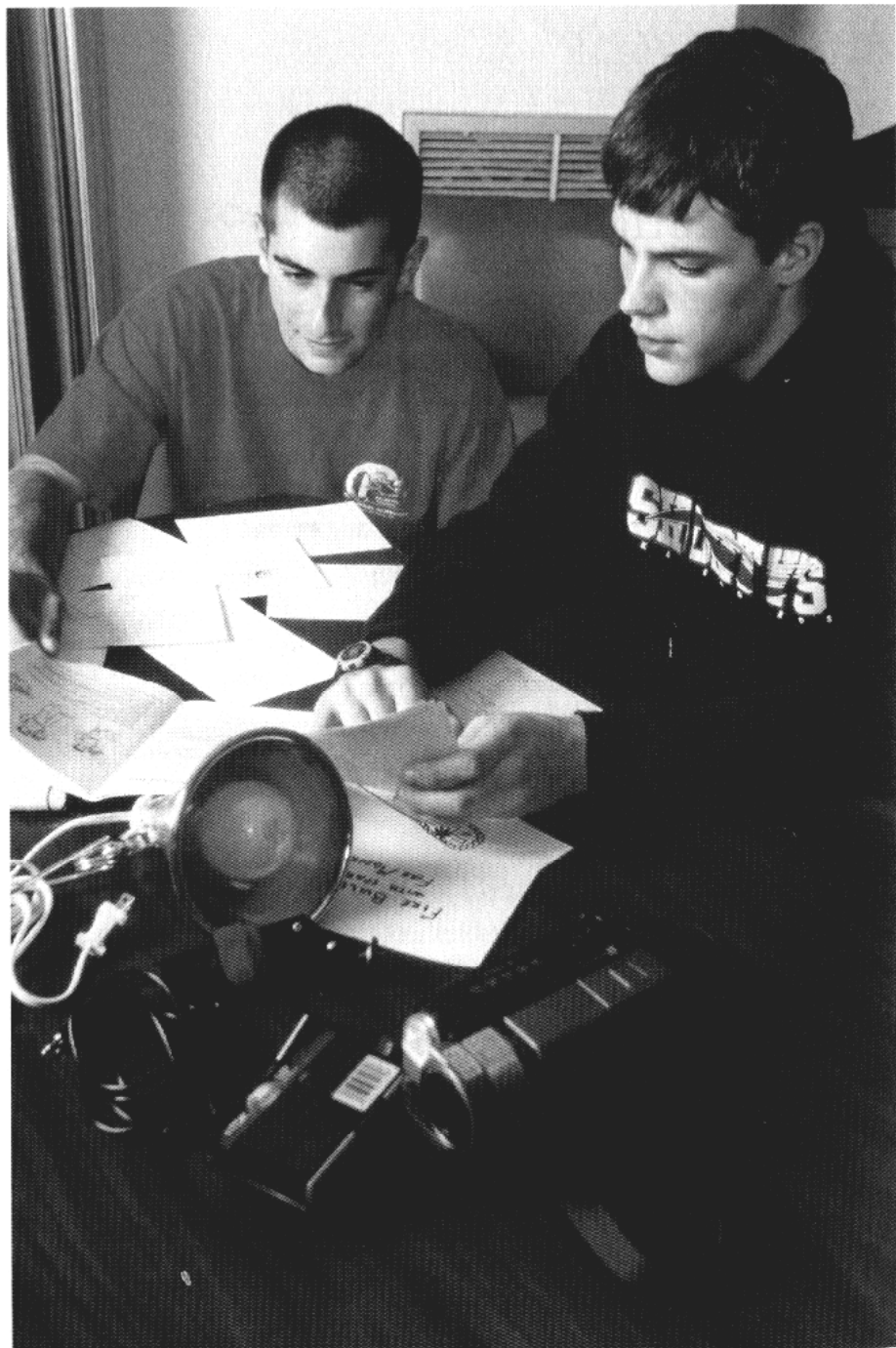# CINEMATOGRAPHY

2001 ed.

BOY SCOUTS OF AMERICA
MERIT BADGE SERIES

What Is Cinematography?

Cinematography is the art and science of motion picture photography, the visual element of this contemporary way to tell stories. A cinematographer uses framing, movement, camera angle, and lighting to tell a story, set its mood, and leave a desired impression on an audience. Although photographic stock and chemical processes are vital to filmmaking, it is the art and science of the moving picture that truly give the picture its life.

This pamphlet describes the fundamentals of producing motion pictures, focusing on the video format rather than film. Video equipment is more available and less expensive to use than film, allowing more freedom to experiment and develop cinematography style while still offering the same opportunities and challenges of producing a motion picture.

