Exploring Photography
The 4-H Photography Program

The 4-H photography program centers around five manuals. Three manuals take you from beginning photography to intermediate photography to advanced photography. A fourth manual leads you into the darkroom where you learn how to process and print your own film. And a fifth manual introduces you to moviemaking. For your special interests, there are several four-page skill sheets. The skill sheets examine topics like news photography and careers in photography. Here's a list of all the 4-H photography publications.

Unit 1: Adventures with Your Camera
(for the beginning photographer)

Unit 2: Exploring Photography
(for the intermediate photographer)

Unit 3: Mastering Photography
(for the advanced photographer)

Darkroom Techniques
(for the person who wants to process and print his own film)

Exploring Moviemaking
(for the person who wants to make movies)

Advanced Skill Sheets
(self-determined projects)

Awards Available in 4-H Photography

County:
Four gold medals of honor in photography

State:
An expense-paid trip to National 4-H Congress

National:
Six educational scholarships of $1000 each. In addition, a scholar incentive grant of $500 is given to those national winners whose grades rank in the upper half of their class during the semester they use the $1000 scholarship.

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In teaching photography, 4-H'er Sheila Looper of Mansfield, Arkansas, stressed the fundamentals covered in Unit 1. From time to time you, too, may want to review Unit 1.

**INTRODUCTION**

Unit 2 is where the action really starts. In Unit 1 we covered basics like getting close, keeping people busy, and using a simple camera and flash. Now you can tackle some of the fundamental principles of photography — the principles that allow you to start experimenting and allow you to start expressing yourself through photography.

The subjects in this unit are critical to an understanding of making pictures. We'll first talk about making a picture look right — how to get the best picture possible by studying your surroundings and by using simple guidelines that artists have used over the centuries. Then we'll discuss light and how it works with film and a camera to make a picture. We'll show you how to set an adjustable camera for different lighting conditions and for different subject situations. We'll also explore action photography and learn how to stop fast-moving subjects.

If you're unsure about working your adjustable camera you can learn about its controls by starting on page 21. Come back to page 1 later. If you have a simple camera, you can still do the first half of this book. For the second half you might be able to borrow an adjustable camera or work with somebody who has one, or you can just read and learn about how an adjustable camera works.

**Things You'll Need**

1. A camera that takes still pictures. Any camera will be OK, but we recommend an adjustable or automatic camera with aperture and shutter speed controls as some sections of this manual discuss using aperture and shutter speed controls.

2. Two rolls of 36-exposure film or four rolls of 20-exposure film. One of the rolls should be 36-exposure color slide film for assignments 6 and 7.

3. Photogram materials — see page 17.

4. A large piece of white cardboard to use as a reflector.

5. A flash unit for your camera.

If you have trouble obtaining what you need, ask your photo dealer for help. He or she can give you advice about which materials to buy and how to stay within a budget. If there's no photo dealer nearby, ask one of these people for help:

- County Extension Agent
- Professional photographer
- Photography teacher
COMPOSITION

Composition is the arrangement or position of subjects within a photograph. More simply, it's where the subject looks best in a picture. Photographs of the same subject can have many different compositions (arrangements). Look at the photos on this page. The composition changes from picture to picture. In one picture, the boy is in the top left corner, in another he's in the top right corner. In the other two pictures he's in the center of the picture, but he's much bigger in one than in the other.

You can change composition in many ways. Move close to make the subject appear larger. Move away to make the subject appear smaller. Climb onto something or crouch to change the angle of viewing the subject. Walk around the subject for a back or side view. Slightly shift the camera to move the subject from right to left within the picture area. Before you take a picture consider the many possible compositions, then choose the one that best suits your subject. Composition is like a jigsaw puzzle scattered across a table. All the pieces are there, but you have to sort, separate, and match them to make the picture.
Here's a picture with good composition. The photograph tells a complete story — a successful day of fishing — with no extra subjects. The photographer used a low angle to isolate the fishermen and canoe against the sky.

Seeing — You and Your Camera

To learn composition you must learn to see as your camera sees. Look at the bottom picture. Now close your eyes (no peeking) and list everything you saw in the picture. Did you remember the window? How about the signs and car? Like the photographer who took this picture you probably saw the girl and nothing else. But the camera saw and recorded everything. It saw the signs, the car, the sidewalk, the wall, the window, the door, and oh yes, the girl.
The camera sees everything. It always does. But often you see only what interests you. If you're thirsty, you open a cupboard and remove a glass. Although you looked in the cupboard, do you remember everything you saw in there? Not likely. A camera would have. You must see everything in the picture you're about to take. When you learn to see everything, you'll be able to rid your photographs of trivial things.

Isolate the subject

Let's compare these two photos of the same boy. In the top photo you see the boy and at least ten other things. In the bottom photo you see the boy and only a few other things. Which photo would you say directs more attention to the boy? Certainly not the top photo — it's too cluttered. The bottom photo directs more attention to the boy. He's practically the only thing to look at. If you look at the picture, you have to look at the boy. That's good composition. And it works by isolating the boy.

