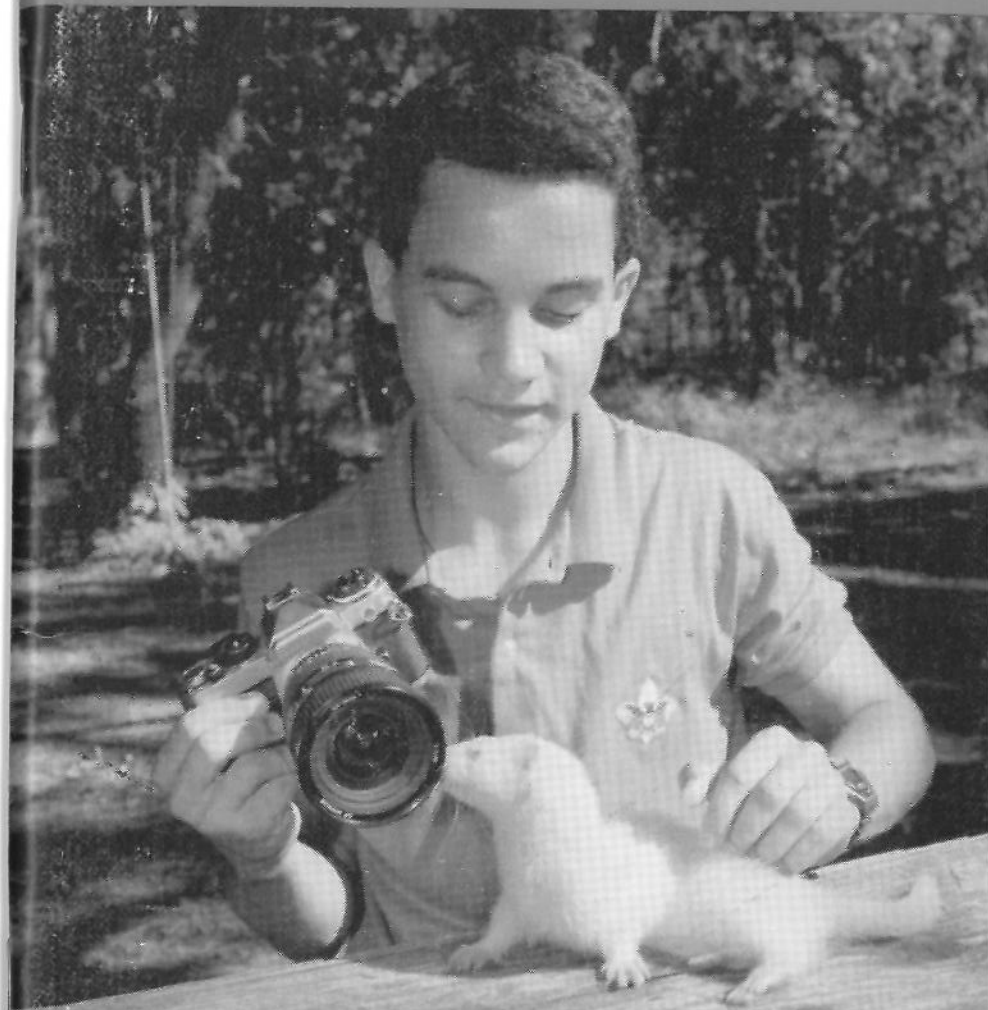




# PHOTOGRAPHY



BOY SCOUTS OF AMERICA  
MERIT BADGE SERIES

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# Requirements

1. Tell what makes a good picture. Show your understanding of these as you take pictures for requirement 2.
2. Do the following:
  - a. Take pictures illustrating at least eight of the following picture-taking techniques. Use comparisons to illustrate your points.
    - (1) Camera steadiness.
    - (2) Rule of thirds.
    - (3) Level horizon.
    - (4) Moving in close—fill the frame.
    - (5) Framing.
    - (6) Direction of light—front, side, and backlighting.
    - (7) Quality of light—flat light, bright sunlight and time of day.
    - (8) Point of view—eye level, high and low angle.
    - (9) Use of leading lines.
    - (10) Flash—proper range and reflective surfaces.
  - b. Do one of the following, utilizing techniques of planning a photo report. Start with planning cards; then do your photography and editing, and complete the requirement by presenting your report in an organized manner to your counselor.
    - (1) Expose a roll of print film and select 5 to 10 good pictures for your picture story. Mount the pictures on a large art board or in a photo album.
    - (2) Expose a roll of slide film and select 10 or more good slides to tell your story.
3. Explain how photographic film is processed and tell how black-and-white prints are made, or process and print your own pictures and show your counselor, explaining the steps you took.
4. Do the following:
  - a. Explain to your counselor the basic parts common to all cameras using a diagram you prepared.
  - b. Explain common photographic terms such as lens, shutter, viewfinder, camera angle, exposure, negative, transparency, f-number, and planning card.
5. Describe jobs in photography.

# Photography—What It Can Mean to You

Earning this merit badge should be one of the most fun-filled, enjoyable experiences you've ever undertaken. Photography is a fascinating subject because there is almost no limit to how far you can go. The purpose of this book is to teach you the basic concepts of photography and open up to you a new field of exploration.

Taking pictures of your family, friends, pets, vacations, community affairs, and Scouting activities, whether it be still pictures or movies, can be rewarding. It can help you in school to get better grades and be useful in your future career—it might even become your career. No matter what degree of interest you take, you will benefit from learning the basic rules of picture-taking and camera handling. The sooner you learn and practice the basic rules, the better your pictures will be and the more you will enjoy photography.

You will find all the information you need, including a glossary, in the following chapters of this book to complete the requirements for the Photography merit badge. In addition, we hope it will encourage you to go even further on your own beyond the requirements of the badge.

# Photography—How It Works

Before you begin taking pictures, it's important to understand how photography works.

## Basic Elements

Just as every art and science has its basic elements, so photography is made up of basic components—light, a subject, a camera, and film.

### Light

To record a photographic image, film must be exposed to light. For good pictures, you must expose the film in your camera to the proper amount of light. If too little light reaches the film, your pictures will be too dark (underexposed). If too much light reaches the film, your pictures will be too light (overexposed). It is important to read the exposure data in your camera instruction manual, on the film carton, or in the instruction sheet that comes with your film.

### Subject

A good subject is whatever appeals to you. It may be a Scouting activity, a family picnic, a spectacular sunset, or your favorite pet. These are pretty basic picture-taking opportunities. But try some unusual things, too. You would be surprised at what using your imagination can do.

## The Basic Camera

Most cameras have the same basic parts:

1. A lighttight box to keep light out and serve as a frame to hold the other parts.
2. A lens to collect the light reflected from a subject, which forms an image on the film. The lens may be factory set for normal picture-taking distances or it may be of the focusing type. The focusing type of lens is adjustable for the correct distance between the camera and the subject.

3. A lens opening to control the intensity of light reaching the film. The size of the lens opening may be fixed or adjustable. Some automatic cameras have a variety of lens openings.
4. A shutter to control the length of time that light reaches the film. The shutter keeps all light out until you take a picture. Simple cameras have one or two shutter speeds. Automatic and more versatile cameras may have a wide range of shutter speeds. A fast shutter speed has the advantage of letting you capture action scenes. A slower shutter speed lets you take pictures in low-light situations.
5. A shutter release to open and close the shutter.
6. A film-advance mechanism to advance the film for the next exposure.
7. A viewfinder to frame your picture area. If your camera didn't have a viewfinder, you wouldn't be able to tell what your camera will see when you take the picture. Today, most cameras have the eye-level type of viewfinder.
8. Some cameras have a socket for a flipflash, magicube, flashcube, flashbulb, or flashbulb holder. Other cameras have a socket to mount an electronic flash or may have a built-in electronic flash.

## Types of Cameras

Although all cameras are basically the same, some cameras offer certain features that others don't. We will say at this time, however, that there are basically three types of cameras: simple, adjustable, and automatic (including instant).

### Simple Cameras

To make things easy, we'll call any camera simple that doesn't offer a wide range of manual adjustments for shutter speed, distance setting, and lens opening and that doesn't have an exposure-control system. Simple cameras have only one or two shutter speeds and are factory focused for normal picture-taking distances (4 or 5 feet to infinity). Some have a fixed lens opening and others have two or three different sizes of lens openings. Set the lens opening according to the exposure table in the camera instruction manual or the film instructions.

### Adjustable Cameras

An adjustable camera has controls that allow you to take pictures under a wider range of conditions than is possible with a simple camera.

Adjustable cameras have a selection of shutter speeds, including very fast shutter speeds for action shots. Most adjustable cameras have focusing lenses which can be focused for closeups—2 to 3 feet and sometimes closer. Adjustable cameras also offer a wide range of lens openings. These lens openings are set by moving a lever, a pointer, or a dial and are usually designated by f-numbers. (Lens openings on some cameras are designated by exposure index number).