A cinematographer learns to use effective light, accurate focus, and appropriate zoom and camera movement to tell stories. This pamphlet also will teach you how to develop a story and describe other pre- and postproduction processes necessary for a quality motion picture.

History of Cinematography

It's really pretty amazing when you think how far moving pictures and the making of movies have come in their relatively short existence. And it's amazing when you think of what a strip of movie film really is: a series of individual still photos recorded in a camera at a certain speed (about 24 frames per second) and projected at the same or a similar speed. On a film strip, the frames are

separated by thin, unexposed lines, but in a projector, a rotating shutter opens and closes to obscure those lines and permits each frame to be flashed twice on the screen. An audience watching a film in a theater actually sees only the pictures depicted on each of the frames (and sits in darkness in between); what appears to be the flowing movement of action on the screen is just an illusion.

Around the time that photography was invented—1826—there already were hundreds of optical toys that used images on cylinders with shutter devices to produce the illusion of motion. The phenakistoscope (Greek for "deceitful view") of 1832 and the zoetrope (Greek for "live turning") of 1834 had "phase drawings" (like a rider mounting a horse) on the inside of a rotating disk that when looked at through slots seemed to move. By 1849, the drawings had been replaced with phase photographs (of, for example, horse and rider jumping trestles) that were set up and posed, not recorded from a live event.

In 1876, the wet plate negatives used in photography were replaced with dry plates, reducing exposure time from minutes (people had to hold a pose for that long) to as little as one-hundredth of a second and allowing "series" photography. In the next year, in a test that proved a galloping horse lifts all four hooves from the ground at once, 12 cameras were triggered in succession, showing the horse's stages of galloping motion. Two years later, hand-drawn, tinted drawings based on series photos were mounted on a circular glass disk and projected with a magnifying lens and light source onto a wall in a dark room.

In 1882, a "chronophotographic gun" (it looked like a rifle) recorded the first series of photos of live action in a single camera that imprinted images on a rotating glass plate. In 1883, the glass plate became a roll of paper film. In 1887, it was roll film made of celluloid (a material invented as a substitute for ivory billiard balls).

In 1889, inventor Thomas Alva Edison developed the kinetograph, a motion picture camera that used a stop-motion device to ensure regular movement of the film through the camera. Holes in the celluloid filmstrip let clawed gears pull it through the camera and projector. The kinetograph led to his kinetoscope, a coin-operated viewing device the size and shape of a small icebox on which a person could view 40- to 50-foot movies (boxing matches, ballets, vaudeville routines) run on spools between an electric lamp and shutter. They became the rage, starting in New York City, and the Edison Manufacturing Company began supplying 60-second "shorts" to run on them.

By 1893, the first movie studio was created, a small room with a section of roof that opened to admit sunlight and moved on a circular track to follow the sun across the sky. Hundreds of shorts were produced, but only as recordings of a particular event or subject, not as stories to be told. And editing such things was unheard of, no one wanted to edit "reality."

A new kind of projector broke the film less often than earlier machines, leading to films of greater length (six minutes) and the showing of films to large audiences—films being politicians' speeches, travelogues of foreign cities, barbers cutting hair, and the like. It wasn't until 1900 that the idea arose to use this new medium to tell a story with such things as fading to black between scenes (like the curtain coming down during a stage play); combining interior and exterior settings; cutting, or shifting, between staged scenes and stock footage (from the Edison archive); and using special effects (like enhancing a gun battle with extra bursts of smoke).

