOTOGRAPHING FINGERPRINTS

FINGERPRINTS are universally accepted as being uniquely individual to a particular person and in many cases are sufficient evidence to support conviction. Despite advanced age or even death of the individual and partial decomposition of the fingers, fingerprints retain their pattern and are acceptable for identification.

Fingerprints found at the scene of a crime and compared with the known fingerprints of a suspect are one of the strongest pieces of evidence in the prosecution of the criminal. Photography enables the technician to enlarge latent fingerprints so that they may be viewed by the jury, thus permitting the presentation of evidence from objects which cannot be taken into court. There are many possibilities in this type of photography and it calls for technical training and experience.

Latent fingerprints found at the scene of the crime are almost always poorer than carded prints, either because of the irregular surface on which the prints are found or because of heavier pressure exerted by the fingers in picking up or moving an object. Even squashed or spread-out fingerprints frequently can be photographed so as to provide the necessary number of points of similarity to make an identification.

Since some courts do not approve of identification devices such as arrows, cards, numbers, etc., appearing in the picture of a scene, it is recommended that two sets of negatives be exposed, one with identification markers and one without. The identification negatives will be valuable as reminders to the technician, previous to testifying.

A series of photographs should be made of the area where the fingerprints are found, such as a complete view of an automobile, showing its license plate for identification; a front view of the house or building concerned, showing its address number if possible; a photograph of the door, window, piece of furniture, or other object where the fingerprints are found. A complete set of photographs of the scene will enable the technician to bring to the courtroom as clear and complete a picture of the crime as possible to assist the judge and jury in rendering a verdict.

Dusting

For the reproduction of fingerprints, the latent or faint impression first must be made to contrast with the background on which it appears. This is done by dusting it with a suitable powder, using a fine camel's-

hair brush. Light surfaces require a black powder and dark surfaces a white or gray powder. If large areas are to be examined, it is convenient to use a powder atomizer or spray. Further contrast is obtained in the photograph by using Kodak Contrast Process Ortho or Contrast Process Panchromatic Film for the exposure.

Equipment

The Graflex Finger Print Camera, a complete, self-contained unit, with lamps located inside the camera and with a fixed-focus lens, is available for fingerprint photography. It is a convenient instrument for recording ordinary fingerprints or other objects in a flat plane, such as textiles, signatures, stamps, etc. It is made by Graflex, Inc., Rochester, N. Y.

The Kodak Master View Camera, 4 x 5, the Kodak View Camera No. 2D, 5 x 7, and press-type cameras offer flexibility in operation for difficult or unusual situations and allow maximum control over lighting arrangements to accentuate faint prints or prints on irregular or curved surfaces. Photoflood Lamps No. 1 in reflectors will provide sufficient illumination for most fingerprint photographs.

Procedure at the Scene of Investigation

If a building has been entered, a thorough inspection of the means of entry should be made. In the case of a jimmied window, or sprung door, fingerprint powder should be dusted lightly over the surface and any discernible fingerprints photographed.

The next step is an inspection of the interior of the building. Gloves should be used to insure that no new fingerprints are left. All promising surfaces should be powdered, and photographs of any latent fingerprints should be made immediately.

A Kodak View Camera No. 2D, high contrast film, and cross lighting from one Photoflood Lamp No. 2 were used to photograph this section of a suspect's fingerprint unwittingly left in fresh putty on a window frame. Photograph at right is suspect's fingerprint made for comparison purposes. Courtesy Police Department, Rochester, N. Y.

If fingerprints are found on a weapon, bottle, or other object with an irregular or curved surface, they can be photographed with a view camera. The object should be placed on a solid support away from any outside light. With the fingerprints properly illuminated and in focus, the lens should be stopped down to *f*/22 to obtain satisfactory detail. After the fingerprints are photographed and any other necessary photographs are made, fingerprints should be taken of persons who may have had occasion to handle the articles so that they can be checked later against the photographed fingerprints.

When a fingerprint is visible in blood at the scene of a crime, it is possible to photograph it by using side lighting from a photoflood lamp in a Kodaflector. After the fingerprint has been photographed, the area containing the print should be cut away and removed for analysis.

Many fingerprints at crime scenes are found on furniture of different color, finish, etc., and it is suggested that Kodak Wratten Filters be used to secure contrast between the dusted print and the background.

The Contrast Viewing Kodaguide, containing four gelatin filters, can be used to help select the Kodak Wratten Filters which will produce the desired color contrast. This Kodaguide lists the filter factors and information on the Kodak films suitable for use with each filter.

In some instances, fingerprints are discovered at a crime scene without the aid of dusting powder. In such cases, the prints should also be photographed without the aid of powder. This usually can be accomplished by using a cross light from photoflood lamps in Kodaflectors. The same technique is helpful in exposing prints found in dust. The light should be manipulated until the prints appear sharp on the ground glass of the camera. Negatives should be made without the use of dusting powder whenever it is possible to see the prints, because of the danger of destroying some of the ridges in the prints by dusting.

One method of photographing fingerprints on glass is to place a black velvet cloth, larger than the area to be covered, behind the glass which is dusted with light powder. This requires reversal of the negative to obtain a black fingerprint in the finished photograph.

Another method involves the use of a sheet of opal glass and a small (10-watt) frosted lamp. If the fingerprints are found on flat glass, such as a windowpane, a sheet of opal glass is taped to the back of the dusted area and the lamp is placed about 8 inches behind the opal glass. The exposure is about 10 seconds with the camera lens set at *f*/16, using Kodak Contrast Process Panchromatic or Contrast Process Ortho Film. If a fingerprint camera is used, the exposure is about 10 seconds with the lamp placed about 12 inches behind the opal glass. The lights inside

the camera are not used. This procedure eliminates the necessity of reversing the negatives to obtain a black print, as the image of the fingerprint photographs dark against the opal-glass background.

In daylight, of course, no lamp need be used if the fingerprints are on the inside of a windowpane. In this case, the exposure would vary according to the amount of daylight reaching the window.

The same principle may be adapted for photographing fingerprints on clear glass objects of irregular or curved shape, such as drinking glasses, bottles, etc. In these cases, the object on which the fingerprints appear is placed before an opal-glass background so that the side of the object which bears the fingerprints is nearest the camera. The opal-glass background is illuminated from the rear by the small frosted lamp. The exposure will vary according to the size, shape, and thickness of the object. Shifting of the light source may be required for best fingerprint contrast. In some cases, a larger lamp may be advisable.

In the above procedure, it is important to control illumination so that the greatest intensity of light falling on the fingerprint is transmitted through the opal glass.

Exposure

Fingerprints should be photographed as near actual size as possible. A ruler can be included in the field of view as an aid in focusing and to show the relation between the image size on the ground glass and the actual size. With a view camera or a press-type camera, the bellows must be extended to a distance equal to twice the focal length of the lens. This increased lens-to-film distance changes the effective aperture of the lens to double the *f*-number marked on the lens. For example, the *f*/8 marking on the diaphragm scale has the actual value of *f*/16. This subject is dealt with in greater detail in the section on Copying. These approximate exposures apply for *effective* lens apertures:

Two Photoflood Lamps No. 1 at three feet from the fingerprint	Black powder on light surface	Light powder on dark surface
Kodak Contrast Process Ortho Film	1/5 sec at *f*/16	1/2 sec at *f*/16

When the latent impressions are not readily apparent or do not stand out strongly against the background, the lights can be moved until the fingerprints appear to best advantage, possibly by cross lighting with one lamp to bring the ridges into relief.

The Graflex Finger Print Camera enables the operator to obtain an actual-size image without focusing. The camera contains four lamps operated by batteries located in the camera, making it independent of existing light conditions or facilities. Approximate exposures with this camera with fresh batteries are:

Kodak Film	Black powder on light surface	Light powder on dark surface
Kodak Contrast Process Ortho	2 sec	8 sec
Kodak Contrast Process Panchromatic	1½ sec	6 sec

Fingerprints on Multicolored Surfaces

If latent fingerprints are found on a background of two or more colors, the interference of these colors sometimes can be avoided by the use of a filter with Kodak Contrast Process Panchromatic Film and the correct dusting powder. For example, fingerprints on a background of blue and green can be photographed by using a white powder and Kodak Contrast Process Panchromatic Film with the Kodak Wratten A Filter (red). When many colors make up the background, it is difficult to obtain proper contrast between the fingerprints and all of the background and, in this case, it usually is desirable to make the photograph by ultraviolet light, as described in Chapter VII.

"Lifting"

When it is impossible to secure a good photograph of a latent impression because of the surface, background, or lack of electricity to supply illumination, the fingerprints can be "lifted" to be photographed at headquarters. This is accomplished by covering the dusted fingerprint with a gummed "lifter" contrasting in color with the dusting powder. The lifter is pressed firmly and evenly into contact with the latent fingerprint. When the gummed lifter is removed, the dusted impression of the print adheres to the sticky surface. The lifter should be covered immediately with a small piece of transparent sheeting, such as Kodapak Sheet, for protection. The impression can then be placed against a new background for photographing. Since the lifted print is usually reversed from left to right, this must be taken into consideration when rephotographing, so that the proper pattern is maintained. *Important:* Always photograph the fingerprint as originally found, if possible.

Reversing White-Powdered Fingerprints

The use of black powder for dusting latent impressions of fingerprints enables the photographer to develop the negative and print in the normal manner.

When white powder is employed, the ridges appearing in the photograph will be reversed from those on the fingerprint cards, in which black ink is used on a white surface. Therefore, in order to make the ridges black in the photograph, it is necessary to prepare a "positive" from the negative. This is done by placing the negative in a printing frame with the emulsion or dull side toward the glass and then placing a sheet of Kodak Contrast Process Ortho Film on top of it, with the emulsion side against the back of the negative. This is necessary to prevent the fingerprints from being reversed from left to right in the photographic print. This operation must be performed in the darkroom with the correct safelighting.

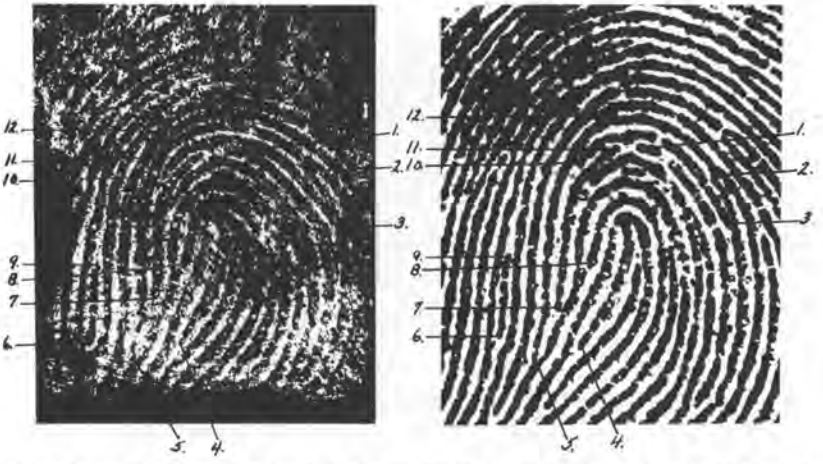
Exposure is made with a 50-watt lamp, switched on and off as quickly as possible, and the printing frame placed about 8 feet from the lamp. The exposed film is then processed. Too great density means too great an exposure; too great transparency means too short an exposure. The printing frame should be moved nearer or farther away from the lamp, depending on the results. From this film a photographic print is made in the usual manner, to produce a fingerprint having the same appearance as fingerprints taken with black ink on a white card.

Kodagraph Contact Paper offers an easier solution to the problem of reversing white-powdered fingerprints. First, a photographic contact print is made on the Kodagraph Contact Paper, the *base* of the negative being placed in contact with the emulsion side of the paper. From this print, a copy is made by the reflex technique described on page 60. In this copy, the fingerprints will be black and properly oriented.

COMPARISON AND PRESENTATION OF FINGERPRINTS

If comparison of the latent fingerprints found at the scene of the investigation with the fingerprints on the subject's card proves them to be identical, the next step is to prepare enlargements from both sets of fingerprints for presentation in court. A copy negative of the carded fingerprint must first be made on Kodak Contrast Process Ortho Film, and then this negative and that made at the scene of the crime should be enlarged to 8 x 10 inches.