How do you isolate a subject? First you have to realize it's not isolated. Remember, when you're looking through the viewfinder, you often forget to see all of what's going to be in the picture. You must be aware that your subject is not isolated. Once you know that, try to isolate your subject with one of the four ideas on the next page.
1. Remove the extra things from the picture area.
2. Move your subject to an uncluttered area.
3. Move yourself. Bend down for a low angle so the sky forms a plain background or climb up onto something so the ground forms a plain background. Walk around your subject to find a viewpoint that isolates it.
4. Move close until the subject fills the viewfinder.

Project 1
Take five pictures of different subjects. Let each picture show no more than three things in it. This means that as you look through the viewfinder you will have to count each thing you see. Get rid of those extra things by:
- Removing them
- Moving the subject
- Moving yourself
Subject Position in Picture

Do you usually place your subject in the center of the picture? Why? You don’t have to. It’s OK if your subject shows up left of center or right of center in the picture. In fact, your pictures might look more lively and interesting when your subjects are off-center.

Persons in pictures also look better when off-center. But leave more room in front of a person’s head than behind. When you take scenic pictures, keep the horizon off-center, too, unless you want your pictures to look like they were folded across the middle. Place the horizon low and you have a picture full of sky to soar into. You have freedom, airiness, spaciousness, and great distances yawning into the beyond. Place the horizon high and you have a picture full of ground to walk on. You have confinement, nearness, short distances tying you to the earth.

However, symmetrical subjects and balanced subjects often look good in the center of the picture, where their symmetry is preserved.

Vertical or Horizontal Pictures

Once you find a good subject, the first step in composition is to decide whether to photograph the subject vertically or horizontally. Tall things usually look good in a vertical picture — it stresses the height. Wide or long things usually look best in a horizontal picture — it stresses the width. Of course, if your camera makes a square picture, you don’t have to worry.
When you don't leave room in front of a person's face, the picture seems to press in against the face.

More room in front of a face than behind leaves a portrait with a little breathing room.

Low horizon: spacious sky
Mid-horizon: picture looks folded
High horizon: spacious earth
Lines and Shapes

What do you see in the top photograph? Although there are three people, you probably also see a triangle. The human eye seeks shapes and lines within a photograph. When it finds them, it is somehow pleased.

Some lines you can’t miss. These lines might be in the form of a road, a fence, or a rooftop.

Other lines are not as obvious as a road or fence. They seem to be hidden in the picture as if they were waiting to be drawn between the dots in a connect-the-dots picture. You may not be aware of these lines but your eyes usually see them anyhow. These hidden lines and the shapes they form attract your eye; they make you look at them. In this way hidden shapes and lines point at the main subjects and keep the viewer from straying to less important parts of the picture.
Framing

Another way of showing the viewer the main subject is framing. Framing can call attention to your subject just as a real picture frame separates a painting or photograph from its surroundings. You don't need to put your subject in an actual frame when you take a picture. You only need something to act as a frame: a pair of legs, a window, the crook of an arm or a tree, an opening in a leafy branch.

By showing something near and something far, framing also adds dimension to a picture.

Through framing, 4-H'er Robyn Dayley of Burley, Idaho, has hidden much of this girl's face and created a sense of mystery. Who is she? What's she doing hiding behind a tree?
Patterns
Pattern is the repetition of shapes and lines. Patterns arrange a picture and hold it together. Bold and uniform patterns leave no doubt as to what you're seeing. You can find them everywhere: a wall of windows, a basket of grapes, a table set for dinner.

Patterns don't always have to be exact repetition. A break in the pattern can bring surprise.
Perspective

Because photographs are flat pieces of paper, you can’t always be sure of the real sizes of things or distances between them. It’s easy, though, to show size and distance.

When you take a picture of something far away, such as a mountain, include something nearby in the picture, such as a branch or a boulder. The nearby branch brings the viewer to the position where the photographer stood and makes the mountain seem even farther away.

To show that a subject is massive or tall, show something of a known size next to it, such as a person.
Textures

Texture can be as smooth as a popsicle sliding by your lips or as rough as gravel scratching your hands. It can be as sharp as a razor blade or as dull as a pencil eraser. You know texture by touch, by how it feels to your fingers, your feet. So when you see texture in a picture, you know how it feels. For instance, when you see a picture of old barn wood, you can almost feel it. And when you see a photo of a rutted dirt road, you can almost feel the bumps from the last time you bounced and rattled along a similar dirt road.

Pictures that show texture remind us of feelings and cause us to react. Smooth (milk carton, phone, desk top) is nice, rough (gravel, fence, straw) is abrasive, sharp is dangerous, and so on.

By knowing how people react to texture in your pictures, you can make your pictures "feel" the way you want them to.

Lighting is very important in showing texture in a picture. Sidelighting emphasizes the texture. The deep shadows of sidelighting can make even an eggshell seem rough. Frontlighting or toplighting deemphasizes texture. It can make a rutted road appear smooth.