By 1907, one million people per day were seeing movies in nickelodeons across the United States. Sound and color were added. Filmmakers in countries around the world began producing their own works. Westerns, musicals, horror films, propaganda films, film noir, gangster films, future wave, blockbusters—they were all accomplished in a relatively short, very amazing 40 years.
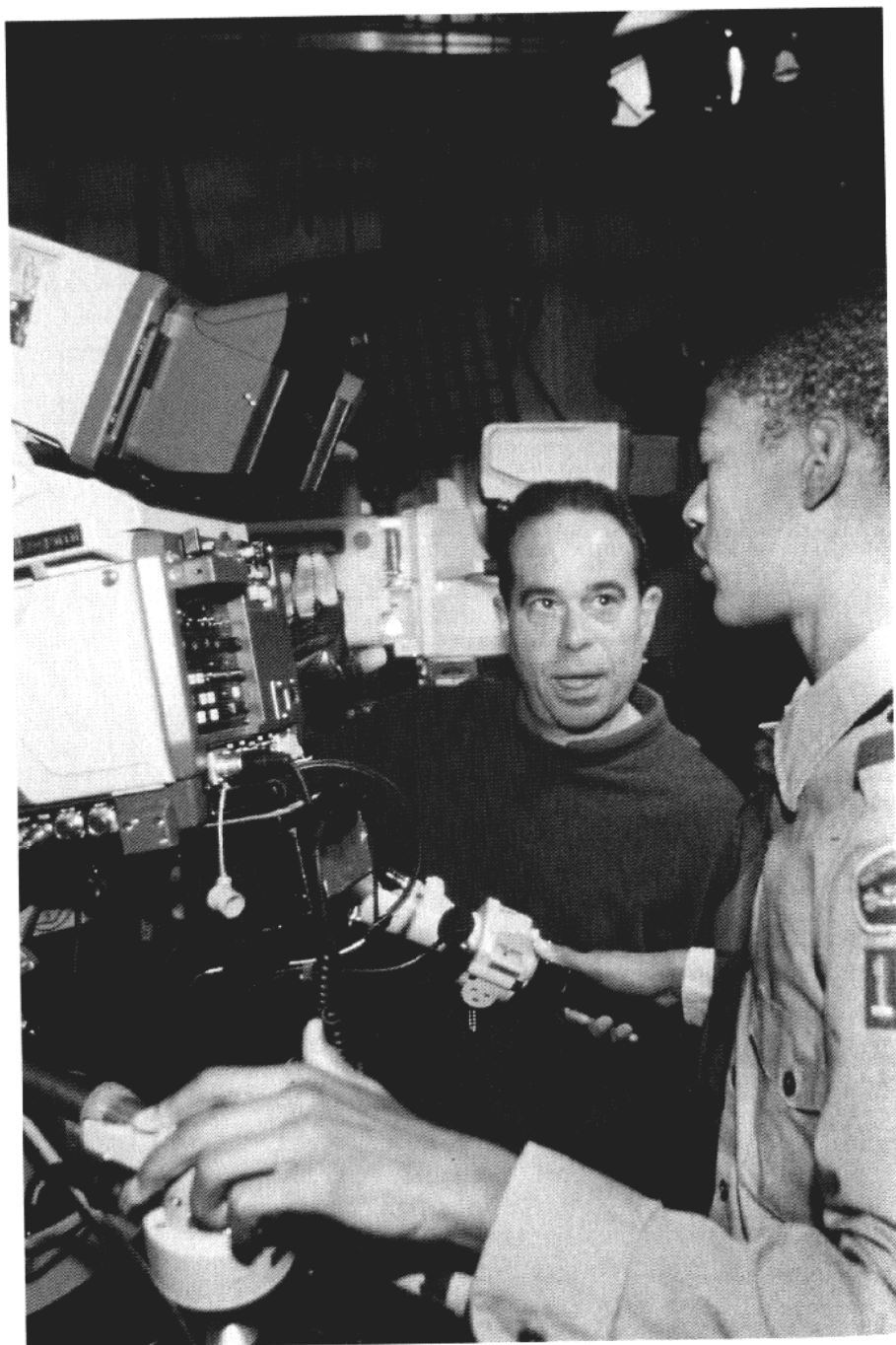
Professional Equipment

Professional cinematographers on feature film, cable, and TV productions use a variety of tools to create the images desired by the projects' directors and producers. Just as an artist has many colors on his palette, the cinematographer has unlimited combinations that can be mixed and matched to create the desired effects: a variety of cameras and lenses, lens filters, lights, cranes and booms, and many others.

Cameras

Quiet, synchronized-sound film cameras are used for dialogue scenes, while loud high-speed cameras capture special effects and action. The camera that runs at 500 frames per second will take a one-second live-action event and make it appear on screen for almost 21 seconds. This ability to warp time is just one part of movie magic.

Lenses

Professional motion picture cameras accept prime and zoom lenses. Prime lenses are designed and built to one focal length and offer only one field of view for the camera. A zoom lens lets you change image magnification without changing lenses. Video cameras usually have a single zoom lens instead of a selection of primes, but that doesn't mean you have to zoom (close in or pull back from a subject) during a shot. Many professional cinematographers use a zoom as a "variable

Prime lens

Zoom lens

prime lens," selecting the focal length appropriate for each scene without having to mount a different focal-length prime lens for each shot. This ability to quickly change focal lengths speeds up the photography process.

Three sets of numbers are used to describe lenses.

F-stop. The lower the number, the wider the aperture of the lens and the more light it passes to the camera and, therefore, the film. The lower the number, the "faster" the lens is. Prime lenses generally have wider apertures and are helpful when shooting in low-light situations.