In making enlargements of exhibits for the jury, it is suggested that, in addition to any others that may be required, one enlargement be furnished for each two jurors, because two persons are more likely to



Since it is usually necessary to make several duplicate exhibits for the judge, jury, and attorneys, it is suggested that the original exhibit be marked with comparison lines and photographed. A number of copies, with identical notations on each, can then be made from the copy negative. Courtesy New York State Police, Batavia, N. Y.

follow the description of the print than one. It is well to keep in mind that most members of the jury are inexperienced in the science of fingerprinting; to most laymen it is still a mystery how an expert can determine the similarity between two fingerprints.

When enlargements of both the carded fingerprints and the specimen fingerprints photographed at the crime scene are made, lines of comparison should be drawn out and numbered in ink. Since it is sometimes necessary to have as many as fifteen marked-up prints, it is suggested that the marked prints be rephotographed on Kodak Contrast Process Ortho Film; thus negatives are produced from which any number of prints can be made, with identical notations on each. In this way no confusion can result as the points are being discussed.

Chapter VI

FIELD PHOTOGRAPHY

When the law-enforcement photographer is called upon to participate in a field investigation, information is usually lacking as to just what types of pictures he will be expected to take. For this reason, it is wise for him to be prepared for any photographic situation.

Equipment

Most of the equipment can be carried in two cases. One case can contain the view camera; two lenses, one normal and one wide-angle; numbered film holders loaded, respectively, with Kodak Super Panchro-Press, Type B, Film, Kodak Commercial Film, Kodak Contrast Process Ortho Film, and Kodak Contrast Process Panchromatic Film; Kodak Wratten Filters A, K1, K2, X1, X2, G, C5, and F; and a focusing cloth.

The other case might be packed with a Graflex Finger Print Camera; numbered film holders loaded, respectively, with Kodak Contrast Process Ortho Film and Kodak Contrast Panchromatic Film; Kodak Verichrome Film Packs with film-pack adapter; white, gray, and black fingerprint powders; several fine camel's-hair brushes; fingerprint ink; a rubber roller; a small piece of plate glass; fingerprint cards; a three-way flashgun; Photoflash Lamps No. 22; a pocket flashlight; a magnifying glass; a steel tape; a notebook; a pencil; and similar materials. A Crown Compact Stand and a lighter tripod with tilting top, and two Kodaflectors with Photoflood Lamps No. 2 should also be taken along.

ACCIDENT PHOTOGRAPHY

Automobile-accident photographs constitute about 50 per cent of all evidence photography.

The objects of evidential value should fill the picture space in an accident photograph. It is just as much out of order to show objects and conditions irrelevant to the accident as for a witness to ramble on about something not related to the case. Expose to make the photograph tell the complete story. The photograph should speak for itself. A Kodak Master View Camera, 4 x 5, or a Kodak View Camera No. 2D, 5 x 7, with a lens having a focal length equal to the diagonal of the negative size is recommended for this type of work. Kodak Super Panchro-Press, Type B, Film is recommended for accident photography.

In order to make photographic evidence as valuable as possible,

Photographs illustrating the importance of making several views of cars involved in accidents. From the two photographs above, it appears that the black sedan ran into the right side of the bus. Photograph at right, however, shows the bumper of the bus embedded in the right side of the sedan.

automobile accidents should be recorded immediately after their occurrence—in any case, before the car or cars have been moved or other valuable evidence, such as skid marks, tire impressions, pieces of glass, etc., have been obliterated or removed. For this reason, it is recommended that accident patrol cars carry suitable photographic equipment at all times and that at least one member of each crew be instructed sufficiently so that he can make good evidence pictures.

A brief examination of the scene usually reveals the position from which the most telling evidence picture can be made. In many cases, additional pictures from various angles will be necessary to tell the whole story. A picture showing the marks of the first impact in many instances helps to place responsibility for the accident. At least one photograph should show the license plate of the car or cars involved, in order to establish their identity. Conditions surrounding the scene, such as street intersections, condition of the pavement, location of the traffic signals, obstructions of view, etc., should be photographed from the driver's eye level. If a case is brought to court and, for some reason, trial is delayed for a considerable time, photographs taken at the time

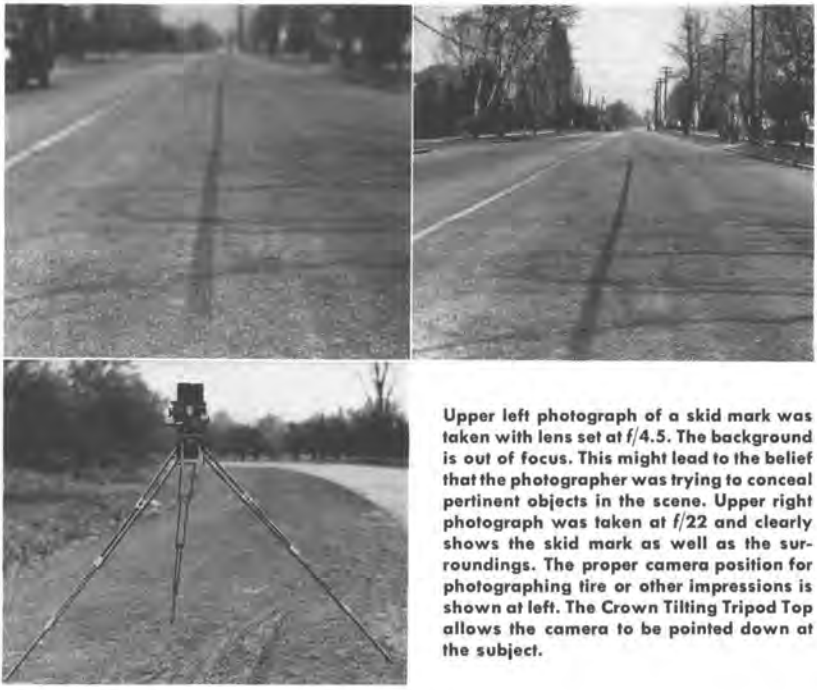
of the accident will carry considerable weight, especially if seasonal and other changes have altered the scene in the meantime.

In order to corroborate the testimony of an eyewitness, one photograph should be made, at his eye level, from the point from which he viewed the accident.

Data Cards: It is recommended that a data card bearing the following information be filed for future reference with each set of evidence negatives: Case number, date, time, subject, location, camera, type of lens, film, type of paper—contact or enlarging, developer, direction of camera, height of lens, measurements, notified by, witnesses, history of case, and newspaper clippings.

Kodak Super Panchro-Press, Type B, Film is recommended for all daylight and flashlight exposures, with the exposures given in the tables on pages 21 and 23. Dark-colored cars require about one stop more exposure than light-colored ones.

Photographing dents or other marks left on a vehicle presents a problem in lighting, since at certain angles reflections obscure detail or cause the photograph to render the scene different from that



Upper left photograph of a skid mark was taken with lens set at f/4.5. The background is out of focus. This might lead to the belief that the photographer was trying to conceal pertinent objects in the scene. Upper right photograph was taken at f/22 and clearly shows the skid mark as well as the surroundings. The proper camera position for photographing tire or other impressions is shown at left. The Crown Tilting Tripod Top allows the camera to be pointed down at the subject.

seen by the eye. In such cases, it is necessary to examine the scene until a point is found where the reflection no longer appears, the camera being placed in that position for the exposure.

According to the "Accident Investigation Manual,"* photographs of the following subjects are often needed as evidence or to complete the record of a case:

1. Several scenes taken from the driver's point of view as he approached.
2. Points of impact as shown on the car and object struck.
3. Skid marks, showing their length and direction.
4. Traffic-control devices, including signs, signals, and road markings—usually taken from the point of view of the approaching motorist.
5. Nature of the roadway at location, showing the type of pavement, defects in the surface, width of the shoulder, etc.
6. Position of the cars, victims, and parts of cars after impact, showing their distances from the point of impact.
7. View obstructions, such as buildings, signboards, hedges, fences, parked cars, etc., or the lack of them.
8. Blood, flesh, hair, fabrics, scrape marks, etc., frequently useful in hit-and-run cases.
9. Tire prints.
10. Defects in the cars involved, such as a missing head lamp, stickers on the windshield obscuring the driver's vision, or a truck lacking a turn indicator.
11. The roadside, to show the type of district as open country, residential, business, industrial, etc.
12. Overloaded vehicle showing sagging springs or an unusual width of load, as hay.
13. The driver suspected of a violation, especially if he is obviously intoxicated.

The following measurements are often needed as evidence or to complete the record of a case:

1. Skid marks, showing their length and position.
2. Point of impact in relation to the center line or curb line of the pavements.
3. Distance traveled, after impact, by the car and objects struck.
4. Width of the street, pavement, shoulders, and right of way.
5. Distance of view obstructions from an intersection.

*Published by The Northwestern University Traffic Institute with the co-operation of the Safety Division of the International Association of Chiefs of Police.

Photograph at left, above, was taken with a camera equipped with a lens of normal focal length, and represents the scene in normal perspective. Photograph at right, above, was taken from the same spot, but with a telephoto lens. The angle of view is too narrow and distance is seemingly compressed. Photograph at right was taken from same position, but with a wide-angle lens. Distance is exaggerated.

6. Height of view obstructions.
7. Distance of traffic-control devices from the pavement, to show their exact location.
8. Distance from the pavement to the fixed object struck.
9. Distance from the collision point to objects found, such as parts of cars.
10. Distance from the camera to the principal objects in the photographs.
11. Width of the shoulders and right-of-way of rural highways.
12. Clearance distances in cases of parked cars and other obstructions in the street or highway.

Hit-and-Run Cases

At the scene of a hit-and-run crime, a careful search should be made for pieces of glass; metal from the car, such as grille work; parts of the door handles, etc.; chips of enamel and paint; dirt removed from the car by the impact, etc. All of these subjects should be photographed at the scene of the accident.

When a suspect car is examined, it should be placed on a hoist, such

What appears to be a blind intersection in the photograph at left, is revealed to be a fairly open corner in photograph at right, taken from the driver's viewpoint.

as is generally used at a gasoline station, to make a thorough examination of the underside of the chassis. Look for fresh brush marks on the oil pan or springs, pieces of clothing, hair, blood, body tissue, etc. Any evidence of this kind should be photographed before it is removed (see illustration, page 104). A hand-held camera, such as the Kodak Medalist II, is recommended for such difficult shots.

A search should be made for fingerprints on the car, near the point of impact, as well as on movable articles such as bicycles, handcarts, etc. The car should be treated as a piece of evidence until it is certain that no further information can be secured from it. Everything of possible evidential value should be photographed.

Skid Marks should be measured with a steel tape, and their beginning and end marked clearly. If the markings are especially prominent, photographs can be made of portions of them to show the detail. Side lighting usually causes such impressions to stand out more clearly than flat lighting. An exposure of 1/5 second at *f*/11 with Kodak Contrast Process Ortho Film on a bright day will produce a negative of good contrast. This film is not suitable for general-view work.

Night-Accident Photography

Many serious accidents occur at night, and the police photographer must be equipped to photograph such scenes. For this work, photoflash lamps are recommended, with the exposures given in the table on page 23. Kodak Super Panchro-Press, Type B, Film is satisfactory for flash exposures. The camera should be placed on a tripod for flash exposures unless a synchronizer is being used. The following recommendations refer to Kodak Super Panchro-Press, Type B, Film.

Automobile in photograph at left appears to be parked at the curb, but shifting the position of the camera reveals wide separation between automobile and curb.

General photographs of the cars involved usually can be made at a distance of 25 feet, for which one Photoflash Lamp No. 22 is sufficient with a lens opening of *f*/8. Close-up shots showing the damage done to the cars are possible at about 10 feet, with one lamp and a lens opening of *f*/16 to *f*/22. For covering greater distances to show the approach to the scene, two or three lamps can be used with the lens set at *f*/5.6. A time exposure of three seconds before the flash and three seconds after the flash generally is desirable to show any street lights illuminating the road.

CRIMES OF VIOLENCE

When a crime of violence has been committed, photographs of everything bearing on the scene of the crime should be made. These photographs will be invaluable in the subsequent study of the crime as well as in presenting the evidence and in questioning witnesses and suspects. In many cases, the photographs will be found more reliable than the memory of a witness, especially if the proceedings are delayed. Careful attention to the fundamentals of good photography and a good eye for relevant material are therefore extremely important.