Project 2

1. Take three pictures of the same subject with the subject located in different positions within the picture. Which position looks best?

2. Take two pictures of at least four of the following topics:
   - Horizon lines or shapes within a picture
   - Person in center of picture
   - Person not in center of picture
   - Patterns
   - Texture
   - Color
   - Depth
Color and Your Photos

Some pictures shout with color, others whisper. It's not easy learning what colors, what brightness, and what color combinations should be in your pictures. Often you don't have a choice of colors — they're simply there. You can't always wait for a gray sky to turn blue or for the snow to melt into green grass. But sometimes you can wait. And then you can use a blue sky as a background for a red barn.

Which color combinations are good and which are bad? There's no easy answer to that question. You may like the same colors that somebody else dislikes. So who is right? You both are. Because so many people like so many colors, there can't be any rules for choosing colors. But there are some ideas on how to use different colors and to judge their effects.

The colors and brightness range in a picture can make a subject stand out or fade into the background. For instance, by changing colors to match its surroundings, a chameleon can make itself nearly invisible so that no other animals can find it. By putting on a bright orange vest, a hunter can make himself clearly visible so that he can be seen and not accidentally shot. The hunter's orange vest greatly differs from the background of the woods.

The word contrast is used to describe how different the colors and brightnesses within a picture are. Colors that are very different, like blue and yellow, have a lot of contrast. Colors almost the same, like orange and red, have little contrast.

Contrast can make your subject stand out or fade into the background. A boy in a red shirt playing baseball on a dirt field stands out, but a white barn fades into a cloudy sky.

Pictures with few contrasting colors are often delicate and muted. Many colors may abide in such pictures, but similar colors flow and wash together as one. Mists from fog or rain subdue and blend colors. Pictures with low contrast seldom have a dominant subject to display. Rather, they display the soft colors themselves and often evoke peaceful or sad feelings.
Birth of a Photograph

I saw this lighthouse and thought I'd like to photograph it. The first thing I had to decide was whether I wanted a vertical or a horizontal picture of it. It was tall so it seemed like a vertical picture would be good. I tried that first.

But a long catwalk led up to it so maybe a horizontal picture showing the catwalk and lighthouse would be better. Should I use a low, high, or normal angle? I decided for a fairly low angle. That way the lighthouse would look tall even though it was in a horizontal picture.
I decided the position of the lighthouse in the second picture wasn't quite right. The picture showed the catwalk better than the lighthouse, which was the main subject. The picture also didn't show the snowy, blustery weather. So I moved back and to the side to show the snow as well as the lighthouse.

But something was still missing from the picture, and I wasn't quite sure what it was. Then just as I was taking another picture somebody walked out onto the catwalk. You know what? I like this picture even better. The person standing on the catwalk shows how far it is to the lighthouse and a cloud of blowing snow makes it seem extra cold.
LIGHT AND PHOTOGRAPHY

The Greek roots of the word photography—photo, graphos—mean writing with light. Film is the surface you write on and the camera is the writing tool. Light reflected from your subject is the ink.

Film is a plastic ribbon coated with a light-sensitive substance called the emulsion. The emulsion is usually a clear material that contains silver halide (a chemical compound that consists of silver and usually bromine).

Areas in the negative struck by bright light turn black; areas struck by not-so-bright light turn gray, and areas that receive no light remain clear. That’s why a black-and-white negative looks the opposite of the scene you remember.

When you take a picture, light strikes the emulsion and an invisible change takes place in the silver halide particles.

When the exposed film is treated in special chemicals, the invisible image in the emulsion becomes visible.

When processed in chemicals similar to those used for the film, the paper will have a scene that looks like the one you photographed. The light goes through clear areas in the negative that represent dark areas in the scene to make dark areas on the print. Dark areas on the negative (light areas in the scene) block light from reaching the paper, which remains white when processed.

Naturally, when film and photographic paper are manufactured and used, they are handled in darkness—otherwise they might be spoiled by light. Your camera is also completely dark inside when closed. And the area where film is processed and prints are made is dark—completely dark for film. Paper can be handled under special lights called safelights.

To get the scene looking normal, more light must be projected through the negative onto a piece of photosensitive paper that has an emulsion similar to that of the film.
What You Need

1. A few sheets of 8 x 10, black-and-white photographic paper.* Keep it in the dark.
2. A very dark place. Closets, bathrooms, basements, attics, even kitchens are OK — especially at night. Cover the counter with plastic to prevent stains from chemicals.
3. 4 glass baking dishes bigger than 8 x 10 inches
4. 3 chemicals (sometimes offered as a kit) to process black-and-white paper: developer, stop bath, and fixer.*
5. A simple safelight.* This is a special light that photographic paper does not react to.
6. A bright light such as a desk lamp

* Ask your photo dealer for recommendations.

Preliminary Steps

1. Position the safelight at least 4 feet from the processing trays and desk lamp.

2. Make sure the room is dark with no light slipping in through cracks. Cover any light leaks with newspaper or masking tape.