Millimeter. This number represents the focal length of the lens. A low number represents how "wide angle" the lens is and how wide the camera's field of view is. A high number indicates how "long," "tight," or "telephoto" and how narrow the angle of view is. A zoom lens is adjustable, giving you a range of focal lengths in one housing.

Zoom range/ratio. Dividing the larger millimeter number by the smaller millimeter number determines the range of magnification a zoom lens can deliver. A zoom with a 10mm wide angle and a 100mm telephoto is considered a 10-to-1 zoom (100/10 = 10). If the zoom were 210mm to 14mm, the zoom range would be 210/14 = 15, a 15-to-1 ratio. When shopping for a workable zoom lens, look for the widest aperture (a low f-stop) and the greatest zoom range.

Parts of a Zoom Lens

Three basic parts of a zoom lens are the focus, zoom, and aperture.

- The camera operator uses the **focus** to adjust the sharpness of an image.

- The **zoom** changes the lens's focal length.

- The **aperture** controls the amount of light passing through the lens.

Film

These three are the most commonly used sizes of film.

- **35mm.** Major motion pictures are usually shot on 35mm film. But more and more motion pictures are now being shot on high-definition video. Cameras that use 35mm film are normally large and bulky and mounted on cranes or special dollies. Up on the movie screen, 35mm film shows less grain than 16mm. It is used mainly by the motion picture industry.

- **16mm.** Because it is cheaper to produce 16mm film than 35mm, many low-budget, educational-type, or independently produced films use the 16mm format. Videotape is quickly becoming a typical substitute.

- **8mm.** Your grandparents may have some small reels of film they shot of your parent years ago on a tiny, noisy camera that was sold to the general public to shoot home movies. This type of film usually has no audio. Cost of professional development is high, and few facilities in the United States do such work. Today, 8mm has been totally replaced by video.

Lighting

Professionals have at their disposal many sizes of lights and special effects techniques to create moods for any shot envisioned by a director. Like a theatrical set, lights are placed around the action in a scene to illuminate it or throw shadows across it.

Sound

Cinematographers usually aren't responsible for a professional production's audio, or sound, just as postproduction is out of their hands. Their work goes to a film editor, who cuts it to a director's liking, then on to be distributed in theaters.
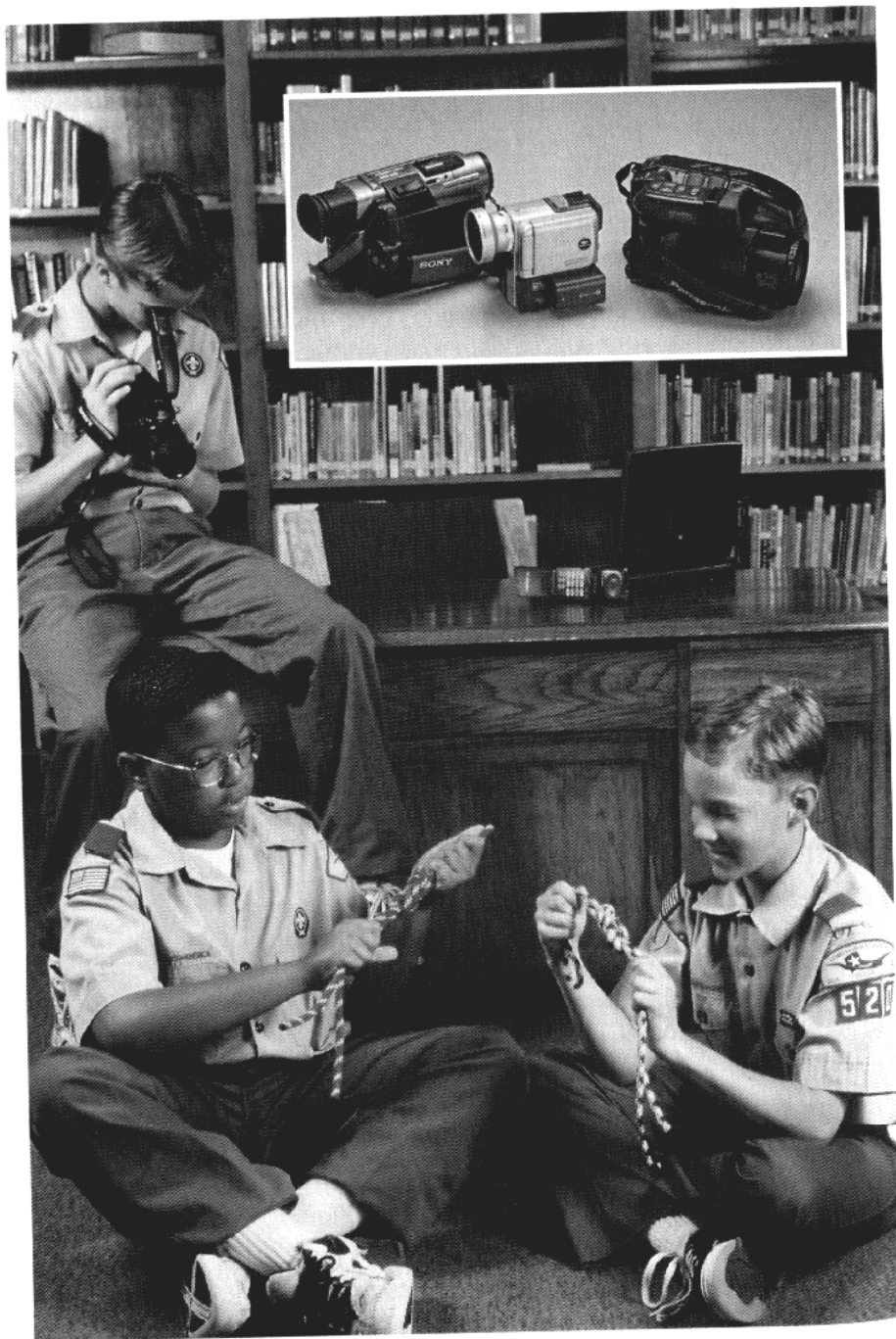
Your Project