A typical series of f-numbers is f/2.8, 4, 5.6, 8, 11, 16, and 22. The small f-numbers on your camera correspond to large lens openings, and the large f-numbers refer to small lens openings. The largest lens opening in this series is f/2.8 and the smallest is f/22.

### Automatic Cameras

An automatic camera combines the ease of operation of a simple camera with some of the picture-taking versatility of an adjustable camera. Automatic cameras have an exposure-control system that regulates the size of the lens opening or the shutter speed (or both).

Some automatic cameras have a fixed focus and a fixed shutter speed. On others, you set the correct subject distance only; on still others, you set the shutter speed or lens opening as well. Instant cameras fall into the automatic category.

### Movie Cameras

Movie cameras work basically like any of the cameras mentioned above, except that the end result is a moving picture that takes in a whole segment of action. There are simple movie cameras that are basically factory set for distance settings and lens openings and have an automatic exposure-control system. There are also more advanced movie cameras that allow you to zoom in on subjects at greater distances.

## Film—What Do I Choose?

Film is a light-sensitive material that records an image. Just as there are different types of cameras, there are different types of films. When you buy film, make sure you buy the right type and size for your camera, because film comes in many different types, sizes, and speeds.

### Types

Film for general photography comes in five basic types for producing color prints, black-and-white prints, color slides, movies, or instant prints. Each type of film is intended primarily to make only one of

these five kinds of pictures. However, you can have color prints made from color slides and from instant prints. You can also have color slides made from color negatives.

### Size

Every camera uses film of a particular size, indicated by a number—for example, 110, 126, or 135—or by a special name. Check the camera instruction manual to see what size film your camera uses. If you cannot locate your manual, take your camera with you when you go to buy film. If you have an instant camera, be sure to buy film designed for your camera.

### Speeds

As there are different types and sizes of film, there are also different speeds of film. The amount of light a film requires indicates its sensitivity. This sensitivity is commonly described in terms of speed. For the purpose of this assignment, you need be familiar with only the most common film speeds. The speed is usually denoted by an ISO or ASA number and is clearly indicated on the film box.

The most commonly used ISO/ASA numbers range from 25 to 400. For convenience, the numbers are usually classified into three speed categories: slow (25 to 40), medium (64 to 125), and high (160 to 400). Slow-speed film can be used whenever adequate light is available—for example, bright scenes such as a sandy beach or snowy ski slopes on a clear, sunny day. Medium-speed film is intended for more common photographic conditions—daylight and a relatively stationary subject. It is a good, all-around film. High-speed film requires less light for proper exposure than slower speed film, and it allows you to take pictures in low light both indoors and outdoors. It also lets you use a fast shutter speed when you want to capture action.

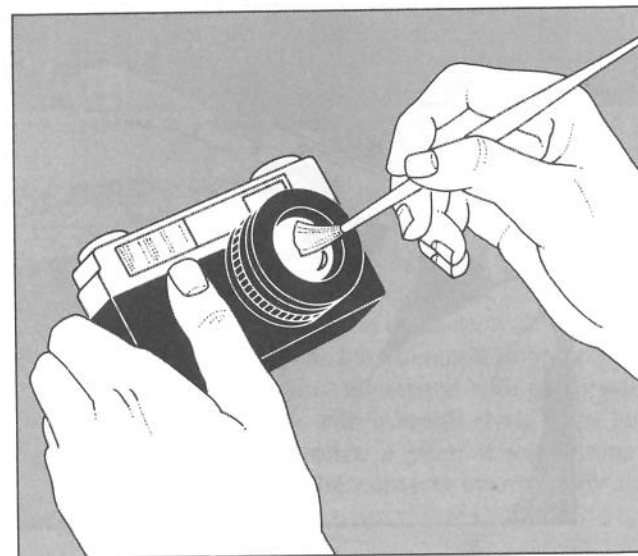
# Care of Your Camera and Film

## The Camera

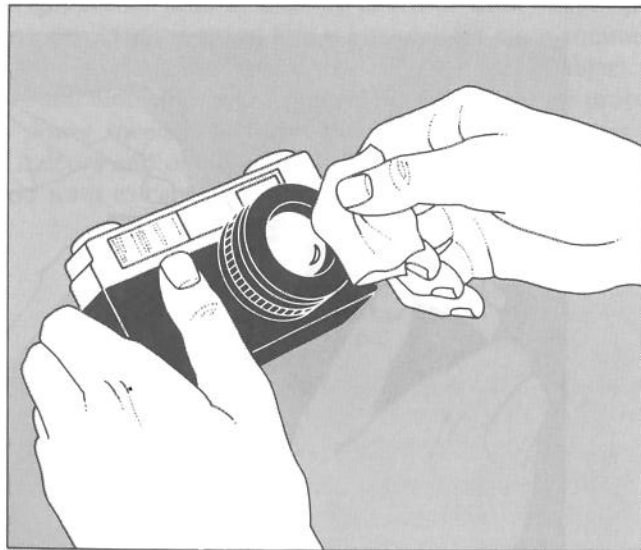
It is important that you keep your camera clean and in good working order. Otherwise your pictures will be disappointing. The first important step is to read the instruction manual that came with your camera. It should tell you the best ways to keep your camera clean. If you don't have a manual, here are some important rules that apply to all cameras:

### Keep the Lens Clean

Carefully blow away any grit or dust; then gently wipe the surface of the lens with a clean, soft, lint-free material or lens-cleaning paper. Clean both the front and back surfaces of the lens (if the back of the lens is accessible through the back of the camera). Don't try to take the lens apart. CAUTION: Never clean camera lenses with a treated cleaning material designed for use on eyeglasses. Chemicals in these materials can injure the special coating on your camera lens.

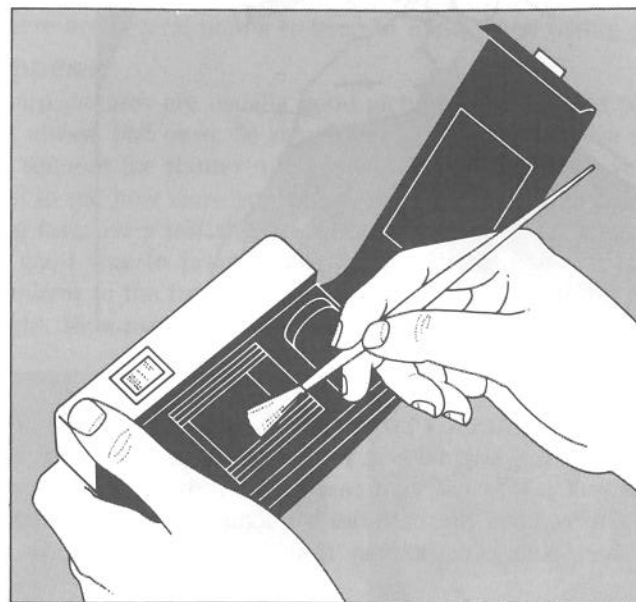






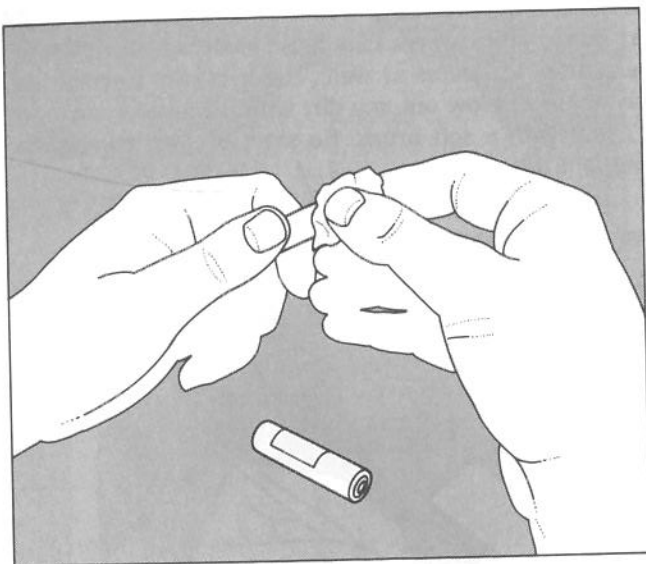
### Keep the Camera Body Clean

Dust and dirt inside your camera can cause spots on your pictures and can jam the shutter apparatus as well. The best way to clean the inside of your camera is to blow out any dirt with a rubber syringe, or carefully brush it out with a soft brush. Be sure to clean around the film-spool cavities and the sprockets.



### Clean the Battery Terminals and Camera Contacts

Many cameras contain batteries for flash or automatic exposure meters. These batteries usually last a long time, but they should be checked and cleaned every so often. Batteries give off a gas that forms small, sometimes invisible deposits on the contacts, both on the batteries and inside the camera. To clean these hard-to-reach battery-compartment terminals, use a cotton swab slightly moistened with clean water only. Clean battery surface periodically with a rough cloth. It's a good idea to replace your batteries about once a year. If your camera uses flashcubes, not magicubes, clean the contacts by manually turning a flashcube several times in the socket.