Exposure

The first photograph to be made is one of the scene of the crime, including the body. The camera must be kept level, if possible, to prevent any distortion in the scene. In an average room, a single Photoflash Lamp No. 22 will provide ample illumination on Kodak Super Panchro-Press, Type B, Film with the lens set at *f*/16. The lens should be focused on the victim's head to insure identification of the photograph.

Next, pictures of the body itself, both general and close-up, should be taken to identify the body and show its condition at the time of in-

vestigation. If there are no visible injuries serious enough to have caused death, photographs must be made at the autopsy. With the lens set at *f*/16, one Photoflash Lamp No. 5 at 10 feet is sufficient.

Special Procedures

If the weapon with which the crime was committed is found, it must be marked for identification and photographed. This can be done by placing the tripod with a tilting tripod head over the weapon and pointing the camera straight down. In the case of a gun, the weapon then should be removed and another exposure made to show possible markings left on the floor by the weapon. If a gun is purposely "planted" near the victim to indicate suicide, markings are not likely to be found on the floor.

Cartridge cases, bullets, and portions of the criminal instrument, such as a knife blade, should be marked for identification and returned to headquarters for photographing. Subsequent examination of the markings on this evidence and their satisfactory photographic comparison with the markings on or produced by the suspected weapon may be convincing in the presentation of the case in court.

A photograph of the room or scene undisturbed and, of course, before the body has been removed will be invaluable in reconstructing in court at a later date crimes of homicide or assault. A case carefully worked up on the basis of bullet angles, which may be accurately plotted by means of photographs, may easily make the difference between conviction and acquittal. Articles bearing fingerprints should always be photographed.

Photographs of wounds in homicide cases usually can be taken to better advantage at the morgue where one has the assistance and advice of the coroner or coroner's physician.

Left, a murder victim photographed in the morgue with the assistance of the coroner's physician. The bullet holes were photographed before a probe was made to recover the bullets. Right, photograph, also taken at the morgue, of a victim in a stabbing affray, showing the cuts and abrasions on the victim.

Photographing the unknown dead, probably best done at the morgue also, necessitates a somewhat different procedure from that used with identified homicide victims. Such photographs seem best when taken with the camera vertically over the face of the corpse for one view, then with the head or body turned to the side for a second or profile view, much as identification pictures are taken.

If a substance suggesting bloodstains is noticed on the floor, it should be photographed, following the same procedure as is used in photographing the weapon. When more than one shot is made, it is wise to place a number beside each stain when it is photographed and to make a written note of the position. In addition, samples of the stained flooring should be cut away for chemical analysis at headquarters.

All rooms having direct connection with the one in which the death occurred should be photographed. It is well to take two views of each room, one from each end. Additional shots should include the exterior of the building from all sides, one or two shots showing conditions about the building.

Suspicious footprints and tire marks found near the scene should be photographed immediately. For this work, Kodak Contrast Process Ortho Film is recommended for producing the desired contrast. An exposure of about $\frac{1}{5}$ to $\frac{1}{2}$ second at *f*/11 in bright sun is necessary. Maximum detail is revealed in such photographs when side lighting is employed. If the photographs are made at night, one Photoflash Lamp No. 22 at $3\frac{1}{2}$ feet and the lens set at *f*/16 produces good results on Kodak Contrast Process Ortho Film.

For photographing interiors, a single Photoflood Lamp No. 2 often can be used to advantage. A time exposure of four or five seconds at *f*/16 with Kodak Tri-X Panchromatic Film is sufficient for normal-size rooms when the lamp is behind the camera and is moved continually in a circle to eliminate shadows. It is suggested that an experiment in this procedure be conducted in a measured room at headquarters, and exposure tests made, to insure best results at the scene of the crime.

In connection with all photographs concerning the crime, notes should be kept regarding the time of day, exposure, camera, lens, etc. These may be valuable during the cross-examination of the photographer on the witness stand.

Photoflash Technique for a Series of Rooms

Sometimes it is necessary to show the full depth of a row of three or four adjacent rooms in an apartment or building. The following procedure gives good results:

The camera is set on a tripod and focused for a point at about half of the maximum range to be covered. The lens is stopped down to *f*/22 and the shutter set on "Time." An assistant is stationed in the farthest room, out of sight of the camera, with a flashgun and a Photoflash Lamp No. 22 pointed away from the camera. He notifies the operator when he is about to flash the lamp, and the operator then opens the shutter before the flash and closes it immediately afterward. This procedure is then repeated in a nearer room, and the final lamp is flashed behind and to one side of the camera. Throughout this procedure, great care must be taken not to move the camera. When the picture is printed, it will reveal not only the room in which the camera was situated but also the depth of the three or four rooms.

BURGLARY CASES

In photographing evidence at the scene of a burglary, important items to be covered are: the point of entrance of the intruder; the place of exit; the damage done, if any; and the tools used.

Any instrument used to gain admittance probably will leave some mark, or "trace," on the surface of the point of entrance. Because tools, such as jimmies or axes, have distinctive markings or irregularities which are left on any softer materials on which they are used, photographs of these traces are valuable. The exposures can be made in daylight on Kodak Ortho-X Film, preferably with the light coming from the side so that the "hills and valleys" of the trace stand out in relief. An exposure of 1/25 second at *f*/16 in bright sunlight is satisfactory. If the photograph is made at night, Kodak Super Panchro-Press, Type B, Film is recommended, with one Photoflash Lamp No. 5 and the lens set at *f*/22, or with one Photoflood Lamp No. 2 in a Kodaflector four feet from the subject, and an exposure of 1/25 second at *f*/11.

Example: A doctor discovered a burglar attempting to break into the doctor's home by removing a blind from a rear window. He notified the police, who, upon their arrival, apprehended a man in a rear yard next to the doctor's home. They searched the suspect and found a 12-inch jimmy in his possession. He was confronted by the doctor who was unable to identify him. The suspect denied he was at the window. The blind was photographed as the police found it, showing one slat broken from its fastening. The blind and slat were removed to the photographic laboratory where, with proper illumination, a photograph was obtained showing the perfect matching of the jimmy with the indentation in the slat. The suspect stood trial, was convicted on this evidence, and received a long sentence in a state prison. (Illustration, page 80.)

At left is a photograph of a window blind, at the rear of a doctor's home, showing one slat broken from its fastening. Upper right photograph shows the two indentations in the slat, and lower right photograph shows perfect match of jimmy and slat indentations.

Another example: Two men walking on a street early in the morning were stopped and questioned by a police officer. Dissatisfied with the answers to his questions, he searched the men and found several tools: pliers, screwdrivers, a small jimmy, and a chisel with a piece broken from its end. The police officer arrested the men on suspicion. Later that morning, the owner of a garage reported a burglary and an attempt to enter the garage safe by force. The officer who had questioned the two men earlier investigated the burglary and discovered three fresh indentations near the top of the left door of the safe. He made an investigation of the tools found in the possession of the two men, and was able to fit the edge of the chisel into the cuts on the safe door. This evidence brought a verdict of guilty. (See illustration, page 81.)

It often is well, in connection with burglaries, to make pictures of unwarranted acts of vandalism, destruction of merchandise and furniture, and records and papers torn up and thrown about.

A general view of the door, casing, or other object which bears the marks should be photographed to identify the close-up pictures. If practical, the object bearing the traces can be removed to the laboratory where proper means of illumination and manipulation will afford the best possible photographic exhibit.

If the suspected instrument is found later, a trace can be made on a similar surface and then photographed in the same manner as described above. Enlargements from both the original negative and the new negative can be made and a comparison of the markings can be shown.

Photographs of any damage done should be made immediately, before any repair is started. Any interior views can be photographed

A search of two suspicious men disclosed tools which they claimed had been used in the repair of an automobile. The two were arrested on suspicion, and later in the morning a report was made that an attempt had been made to enter a safe not far from where the men were picked up. Three distinct marks were found near the tops of the safe doors. A chisel, claimed by one of the men, fitted the indentations on the safe doors. The fact that he had claimed ownership, plus the matching of the chisel and indentations, placed him inside the building. This evidence was presented in court, and a verdict of guilty was returned.

on Kodak Super Panchro-Press, Type B, Film with photoflash lamps. Also, any tools which may have been used to commit the burglary should be marked for identification and then photographed. And, of course, the scene should be examined for fingerprints.

There are many problems and possibilities involved in a burglary case. Someone may have seen the car used in the burglary, or the individual or individuals themselves. A clear and comprehensive photograph of the street or streets is often of extreme value in refreshing the mind of a witness as to the circumstances under which the car, the person, or persons were seen. In the event that a car was used, there may be tire tracks. If made on a wet pavement, tire tracks rapidly disappear, and this necessitates prompt action on the part of the photographer in order to record them on film. A clean tire impression on perfectly white

snow is a photographic problem in itself. A promptly taken, high-contrast photograph is about the only means of preserving this type of evidence. Side lighting is needed to reveal detail in the track.

ARSON CASES

Arson is a charge on which, in a great many cases, it is extremely difficult to obtain a conviction. Good photography, completely covering all aspects of the fire scene, is effective with the jury.

Photographs in cases where arson is suspected should show the scene of the damage and the extent of the damage. Shots must be made of every part of the damaged building, and several views of each side of the building should be included.

Since charred wood, which is of particular interest in such pictures, is dark in color, exposure times are greater than those normally required. If charred wood on the outside of the building is photographed in sunlight, the exposure required for a given film is about four times (or two stops) that required for an average subject. The larger lens

Photographic evidence in an arson case, showing the trailer and excelsior which were intended to spread the fire. The fire was discovered and extinguished before the house was completely destroyed, and this photograph was instrumental in obtaining a conviction.

opening disregards the highlight areas of the scene and yields great detail in the shadow or dark area.

Paths of paper or excelsior often are used as "runners" to carry the flames from one room to another. A time bomb or fragments of one may be discovered, and such important pieces of evidence as these should be photographed. These specimens should be taken to the police chemist to be analyzed for the presence of inflammable material.

Here, possibly even more than in other police cases, the necessity of numbering the film holders to correspond with notes made at the scene must be stressed. These cases often require exposure in many places, and this practice assures complete and truthful evidence.

It is frequently difficult for a jury to imagine a person attempting to burn his own home. It "doesn't seem natural" and there may be a tendency on the part of the jury to give the suspect the benefit of an improper doubt. Photographs of the premises showing trailers of rags or excelsior with cans of gasoline or other inflammables and materials of arson may well be the deciding evidence in the case.

Chapter VII

SPECIAL TYPES OF PHOTOGRAPHY

FIREARMS IDENTIFICATION PHOTOGRAPHY

THE IDENTIFICATION of firearms is a science in which photography has a very important part. The projectiles themselves, the firing pin indentation in the soft metal of the priming cap, the impressions left by the breach of the gun on the rear of the cartridge when the explosion forces it back against the frame, extractor and ejector marks on shells, as well as irregularities inside the barrels and cartridge chambers of firearms—each of these, however microscopic, is individual to a particular gun. By means of the comparison microscope and photography, it can be determined whether or not two bullets have been fired from the same gun. If the equipment necessary to make comparison photographs is not available, the police department should send the evidence bullets and gun by Railway Express to the Federal Bureau of Investigation, to have such photographs made.

Examination of the Bullet

When a bullet is obtained for identification, its base should be examined. If it is pitted, with perhaps a black sooty residue, the cartridge was probably loaded with black powder. In the absence of both pit marks and residue, it is safe to assume that the charge was smokeless powder.

The bullet should be photographed before being cleaned. After powder residue and other evidence marks have been noted, the bullet should be prepared for examination by washing it in a normal saline solution to remove dried blood and tissue. (This solution can also be employed to perform the "Benzidine" test for blood.) It is then dried on a clean blotting paper and washed with carbon tetrachloride to remove wax and traces of oils and fats. It is especially important that the bullet be clearly marked for identification, preferably with your initials. This should not interfere with pit marks or any points that have been in contact with the interior of the gun barrel, so that there will not be any question of the bullet's markings having been disturbed.

To identify the manufacturer, the bullet must be weighed and checked against a chart of bullet weights. Then the cannelures, or grooves, of the bullet under examination are compared with those of each bullet whose weight, as given in the chart, falls within a few grains of that of the bullet in question.