For Our Purposes

For early projects, rely on a consumer video camera you might borrow or rent. These amazing cameras give the new cinematographer almost every important element needed in making a first production. And the best thing about shooting video is the advantage of inexpensive tape and automatic/low-light exposure.

Your first production may not win an Oscar; video limits your ability to make as much "movie magic." However, don't be defeated. Take this time with video equipment to refine your skills in composition, camera movement, and lighting—always as important as the story being told. As you move through the process, you will learn about cinematography elements and principles.

Video or Film?

Video is the most common production medium because of the affordability and convenience of the camcorder and the mass availability and low cost of blank videotape. Based on six hours of recording capability, a running minute of video can cost as little as a penny. And unlike film, videotape is reusable, meaning you can rerecord.

While physical editing of film and video is different, the basic production concepts are the same. For example, having proper light, knowing how to focus a camera, and the sensible use of zoom and pan are common to both media. If a camera operator makes the audience dizzy with scenes from a camcorder, they will become just as dizzy watching film footage.

Film is used mostly by professionals in the film and television industries because it currently has some distinct advantages over video—better resolution and contrast ratios.
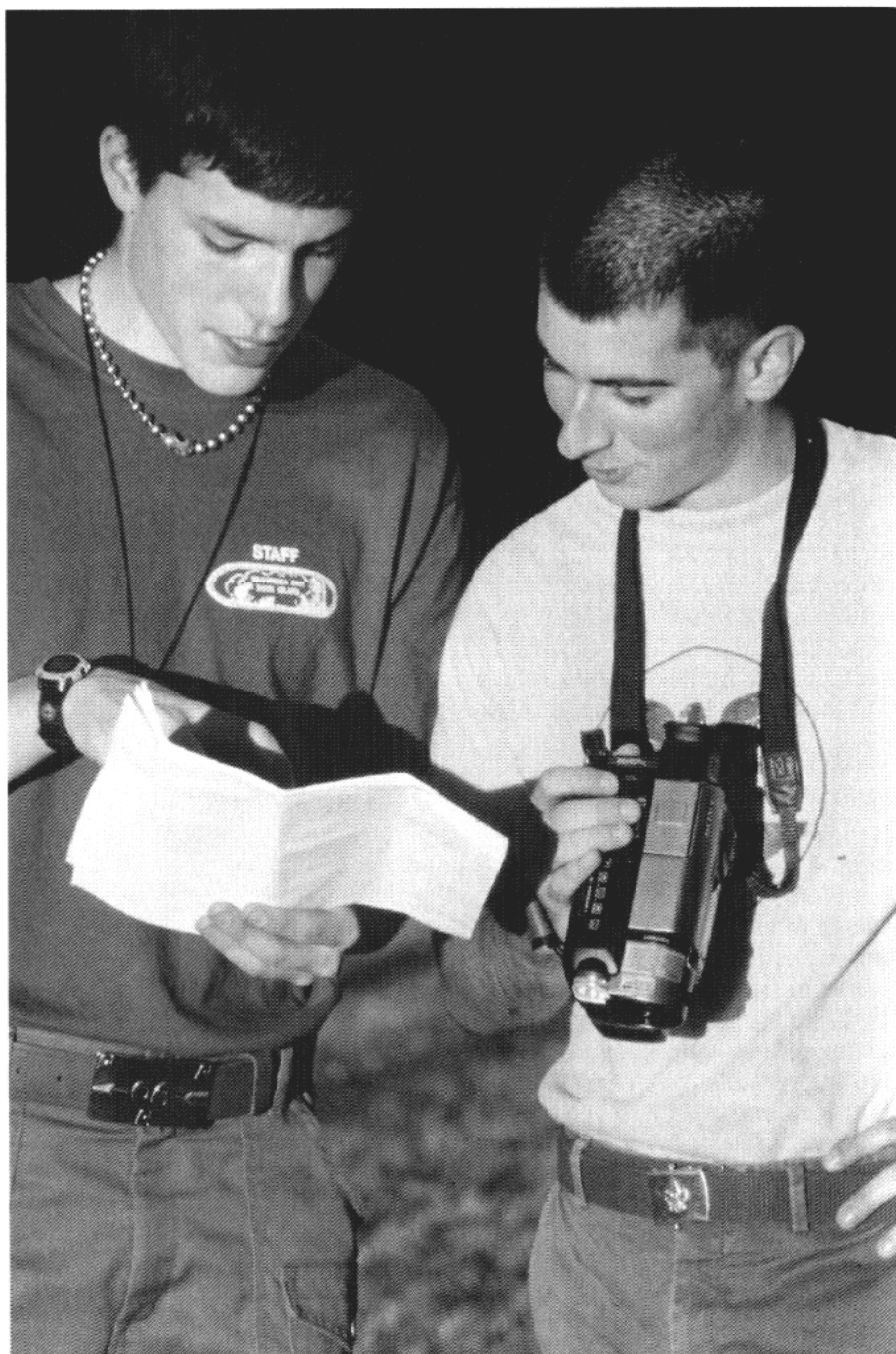
Getting Started