### Store Your Camera Properly

If you have the original box your camera came in, store it in that. Otherwise, put it in a carrying case or a sturdy cardboard box. It's a good idea to remove the batteries for long periods of storage. Make sure you keep your camera away from heat and damp areas.

### Film

With only a minimum of care, your film can give you good results. Heat and humidity can harm photographic film so it's wise to keep film in a cool, dry place. Many films supplied in vapor-tight packaging require no additional protection until you open the package. So don't open a film package until you are ready to use the film.

Use the film before the date printed on the carton. When you load and unload your camera, try to do it in a place away from direct sunlight. And try to get your exposed film processed as soon as you have finished a roll.

# What Makes a Good Picture

There are several points to keep in mind when taking a picture:

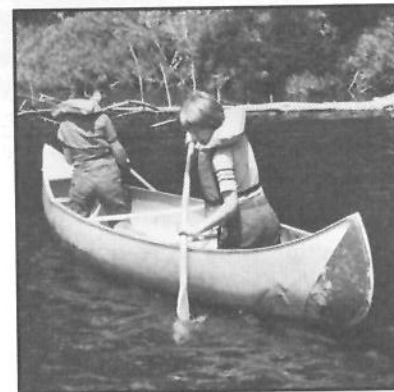
### Sharpness

Sharp pictures are usually good pictures, and blurred pictures are almost always bad ones. So remember to hold the camera steady and gently squeeze the shutter release. Also, be sure to check your camera manual to see how close you can get to your subject. If your subject is moving fast, use a fast shutter speed to help stop the action.

A good way to practice holding the camera steady is to tape a small mirror to the front of an empty camera. Stand so that the sun (a flashlight, slide projector, or other strong directional light source may

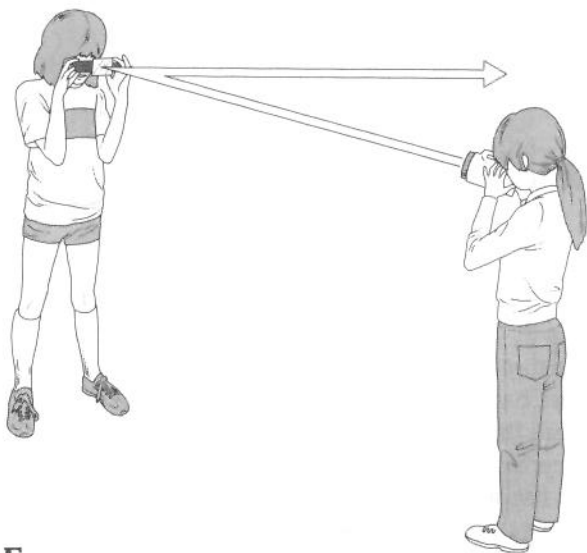


Blurred



Sharp

be used in place of the sun) strikes the mirror and the reflection is thrown into a shaded area, such as a wall, where it can be seen easily. Notice how the patch of light does not move much when the camera is held steady. But notice how much the light moves when the shutter release is jabbed sharply or carelessly. Practice pressing the shutter release with a smooth, gentle finger movement to cause the least possible movement of the reflected light.



## Proper Exposure

Exposure refers to the amount of light that reaches the film when you press the shutter release. Overexposure means that too much light has struck the film, and underexposure means that too little has struck the film. Your best pictures will be properly exposed—they will look as bright or as dark as the scene you photographed. If you follow the instructions in your camera manual and the instructions on the film carton or on the sheet that is packed with some film, you'll get properly exposed pictures.

## Close-Ups

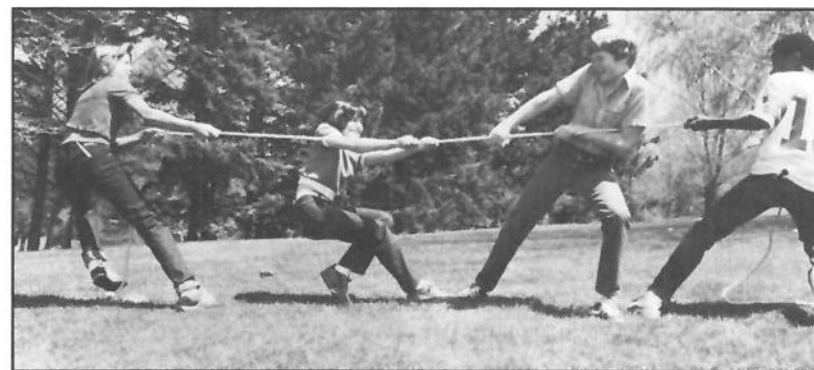
Getting close to your subject can't be stressed enough. Most good pictures have only one main subject or center of interest. The closer you get to this subject, the more likely you are to cut out any distracting extras that might be in the scene. The rule is "move in close enough to fill your viewfinder with your subject." But don't get too close or your pictures will be fuzzy or out of focus. Many cameras can't take sharp pictures of subjects closer than 4 or 5 feet. Check the instruction manual for your camera's limits.

## Choose the Best Viewpoint

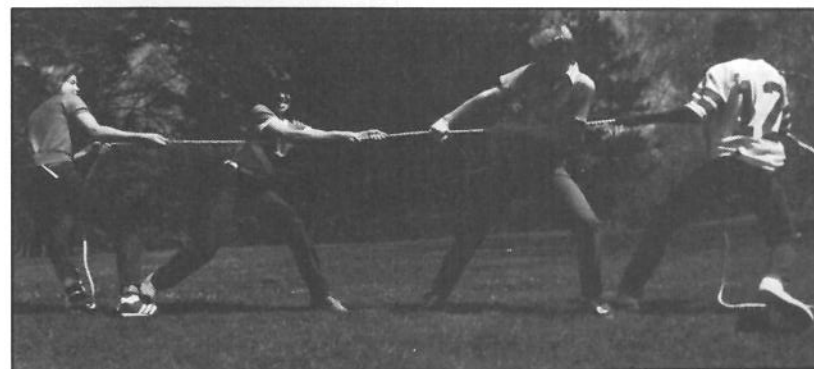
When you find a subject, don't just walk up to it and snap the shutter. Instead, study it from all levels. Walk around your subject and choose the angle that tells the story best. A normal camera angle, looking straight across at your subject from his own level, usually produces the



Overexposed



Proper exposure



Underexposed





Too far away



Closeup

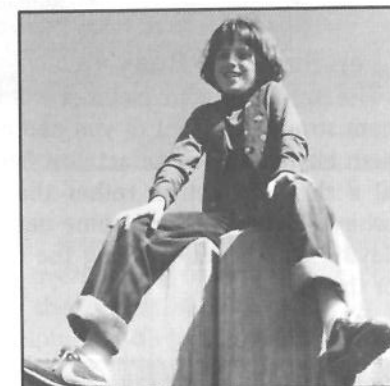
most honest—although not the most dramatic—viewpoint. Animals and children usually look their best when photographed at their own level. You can also avoid a cluttered or ugly background by looking up at people using a low angle with trees or a blue sky as your background, and many scenic pictures will look more vast if you look down at them—a high angle.

### Have a Strong Center of Interest

Have one strong center of interest. While you may want to include a secondary subject, make sure it doesn't detract from your main subject. Avoid putting the center of interest in the center of your picture. For a pleasing composition, try placing your center of interest according to the rule of thirds: divide the picture area into thirds, both vertically



High angle

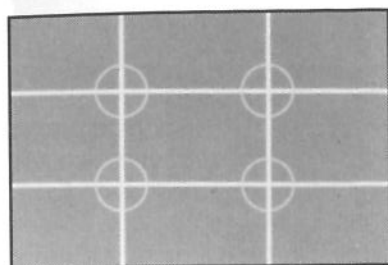


Low angle



Normal angle

and horizontally. Place your center of interest at one of the four places where the lines intersect. Have the subject look or move toward the center of the picture.



Rule of thirds

### Keep Subjects Busy

The people in your pictures will look stiff and unnatural if you stand them straight in front of you and ask them to smile. It's better to have them engaged in some activity. People will be more relaxed and natural if they are active, rather than trying to smile in a "say cheese" fashion. Picture them in some natural position—working in the garden, playing with a pet, washing the car, or doing whatever is comfortable for them.



### Framing

Framing means almost surrounding your distant subject with some nearby foreground material, such as overhanging branches. The contrast between the near objects and the distant subject can help to establish distance. Framing is also helpful for disguising a dull, boring sky or hiding unwanted scene elements. Pose a brightly dressed friend or family member in the foreground to add color and scale.



### Use Lines for Interest and Unity

Predominant lines generally should run into the picture not out of it. You can find a line in almost anything—a road, fence, stream, or hedge, for example. Even a line of people waiting to buy movie tickets can be used effectively. These lines are called leading lines because they lead the viewer's eye into the picture and often right to the subject.

You won't find a leading line with every photo subject, but when you do, take advantage of it.