If a gun, suspected of being the instrument of the crime, has been found, it is necessary to obtain a test bullet from it. Three or four shells of the same type and manufacture as the evidence bullet are selected and fired through the gun into a box, about 18 inches square and six feet deep, filled with some soft material, such as cotton waste. The test bullet is recovered and cleaned with carbon tetrachloride; it is then ready for comparison with the evidence bullet under the microscope.

Comparing Bullets

The comparison microscope accommodates both bullets simultaneously, on individual stages equipped with bullet holders which permit manipulation and rotation of the bullets for comparison. Bullets can be mounted by means of special chuck holders accommodating bullets of different caliber, or, if the microscope equipment does not include these chuck holders, the bullets can be mounted by means of wax. A system of prisms in the microscope presents a single image to the observer—an image which shows the base of one bullet and the nose of the other, as if the bullets had been cut into two parts and the nose of one affixed to the base of the other.

The bullets are rotated on the stages and, if a relative position can be found at which the markings match, that is, appear to be continuous from one bullet to the other without interruption, it is safe to assume that the projectiles have passed through the same gun barrel. Wherever the striations or markings are deepest or broadest, the most convincing photographs can be made.

Photographing Bullets

Photomicrography: With the markings matched under the comparison microscope, photographs can be made through the microscope with a photomicrographic camera or with the department's view camera, adapted to fit the eyepiece of the microscope. The resultant picture, known as a photomicrograph, shows portions of the two bullets in juxtaposition and allows great magnification directly on the film. The exposure, based on tests according to the type of lighting employed, can be made on Kodak Tri-X Panchromatic or Panatomic-X Film. Once the test has been made and the most satisfactory results possible obtained, this exposure can be used as the basis for all future photomicrographs with the same setup. The evidence bullet is usually darker in color than the test bullet, but this can usually be corrected when photographs are made through a comparison microscope by opening the microscope diaphragm for the evidence bullet.

A comparison microscope with special camera set up to photograph two bullets. The test bullet and the evidence bullet are placed on separate stages. Photographs so made show the nose of one bullet and the base of the other as a single bullet. Courtesy Bausch and Lomb Optical Co.

Bullets oxidize, but their original color can be restored by immersing them in ammonia for several minutes.

Photomacrography: Another method, which has found favor with many law-enforcement photographic laboratories, employs the comparison microscope merely to establish similarity of the markings of the bullets. If the bullets are identified as having come from the same gun barrel, areas for photography are selected, and the bullets are marked with ink ("T" for test bullet, "E" for evidence bullet) by means of a toothpick or some other nonabrasive object. The bullets are then removed to a special bullet holder, such as the Spencer Bullet and Shell Photo Stand, equipped with gears so that the two bullets can be rotated simultaneously. The camera and bullet holder should be set up in a horizontal position for greatest rigidity. Thus arranged, the two bullets are placed in front of the camera lens and photographed separately.

A lens well suited to this work is the Bausch and Lomb 72-mm Micro-Tessar, with the camera bellows drawn out to give a four-diameter direct magnification on the resultant negative. By means of cross lines etched or drawn on the ground glass, certain striae or valleys can be lined up easily. Any points of comparison which the operator desires especially to show should be sketched on the ground glass so that similar markings on the test bullet can be made to coincide. This is particularly important because a bullet which has struck a hard object may have bulged or flattened, in which case points of comparison are not easily shown. Patience and care are required for this work.

Such photographs, in which there is a direct enlargement of a small object, are known as photomacrographs.

Lighting and Exposure: The problem of lighting is not an easy one because of the curved nature of the objects to be photographed. One

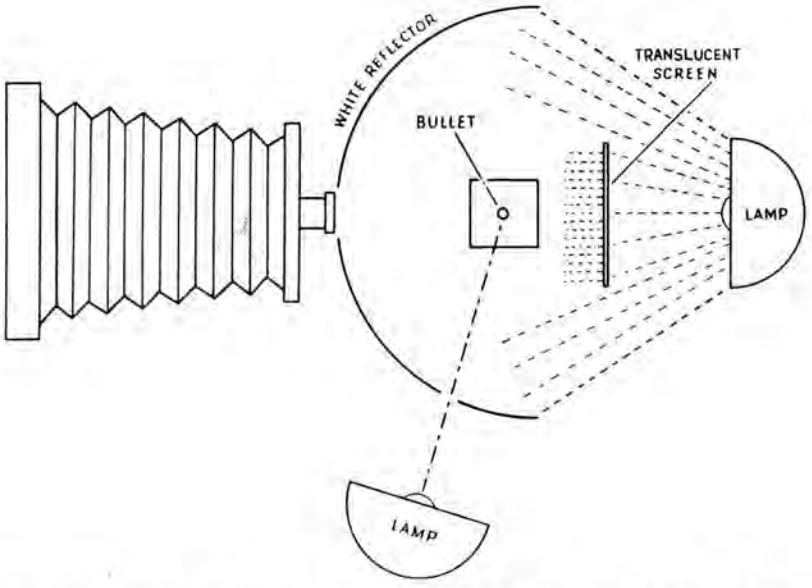
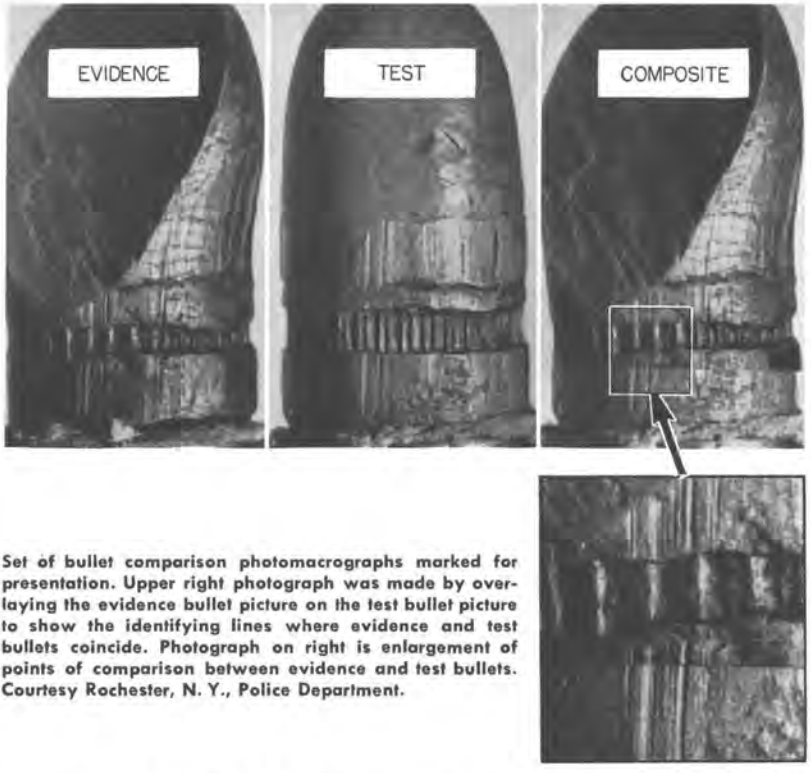


Diagram of lighting arrangement suggested in text for photographing bullets. Diffusing medium can be flashed opal glass, ground glass, or Kodapak Matte Sheet.

simple and satisfactory method is to set up a Reflector Photoflood Lamp (RFL2) four or five feet in front of the lens and facing it. Between the light and the bullet there should be a card with a flashed opal-glass or ground-glass window at least two inches square so that light passing directly into the lens will first go through this window. This serves to outline the bullet on an even, white background.

A curved reflector containing a hole through which the lens can photograph gives nicely rounded general illumination. Such a reflector can be made from a hatbox, the inside of which is painted a flat white. A slit cut in one side of this reflector, so that a parallel beam of light can be directed toward the surface of the bullet, produces added definition of the fine lines on the bullet. For this parallel spot beam an ordinary 250-watt projection lamp can be used.

With this setup, the use of Kodak Panatomic-X Film, with a lens opening of *f*/16, and an exposure of approximately 1 minute to the reflected light and 2 seconds to the parallel beam, usually results in satisfactory negatives. Kodak Panatomic-X is a fine-grain, high-quality, panchromatic film of moderate speed and contrast, and is particularly suitable where a considerable degree of enlargement is desired.



Set of bullet comparison photomacrographs marked for presentation. Upper right photograph was made by overlaying the evidence bullet picture on the test bullet picture to show the identifying lines where evidence and test bullets coincide. Photograph on right is enlargement of points of comparison between evidence and test bullets. Courtesy Rochester, N. Y., Police Department.

Presentation of Bullet Photographs: In presenting photographic evidence of firearms identification, a set of comparison photographs should be mounted on one card, so that the comparison of test and evidence bullets is made plainly evident to the jury, many of whom may not be acquainted with firearms. Photomacrographs, which should be enlarged to 8 x 10 or 11 x 14 inches and mounted on a heavy card with all points of comparison properly and distinctly marked, make very convincing evidence. The photomacrographs made by the method just described can be particularly valuable. The method of presentation consists of an exhibit of 3 8 x 10-inch enlargements. One photograph of each bullet is necessary. The third picture shows the evidence bullet fitted over the test bullet to reveal the coinciding areas. In the overlay, the evidence picture is hinged so that it can be swung back and forth from the test picture permitting comparative and separate views. In this way, a complete and easily intelligible presentation is accomplished since the jury sees the bullets as they appear when held in the hand.

COLOR PHOTOGRAPHY

Photographing suspects or evidence in full color is an important step toward more accurate criminal identification. By this means the complexion, blemishes, bruises or wounds, hair, etc., can be shown in a way which prevents any possible misunderstanding by a police officer or a juryman unfamiliar with the monochromatic rendering of colors. Gradations in colors can be seen in relation to the whole subject and without the sacrifice of any other colors.

Kodachrome Films

Kodachrome Professional Film is supplied in all popular sheet sizes and is available in two types: Daylight Type, and Type B for artificial light. The latter type is more applicable to law-enforcement photography, and exposure recommendations are given below. Although Kodachrome Professional Film, Type B, is intended for use with special 3200°K Mazda Lamps, it can be used with photoflood lamps if a Kodak Color Compensating Filter CC15 is used. It can also be used with shredded foil or wire-filled photoflash lamps and a Kodak Wratten Filter No. 2A, provided that the whole flash is used or the synchronizer is set to take the picture at the peak of the flash.

Kodachrome Film in rolls to fit the Kodak 35 Camera and other 35mm cameras, as well as Kodak Bantam cameras, is also supplied in two types: Daylight Type, and Type A, the latter being balanced in color for use with photoflood or photoflash lamps.

Exposure

Kodachrome Film requires more exact exposure than is necessary in black-and-white photography. Exposure recommendations for the film should therefore be followed carefully.

KODACHROME EXPOSURE TABLE FOR ARTIFICIAL LIGHT
In Rooms with Light-Colored Walls and Ceilings

Film	Type and Number of Lamps	Lamp-to-Subject Distance	Shutter Speed	Lens Opening
Kodachrome, Type B	One Photoflash No. 22*	6 ft	"Open"	f/16†
	Two 500-watt PS-25 3200°K	7 ft	1 sec	f/11
Kodachrome, Type A	One Photoflash No. 11	7 ft	"Open"	f/16†
	Two Photofloods No. 2	7½ ft	1/5 sec	f/4.5

*With Kodak Wratten Filter No. 2A.
†In 6-inch or 7-inch polished reflector.

For additional information about exposing Kodachrome Film, the Kodak Data Books, "Kodachrome and Kodacolor Films" and "Ektachrome and Kodachrome Professional Films," are on sale at Kodak dealers.

When Kodachrome exposures are made, black-and-white photographs of the same subject should also be taken. This is a safeguard in case of the possibility of defect or damage in the processing of one film or the other.

Processing Affidavit: If the Kodachrome Films sent to the Eastman Kodak Company for processing are to be used in court, they should be accompanied by a letter requesting an affidavit regarding the processing. This affidavit will bear the dates the film was received, processed, and returned; the processing number; and the assertion that no portions were removed or retouched in any way. This procedure precludes objections from a defense attorney concerning the introduction of a film which was not developed by the photographer himself. The number of courts in which Kodachrome pictures are accepted is growing rapidly.