Just as months of planning go into preparing an Indy 500 race car to cross the finish line, you will have to plan before your first video can be shown, or screened. In fact, before the first shot is made, your budget, staff, and equipment needs will have to be considered and resolved.

Budget

Determine how much money is available for your production; that's your budget. Remember, a car can't run without gas. Consider the equipment you may need—such as camera(s), VCR, and tape—and the accompanying financial considerations. Cost of equipment and services is discussed throughout this pamphlet. Take the time to understand each process of production to figure out how much time and money it will take.

Staff

Determine what kind of staff you will need (if any) and assign responsibilities. Here are some of the positions related to film and video production. Depending on your budget or "volunteers," you may be able to get help in these areas. Remember, though, that as the filmmaker, you should be involved with all these processes.

- The **producer** is in charge of the entire production and bears responsibility for its success. This person hires everyone connected with the project, including the director, the designers, and the cinematographer, who is responsible for all camera operation.

- The **associate producer** helps the producer and usually stays on the set during production.

- The **cinematographer** is responsible for creating the look, the mood, and the feel of the visuals.

- The **director** guides the actors and the motion during filming.

- The **writer** prepares the script.

- The **camera operator** frames the shot in the camera and plans moving shots.

- The **assistant camera operator** works with the camera operator to move the camera from setup to setup; adjust the focus; keep track of batteries, tape, and film stock; and take notes as they relate to the camera department.

- The **lighting director** or **gaffer** handles lighting before and during the shoot.

- The **best boy** is the chief assistant to the lighting director or gaffer.

- The **set designer** creates the artificial settings for scenes.

- The **key grip** sets up the scenery for the production.

- **Engineers** manage the machines that control, or mix, sound, lighting, and special effects.

- The **editor** or **cutter** selects the scenes that tell the story effectively.

Equipment

Video Cameras and Lenses

Most lenses on video cameras are auto-focusing zoom lenses rated with a ratio such as 6-to-1. This means the lens can expand the view to a full scene that is six times as wide as what the telephoto saw. Newer camcorders have 8-to-1 zooming, while professional/industrial cameras can accommodate 12-to-1 and 14-to-1 zooms and cost thousands of dollars.

Many camera lenses have a manual aperture control that opens the iris of the lens wider or makes it narrower, just like the iris in your eye widens in dim light and narrows in bright light. Cinematographers can manually control the iris for forced fading and/or special effects with light. The iris opening—called the aperture—is rated in changeable f-stops. Keep in mind the following rules of optics concerning the f-stop on a lens.

Video cameras will automatically make aperture adjustments, but when shooting film:

On bright days

- You may need a small opening in the iris (a small aperture).

- Use a high f-stop number, such as f/16.

- You will have a large *depth of field* (the amount of focus in front of and behind the subject).