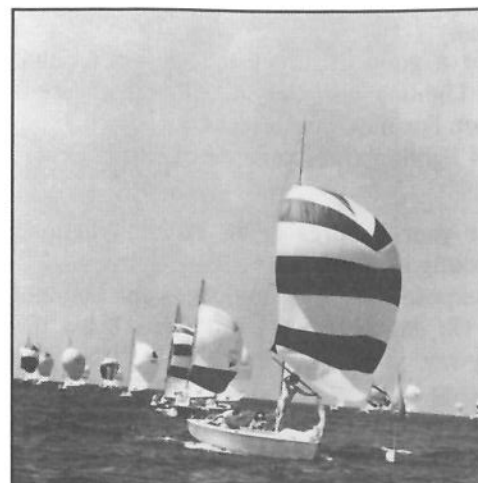
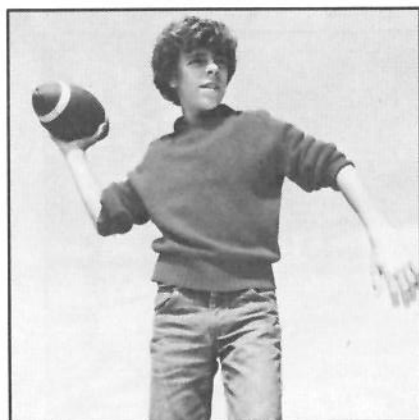
### Watch the Background

Remember to watch what appears in the foreground and background of your pictures. Even if you don't notice something distracting, your camera will. So before you squeeze the shutter release, stop and look to see if there is a lamp or pole growing out of your subject's head. If the background is cluttered or distracting, change your position or that of your subject. Trees and blue sky make excellent backgrounds.



Cluttered background

Sky as background



### Level Horizon

One thing that is easy to overlook in taking a picture, but awfully important in viewing it afterward, is to keep the horizon level. These two examples show what can happen if you don't. Make sure it is straight in the viewfinder and don't cut your picture in half by placing the horizon in the middle of the picture.

## Lighting

Besides the ingredients for a good picture listed earlier, lighting also plays an important part. Lighting also ties in with the different speeds of film mentioned earlier. For now, let's discuss outdoor lighting and how the different kinds of lighting can affect your picture.

### Outdoor Lighting

To get good exposure for your pictures in all different lighting conditions, keep these basic points in mind:

- All cameras will take well-exposed pictures outdoors in the sunlight with a medium-speed film. On days when the sun isn't out but the sky seems quite bright anyway, your medium-speed film will also work fine.
- On cloudy, dark days, you may have to use a high-speed film for prints because pictures made on medium-speed film may be underexposed.
- If you want to take pictures in deep shade, even on a sunny day, you should use a high-speed film.
- Pictures of people made on cloudy, bright days or in the shade are often better than those made in sunlight. Bright sunlight makes people squint and makes dark shadows that may hide a person's features.

These basic points are true for all types of cameras—simple, automatic, and adjustable. However, as discussed earlier, if you have an automatic camera, you can be a little more flexible because the camera itself will make its own adjustments for different lighting conditions to give you the best pictures possible. Most automatic cameras have an electric eye that measures the average amount of light in the scene and then adjusts the lens opening, the shutter speed, or both, to let in just the right amount of light. You may have to set the lens for distance. To be sure, read the instruction manual for your camera.

If you have an adjustable camera, you can be even more flexible because the camera is adjusted by you and you can take pictures on nearly any kind of day. Check the instruction manual that comes with your camera for the settings under different lighting conditions.

The locations of your camera and your subject and the position of the sun all make a difference. The typical pose uses *frontlighting*, which means posing your subject and positioning yourself so the sunlight shines over your shoulder and strikes your subject on the side facing you.



Backlighting



Sidelighting



Frontlighting

Often you can take more interesting pictures by changing your position so the light comes from another direction. For example, with *sidelighting* the sun strikes your subject from one side, brightly lighting one half and creating shadows which emphasize the shape of the subject.

*Backlighting* means the sun or light source comes from behind your subject. You probably won't get much detail in the subject if you're using a simple camera. Most likely you'll get a silhouette or a halo effect. An automatic or adjustable camera is more versatile in these situations. Backlighting can be dramatic especially in early morning or late in the day when the sun is low. Indoors, silhouettes in front of a window can be interesting.

### Using a Flash

Besides taking pictures outdoors, there will be many occasions when you'll want to take indoor pictures. This requires the use of a flash, whether it be flipflash, magicube, flashcube, flashbulb, or electronic



Too close



Just right



Too far away

flash either attached or built-in. All you have to remember is that you must stay within a definite range to get pictures that are properly exposed. This is important.

With a simple camera that has a fixed-focus lens and a preset lens opening, a good rule of thumb is that any subject from 4 to 9 feet will be properly exposed. Subjects less than 4 feet from your camera will be too light, and any subject farther away than 9 feet or so will be too dark. You don't have to measure the distance exactly, but if you're in doubt, pace off the distance to be sure. If you have an automatic or adjustable camera, your flash range may be greater. In all cases, to find the exact range for your camera, check the instruction manual for your camera or, in some cases, for your flash unit.



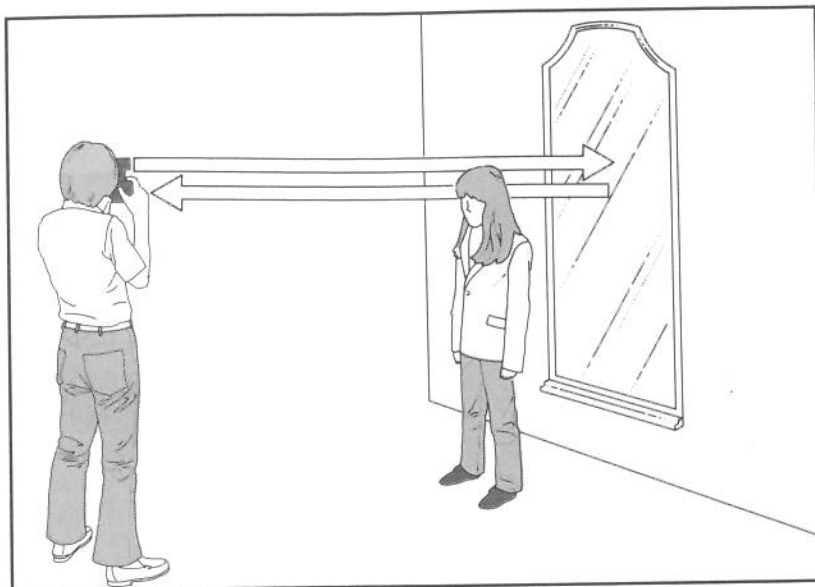
Facing mirror



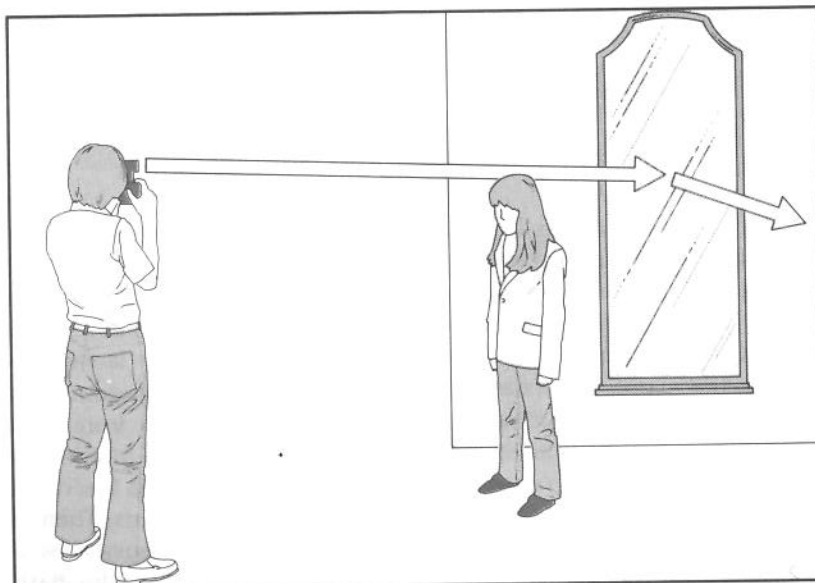
At angle to mirror

A couple of tips here: Don't take any flash pictures if you're directly facing a mirror, window, or some other shiny surface. Try to stand at an angle so the bright flash isn't reflected back at the camera lens. Also, if your subject wears glasses, make sure you can take the picture at an angle to the glasses, because if the flash is directly facing the subject, the glasses will reflect the flash just as a mirror would. If you are photographing a person or an animal less than 15 feet from your camera, you may find that the eyes will have an eerie, often red glow in your flash pictures. You can avoid this by turning on all the room lights—the extra brightness will help reduce the size of the iris. Then, if possible, increase the distance between flash and camera lens or use a flash-extension device. Finally, back off to a point within the flash range where the reflections will be less noticeable.





Shiny surface reflects flash back into lens.



At an angle, flash reflects off in a different direction.

# How To Make a Photo Story

Photo stories are fun and easy to make, and they allow you to use your pictures to convey a message to someone else.