Kodachrome transparencies in the form of lantern slides with outside dimensions of 3¼ x 4 inches, or in 2 x 2-inch mounts, can be displayed to the jury by projection. If the transparencies are protected by cover glass, they can also be handled freely by the members of the jury for individual inspection.

Kodak Ektachrome Film

With the introduction of Kodak Ektachrome Film, photographers now have a sheet color film which they can process completely in their own darkrooms. This advantage is important to the staff photographer who desires to inspect his color transparencies soon after the pictures are taken. Transitory conditions at the scene of a crime or accident are often difficult or even impossible to reconstruct, and by processing the film immediately after the exposures are made, the photographer has the opportunity to inspect the transparencies and, if necessary, make additional exposures before the evidence or scene is altered.

Kodak Ektachrome Film is a reversal color film which produces transparencies almost identical in appearance to Kodachrome Professional Film transparencies. Available in Daylight Type and Type B, for artificial illumination, Ektachrome Film can be exposed in any sheet-film camera having lens and shutter equipment capable of handling Kodachrome Film. The speed of Ektachrome Film is comparable to that of Kodachrome Professional Film. Ektachrome Film, Type B, which probably is of greatest interest to the photographer of evidence

subjects, is adjusted for use with 3200°K tungsten filament lamps operating at their rated voltage.

All the chemicals for preparing a complete set of processing solutions are available in a Kodak Ektachrome Processing Kit. Kits are available in three sizes, containing, respectively, the correct quantities of chemicals to mix ½, 1, and 3½ gallons of each of the solutions. Processing can be accomplished in about 90 minutes, less than 20 minutes of which is carried out in darkness. No special equipment is needed that is not ordinarily used for processing black-and-white film.

Complete instructions for exposing and processing Kodak Ektachrome Film are contained in the instruction sheets accompanying the film and the chemical kits. Further information about Ektachrome Film may be obtained from Kodak dealers or by writing the Eastman Kodak Company, Sales Service Division, Rochester 4, New York.

ULTRAVIOLET PHOTOGRAPHY

Many objects, when irradiated with ultraviolet light, emit a visible glow, called "fluorescence." Because of the fluorescence in various colors of certain materials or because the constituents of an object reflect ultraviolet rays differently than they do visible light, ultraviolet photography can often supply evidence of things which are otherwise invisible and which cannot be photographed by the usual methods.

The examination of important documents, if there is a question of alteration or falsification, is often accomplished only through the use of ultraviolet photography. Erasures, both chemical and abrasive, often can be made visible because there may remain in the surface of the paper, which is composed mainly of strongly fluorescing cellulose, one or more constituents of the original ink, causing lower fluorescence in those areas.

Bogus or fraudulent checks frequently can be detected because different pulps or dyes will fluoresce in different shades. Many so-called "invisible" inks can be made to fluoresce, and forgeries and erasures often respond favorably to ultraviolet light. Stains on suspected surfaces can often be photographed, although frequent exposure to ultraviolet light may alter their fluorescence.

Photography by Reflected Ultraviolet

There are two methods of photographing by ultraviolet radiation. The first makes use of the invisible ultraviolet light reflected from the object and requires that all visible light be excluded from the camera lens. This is accomplished by using a suitable ultraviolet source, such as a

mercury-vapor arc lamp, and an ultraviolet-transmitting filter over either the lamp or the camera lens. This filter must absorb all visible light but must transmit the ultraviolet freely. The Corning Violet "Ultra" Glass No. 5860 can be used over the lamp, in which case the photograph must be made in total darkness. If there is no convenient method of darkening the room, the Kodak Wratten Filter No. 18A is required over the camera lens and no filter is necessary at the light source. Although all films are sensitive to ultraviolet, a non-color-sensitive film such as Kodak Commercial Film is recommended. With one lamp of about 200 watts, suitably screened with a Corning No. 5860 filter and placed 20 inches from the subject, an exposure of about one minute at *f*/16 is suggested as a basis for trial. As a rule, two other exposures should be made, one giving four times (two stops) more and another giving four times less than the first. One of these usually will be satisfactory.

Fluorescence Photography

The second method, photographing fluorescence, must be carried out in total darkness. Therefore, the Corning No. 5860 filter should be used over the light source. In addition, because the reflected ultraviolet is stronger photographically than the visible fluorescence, a Kodak Wratten Filter No. 2A must be used over the camera lens to absorb the ultraviolet. Although the color of the fluorescence is usually blue or greenish yellow, it may range from violet to red; therefore, panchromatic films or plates are recommended. Kodak Contrast Process Panchromatic Film is suggested for strong contrast, although greater sensitivity with less contrast can be obtained on Kodak Portrait Panchromatic Film. Exposures for fluorescence range from 30 seconds to 1 hour at *f*/4.5, depending on the nature of the material.

Some commercial sources of near-ultraviolet which incorporate the ultraviolet filter in their own glass can be used with good results with some invisible inks, certain pigments, anthracene powder, etc., which fluoresce brightly. These lamps transmit too much visible light for photographing satisfactorily fluorescence in old documents. Average exposures, with the Kodak Wratten Filter No. 2A over the camera lens and two lamps such as the General Electric B-H4 in reflectors at 20 inches from the object, are from 1 to 5 minutes at *f*/4.5 on Kodak Contrast Process Panchromatic Film. For accurate results, a series of test exposures should be made.

Fingerprints against a multicolored background are especially difficult to photograph by normal methods. If the latent fingerprints are

dusted with anthracene powder and illuminated with ultraviolet radiation, very sharp outlines of the fluorescing impressions are reproduced with little or no interference from the background. Where the background contains considerable red, the fingerprints can sometimes be photographed with better results in ultraviolet light by using Kodak Commercial Ortho Film with a Kodak Wratten K2 Filter. The exposure is about 2 minutes at *f*/16 with two General Electric B-H4 Lamps at 20 inches from the subject. The reversal process of making the print from a positive transparency is necessary when using anthracene powder.

INFRARED PHOTOGRAPHY

Infrared photography extends the vision of the camera beyond the limits of the human eye, affording a medium for making evidence and technical photographs not otherwise possible.

In addition to the light which we can see, there also exists invisible radiation which manifests itself at both ends of the spectrum. Beyond the violet in the spectrum there is "ultraviolet" radiation, of short wave length. At the other end of the spectrum, at wave lengths longer than the red, there also exists invisible radiation called the "infrared," meaning "below the red." It can be recorded on plates and films which have been specially prepared.

Kodak Infrared Film is convenient for evidence and scientific applications. Either normal or high contrast is obtainable by varying the development technique. All common sheet-film sizes are available. Kodak Infrared-Sensitive Plates are available in practically all sizes up to and including 30 x 40 inches. They are made for general infrared photography. A Kodak Safelight Filter, Wratten Series 7 (green), is the recommended safelight filter for use when handling Kodak Infrared Film. The Series 7 is for infrared-sensitive materials *only*.

Equipment for Infrared Photography

There is no fundamental difference between the practice of infrared photography and that in which visible light is used. Any photographer, equipped for work with panchromatic films and plates, can make infrared photographs without additional equipment other than a suitable filter for use on the camera lens. There are, however, a few precautions which should be observed. In some of the older cameras, bellows, shutter blades, and dark slides are not entirely opaque to infrared radiation and therefore may produce fog on infrared-sensitive materials. Most of the materials used in the more modern cameras, however, are absolutely safe. The dark slides manufactured by the

Eastman Kodak Company have five dots embossed in their tops to indicate that they are safe for infrared photography. Metal slides are safe.

Kodak Infrared Film and Plates are sensitive not only in the extreme red and infrared regions of the spectrum but also in the blue region. It is therefore necessary to use a filter which absorbs the blue light in order to allow the picture to be made entirely by infrared radiation. Kodak Wratten Filters No. 25 (red) and No. 87 are the filters most frequently used for infrared photography.

Focusing

In the case of many lenses, the infrared rays do not focus in exactly the same plane as visible light rays. While lens types vary in their infrared focusing correction, as a general rule sharper infrared pictures are obtained if the lens is extended by about ¼ per cent of its focal length after it has been focused by visible light. Many Kodak lenses have a red dot on their focusing scale to indicate the proper setting for infrared photography. Some lenses will give satisfactory focus for the near-infrared by focusing on a ground glass with a Kodak Wratten Filter No. 25 over the lens. To obtain additional sharpness, the diaphragm should be closed down as much as practicable under existing picture-taking conditions.

Artificial Illumination

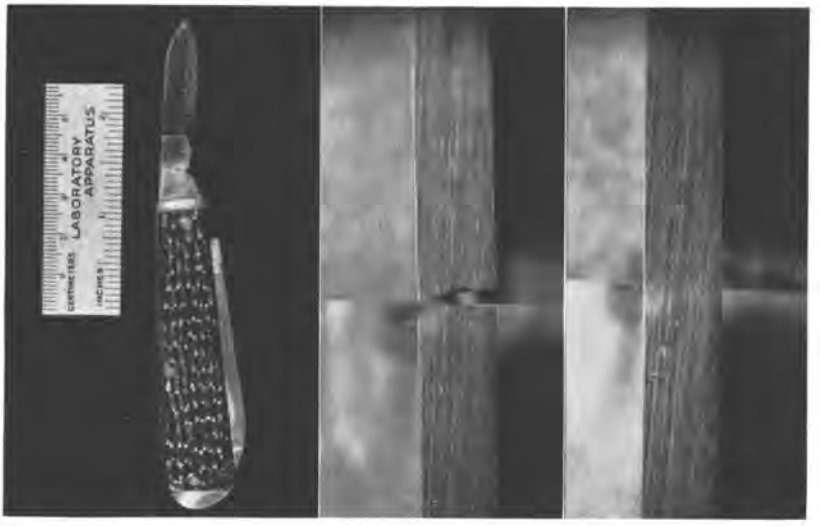
Fortunately, the light sources which are in common use for ordinary photography are suited ideally to infrared photography. Photoflood lamps, regular studio lighting, or ordinary tungsten lamps may be used.

Photographs in Darkness

Inasmuch as infrared radiation is invisible, infrared photographs can be made in total darkness provided that a sufficient intensity of infrared radiation is supplied by artificial sources.

This technique also permits flash photography in almost complete darkness and without the usual flash of light associated with ordinary flashbulbs. The only thing visible is a dull red glow from the lamp itself. The radiation comes from a flashbulb which the manufacturer has coated with an infrared-transmitting lacquer much like the Kodak Wratten Filter No. 89A. While the subject exposed to infrared radiation is invisible, it is readily recorded by infrared film. No filter is needed over the camera lens.

The maximum working distance with a No. 22R lamp and an *f*/3.5 lens is 20 feet. The following guide numbers apply to Kodak Infrared Sheet Film and Roll Film, with a shutter speed of 1/50 second or slower:



Evidence in a burglary case. The pocket knife was found on the suspect; the piece of knife blade was found in a window frame after an attempt had been made to burglarize the residence. Note ruler which establishes size. The photographs at center and right were made through a comparison microscope, the center photograph showing that there are two pieces of steel.

Lamp	*7-inch Reflector*	*5-inch Reflector*
Mazda Synchro-Press No. 22R	75	60
Mazda Synchro-Press No. 5R		55

Divide these guide numbers by the lamp-to-subject distance in feet to find the f*-number of the lens opening.*

Photography by infrared radiation can sometimes be used for photographing criminals at work. A switch which the criminal will unconsciously operate to trip the shutter and set off the infrared flash will usually produce a photograph for identification.

Examination of Evidence by Infrared Radiation

Another important use for infrared photography in criminal detection is to show the difference between two apparently similar objects or to render visible markings which are invisible by ordinary light. The reflection and transmission of infrared by a material are frequently quite different from its behavior in visible light, and infrared radiation can penetrate many objects which are opaque to the eye.

Among the applications in criminology are the detection of erasures, obliterations, and forgeries, as well as the deciphering of charred

documents or those which have become illegible through age or abuse. Inks, dyes, and pigments which are visually identical often can be differentiated. Stains the same color as the background can be detected, and lead-pencil writing in sealed envelopes can often be examined. Fingerprints may be photographed on multicolored objects by dusting the surface with a powder that is opaque to infrared rays, such as lampblack, and using a Kodak Wratten Filter No. 87 over the camera lens.