3. Mix chemicals according to instructions and put them into 3 of the baking dishes. Fill the last baking dish with water. (It's best if you put the last baking dish into a sink where you can run water slowly into it.)

4. Set up the bright light.
How To Make a Photogram

1. Turn off all lights but the safelight. Lay a piece of photographic paper flat on your working surface.

2. Arrange some small, interesting objects on top of the paper.

3. Shine the bright light over the objects and paper for at least 10 seconds. Then turn off the bright light.

4. Follow chemical kit instructions for processing the paper. Usually it goes like this:
   a. Put exposed paper into developer for 90 seconds. Agitate by lifting corner of pan every 5 seconds.
   b. Remove paper from developer — place into stop bath for 10 seconds.
   c. Remove from stop bath — place into fixer. After 10 seconds you can turn on the room lights to see how your photogram looks. But 5 minutes in the fixer is necessary to make the image last.

5. Analyze your first photogram. In areas where no objects existed, the paper should be black. Areas covered by objects that block all the light should be white. Areas covered by translucent objects that pass some but not all of the light should be gray.

6. Experiment with different objects. To make gray areas, try removing objects after a few seconds of exposure of light. Experiment with different exposure times (how long you leave the light on) for different effects. Try making scenes with objects and paper cutouts. See what images glassware makes.

NOTE: If you liked making photograms, you might enjoy learning how to process film and make prints. See Darkroom Techniques.

Film

Film comes in many shapes and sizes. To help you choose your film, we'll explore some of the advantages of different kinds of film.

First, there's size — the film must fit your camera. Film comes in one size for 35 mm cameras, another size for 126 cameras, a much smaller size for 110 (pocket) cameras, and a much bigger size for 120 cameras. The pictures from 120 and 126 cameras are usually square, and those from 35 mm and 110 cameras are rectangular.

Different films give different kinds of pictures. Some make color negatives that a photofinisher uses to make color prints. Some give color slides that you project for a really big image. Other films make black-and-white prints.

Films are available with different sensitivities. Some films require more exposure than others. When you choose a film, answer these questions:

1. Does it fit my camera?
2. Do I want color slides or color or black-and-white prints?
3. Do I want medium-speed film for normal outdoor lighting and normal subjects?
4. Do I want a slow-speed film for extra sharp pictures of motionless subjects in bright light?
5. Should I ask for a high-speed film for dark conditions or for fast shutter speeds with fast-moving subjects?
How a Camera Works with Light

You probably remember from Unit 1 how a simple camera works with light and film to make a picture. A hole behind the lens called the aperture lets in a certain amount of light to the film, but only when the shutter is open. When the shutter is closed, no light gets to the film. With a simple camera the hole or aperture is one certain size and the shutter stays open for the same length of time for all pictures. The size of the hole and the length of time that the shutter stays open are planned by the camera designer to give you pictures that are clear and bright on sunny days and with flash.

With a simple camera like this one, all you do is press the shutter release. It has no adjustable shutter, aperture, or focus.

Often packaged with 120 and 135 film, the film instruction sheet gives exposure recommendations for indoor and outdoor lighting, tips on film care and loading, and other information. Read one to learn more about the film you are using.
Underexposure:
Too little light reaching the film makes a dark picture.

Film needs a certain amount of light to make a bright picture — this picture-taking light is called the exposure. If the film gets too much light, the picture will be too light (overexposed). If it gets too little, the picture will be too dark (underexposed). On very dark days outdoors and indoors without flash, a simple camera would take a very dark picture. The reason is that not enough light gets to the film — the aperture is fairly small and the shutter doesn’t stay open very long. If you could make the aperture bigger or hold the shutter open longer, your picture would look OK. And that’s just what you can do with an automatic or adjustable camera.

Correct exposure:
The correct amount of light reaching the film makes a picture of correct brightness.

Overexposure:
Too much light reaching the film makes a very light picture.

Although rangefinder cameras like the one this girl is holding can be partially automatic, most have some adjustable controls, such as aperture and shutter speed selection. However, rangefinder cameras do not allow changing of lenses.

In this cutaway view of a rangefinder camera, you can see that the leaf shutter and aperture are built into the lens. In single-lens reflex cameras, the shutter is part of the camera body and not part of the lens.
Adjustable Camera

In an adjustable camera, you can change the size of the aperture. If you make the hole larger, more light will come through. If you make it smaller, less light will come through. The shutter is also adjustable. You can choose how long it stays open to admit light to the film. The longer it stays open, the more light it lets in to the film. The reason for these adjustments, of course, is to allow you to take pictures when the light is dim or when it's very bright—all you have to do is change the shutter speed and aperture opening.