## What Is a Photo Story?

You can answer that simply by defining the word "story," which is usually a description of an event with a beginning, a middle, and a conclusion. Photos can show the beginning, the middle, and the outcome of an event without a single word.

A single photo tells about a particular moment and no more, but a series of photos can cover a long expanse of time. In one picture, you can't show how you planted a garden, cared for it all summer, and then ate the ripe vegetables. You need several pictures, each telling a different part of the story. You can actually see what took place, instead of reading about it or listening to an account of it.

The best photo story is a sequence of pictures that tells a complete story about something that happened. You can use prints, slides, or movies to tell a photo story.

## Planning Your Photo Story

You'll need to plan carefully to make a good photo story. The first and most important step is to select one clearly defined topic or subject. If you have an idea, decide what should happen in the beginning, how the story should develop, and what the conclusion should be. Determine exactly what you want to tell and how much you want to say. Then see how many pictures you'll need and decide whether prints, slides, or movies would be the best means to tell your story.

## Research and Organize Your Material

Before you begin taking pictures, collect as much information about your topic as possible. Naturally, the amount of time you spend on research will depend upon the scope of your report and how you plan to use it. Sometimes it's best to write all the information down so that you'll be sure not to leave anything out. An easy and economical way to do this is to use the planning card technique.

Planning cards are simply plain pieces of paper or cards (4" × 6" index cards make excellent planning cards). Each card represents one photograph. On each card, make a rough sketch (stick figures are fine) of what you want the picture to show. Then next to the sketch write all pertinent data, such as location, time of day, camera-to-subject distance, camera angle, and the message of the picture. Each card becomes an accurate blueprint that takes the guesswork out of picture-taking.

After you have completed your research, you are ready to organize your report. It's time to arrange the facts you have collected and determine the kind and number of photographs you will need to convey your message. Begin by arranging your planning cards in a logical or chronological order. Laying them out on the floor is usually a good way to do this. You'll probably find that you'll want to juggle the order of the cards several times to achieve the best sequence.



Long shot



Medium shot



Closeup

## Taking Your Pictures

After you've decided what pictures you'll need, go out and take them. Try to remember the elements of a good picture discussed earlier—good background, sharp images, correct exposure, etc. Also keep in mind when taking your pictures to include long, medium, and closeup shots for more impact in your story. This is known as the camera-to-subject distance. For example, if you're trying to establish a setting, choose a *long shot* that shows an overall view, such as a group of people.

If you want to focus on a particular person in the group, you probably would want to get a little closer. This is called a *medium shot* and narrows down the center of interest and features your main subject—the person in this case—at full-frame size. In other words, one person dominates the picture.

If you want to feature only something the person is holding or doing, you take a *closeup* shot. A closeup focuses on only one item of primary interest.

Vary your distances as well as your angles for best results. Use common sense and imagination, and when in doubt, always take more closeups; they add detail and spark interest.

Also remember to take advantage of on-the-spot inspiration. If you plan to take a shot one way and then see another, better way to take it, take both and see which one comes out better. And if something funny or unexpected happens during shooting, grab the picture while you can. Unplanned pictures can sometimes be your best shots.

you're saying. Then put them in order—not only chronological order of presentation, but also in an order that is visually attractive and sensible. Don't have jarring transitions from one slide to the next. Titles in your slide show are also helpful because they can give your audience important information about your story such as the subject, location, and perhaps the date. You can make your own titles by using alphabet blocks, finger paints, or chalk and a blackboard, but ready-made titles are easy to find. They can be found at the entrance to every park, on important buildings, and at the city line of almost every city you visit.



An illuminator is a big help when you edit slides.

To photograph them, just look at the sign through the viewfinder of your camera and move close enough to the sign so you can read it easily. Remember to check your camera instruction manual to find how close you can get and still have the picture in focus.

Before you actually make your presentation, rehearse it several times so you'll know what to say when each picture is on the screen. It's a good idea to limit your show to a maximum of 30 minutes and to limit each slide to a maximum screen time of 10 seconds. In fact, the shorter the better so your audience doesn't get bored. Position the

projector, the screen, and the chairs before your audience arrives. Be sure the chairs are placed so everyone has a good view of the screen. Test all your equipment beforehand and be sure to have a spare projector lamp on hand.

Signs make great titles.  
A sand title makes an  
appropriate introduction  
to a movie about a day  
at the beach.





Scene 1: 4 seconds

Scene 2: 10 seconds



Scene 3: 3 seconds



Scene 4: 4 seconds



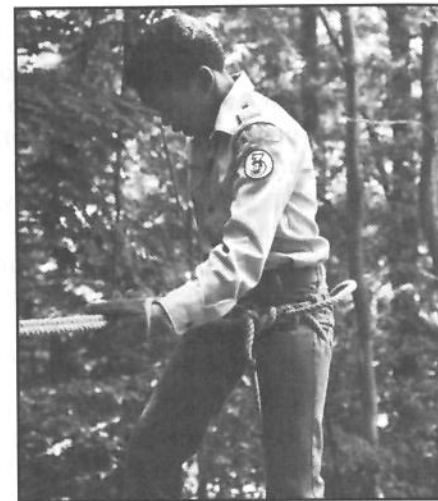
Scene 5: 5 seconds

## Movies

Movies are also a good way to present a photo story. They are effective when action is a critical part of your story. The same rules apply as for prints and slides. Use planning cards to prepare your presentation. Edit your movies in a storytelling sequence and try to include titles throughout your presentation to avoid lengthy explanations whenever possible.



Scene 6: 4 seconds



Scene 7: 6 seconds



Scene 8: 8 seconds



Keep in mind the scene length, which is the length of time a scene is on the screen. Most scenes last anywhere from 3 or 4 seconds to 10 or 12 seconds. Each scene should be only as long as it needs to be to capture the action of that scene. Some activities deserve only 5 to 6 seconds on the screen while others merit 10 or more. If you're filming a continuous activity, use lots of brief scenes made from different camera angles instead of one or two long scenes. This saves film and produces a more interesting movie.

As a general rule, the greater the camera-to-subject distance for a given subject, the longer the scene. For example, a long shot of a dog getting a bath should be on the screen for a longer time than a closeup of the dog's unhappy face. The important things to remember are to keep each scene on the screen only long enough to capture the action and make your point, and to use a variety of scene lengths in your movies. As a rule of thumb, use about 20 to 25 scenes for every 50 feet of film. Here's a movie story with captions to indicate an appropriate length for each scene. (See previous page.)

Rehearse ahead of time so you'll know what to say when the pictures are on the screen. And remember, don't make it too long or your audience may lose interest.

# Processing, Printing Black-and-White Film

So far we've been talking about the things you should know and consider while you have your camera in your hands, ready to take a picture. But what happens after you've taken a roll of prizewinners? Understanding the processes of film developing and printmaking is essential to acquiring a firm grasp of photography. Besides all that, processing and printing your own film are rewarding and lots of fun. With a little practice, you'll find it's easy, too.

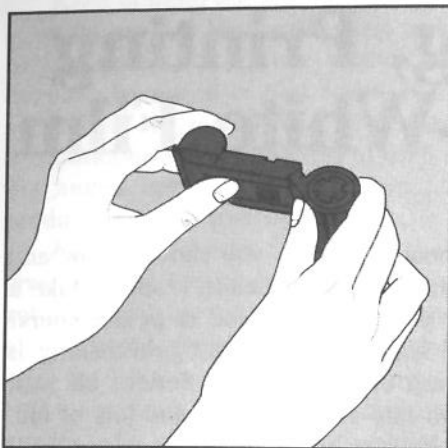
## Preliminaries

To process film you'll need a dark room for the loading of the film into a lighttight processing tank. Any room that you can completely darken will do. You can use a closet, basement, or kitchen, or even set up a permanent darkroom. Once the film is loaded into the processing tank, all the other steps can be carried out in normal room light. Sit in the room you're going to use as a darkroom for 5 minutes with the lights turned off. After 5 minutes, if you still can't see a sheet of white paper placed against a dark background, the room passes inspection. If there are light leaks, cover them with heavy cloth. Use a rug to cover the crack under the door.

## Equipment for Processing

- A processing tank designed to take your film size.
- A darkroom thermometer.
- A 32-ounce (946 milliliter) darkroom graduate or kitchen measuring cup.
- Some film clips or spring-type clothespins.
- Three large containers.
- Darkroom timer or a clock with a sweep-second hand.
- Chemicals: developer, stop bath, fixer, and a hypo clearing agent.
- Stirring paddle.
- Viscose sponge.





Opening 110 or 126 film.

## Processing Your Film

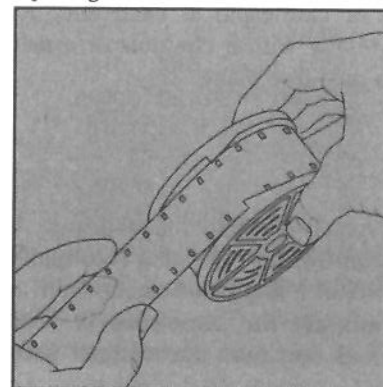
To get best results, carry out the procedure quickly and efficiently. It's a good idea to prepare a 3" × 5" card in advance for each step. As you complete a step, set that card aside to avoid confusion or repetition of a step. Become familiar with the procedure of loading film into your film tank. If you have a roll of out-dated film, use it to practice loading in room light, and

then in the dark. And to make things easier, line up the equipment you'll need—the film-processing tank, tank cover, film apron or reel, exposed film, scissors, and a can opener if you are processing 135 film—so you'll be able to locate each item quickly.