It is recommended that documents thought to be forgeries or having chemical changes be photographed by both the infrared and ultraviolet techniques. Some inks are transparent to one and not to the other. It is usually possible to detect chemical changes by using both methods.

Charred Paper

Photographing charred paper is a tedious task and requires considerable patience. The charred paper is usually brittle and will crumble if too much pressure is applied. Success has been attained by placing the specimen in a box, covering the top of the box with a damp cloth but not permitting it to touch the paper. It may take several hours for the paper to absorb enough moisture to allow handling, depending largely on the type of paper. When it is possible to handle the specimen, it should be placed between two pieces of clean glass, larger than the specimen. The pieces of glass should then be taped together at the edges. It is recommended that the specimen be backed with a piece of black photographic paper. Flat lighting is recommended.

Medicolegal Photography

Infrared photography can also record diffusions of venous blood under the skin. This has a valuable application because a deep-seated bruise, inflicted shortly before death, may not be apparent on the surface of the body and therefore fail to show evidence of a struggle. An otherwise unexplainable dark area on an infrared photograph would localize the diffusion, thus directing the medical examiner in making further investigation. The regular methods of confirming the findings should be adopted since superficial vascular tumors also produce dark shadows on the infrared record, and the photograph is therefore not conclusive.

Exposures for Infrared

A trial exposure for copying documents with Kodak infrared materials and the Kodak Wratten Filter No. 87 is 4 seconds at *f*/16 with two Photoflood Lamps No. 1 in Kodaflectors 3 feet from the subject. Approximate exposures for other subjects are as follows:

Photoflood Exposures: Through Kodak Wratten A (No. 25), or F (No. 29) Filter.

Distance, Lamps-to-Subject	4 No. 1 Photoflood Lamps in Kodaflectors		2 No. 22 Photoflash Lamps in Kodaflectors
	Aperture	*Time*	*Aperture*
3 feet	*f*/16	½ sec	*f*/32
5 feet	*f*/16	1 sec	*f*/22

The exposure index (tungsten) is 8 through a Kodak Wratten Filter No. 25. No exposure index is given for daylight since the ratio of infrared to visible light in daylight varies considerably, and meters respond principally to visible light. For tungsten light, this ratio is sufficiently constant to warrant the use of a meter.

In the case of unusual subject matter or uncertain light conditions, it is advisable to make a series of exposures, the first corresponding to the best estimate; the next, four times (two stops more than) the first; and the third, four times less than the first. One of these exposures will usually be satisfactory.

Because infrared photography saves time and trouble in cases where chemical analysis might be necessary, it should be attempted first if there is any suspicion concerning the item. Recommended developers and development times are given in the table below:

Develop at 68°F (20°C) in total darkness or with Kodak Wratten Safelight Series 7.

Kodak Developer	Continuous Agitation (Tray)	Intermittent Agitation** (Tank)
D-76* (General Use)	6 minutes	8 minutes
Microdol* or DK-20 (Fine Grain)	7 minutes	9 minutes
DK-50* (High Contrast)	7 minutes	9 minutes
D-19* (Maximum Contrast)	7 minutes	9 minutes

*These developers are available in prepared powder form in several package sizes.
**Agitation at one-minute intervals during development.

THE CINE-KODAK CAMERA IN LAW ENFORCEMENT

The use of motion pictures is increasing constantly in the law-enforcement field, not so much in the apprehension as in the conviction of lawbreakers. In situations such as strikes, which may lead to violent disturbances of law and order, a motion-picture record can be extremely valuable in showing both the instigators and the conditions prevailing at the time. Photographic evidence of a suspect's actions and whereabouts is often obtained through the use of a telephoto lens, which permits clear, sharp motion pictures to be made from a great distance without the knowledge of the suspect. A motion picture of a suspect's normal gait may be decisive in cases where the most important evidence

is that of footprints found at the scene. Traffic study and police training can be facilitated through the use of motion pictures.

Drunken-Driver Tests

Outstanding success has been achieved by the use of motion pictures in the conviction of drunken drivers. The photographic procedure is a simple and quick one. Either the Cine-Kodak Magazine 16 Camera, easily loaded with 50-foot film magazines, or the Cine-Kodak Special Camera, with its longer-running spring motor and its adaptability to an electric-motor drive, is excellent for such work.

A satisfactory setup for drunken-driver tests requires a room at least 30 feet long. A white line about two inches wide and 20 feet long is painted on the floor. Four Photoflood Lamps No. 2 in Kodaflectors will provide sufficient illumination for Super-XX Panchromatic Film, 16mm, with the lens set between *f*/2.8 and *f*/4. For full-length shots, the focus can be set for 15 feet; close-ups should be focused and made at 4 to 6 feet. The Cine-Kodak camera should be used on the Cine-Kodak Tripod to insure absolute steadiness of the camera and still permit freedom of vertical adjustment when the subject approaches the camera.

The tests can be made to show the subject's ability to walk the line, pick up an object from the floor, duplicate a simple design drawn on a blackboard, or hold his arms outstretched to front or side. The subject's face should be included in all shots and at least one close-up should be taken. To establish the time when the movies were made, a large calendar and clock should appear in the background.

Should there be any question of the subject's ability to perform these same tests when sober, a new motion picture can be made of him later, but before he sees the original test film.

This method has had particular success and has more than paid for itself by persuading the subject to plead guilty, thus saving the taxpayers the expense of a trial.

Presentation of Movies

Whenever there is even a remote possibility that the Cine-Kodak film will be introduced as evidence in court, it should be sent by first-class mail to the Eastman Kodak Company with a letter attached requesting the affidavit mentioned in the section on Kodachrome photography. It is important that it can be sworn that there were no deletions from the film and that the film can be identified as the same one sent in for processing. For this same reason, no splices should be made in the film. Each film must be kept and projected separately.

Enlargement of a frame from a demonstration Cine-Kodak Film, 16mm, showing the setup used in making drunken-driver tests. Note date and clock.

It is important in operating the Cine-Kodak camera that normal speed, that is, 16 frames per second, be used, because standard silent projectors operate at that speed with only slight variations. This precludes the contention by a defense lawyer that the evidence is misleading on the grounds that it was taken and projected at different speeds, which would alter the rate of the subject's actions.

SPECTROGRAPHY

Another important photographic technique in the law-enforcement program is spectrography. This requires considerable training and experience. Spectrography is the photography of the spectrum formed by breaking up the light from a source into its constituent wave lengths. Analysis of the specific constituents in materials is possible by introducing a small amount of the material into a source of high temperature, hot enough to volatilize it and convert it into a luminous vapor. The light from this vapor is brought through a condensing lens into the spectrograph which splits it up into its spectrum of individual radiations. These appear as sharp lines, characteristic of elements contained in the sample. The photograph is made on an Eastman Spectroscopic Plate, properly selected for the portion of the spectrum to be examined. The lines on the plate are then identified by comparison with the spectra of known elements or by measurement of the wave lengths of the lines. Such analysis is certain, complete and faster than ordinary chemical methods.

Medium Quartz Spectrograph, useful for general qualitative and many of the simpler types of quantitative analysis. Courtesy Bausch and Lomb Optical Company.

An advantage in this work is that a spectrographic examination can be made of samples of materials or substances too small to remove in the usual manner for analysis, or when there is a limited amount of material available. A few milligrams suffice for a complete qualitative test, revealing not only the major constituents, but also the small traces of impurities and minor constituents that often provide the means of differentiating between otherwise similar materials from different sources. Also, the photograph constitutes a permanent record of the analysis which is convenient for rechecking whenever the need arises.

Typical examples of applications that have proved valuable in law-enforcement work are the detection and identification of mineral poisons; analysis of spots, stains, or substances on clothing, and comparison of their composition with materials found at the scene of the crime; analysis of fingernail dirt; analysis of badly deformed bullets, and comparison with ammunition possessed by the suspect.

Small spectrographs, complete with accessory equipment suitable for police work, are manufactured by the Bausch and Lomb Optical Company. For those departments not equipped to make their own analyses, the Federal Bureau of Investigation maintains an efficient laboratory which will make a report on samples sent in for examination.

Eastman Spectroscopic Plates are supplied in a variety of types of emulsion and classes of sensitizing. Further information concerning their use can be obtained on request from the Eastman Kodak Company.

X-ray Photography

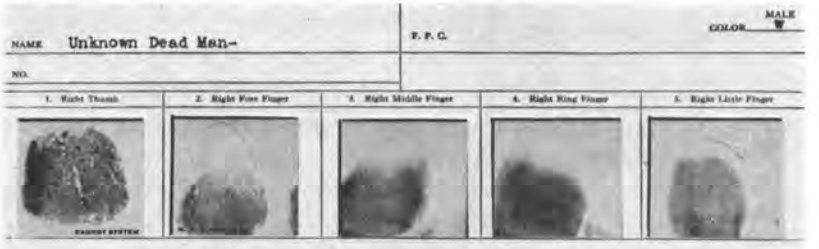
The use of X rays in law enforcement is not generally considered by smaller departments, and yet, as employed by the large identification bureaus, X rays can be useful. By employing soft rays, such as those used for skin therapy, radiographs of the prints from the fingers of unknown deceased persons have been taken even after dry gangrene has

set in, and identity has been established by comparison with recorded fingerprints. Works of art, pearls, etc., can be examined by radiographic means to investigate their internal structure for evidence of authenticity.

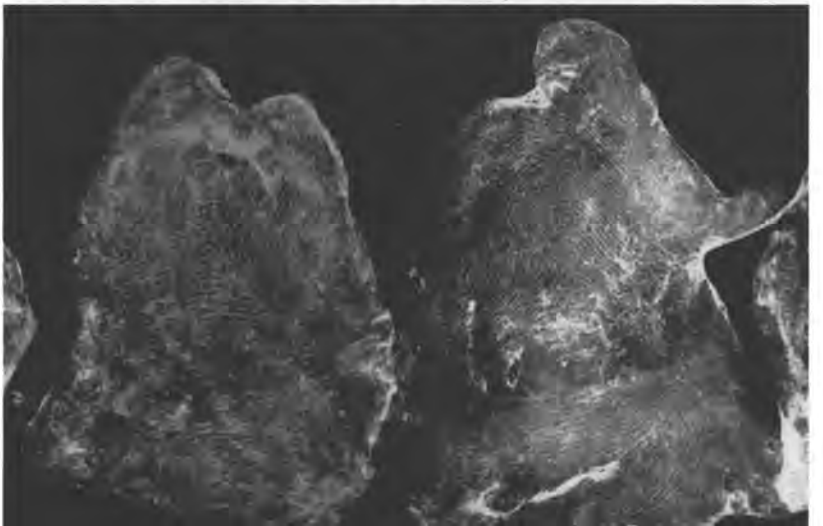
With the use of the fluoroscope, the clothes or baggage of suspected smugglers of precious stones can be searched thoroughly and quickly. The contents of suspicious packages can be determined by the fluoroscope without so much as the removal of the wrapper, or the location of a bullet imbedded in a man's body can be disclosed without a surgeon's knife. Bomb squads are making use of this method to examine the structure of a bomb, and sometimes radiographs are made to trace the ignition wiring; thus the bomb can be opened harmlessly.

These and many other applications of X rays come within the scope of agencies of the law. Police departments having no X-ray equipment can often benefit by having the radiographs made by local hospitals or by industrial users of X rays. Information on specific problems can be obtained by writing the Kodak Research Laboratories, Eastman Kodak Company, Rochester 4, New York.

The top set of fingerprints was taken in the normal manner from the badly decomposed corpse of an unidentified man. The patterns were not clear enough to aid in identification. The patterns were revealed, however, when the lower photograph was made by soft X rays after the skin had been carefully cut away from the fingers. Through these photographs, the man was identified.



Regular post-mortem of finger prints of right hand.



Chapter VIII

PRESENTATION OF EVIDENCE

To SUBMIT as evidence a faked or false picture is actually perjury and is punishable as such. Photographs can be faked in many ways—by distortion in taking, by retouching, by making composite pictures, etc. The truth is the important thing in evidence photography, as it is in all legal testimony. Pictures that are taken for evidence purposes must show clearly the points they are intended to prove. Use every legitimate means to make your photographs illustrate what really happened. When you take evidence photographs, use your camera carefully. Discover your own mistakes—before the defense counsel points them out to you. Remember, negative making is the most important step in producing evidential exhibits. It requires first that the film be exposed correctly and afterwards that it be developed properly.