- You will need more light for a usable picture.

On gray (or low-light) days

- You may need a large opening in the iris (a wide aperture).

- Use a lower f-stop number, such as f/4.

- You will have a limited depth of field (could be inches).

- You will need less light for a usable picture.

f/2.8   f/4   f/5.6

f/8   f/11   f/16
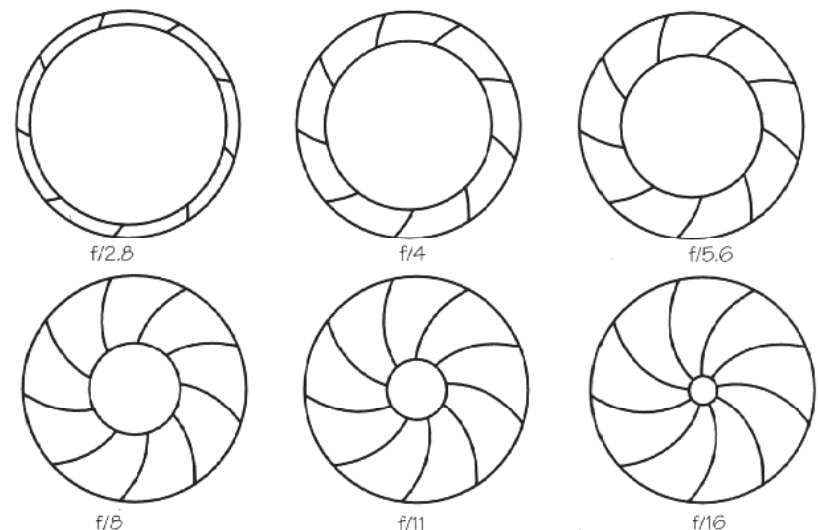
A large number indicates a small opening. A small number indicates a large opening.

Camera Supports

Using a tripod is a way of holding a camera steady. Most tripods have panning heads that allow smoother movement. They have adjustable legs that can be locked into position. On more expensive models, casters can be added to make the tripod somewhat mobile. When selecting a tripod, request one with a fluid head if you plan to pan in your shots.

Even if you are shooting only static objects (as in a demonstration) or "talking heads" (in an interview), you should always plan on using a tripod. To create a moving tripod or dolly, you need a heavy object on rubber tires and a smooth surface, not to mention a volunteer to push you and your equipment around. A wheelchair can be used as a serviceable dolly.

Handheld cameras are extremely lightweight and must be held steady. To keep the camera steady without a tripod (1) rest both elbows on your knees while seated on the ground; (2) lean against a wall; (3) rest your back and take tension off your legs; or (4) walk with your knees bent (backward is suggested rather than forward).

A serviceable lightweight tripod suitable for use with any home movie camera or camcorder

Blank Videotape

A good estimate for determining the amount of videotape needed in shooting is a 10-to-1 ratio. This means that for every minute of edited video you select, you will probably shoot at least 10 minutes of video footage. The length of the piece you plan will determine how much tape is needed. For example: Five tapes at $4 each means a budget of around $20.

If image quality will be a concern in making dubs (or copies) of your finished master tape, then select super high grade (SHG) tape and do all your recording in the fastest recording mode (SP or standard play in VHS format). Add a few dollars for each SHG tape. Now you are near $30 total for tape.

Microphones (Audio)

Determine if you need an external microphone for audio. Most cameras and camcorders come with microphones, but they are usually attached to the camera and are so sensitive that they also pick up distant sounds, motor noises, and even the camera operator's breathing, all of which create a noisy nuisance on film.

Budget an external microphone and a 50-foot extension cable with rugged ends. Because some microphones experience loss with extension cables, ask before you rent. A common handheld microphone is usually less expensive than a miniature microphone that can be clipped to clothing (called a *lavaliere* microphone). If you will be recording talent (the person you are shooting), a lavaliere can add realism and professionalism to the shoot. Budget $50 or more.
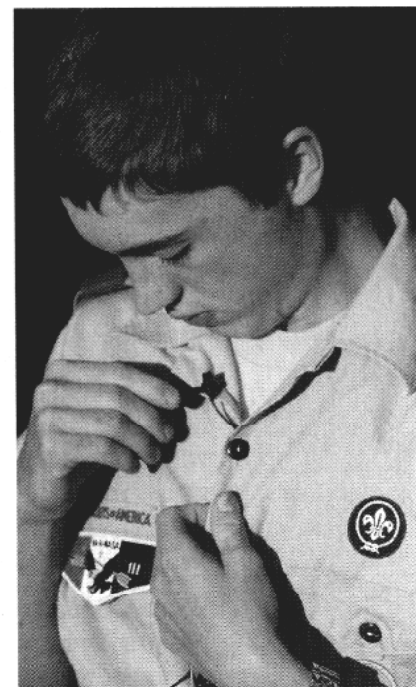
A lavaliere microphone can provide flexibility and set a professional tone during shooting.