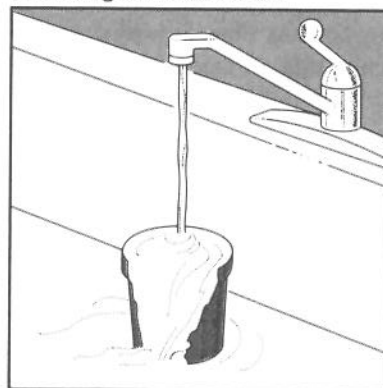
1. Label the three glass containers "Developer," "Stop Bath," and "Fixer." Mix the three solutions according to the instructions that come with the chemicals.
2. Pour the required amount of developer into the measuring cup or graduate. Stabilize the developer at 68°F (20°C) by placing the cup in a tray of warm or cool water. When the developer reaches 68°F (20°C), pour the developer into the developing tank. Rinse the measuring cup after each step.
3. **In total darkness** open your film as follows:  
*Roll film.* Remove the "Exposed" sticker. Peel the paper from the film, and cut free the end that's attached to the paper.  
*110 and 126 cartridges.* Break open the cartridge by bending the two cylindrical chambers toward the label. If you have 110 film, pull the paper backing out of the broken cartridge in a direction that rubs the paper against the cartridge. The film will come out along with the backing. Film in 126 cartridges is attached to the paper backing with a strip of tape. Detach the film and discard the paper and tape.



Opening 35mm film.



Threading film onto a reel.



Washing film in the tank.

*135 magazines.* Hold the magazine with the long spindle end down. Use a hook-type bottle opener to pry off the upper end cap. Rap the long end of the magazine sharply on a hard surface to release the film if it doesn't come out easily. (Leave the film spool attached to the inner end of the film until after you have wound the film onto the tank apron or reel. Then cut the film off the spool with your scissors.)

4. Handling the film by the edges, roll it into the apron or reel according to the tank instructions. Put the reel or apron into the tank, secure the lid, and start timing. You may now turn on the room lights.
5. Tap the tank against your working surface to remove any air bubbles. After 30 seconds, agitate the tank by inverting it, rotating it in a circular motion, or rotating the reels. Do this for about 5 seconds at 30-second intervals. At the end of the recommended developing time, pour the solution back into the developer jar. When pouring, tip the tank only slightly at the start.

6. With the tank tilted a bit, pour the stop-bath solution, stabilized at 65° to 75°F (18° to 24°C), through the opening in the top. Do not open the tank. Agitate gently for about 30 seconds, then pour the liquid back into its original container.
7. Add the fixer solution, stabilized at 65° to 75°F (18° to 24°C) and agitate as before. At the end of the fixing time, pour the solution into its container.
8. Remove the tank cover. Place the tank under a moderate stream of 65° to 75°F (18° to 24°C) water, and let the film wash for about a half hour. To shorten washing time, rinse the film in hypo clearing agent. First, wash the film for 30 seconds. Next, submerge it in a hypo clearing agent solution for 1 to 2 minutes, with moderate agitation. Then you need only wash in water for 5 minutes.
9. Hang up the film with a film clip or clothespin at each end. To speed drying, wipe the surfaces carefully with a chamois or a soft viscose sponge. Let the film dry in a dust-free place.

## Printing Your Negatives

Once you've processed your film, you'll want to make prints. A good way to help you select the best negatives for enlarging is to make a proof sheet first. A proof sheet consists of many prints made from a strip or strips of negatives. These prints are the same size as your negatives. They are made by placing your negatives into contact with photographic paper.

Since photographic paper is sensitive to light, you must handle it in a dark place. Paper isn't as sensitive to light as film, however, so you can process paper under safelight illumination. A safelight has a low-wattage bulb and a special filter.

## Additional Equipment for Printing

You can use some of the same equipment you used in processing. However, you'll need the following additional items in order to print your negatives:

- A printing frame and a 7-watt light bulb or an enlarger and a piece of glass. You can make a printing frame by using a piece of window glass and a piece of composition board. Both pieces should be the same size. Put one piece on top of the other and use wide adhesive

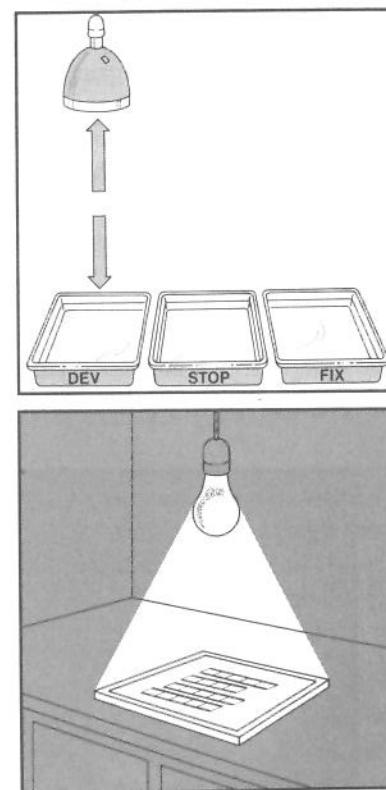
tape to make a hinge connecting the two pieces. (It's a good idea to tape the remaining edges of the glass so you won't cut yourself).

- Four 8" × 10" trays.
- A safelight with a light amber filter.
- Photographic paper, 8" × 10".
- Paper developer.

## Making a Proof Sheet

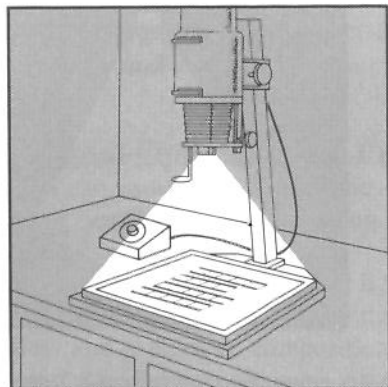
If you've processed your own film, you have already prepared the stop bath and fixer. Don't use film developer for photographic paper. Mix the developer for the paper according to the instructions. Pour it into a jar labeled "Developer," and start with step 2.

1. In your three large containers, mix the developer, stop bath, and fixer solutions according to the package instructions. Label the containers "Developer," "Stop Bath," and "Fixer."
2. Stabilize the developer at 65° to 75°F (18° to 24°C) and pour about ½ inch into the tray labeled "Developer."
3. Stabilize the stop bath at 65° to 75°F (18° to 24°C) and pour about ½ inch into a tray labeled "Stop Bath," or "Stop."
4. Stabilize the fixer at 65° to 75°F (18° to 24°C) and pour about ½ inch into a tray labeled "Fixer."
5. Arrange your trays in front of you so, from left to right, you have developer, stop bath, and fixer. Then rinse your hands well and dry them thoroughly. Turn off all lights except the



**NOTE:** It's a good idea to rinse your graduate or measuring cup after steps 2, 3, and 4.

5. safelight. The safelight should be placed at least 4 feet from your working area.
6. Open the package of paper, remove one sheet, and close the package again so light can't get in. Place your negatives on top of the paper so their dull side face the shiny side of the paper. The negatives should be near the light source. Cover with the glass.
7. If you're using a printing frame and a 7-watt bulb to make your proof sheet, hang the bare bulb 2 feet (0.6 meter) above the frame and turn it on for about 10 seconds. The length of time the bulb is on is called the exposure time. You may have to experiment a bit (see step 12) to get the correct exposure time for your negatives.
8. If you're using an enlarger, place the empty negative carrier in the enlarger, and set the lens at f/11. Adjust the enlarger height so the light covers an area just a bit larger than your paper. Expose for about 8 seconds. Again, you may have to experiment to get the correct exposure time.
9. Remove the paper from your printing frame and slide the paper, shiny side up, into the developer (left-hand tray). Rock the tray gently for 1 minute by tipping up first one end, then the other.
10. Take the paper out of the developer, and after letting it drain for a second or two, slide it into the stop-bath solution (center tray). Agitate the tray for 5 seconds in the same manner you did before.
11. Withdraw the paper from the stop bath and slip it into the fixer. Agitate frequently for 2 minutes, and keep it separated from any other prints in the tray. After the print has been in the fixer for 25



- to 30 seconds, you can turn on the room lights.
12. Examine your proof sheet. If most of the pictures seem too light, try again with double the exposure time you used at first. If most of the pictures seem too dark, use half the exposure time. It's a good idea to keep notes on your exposure times and the results. You'll soon be able to come up with a good average exposure time to use.