The great responsibility of the photographer in law enforcement is brought home by the fact that many times a man's life or liberty is dependent upon the pictures offered in court. It is, therefore, of great consequence that the photographer not only attain a complete mastery of his subject, but also be able to convince the judge and jury that his knowledge is not open to question.

QUALIFYING THE WITNESS

To the first aim—mastery of the subject—this booklet has been directed. As a help in establishing one's competence in the eyes of a judge and jury, it is suggested that the law-enforcement photographer arrange with the district attorney's office, before the courtroom appearance, to begin with a series of questions to aid in this purpose. Such a series may include the following questions:

What is your name?

Where do you live?

What is your occupation?

Does this occupy your entire time?

How long have you been engaged in identification work? (In case of the presentation of firearms evidence, questions concerning experience, training, familiarity with the comparison microscope, and methods used can be inserted.)

Was there a time at which you took some photographs at No. Four Blank Street?

Please give the date, the time you were notified, and by whom?
Here are a number of photographs. Did you take them?
What type of equipment was used?
Did you develop and enlarge the pictures yourself?
Explain to the court just what these photographs represent:
The scene—the direction of the camera—the distance between the camera and the subjects photographed.

With such a foundation at the beginning of the testimony, there is little likelihood that the competence of the photographer and the validity of the evidence will be discounted later.

PREPARATION OF EXHIBITS

In the presentation of evidence it is wise to have the exhibits prepared carefully, since the accuracy of the testimony may be reflected by the pertinence and accuracy of the photograph. A standard size should be employed, usually 8 x 10 inches, unless some particular exhibit demands greater magnification to prove a point conclusively. Also, each photograph should be clearly understandable and related to the point which it is desired to make. The number of exhibits should be kept to the minimum necessary to show the important features. The degree of magnification of the subject or negative should be marked on the back of the print to make this information readily available, if it is required in cross-examination. Confusion in the minds of the jury can be avoided by the presentation of the photographs in logical order so that a normal sequence can be realized just as if the members of the jury had been present at the scene of the crime.

If several copies of a single fingerprint are to be distributed, the use of a master print from which copies are made will be advantageous. A master print, marked and described, can be rephotographed, so that all additional copies will duplicate exactly not only the subject matter of the original print, but also the added markings. In this manner there is left no possibility for objection by the defense attorney.

THE PHOTOGRAPH AND THE EYE

Occasionally, with accident-scene photographs, a question may be raised concerning the comparative sizes of the images as shown in the print and as the eye saw them. If the normal camera lens has been used, the image on the print, when viewed with one eye at the same distance as the focal length of the lens, multiplied by the number of diameters' enlargement which may have occurred, will be the same size as was actually seen by the witness. Thus, if the photograph was made with a

Casual inspection of a suspect car in a hit-and-run case revealed no incriminating evidence. As is the proper procedure in investigating such cases, however, the car was placed on a hoist in a garage for further inspection. Fresh brush marks were found on the underside of the car and an impression was found in grease on one of the rear springs (left). This impression was photographed (top right), and the photograph compared with one of a sample of cloth from the victim's coat (lower right). The driver of the car was convicted. Courtesy Fulton County Police Department, Atlanta, Ga.

4 x 5 camera and an 8-inch focal length lens, and then the whole negative enlarged to 8 x 10 inches, the proper viewing distance would be 8 inches multiplied by 2 (diameters' enlargement), or 16 inches.

If the picture has been made with a wide-angle lens, the whole print cannot be viewed comfortably at the proper distance; therefore, the print has to be moved farther away, and then the perspective is distorted. Likewise, if a print made with a camera with a telephoto lens is held at the proper viewing distance, the print by no means fills the field of vision. The print is therefore moved closer and the opposite type of perspective distortion occurs. A typical example of the latter case is the newsreel telephoto shot of a baseball game in which the pitcher or batter seems to be standing close to the outfield fence.

Image Detail: Another possible question in connection with the testimony of a witness is whether a photograph taken under adverse light conditions represents faithfully the detail which the eye saw.

There are two aspects to this problem—how much can be seen, and how much will be seen. Since the latter question depends on the individual's ability to perceive detail quickly, it cannot be answered entirely by photographic methods. Nevertheless, photographs can be of considerable assistance in answering this question.

The other question involves a problem of how much exposure to give a film to reproduce the scene exactly as the eye could see it. Photography differs from vision in that the eye can perceive no more detail than it sees in a fraction of a second, while in photography the amount of detail is cumulative with time.

It is impossible to state a definite figure of equivalence of photography and vision for all conditions, since the sensitivity of the eye varies enormously, depending on the light conditions to which the eye can become adapted. Nevertheless, for one type of condition, illumination by automobile headlights, an approximate equivalence of photography and vision for a partially dark-adapted eye can be stated thus:

> If a negative is made on Kodak Tri-X Panchromatic Film exposed at *f*/4.5 for 60 seconds, the amount of detail recorded clearly in the darker areas will be about equal to the detail in the original scene which could be seen clearly by the eye.

PHOTOGRAPHS ADMISSIBLE AS EVIDENCE

Now we come to the type of photograph that can be presented as evidence. Every photograph should tell a story. It should have a readily recognizable subject, and it should be possible for anyone seeing the photograph to understand why it was made and what it illustrates.

Any picture which has a direct bearing on the issues involved and which is not used to give a false impression, confuse the questions, or stimulate the emotions is admissible.

OFFERING THE PICTURES IN EVIDENCE

The scene is a courtroom in any American city. The case being heard is one of manslaughter resulting from an automobile accident. The photographer is sworn in and is asked the following questions:

What is your name?

Where do you live?

What is your occupation?

What previous experience have you had in making photographs?

Have you ever been consulted by outside law-enforcement agencies relative to the technique in making evidential photographs?

About how many times?

Was there a time when you were called to the scene of the accident to make certain photographs?

I show you several photographs and ask you if these are the photographs taken by you.

Do they represent the scene at the time the photographs were taken?

Explain the technique followed in making these photographs.
Type of camera?
Lens?
Diaphragm?
Shutter speed?
Type of film?
Filter?
Light source: daylight, photoflash, or photoflood?
Number of negatives?
Distance from camera to subject?
Height of lens from the ground?
Contact or enlarged prints? If enlarged, how many times?

The district attorney asking these questions turns to the judge and says, "I offer these pictures in evidence." "They are admitted," the judge replies.

Thousands of pictures, introduced in the same manner, help the courts administer justice every day. If it were not for photographs, a great many people would never receive accident compensation, property suits would go unsettled, forgeries would go undetected, and criminals would escape conviction and punishment. What better way is there to explain a scene than to show a picture of it? Judges and juries, instead of being confused by a deluge of descriptive words, can understand a point very clearly when it is illustrated by a photograph. Pictures show what words cannot convey. It is true that one photograph is worth a thousand words in a court of justice.

Photographs such as that illustrated below should be made to record evidence of ransacking before the room is placed in order or otherwise changed. This photograph was made by combining photoflood and normal daylight illumination.

Selected References on

PHOTOGRAPHY IN LAW ENFORCEMENT

SINCE this book is intended for the use of the police and other authorized crime investigators, most of the reference material is of a technical or semitechnical nature, although there are listed a few articles from popular or semipopular magazines or journals. Some of the reference journals, such as the *F.B.I. Law Enforcement Bulletin* and publications of the Division of Investigation of the Department of Justice, are not usually obtainable by the general public, but the F.B.I. and Department of Justice will co-operate with authorized law-enforcement agencies in making them, or copies of them, available.

The Eastman Kodak Company is not in a position to supply facsimiles of the original articles and books from which these references are cited, except in the cases of those articles and books published by the Company and still in print. Many public libraries, such as the New York Public Library, Fifth Avenue and 42nd Street, New York 18, N. Y., and The Photoduplication Service, Library of Congress, Washington, D. C., supply facsimiles of articles and books at a reasonable price. Other photoduplication services are listed in the Directory of Microfilm Services in the United States and Canada, published by the Special Libraries Association, 31 E. 10th Street, New York 3, N. Y. The F.B.I. and the U. S. Department of Justice should be consulted for copies of their restricted publications. Other original periodicals and books can often be purchased from book dealers or publishers.

Document Examination

ARTICLES

THE ACTION OF CHARRED PAPER ON THE PHOTOGRAPHIC PLATE AND A METHOD OF DECIPHERING CHARRED DOCUMENTS, Raymond Davis. *Bureau of Standards Scientific Paper No. 454*, 1922. The charred paper is placed between two photographic films or plates in direct contact with the photographic emulsion and is allowed to remain in the dark for about a week, then the films or plates are processed in the usual way.

DECIPHERING OF CHARRED DOCUMENTS, G. A. Jones. *Nature*, **147**: 676-77, May 31 (1941); *Brit. J. Phot.*, **88**: 298, June 20 (1941); *Minicam Phot.*, **5**: 73, 93-94, No. 9, May (1942). The charred paper with printed matter is illuminated by strong glancing light, which increases the contrast between them. Further contrast is obtained by use of high-contrast film, and contrast development.

DETECTION OF FORGERY BY INVISIBLE LIGHT, W. R. Mansfield. *Phot. J.*, **75**: 169-73, Apr. (1935).

THE PHOTOGRAPHY OF ALTERED AND FADED MANUSCRIPTS, N. F. Beardsley. *Library J.*, **61**: 96-99, Feb. 1 (1936).

FRAUDULENT AND FORGED CHECK EXAMINATION, Anon. *F.B.I. Law Enforcement Bull.*, **7**: 20-22, No. 2, Feb. (1938).

OBLITERATED WRITING—ITS DETECTION AND RESTORATION, Anon. *F.B.I. Law Enforcement Bull.*, **10**: 3-30, No. 1, Jan. (1941).

INVESTIGATING DOCUMENTS WITH PHOTOGRAPHY, John Fawcett Tyrrell. *Complete Photog.*, **6**: 2153-60, Issue 33; 2161-63, Issue 34 (1942).

A NEW METHOD OF DECIPHERING OF CHARRED DOCUMENTS, W. D. Taylor and H. J. Walls. *Nature*, **147**: 417, Apr. 5 (1941). Experiments have been carried out in the London Metropolitan Police Laboratory on the deciphering of charred documents. The documents were treated in a 25 per cent solution of chloral hydrate, and dried at 60°C between each of several applications until a mass of crystals formed on the surface. In the last application, 10 per cent of glycerin was added to the bath. The documents were then copied, using a contrasty, blue-sensitive, process plate. No mechanism was suggested, but the method is stated to be suitable for use on documents with printing, with typescript, and, when slightly modified, with handwriting.

EXAMINATION OF BURNT DOCUMENTS, H. D. Murray. *Nature*, **148**: 199, Aug. 16 (1941). A chemical method of deciphering charred documents is described. The carbonized sheet is treated with a 5 per cent aqueous solution of silver nitrate for about 3 hours. The writing appears in black against a gray background and may be photographed while the sheet is in the solution. The method has been found to work well with handwritten documents and with a limited number of printed documents, but not with typewriting.

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DOCUMENT PHOTOGRAPHY, H. W. Greenwood. Focal Press, London and New York, 1943, pp. 104-10.

Firearms Identification

ARTICLES

COMPARISON CAMERA AIDS IN BALLISTICS STUDY, H. T. Moore. *Camera (Phila.)*, **52**: 217-20, No. 4, Apr. (1936).

FIREARMS IDENTIFICATION IN THE F.B.I. TECHNICAL LABORATORY, Anon. *F.B.I. Law Enforcement Bull.*, **7**: 11-13, No. 6, June (1938).

UNIQUE FIREARMS IDENTIFICATION IN A MURDER CASE, Anon. *F.B.I. Law Enforcement Bull.*, **7**: 25-27, No. 7, July (1938).

IDENTIFICATION OF EXTRACTOR MARKS ON FIRED SHELLS, Charles M. Wilson. *J. Criminal Law & Criminology*, **29**: 724-30, No. 5 (1938-9).

FORENSIC FIREARMS IDENTIFICATION, Anon. *F.B.I. Law Enforcement Bull.*, **8**: 29-35, No. 5, May (1939).

HOMEMADE BULLET-COMPARISON PHOTOMICROGRAPHIC CAMERA, J. D. Corrington. *Nature Mag.*, **32**: 542-43, Nov. (1939).