By turning the aperture ring to a larger number, you decrease the size of the aperture.
Film Speed

Because you can choose how much light gets to the film, you can use different films that need more or less light. The amount of light a film requires indicates that film's sensitivity. This sensitivity is commonly described in terms of speed (slow, medium, fast) and is denoted by an ISO(ASA) number. ISO stands for International Standards Organization; ASA stands for American Standards Association. Some films aren't very sensitive to light so they require larger apertures and/or slower shutter speeds than more sensitive films. They are called slow films and they are usually identified by a low ISO(ASA) number such as ISO(ASA) 25 or ISO(ASA) 32. The advantage of slow films is that they take very sharp pictures. Most people, however, use medium-speed films which are more sensitive to light than the slow films. They have ISO(ASA) numbers that range from 64—125. Medium-speed films are good in most situations — sunlight for most of the day, flash indoors, and sometimes bright days indoors without flash. You can use smaller apertures and faster shutter speeds than with slow films. You'll see the advantage of this when we discuss depth of field and action. Finally, there are high-speed or fast films with ISO(ASA) numbers of 160—400. These films are very sensitive to light and are used to take pictures where the light is dim. They also allow you to use very small apertures and/or very fast shutter speeds.

Aperture and Shutter Speed

Now that we've mentioned shutter speed and aperture, let's find out how they work in an adjustable camera.

Aperture

You can change the size of the aperture to let in more or less light by turning the aperture ring. The smaller numbers on the ring stand for bigger holes and the bigger numbers stand for smaller holes. Each number makes a hole size that lets in half or double the amount of light of its neighbors. Typical numbers may range from f/1.4 (smallest number — largest hole size) through f/2, f/2.8, f/4, f/5.6, f/8, f/11, f/16, to f/22, a very small hole that lets in a small amount of light. (The f shows that the number means aperture size.)

Shutter Speed

You know that the shutter speed controls how long light can get through the aperture and hit the film. It's controlled by a knob or dial marked with some or all of these numbers: 1000, 500, 250, 125, 60, 30, 15, 8, 4, 2, 1, B. The numbers stand for fractions — 1000 really means 1/1000 second and so on down to 2, which means 1/2 second; 1 means 1 second. B is a setting that allows you to keep the shutter open as long as you want. Notice that each shutter speed is either double or half the speed of its neighbors. By changing from one shutter speed to the next, you can either double or halve the length of time that light gets into the camera.

To make more sense out of these numbers, it's helpful to know that changing from one aperture to the next smaller aperture (from f/8 to f/11, for instance) makes the same change in exposure as changing from one shutter speed to the next faster shutter speed (from 1/125 second to 1/250 second). In reverse the same is true. Changing from f/16 to f/11, making the aperture one size bigger, is the same as changing the shutter speed from 1/60 second to 1/30 second, slowing the shutter speed by 1 stop.
Photographers often use the word *stop* to describe aperture openings — *f*-stops. *f*-numbers are the same as *f*-stops. Changing from one aperture size to the next larger (from *f*/*8* to *f/*5.6, for instance) is usually called opening up one stop. Like any kind of slang or jargon, the words and phrases of photography have gotten a little sloppy. Changing from one shutter speed to another is also described in stops. If you change from 1/125 second to 1/500 second you have made a 2-stop change.

Why so many shutter speeds and aperture settings? Primarily to help you get well-exposed pictures in scenes with different amounts of light and with different films. A bright sunny day requires an exposure setting for a medium-speed, ISO(ASA) 100 film of *f*/16 (aperture) and 1/125 second (shutter speed). *f*/16 is a very small aperture and 1/125 second is a fairly fast shutter speed. In a dark scene such as in the top picture the exposure might be *f*/2 at 1/30 second on high-speed ISO(ASA) 400 film. *f*/2 is a very big aperture and 1/30 second is a fairly slow shutter speed.

The beach scene is more than 2000 times as bright as the dark scene, but with an adjustable or automatic camera you can still get good pictures. You can even take portraits by moonlight.
Generally, you'll use medium- fast shutter speeds—1/60, 1/125, 1/250. For most daylight photographs, your aperture settings will vary depending on the shutter speed and the scene brightness. Probably from f/5.6 to f/16, and you will probably use a medium-speed film, ISO/ASA 40–125.

On very dark days, at night, or indoors, you'll use a fast film, ISO/ASA 160–400, slow shutter speeds, 1–30 second and slower, and large apertures, f/2.8 or larger.

By now you probably realize that for any scene there are several combinations of shutter speed and aperture that will give a well-exposed picture. For instance, using a film with a speed of ISO/ASA 100, a sunny day picture can be taken with f/16 at 1/125 second, f/11 at 1/250 second, f/8 at 1/500 second, and f/4 at 1/1000 second. These combinations all let in the same amount of light.

Very interesting, but with so many combinations that give the right film exposure, how do you choose? Good question! Besides controlling exposure (amount of light), the aperture size and shutter speed affect your pictures in other ways too, and this will help you choose the right combination for each picture.

**Depth of Field/Aperture Control**

The aperture setting is very important in determining how much of your picture will be in focus—which is called depth of field. The smaller the aperture, the more of your picture will be in focus. Larger apertures give less area in sharp focus.

If you take a scenic picture and want to have the foreground and background sharp—use a small aperture such as f/16. For a picture of a person in which you want to emphasize the subject, use a large aperture such as f/2.8. The person will be sharp, but the background and foreground will be fuzzy and out of focus. These examples show you how you should make your decision about aperture.