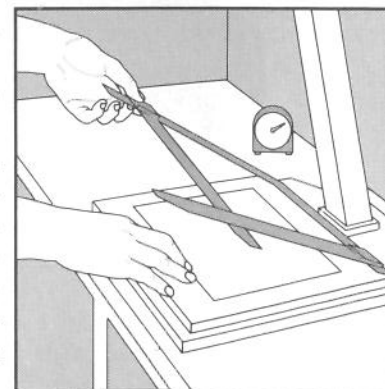
13. Using your fourth tray, wash the print for the time recommended in the paper instructions at 65° to 75°F (18° to 24°C). Use running water, and agitate the print frequently while it is washing.
14. Sponge or squeegee the surface water from both sides of the print and place it onto a flat surface to dry at room temperature.

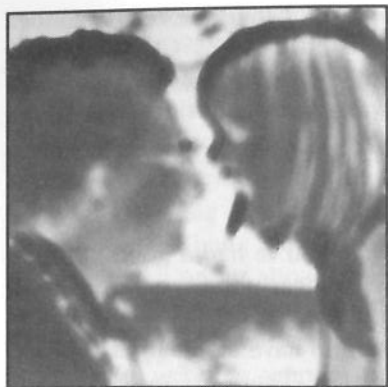
## Enlarging Your Negatives

If you've already made a proof sheet, you've had a good introduction to enlarging. The processing steps are nearly the same. And you'll be using the same chemicals used for the proof sheet.

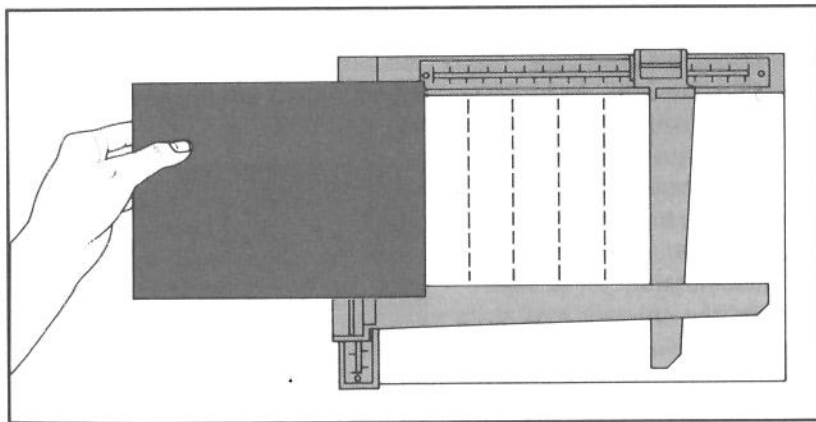
Before you begin, it will be necessary to have an enlarger, an easel to hold the paper, and a camel's-hair brush. There are many types of enlargers and a photo dealer will be glad to help you select one to suit your needs. Be sure to become completely familiar with it. Read the instruction manual. Now you're ready to begin.

1. Prepare your chemicals according to the instructions packaged with them.
2. Put about ½ inch each of developer, stop bath, and fixer into 3 trays, just as you did when making a proof sheet.
3. The wash tray goes to the right of the fixer. Or you can place it in a sink if one is convenient.
4. Holding the negative gently by its edges, dust it on both sides with the camel's-hair brush. Select the correct negative carrier (dust it also if it's glass), and place your negative into it so the emulsion side (the dull side) is down.
5. Slide a sheet of smooth, white, typing paper beneath the guides of the enlarger easel for a focusing aid; turn the safelight on and the room lights off. Wait a minute for your eyes to adjust.
6. Set the enlarger lens at its widest opening (the smallest number on the lens mount). Turn the enlarger on. By adjusting the height of the enlarger, arrange your picture so the desired negative image appears within the easel guides.





7. By adjusting the enlarger lens, bring your picture into the sharpest possible focus. Once this is done, change the lens setting to  $f/11$ , and turn the enlarger off. Take a sheet of enlarging paper, and place it onto the easel, emulsion (shiny) side up.
8. Cover all but a sixth of this sheet with a piece of cardboard, and turn on the enlarger. Every 5 seconds, slide the cardboard over to expose an additional sixth of the paper. At the end of 30 seconds, turn the enlarger off.



9. Process this test sheet for 1 minute in the developer and 5 seconds in the stop bath; then slide it into the fixer for 25 to 30 seconds, and turn the room light on.

10. From your print, choose the exposure time giving the most pleasing result. Turn out the room lights, and put a piece of photographic paper, shiny side up, into the easel.
11. Expose the paper and process it as you did the test print but with a 2-minute fixing time. Lights can go on after 25 to 30 seconds in the fixer. Wash the enlargement for the time recommended in the paper instructions at  $65^{\circ}$  to  $75^{\circ}\text{F}$  ( $18^{\circ}$  to  $24^{\circ}\text{C}$ ). Use running water and agitate the print frequently while it is washing.
12. Sponge or squeegee the surface water from both sides of the print, and place it onto a flat surface to dry at room temperature.





# Careers in Photography

Photography plays a vital role in our daily lives. As a leader in communications technology, photography offers a wide variety of career opportunities. Business and industry rely heavily upon photographers and technicians in advertising, public relations, marketing, research, quality control, and training. Photographers and technicians are needed in education and graphic arts; in federal, state, and local governments; and in the military services. Camera stores, photofinishing plants, newspapers, magazines, television stations, and the fields of freelance and commercial photography offer additional opportunities.

The continual growth of our national economy means new opportunities for talented, well-trained technicians and photographers. New careers in photography grow out of new technology and the increasing use of visual communication. There are usually plenty of photographers, but there would appear always to be a need for qualified technicians. Photographic knowledge and skills are an asset and a key to career advancement in many fields, including education, medicine, engineering, public safety, and research.

## Photographic Careers for Technicians and Photographers

Career Field	Photographic Opportunities
Advertising	Fashion, TV commercials, exhibits, newspapers, magazines, direct mail
Aeronautics	Research, publications, exhibits, TV and movies for education and training



A news photographer races to a scene of excitement.

Agriculture	Journalism, research, publications, slides, motion pictures, exhibits, television
Art and Illustration	Documentation, reporting, fashion, teaching
Business and Industry	Selling photographic equipment and supplies, photofinishing, microfilming and information storage, audiovisual training, document reproduction, photoinstrumentation, cataloging, research, public relations, publications, promotional films, sales training, documentation, reporting, equipment design and control, design and fabrication of instruments used in the photographic industry
Education	Teaching photography, preparing photographs for training manuals, making audiovisual aids and training films, curriculum development
Entertainment	Motion pictures, TV, animation, sports, recreation, travel
Journalism	TV, newspapers, magazines, sports, social events, politics, fashion, national or local events
Medicine	Photomacrography, pathology, X ray, surgery, laboratory research, photomicrography
Military	Aerial photography, combat training, research news, public relations, documentation
Oceanography	Underwater scientific photography—black-and-white and color, still and motion picture
Portraiture	Children, adults, notables, animals
Printing	Photoengraving, photolithography, rotogravure, stripping
Safety and Public Health	Detection and identification, reporting, training
Space Exploration	Research, reporting, publications, exhibits, photoinstrumentation
Transportation	Photomapping, recording, traffic control, instrumentation, safety, training, public relations, maintenance



## Education and Training

The training you need depends upon the photographic career you intend to enter. Also, the kind of work for which you can qualify depends upon your photographic education and experience. Photography courses in some high schools may prepare you for a career opportunity. However, you will need additional training in college, technical school, or the military services for most careers.

Almost every state has colleges, universities, or technical schools that offer courses in some phase of photography. Many colleges and universities have 4-year programs leading to a bachelor's degree with a major in photography. Some colleges and universities offer a master's degree with a major in a specialized area, such as color photography. Other institutions offer a 2-year curriculum leading to a certificate or associate's degree in photography.

Some high school graduates prepare for careers as professional photographers through 2 or 3 years of on-the-job training in a portrait or commercial studio. Many of these trainees are part-time students. Trainees get darkroom experience by learning how to process film and make enlargements. They often assist an experienced photographer in setting up lights, cameras, and props.

If you plan to enter industrial, scientific, or news photography, you will need considerable training after high school. Photographic work in scientific and engineering research requires a good background in science or engineering as well as in photography.

As a prospective photographer, you should be dexterous and have artistic ability. Imagination and originality are assets for commercial and freelance photographers. Press photography demands a good knowledge of news value and the ability to act quickly. If you plan to go into business for yourself, you should have good business sense and a pleasant personality.

## Pursue Your Interest

After consulting the section on "Photographic Careers for Technicians and Photographers," write down the career opportunities that appeal to you. Plan to explore the following aspects of your areas of interest:

- Educational background or training required.
- Employment outlook for this field.
- Earnings and employment conditions.
- Nature of the work.
- Equipment and techniques used.
- Advantages and disadvantages of this type of work.
- Personality traits suited to this type of work.
- Promotion opportunities.

You can find out about these aspects by consulting the following sources:

- Your guidance counselor or your Photography merit badge counselor.
- Publications in the school or public library.
- Specialists in your field of interest.
- Commercial, industrial, and governmental photographic installations.
- Family members and others in whom you have confidence.