METHODS OF SUBSTANTIATING FIREARMS IDENTIFICATION EXAMINATIONS, Anon. *F.B.I. Law Enforcement Bull.*, **9**: 9-20, No. 9, Sept. (1940).

FIREARMS EXAMINATION AND THE IDENTIFICATION OF EDGED TOOLS, Dr. J. H. Matthews. *Proc. 26th Ann. Convention Internat. Assoc. for Ident.*, 1940, pp. 143-47.

BOOKS

TEXTBOOK OF FIREARMS INVESTIGATION, IDENTIFICATION, AND EVIDENCE, Julian S. Hatcher. Small Arms Publishing Co., Marines, N. C., 1935.

Invisible Radiation (Infrared, Ultraviolet Light, and X-Ray)

ARTICLES

COLOR MICROSCOPY IN ULTRAVIOLET RAYS, E. M. Brumberg. *Nature*, **152**: 357, Sept. 25 (1944). Three ultraviolet-wave-length separation negatives are made, and 3-color prints are produced from these. They do not represent anything which can be seen in the original subject but show up invisible variations discernible only by the combination of ultraviolet light and the color-separation procedure.

THE USE OF INVISIBLE RADIATIONS IN POLICE WORK, L. C. Nickolls. *Brit. J. Radiol.*, **12**: 182-90, Mar. (1939).

PHOTOGRAPHY IN THE EXTREME ULTRAVIOLET, N. C. Beese. *Photo Technique*, **2**: 50-53, 65, July (1940).

EXAMINATIONS OF BLOODSTAINS IN THE SCIENTIFIC LABORATORY, Anon. *F.B.I. Law Enforcement Bull.*, **11**: 12-24, No. 7, July (1942).

BOOKS

PHOTOGRAPHY OF FINGERPRINTS ON MULTI-COLORED OBJECTS, Alan Evans. Division of Investiga., U. S. Dept. of Justice, 1933.

PHOTOGRAPHY BY ULTRAVIOLET AND INFRARED, Walter Clark, in *Handbook of Photography*, by Keith Henney and Beverly Dudley. Whittlesey House, McGraw-Hill Book Co., New York, 1939, pp. 595-615.

PHOTOGRAPHY BY INFRARED, Walter Clark. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 2 Ed., 1946.

Motion-Picture Photography

ARTICLES

MOVIE CAMERA EXPOSES GRAFT, Alfred H. Miller. *Pop. Phot.*, 11: 27, 87, Aug. (1942).

CRIME DETECTION, Anon. *Movie Makers*, 19: 101, Mar. (1944). A 16mm black-and-white record film, *The Crime Detection Laboratory of New Jersey*, was recently completed under the direction of Otto G. Sickert. Some details are given about the picture and its making.

F.B.I. USES MOTION PICTURES TO TRACK DOWN LIQUOR THEFT, Anon. *Nat. Phot. Dealer*, 10: 21, May (1944). A brief account is given of the use of motion pictures as evidence in the General Sessions Court in New York City to help convict highjackers who had stolen about $30,000 worth of liquor. This was the first time that motion pictures had been admitted as evidence in this court.

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KODACHROME PHOTOMICROGRAPHY OF STAINED SLIDES, R. P. Loveland, Research Laboratory, Eastman Kodak Co. *J. Biol. Phot. Assoc.*, 12: 143-57, No. 4, June (1944).

DETERMINATION OF EXPOSURE IN KODACHROME PHOTOMICROGRAPHY, R. P. Loveland, Research Laboratory, Eastman Kodak Co. *J. Biol. Phot. Assoc.*, 13: 79-97, No. 2, Dec. (1944).

PHOTOMICROGRAPHY WITH ULTRAVIOLET LIGHT, J. E. Barnard. *Phot. J.*, 77: 258-64, May (1937).

MICROSCOPY IN THE EXAMINATION OF HAIRS, FIBERS, AND RELATED EVIDENCE IN CRIMINAL INVESTIGATIONS, Anon. *F.B.I. Law Enforcement Bull.*, 9: 13-21, No. 8, Aug. (1940).

Spectrography

ARTICLES

APPLICATIONS OF THE SPECTROGRAPH TO TOXICOLOGICAL INVESTIGATIONS, Charles W. Rankin. *J. Opt. Soc. Amer.*, 31: 644-47, Oct. (1941).

IMPROVED METHOD OF EXAMINATION OF SPECTROGRAPHIC PLATES TAKEN IN FORENSIC WORK, L. C. Nickolls. *J. Soc. Chem. Ind.*, 62: 31-32, Feb. (1943). A simplified method for use in examining fragments of paint, glass, counterfeit coins, etc., is described for identifying the lines on spectrographic plates of trace elements in complicated spectra. The method depends on projecting the spectra and registering the iron lines on them with selected iron lines on prepared sheets. On these sheets are certain ultimate and characteristic lines of all the elements. Direct comparison of the projected spectra with those lines shows which elements are present in them, with a considerable saving of time.

General and Miscellaneous

ARTICLES

PHOTOGRAPHY IN THE AUTOPSY ROOM, William F. Payne. *J. Biol. Phot. Assoc.*, 13: 21-28, Sept. (1944).

PETROGRAPHIC EXAMINATIONS, THEIR APPLICATION TO SCIENTIFIC CRIME DETECTION, Anon. *F.B.I. Law Enforcement Bull.*, 14: 12-21, No. 5, May (1945).

TOOLMARKS, Anon. *F.B.I. Law Enforcement Bull.*, 8: 17-23, No. 11, Nov. (1939).

PHOTOGRAPHY IN CRIME DETECTION, J. Edgar Hoover. *F.B.I. Law Enforcement Bull.*, 9: 3-24, No. 3, Mar. (1940).

COLLECTING, PRESERVING, AND IDENTIFYING PHYSICAL EVIDENCE, Anon. *F.B.I. Law Enforcement Bull.*, 9: 36-55, No. 5, May (1940).

PRESERVING TIRE TRACKS BY PHOTOGRAPHY AND CASTING, Anon. *F.B.I. Law Enforcement Bull.*, 9: 13-16, No. 7, July (1940).

MODERN POLICE METHODS IN THE IDENTIFICATION OF UNKNOWN DECEASED PERSONS, Sergeant James W. Russell. *Proc. 26th Ann. Convention Internat. Assoc. for Ident.*, 1940, pp. 107-19.

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PHOTOGRAPHY IN CRIMINOLOGY, William A. Winfield, in *Graphic Graflex Photography*. Morgan & Lester, New York, 8 Ed., 2nd Printing, Jan., 1948, Chap. 22, pp. 321-29.

PHOTOGRAPHIC EVIDENCE, PREPARATION AND PRESENTATION, Charles C. Scott. Vernon Law Book Co., Kansas City, Mo., 1942. This book is a standard reference work on law-enforcement and legal photography, and is recommended. Emphasis is placed on considerations pertaining to the admissibility of photographs as evidence in court, and many legal precedents are cited.

LEGAL MEDICINE AND TOXICOLOGY, T. A. Gonzales, M. Vance, and M. Helpern. Appleton-Century, New York, 1937.

CAMERA TAKE THE STAND, Asa S. Herzog and A. J. Ezickson. Prentice-Hall, Inc., New York, 1940, Chap. 11, pp.163-79.

SELECTED KODAK PUBLICATIONS

A GENERAL REFERENCE LIST OF ARTICLES AND BOOKS ON SPECTROGRAPHY, Industrial Photographic Sales Division, Eastman Kodak Co., Rochester, N. Y., Apr. 4, 1946.

Free copies are obtainable on request.

PUBLICATIONS OF THE EASTMAN KODAK COMPANY, ON SALE AT KODAK DEALERS

KODAK REFERENCE HANDBOOK. A convenient binder containing separators and seven Kodak Data Book sections (Data Books without covers). It can be kept up to date by replacing outdated sections with new editions of the following seven Data Books:

KODAK LENSES, SHUTTERS, AND PORTRA LENSES. A Data Book to read for better understanding of lenses and shutters. Optical formulas, graphs, and Data Sheets make it a valuable reference book.

KODAK FILMS. A Data Book treating the physical and photographic properties of black-and-white films, and including Data Sheets for Kodak roll films, film packs, and sheet films.

FILTERS AND POLA-SCREENS. A Data Book which discusses the theory and use of filters and Kodak Pola-Screens. Includes Data Sheets for the more popular Kodak Wratten Filters. Illustrated in color.

KODACHROME AND KODACOLOR FILMS. A Data Book on still photography and home movies in color. Discusses lighting, exposure, and many special subjects. Illustrated in color. Includes Data Sheets.

KODAK PAPERS. A Data Book on the characteristics of contact and enlarging papers, and methods of selection and use of papers for prints of high quality. Includes Data Sheets.

PROCESSING AND FORMULAS. A Data Book discussing principles and procedures for processing films, plates, and papers. It presents a comprehensive group of Kodak formulas.

COPYING. A Data Book dealing with the copying of all types of originals. Includes Data Sheets for the most suitable Kodak films.

KODAK PHOTOGRAPHIC NOTEBOOK. A loose-leaf, metal-ring binder containing five separators, a quantity of notebook paper, and an introduction with suggestions on how to make the notebook into a valuable supplement to the *Kodak Reference Handbook*.

Kodak Data Books not included in the *Kodak Reference Handbook* but punched for insertion in the *Kodak Photographic Notebook* are:

EKTACHROME AND KODACHROME PROFESSIONAL FILMS. A Data Book on the Kodak sheet films for color photography, including extensive information on their use. Illustrated in color.

SLIDES. A Data Book on the making and showing of slides and transparencies in black-and-white and in color.

INFRARED AND ULTRAVIOLET PHOTOGRAPHY. A Data Book describing both the principles and practice in these two specialized fields.

DARKROOM FILM CHART

Kodak Sheet Film	Recommended For	Exposure Index†		Recommended Kodak Developers and Developing Times in Tank* at 68°F	Kodak Safelight Filter, Wratten Series
		Daylight	Tungsten		
Super Panchro-Press, Type B	General photography in daylight, photoflash, or photoflood.	125	100	DK-60a, 5 min. DK-50, 7 min.	Total darkness
Tri-X Panchromatic	General night and indoor photography, photoflash photography of large areas.	200	160‡	DK-60a, 6 min.	Total darkness
Panatomic-X	Subjects having fine detail, bullets, photomicrography and macrophotography.	32	25‡	Microdol, 16 min. DK-20, 18 min.	Total darkness
Super Ortho-Press	General daylight photography, "mug" photographs.	100	50	DK-60a, 5 min. DK-50, 6 min.	2
Ortho-X	General daylight photography, "mug" photographs.	125	64	DK-60a, 5 min.	2
Commercial	Copying photographs, photographing skid marks.	25	6‡	DK-50, 6 min. DK-60a, 5 min.	1
Contrast Process Ortho	Fingerprints, written or printed material.	—	12‡	D-11 (for high contrast), 5 min.; D-8 (for max. contrast), 2 min. *in tray*	1
Contrast Process Panchromatic	Fingerprints, checks, faded documents, colored written or printed material, faintly visible stains.	—	16‡	D-11 (for high contrast), 5 min.; D-8 (for max. contrast), 2 min. *in tray*	Total darkness
Infrared	Altered documents, charred paper, medicolegal photography, black-out flash.	—	8**	DK-50 (high contrast), 9 min.; DK-50 (medical use), 11 min.; D-19 (max. contrast), 9 min.; D-76 (general use), 8 min.; Microdol or DK-20 (fine grain), 9 min.	7

*Agitation at one-minute intervals during development. Where tray development is specified, agitation should be continuous.

**Index applies when the film is exposed through the Kodak Wratten A Filter (No. 25) and developed as recommended.

†These indexes are intended for meters marked as requiring American Standard Exposure Indexes and for all Weston, General Electric, and similar meters.

‡For copying, the meter reading should be made from a white surface in the copying position. Except in the case of Kodak Contrast Process Ortho and Contrast Process Panchromatic Films, the exposure index should be divided by 5 and rounded off to the nearest calculator figure. Then set the calculator for the light reading in the normal manner. Allow for the effective increase in the *f*-number caused by extended bellows, if the subject is closer than 8 times the focal length of the lens.