You'll notice that there is a way to compare f-numbers you set on the aperture ring and the distance of your subject. Check the distance setting on the lens (page 25) and you'll find a double set of f-numbers or slashes that correspond to the f-numbers on the aperture ring. When you have focused the lens on your subject, check the distance scale (page 25). Not only will you find the distance of the subject, but you'll find the depth of field as well, which is the area between the two marks that correspond to your aperture.
Compare the depth of field (area in focus) of these two pictures. The large aperture of f/2.8 used in the top picture makes only the front girl in focus. The small aperture of f/16 used in the bottom picture makes all the kids and the background in focus.

To determine the depth of field for a specific aperture, say f/8, find the left-hand and right-hand 8's on the bottom row of numbers. Make imaginary lines from those 8's to the distance scale on top. The distance between those imaginary lines on the distance scale is the depth of field.

Note that with a small aperture, the depth of field increases both in front of and behind the subject.
Action/Shutter Speed
Fast shutter speeds (1/250, 1/500, and 1/1000 second) will freeze a fast-moving subject into a sharp, clear picture. Slow shutter speeds, 1/30 second, 1/15 second, and slower, will show a moving subject as a blur. Fast shutter speeds also lessen the effect of camera movement, so that more of your pictures will be sharp. If you use a shutter speed slower than 1/30 second, mount the camera onto a steady surface or a tripod for sharp pictures.

Both sharp and blurred action pictures can be dramatic. You can choose either, depending on how you set your camera. We'll be talking about action later, starting on page 36, so stay tuned as we give a brief overview of exposure meters and how to use them.
With this manual camera, you adjust the shutter speed dial and aperture ring until the needle lines up in the slot. When the needle is lined up, exposure should be correct. The plus sign indicates overexposure (too much light). The minus sign indicates underexposure (too little light).

With this automatic camera, you adjust the aperture ring and the camera selects the correct shutter speed when you press the shutter release. The viewfinder shows what aperture you've chosen and the corresponding shutter speed.

Using an Exposure Meter

Exposure meters measure light and recommend several combinations of shutter speed and aperture for that scene.

Most automatic and adjustable cameras have built-in exposure meters, and this includes most 35 mm cameras. If your camera is automatic, you generally set either the aperture or the shutter speed; the exposure meter gauges scene brightness and then sets the other adjustment automatically. An adjustable camera with a built-in meter requires you to set both adjustments, but the meter tells you when you've got the exposure right. Until built-in meters were made, hand-held meters were almost always used with an adjustable camera. To use a hand-held exposure meter, you simply aim the light-sensitive window at the scene to get recommendations for camera settings.

To use a reflected light, handheld exposure meter, first set the film ISO (ASA) number on the meter. Then point the meter at the subject. The meter will indicate the appropriate aperture and shutter settings.
Since exposure meters vary, read your instruction manual carefully to operate the meter properly. Although meters work differently, there are some good practices that will help you get good pictures with any meter.

1. Every time you load another roll of film into your camera, make sure you set the film ISO (ASA) number on the meter.

2. Move close to the main subject to take exposure readings. Since that subject is the most important, it should be correctly exposed.

3. An exposure meter is not perfect. Since most subjects are of average brightness, the designers of the meter made it to give good pictures of those average subjects. But not all subjects are of average brightness. A black coat is much darker than average and a field of snow is much lighter than average. The meter will make a black coat look too light and a field of snow look too dark, unless you take control. To make a light subject appear light in the picture, open up 1–2 stops (f/8 to f/4, for example) from what the meter indicates. To make a dark subject appear dark in the picture, close down 1/2–1 stop (f/8 to f/11, for example) from what the meter indicates. If a dark or light subject fills only a small portion of the viewfinder, just use the exposure setting indicated by the meter.
Some scenes have both very bright areas and very dark areas. Film cannot generally record details in bright areas and dark areas in the same picture. You have three choices: you can set your camera to record details in the bright area; you can set your camera to record details in the dark area; or you can set your camera somewhere between. Determine whether one area is more important than the other and expose for it. If the areas are equal in importance, average the exposure.

If you set the exposure midway between the exposures for the sunlit and shaded subjects, you can see some detail in both subjects. Note, however, that the sunlit subject is still slightly overexposed and that the shaded subject is still slightly underexposed.

If you set the exposure for the sunlit subject, the shaded subject is underexposed.

If you set the exposure for the shaded subject, the sunlit subject is overexposed.
The meter gives correct exposure information for frontlighted subjects.

Lighting

The light and dark areas of sidelighted subjects often fool the meter into leaving the dark areas too dark.

By opening up one f-stop from the meter indication you can lighten the dark areas of sidelighted subjects.

In backlighted subjects the sun shines right at the camera meter with so much light that the meter indication will cause great underexposure of the subject.