# Glossary of Photographic Terms

**Adjustable camera.** A camera with manually adjustable distance settings, lens openings, and/or shutter speeds.

**Agitation.** Keeping the developer, stop bath, or fixer in gentle motion while processing film or paper. Agitation helps to speed and achieve even development and prevent spotting or staining.

**Aperture.** Lens opening. The opening in a lens system through which light passes. The size of the aperture is either fixed or adjustable. Lens openings are usually calibrated in f-numbers.

**Automatic camera.** A camera with a built-in exposure meter that automatically adjusts the lens opening, shutter speed, or both, for proper exposure.

**Background.** The part of the scene that appears behind the principal subject of the picture.

**Backlighting.** Light shining on the subject from the direction opposite the camera, distinguished from frontlighting and sidelighting.

**Bellows.** The folding portion in some cameras that connects the lens to the camera body.

**Blowup.** An enlargement; a print that is made larger than the negative or slide.

**Bounce lighting.** Flash or tungsten light bounced off the ceiling or walls to give the effect of natural or available light.

**Camera angles.** Various positions of the camera (high, medium, or low; and left, right, or straight-on) with respect to the subject, each giving a different viewpoint or effect.

**Cartridge.** A lighttight, factory-loaded film container that can be placed in or removed from the camera in daylight.

**Clearing agent.** A chemical that neutralizes hypo in film or paper, reducing washing time and helping to provide a more stable image.

**Closeup.** A picture taken with the camera close to the subject.

**Close-up lens.** A lens attachment placed in front of a camera lens to permit taking pictures at a closer distance than the regular camera lens alone will allow.

**Composition.** The arrangement of all elements in a picture: main subject, foreground, background, and supporting subjects.

**Contact print.** A print made by exposing photographic paper while it is held tightly against the negative. Images in the print will be the same size as those in the negative.

**Depth of field.** The distance range between the nearest and farthest objects that appear in acceptably sharp focus in a photograph. Depth of field depends on the lens opening, the focal length of the lens, and the distance from the lens to the subject.

**Developer.** A solution used to turn the latent image into a visible image on exposed films or photographic papers.

**Developing tank.** A lighttight container used for processing film.

**Easel.** A device to hold photographic paper flat during exposure, usually equipped with an adjustable metal mask for framing.

**Editing.** The process of selecting the shots and sequences that will be included in the final film, their length, and the order in which they will appear. Also, selecting slides for a slide show.

**Enlargement.** A print that is larger than the negative or slide; blowup.

**Enlarger.** A device consisting of a light source, a negative holder, and a lens, and a means of adjusting these to project an enlarged image from a negative onto a sheet of photographic paper.

**Existing light (available light).** Strictly speaking, existing light covers all natural lighting from moonlight to sunshine. By our definition for photographic purposes, existing light comprises the light that is already on the scene or project and includes room lamps, fluorescent lamps, spotlights, neon signs, candles, daylight through windows, outdoor scenes at twilight or in moonlight, and scenes artificially illuminated after dark.

**Exposure.** The quantity of light allowed to act on a photographic material; a product of the intensity (controlled by the lens opening) and the duration (controlled by the shutter speed or enlarging time) of light striking the film or paper.

**Exposure latitude.** The range of camera exposures, from underexposure to overexposure, that will produce acceptable pictures from a specific film.

**Exposure meter.** An instrument with a light-sensitive cell that measures the light reflected from or falling on a subject; used as an aid to selecting the exposure setting. The same as a light meter.

**Exposure setting.** The lens opening and shutter speed selected to expose the film.

**Film speed.** The sensitivity of a given film to light, indicated by a number (such as ISO/ASA 64); the higher the number, the more sensitive, or faster, the film. NOTE: ISO stands for International Organization for Standardization. ASA stands for the American Standards Association, the former name of the American National Standards Institute, Inc. (ANSI), that provides the standards for rating film.

**Filter.** A colored piece of glass or other transparent material used over the lens to emphasize, eliminate, or change the color or density of the entire scene or certain elements in the scene.

**Fixing bath.** A solution that removes any light-sensitive silver-halide crystals not acted upon by light or developer, leaving a black-and-white negative or print unalterable by further action of light.

**Flash.** A brief, intense burst of light produced by a flashbulb or an electronic flash unit, usually used where the lighting on the scene is inadequate for picture-taking.

**f-number.** A number used to indicate the size and light-passing ability of the lens opening on most adjustable cameras. Common f-numbers are f/2.8, f/4, f/5.6, f/8, f/11, f/16, and f/22. The larger the f-number, the smaller the lens opening. In this series, f/2.8 is the largest lens opening and f/22 is the smallest. These numbers indicate the ratio of the focal length of the lens to the effective diameter of the lens opening. F-numbers help you get the right exposure.

**Frame.** One individual picture on motion picture film. Tree branch, arch, etc., that frames a subject.

**Frontlighting.** Light shining on the subject from the direction of the camera, that is, from behind the photographer.

**Latent image.** The invisible image left by the action of light on photographic film or paper. The light changes the photosensitive salts to varying degrees depending on the amount of light striking them. When processed, this latent image will become a visible image either in reversed tones (as in a negative) or in positive tones (as in a color slide).

**Lens.** One or more pieces of optical glass or similar material designed to collect and focus rays of light to form a sharp image on the film, paper, or projection screen.

**Lens speed.** The largest lens opening (smallest f-number) at which a lens can be set. A fast lens transmits more light and has a larger opening than a slow lens.

**Long shot.** A scene taken from a relatively long distance. The main subject usually appears relatively small in respect to the entire frame size. In movies, a long shot is often used to establish the location and setting.

**Medium shot.** A picture or movie made about halfway between a long and a closeup shot to simulate normal viewing distance.

**Negative.** The developed film that contains a reversed-time image of the original scene.

**Negative holder.** A device designed to hold the negative in proper position in an enlarger.

**Normal lens.** A lens that makes the image in a photograph appear in a perspective similar to that of the original scene. A normal lens has a shorter focal length and a wider field of view than a telephoto lens and a longer focal length and narrower field of view than a wide-angle lens.

**Overexposure.** A condition in which too much light reaches the film, producing a dense negative (dark) or a washed-out (too light) print or slide.

**Panning.** Moving the camera so that the image of a moving object remains in the same relative position in the viewfinder as you take a picture. Also, moving a movie camera in a horizontal or vertical plane while taking movies for a panorama effect. *Panning should be used sparingly in movies.*

**Planning cards.** Pieces of paper (for example, 4" x 6" index cards) used to plan a movie or a photo story. Each card represents one picture, one shot, or one scene. A rough sketch of the shot and any pertinent information, such as location, camera angle, camera-to-subject distance, and message the shot should convey, can be put on the card.

**Positive.** The opposite of a negative; an image with the same tonal relationships as those in the original scene—for example, a finished print or a slide.

**Print.** A positive picture, usually on paper, and usually produced from a negative.

**Printing frame.** A device used for contact printing that holds a negative against the photographic paper. The paper is exposed by light from an external light source.

**Processing.** A procedure during which exposed photographic film or paper is developed, fixed, and washed to produce either a negative image or a positive image.

**Rangefinder.** A device included on many cameras as an aid in focusing.

**Safelight.** An enclosed darkroom lamp fitted with a filter to screen out light rays to which film and paper are sensitive.

**Shutter.** Blades, a curtain, a plate, or some other movable cover in a camera which controls the time during which light reaches the film.

**Sidelighting.** Light striking the subject from the side relative to the position of the camera; produces shadows and highlights to create modeling on the subject.

**Simple camera.** A camera that has a few or no adjustments to be made by the picture-taker. Usually, simple cameras have only one size of lens opening and one or two shutter speeds and do not require focusing by the picture taker.

**Single lens reflex camera.** A camera in which the scene to be photographed is reflected by a mirror onto a glass where it can be focused and composed. In other words, the scene is viewed through the same lens that takes the picture.

**Slide.** A photographic transparency, usually color, mounted for projection.

**Splicer.** A mechanical device used to join two pieces of film together. A splicer is essential for editing your films.

**Stop bath.** An acid rinse, usually a weak solution of acetic acid, used as a second step when developing black-and-white film or paper. It stops development and makes the hypo last longer.

**Transparency.** A positive photographic image on film viewed or projected by transmitted light (light shining through film).

**Underexposure.** A condition in which too little light reaches the film, producing a thin negative, a dark slide, or a muddy-looking print.

**Viewfinder.** A viewing device on a camera designed to show the subject area that will be recorded on the film. Also known as *finder* and *projected frame*.

# Books About Photography

Recommended by the American Library Association's Advisory Committee to Scouting.

## Photography

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### **Other Helpful Sources**

Books on a variety of photographic topics are available through your photo dealer. For a list of current titles send for a free copy of "Photography Books from Kodak" (L-7). Address request to Department 412-L Eastman Kodak Company, Rochester, NY 14650.

### **Acknowledgements**

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## **NOTES**