Whenever a subject is backlighted, open up 2 stops to give correct exposure to the subject. You can also obtain accurate exposure by moving in close until the subject fills the viewfinder. While in close set the aperture and shutter according to the meter, then move back and take the picture.

We've spent some time talking about exposure, but not about making settings for different lighting conditions. If you remember some of the ideas in Unit 1 about lighting, you'll probably remember that there are three basic lighting directions: frontlighting, sidelighting, and backlighting. You'll also remember that sidelighted and backlighted subjects photographed with a snapshot camera usually look pretty dark. It can be different with an adjustable or automatic camera. You can change the exposure to let in more light and brighten the subject. The rule of thumb is to give 1 stop more exposure (with either shutter speed or aperture) for sidelighted subjects and 2 stops more exposure for backlighted subjects. See the picture examples on this page for an idea of exposure with the same subject and the three different lighting conditions.
You can probably figure out that if you increase the exposure for a sidelighted or backlit subject, anything behind or in front of the subject that is in bright sunlight will look too bright in the picture. One way to help this situation is to reflect light onto the dark side of the subject with a large piece of white cardboard. With the reflected light, you won't have to increase exposure as much. Determine exposure by taking a meter reading very close to the subject (without interfering with the light from the white card).

**Shade and Overcast**

Pictures made on overcast days have a special appeal with some subjects, especially people. There are no shadows and people tend to have more natural expressions. You'll also find that the light is very even because there's little difference between bright and dark areas.

Depending on how overcast the day is, you may have to give 2 or 3 stops more exposure. Take exposure meter readings close to your subject, and don't include much sky, as the brightness of the sky can lead to subjects being underexposed. Shade offers about the same advantages as overcast. Your friend won't squint when you ask for a smile, and there won't be any heavy dark shadows crossing his or her face. Again, shade calls for a 2- or 3-stop exposure increase.
Indoors
On bright sunny days, you can take pictures indoors with a medium-speed film. Make meter readings close to the subject and don’t include sunny doorways or windows when you make the reading. Some of the nicest pictures made indoors are taken near windows that don’t have direct sunlight streaming through. The soft light from outdoors gives you good portrait opportunities.

At night indoors, you’ll want to use a very fast film (ISO/ASA 160—400), slow shutter speeds, and large apertures. A typical combination for a fairly bright room should be 1/30 second at f/2.8 on ISO/ASA 400 film. Turn on all available lights and take your meter reading close to your subject. Try not to include bright lights when you are making the meter reading because they will fool your meter into recommending underexposure.

Outdoors at Night
Although it’s usually pretty dark at night, you can still take good pictures. Sometimes with brightly lighted street or monument scenes, you can take meter readings that will be fairly accurate. Other times you won’t be able to get close enough to your subject to get a good reading and the surrounding darkness will fool your meter into recommending too much exposure, if it’s sensitive enough to recommend anything. Check the short table above for ideas on night exposure outdoors and look at the instruction sheet for a high-speed film. Experiment! Sometimes you can make interesting pictures over a wide range of exposures. Remember that if you use a shutter speed slower than 1/30 second, brace the camera or yourself against something steady for sharp pictures.

Suggested Exposures for Outdoor Night Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>ISO/ASA 200</th>
<th>ISO/ASA 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightly lighted downtown street</td>
<td>1/30 + 2.8</td>
<td>1/60 + 2.8</td>
</tr>
<tr>
<td>High-slit lighted buildings</td>
<td>1/2 + 1</td>
<td>1/15 + 2</td>
</tr>
<tr>
<td>Amusement park rides</td>
<td>1/30 + 2</td>
<td>1/60 + 2</td>
</tr>
<tr>
<td>Night football games</td>
<td>1/60 + 2.8</td>
<td>1/125 + 2.8</td>
</tr>
</tbody>
</table>
* For color pictures, use Tungsten film for the most natural rendition. You can also use Daylight color film, but your pictures will look yellow-red.

Project 7
Use color slide film for this assignment
1. Make a 5-stop exposure series of a subject in bright daylight. To do this, use one shutter speed and change the aperture setting five times.
2. Make a 5-stop exposure series of a subject in artificial room light.
3. Make a 5-stop exposure series of a subject in dark shade outdoors.
4. Make 4 good exposures of the same subject on a bright day using different exposure combinations. Example: 1/125 at f/11, 1/250 at f/8, 1/500 at f/5.6, and 1/1000 at f/4.
Focusing

There is another control on most automatic or adjustable cameras that we haven't discussed yet. Although this control has nothing to do with exposure it certainly makes a difference in your pictures! What we're talking about, of course is the focusing ring on your camera lens. We mentioned focus during the discussion of depth of field (page 21), but we'll talk about it some more now.

If you want your subject to be as sharp in the picture as possible, you have to focus the lens. A subject 10 feet away requires a focus setting different than a subject that is 40 feet away. You probably remember that a simple camera has no focusing ring. That's because the factory sets the lens so that everything from about 4 feet to as far as you can see is sharp. The factory is aided by the fact that the nonadjustable aperture in a snapshot camera is quite small — usually about f/11 — which gives great depth of field. Naturally, if you have a camera with an adjustable aperture — one that gets reasonably big — you need to control the focus because the depth of field at large apertures is quite small.

Many focusing cameras are equipped with a rangefinder which tells you when the lens is focused on your subject. Most rangefinder cameras have a split image that you see in the viewfinder. When you look at the subject in the viewfinder you may see two images. By turning the focusing ring on the lens you can bring the two images together into one image for the sharpest picture possible.

Distance scale

When you look at the lens on your camera, you'll see the aperture ring with its f-numbers and another set of numbers next to the camera. This second group of figures is the distance scale, which tells you how far your subject is from the camera when you have focused the lens. This scale is handy for making flash settings if you have a flash unit for your automatic or adjustable camera. You may also notice another set of numbers or slash marks next to the distance scale. This is the depth-of-field scale. (See page 25.) It shows you how much of the scene will be in focus at different f-number aperture settings. Read your camera instruction manual to find out how the depth-of-field scale works on your particular camera.

Symbol focusing

Not all cameras have rangefinders. Some have a distance scale with a few symbols. You can calculate how far the subject is from you in feet or meters and set the distance scale accordingly. Or you can figure the appropriate symbol (for close, medium distance, or far) and set that symbol.
3. If the shoe is not electrically connected to the camera, connect the small wire (PC cord) that comes with your flash to the camera and to the flash. On the camera, connect the cord only to the terminal marked X.

4. Set the ISO(ASA) film speed on the dial. Turn on the flash and wait for the ready light to light up.

2. Mount the flash onto the shoe on top of the camera. Check your camera instructions to see if the shoe is electrically connected to the camera. If it is, go to step 4.

1. Select the flash shutter speed recommended by your camera instructions. Use 1/30 second when in doubt.

*If you use a shutter speed faster than the flash shutter speed, part of the picture will be cut off.

5. Focus on your subject.

Flash

Flash is fun with automatic or adjustable cameras because you can make good exposures over a much greater range than you can with a simple camera.

Using flash is easy. The following steps will show you how it's done. Be sure to read the instructions that came with your camera and flash for any special information.
6. When the subject is in focus, look at the distance scale on the camera to find how far away the subject is. In this instance, it is 7 ft. (2 m).

7. Now look for that distance (7 ft. or 2 m) on the flash calculator dial and see what aperture lines up with it. In this instance, the corresponding aperture is f/8.

8. Set the aperture ring to f/8.

9. Take a flash picture.

Some flash units are practically automatic. One type has a tiny window that sends a signal to shut off the flash when there is enough light for a good picture. The other kind works with some cameras so that when you focus you are setting the aperture as well.

The first kind -- self-quenching units -- are easy to operate. You first set your film speed on the dial in the back. Then you merely set the f-stop indicated by the flash unit. Pay careful attention to the automatic distance range. Some self-quenching units can operate automatically at several f-stops, depending on how far away you expect your average subjects to be. Read the instruction manual first to make sure exactly how your flash operates.

The other kind -- the ones that are tied into the camera -- may depend entirely on the camera. Some cameras accept automatic and manual flash units and still provide automatic operation. All you have to do is set a "guide number" (found in the flash instruction manual) on a dial on the camera. Then the camera links the focusing ring and the aperture ring. The farther away you focus, the larger the aperture gets.

The guide number is part of an old-fashioned formula used to determine exposure. If your flash unit has a calculator dial, you won't need to use it, but it's handy to know about for later applications of flash. It goes like this: Find the guide number (in the instruction manual) for the flash unit and the film you're using. Focus on your subject and look at the distance scale on the lens for the camera-to-subject distance. Divide the distance (in feet) into the guide number and the result is the f-stop to set on your aperture ring. (For example, with a guide number of 80, the aperture for a subject at 10 feet would be f/8 = 80/10 = 8.)

Most cameras have an accessory shoe on top to hold a flash unit. Some of these shoes (hot shoes) will connect the flash electrically to the camera so that when you press the shutter release the flash fires. If the shoe is not electrically connected, you must connect the flash to the camera with a small wire -- the PC cord. Most flash units are supplied with one. See your flash and camera manuals for instructions on how to connect your flash. Your camera manual will also tell you how to set your shutter speed for proper operation with electronic flash.

Project 8

Take three pictures using an electronic flash unit. If you have an SLR camera, take additional flash pictures with the shutter set at 1/60, 1/125, and 1/250 -- what happens to the picture when the shutter speed is set to 1/250 second?
ACTION
You've probably never considered the vast amount of motion around you -- walkers, cars, airplanes, conveyor belts, swings, roller skaters, skiers, and on and on and on. You've probably spent most of your film photographing still subjects -- people sitting, standing, lying down, and houses, trees, mountains, sleeping dogs, and more. Although still photography captures a single instant, it is possible to take a still picture that captures a moving subject. Moreover, there are several different ways to do it that give different effects. Some techniques halt movement so that the picture is sharp as can be. Other techniques make the movement blurred.