A microphone may be
- Clipped onto a subject's clothing
- Used as a table mike
- Attached to a stand
- Clamped to an aluminum pole, for use as a "shotgun" mike

When shooting a scene, be aware of the following:
- **Continuity.** Try to ensure audio levels of different shots of the same scene match.
- **Effects.** Record typical background noises, if necessary, for later mixing.

Lighting

Lighting from the sun is free, and video loves sunlight. If you must shoot indoors, try to use available indoor light. Guiding your subject to the light keeps your lighting budget at zero dollars. If you must light a scene, use spotlights bouncing off white sheets or walls and ceilings to keep the subject from being "hot," or losing detail in the lightest areas. Renting a spotlight and its holder may cost $50 or more, so it makes sense to use available light whenever possible.

You may also need a light stand or large alligator-type clips to clamp the lights to support poles. Gaffer's tape, also known as plumber's tape in hardware stores, will be handy in awkward situations. You also will need gloves to handle hot fixtures.

Postproduction

While the professional cinematographer doesn't deal with postproduction, you will—and you have to think about it during preproduction. The videotape you shoot will require editing into a final product for showing and perhaps duplication—that means factoring into your budget and timetable use of at least one VCR, or videocassette recorder, with a flying erase head, or perhaps you could use a computer for editing if you have access to one.

How complicated the process of editing is may depend on how complex your project is and how the scenes are shot. A simple production—like recording a court of honor—can be shot in sequence; little editing is necessary. This is called "shooting on the fly," and the technique can be used on more complex projects with careful planning. A very complicated piece may require the breaking up of sequence shooting into sections (shooting all exterior settings, then interiors), which requires more tape and more editing.

VCR(s)

If you do not have access to any equipment, seek assistance for ideas from your merit badge counselor. Maybe you can rent a camcorder for a few days to learn how to use it and then rent it again for the days you plan to shoot. *Be sure to reserve it so it will be available when you need it.*

SHOOTING ON THE FLY

You may not have the budget to secure a second video-tape recorder for editing. Therefore, you may have to make an edited master as you shoot. This is very difficult because each scene must work the first time. To reshoot scenes means you must re-cue the tape to the end of the last scene and then "back into" the scene so you don't have a snowy or distorted picture between those scenes later or during playback. The more times you reshoot a scene, the more pieces you bite out of the previously recorded scene. For this reason, it's important to give yourself plenty of room at the end of scenes.

It's also very important that you try to find a recorder or camcorder with a flying erase head, an extra head that erases the previously recorded tape as you record new scenes. This feature eliminates annoying picture rolls, glitches, and color that wiggles for seconds over your image on playback that may dilute the impact of your finished piece. Most modern video cameras have this feature.

EDITING AND DUPLICATION

If you are not going to edit on the fly (or edit as you shoot), you will need a second VCR (recorder/player, not just player) and appropriate cables for editing (the first is for playback only). Add another audio cable if your footage is in stereo and you want to keep the stereo effect. Many video rental stores rent VCRs from $8 to $10 a day. (You will still need accessory cables to go from your VCR to the rented one.) Even if you think you can finish editing in 24 hours, budget a second day because you will probably need it. Budget $20 for the rental fee plus cables.

While you have the second VCR, make at least two copies of your final edited tape. This copy, called a protection master (pm), can be used while you store your edited master in a safe, cool, dry environment. Budget $3 for labels and $12 for an additional tape (SHG).

Producing a Film

Your first priority is to select a category from the three options in the requirements.

Documentary

A motion picture, TV, or video production that captures a news event or records information on a particular topic with little or no fictionalization does not need a lot of preproduction, but it requires being in the right place at the right time with a "story" you want to tell. One example might be the demolition of a historical building; another, a day in the life of a big-city mayor.

Dramatic

A made-up story with characters and action and/or emotion requires a script, cast, and perhaps rehearsal before shooting begins. Any logical and tasteful scenario you can think of can become a worthwhile production project.

Staged Demonstration

Shooting a procedure presented by an expert will benefit from a script and some predetermined camera angles to show elements an audience would not be able to see in person. Plan for interesting close-ups that show unusual elements. You might show other Scouts how a jeweler sets a gemstone in a ring or how a blacksmith shoes a horse.

Discuss with your counselor the subjects you might explore. Once you have your idea, go to the next step: preproduction.
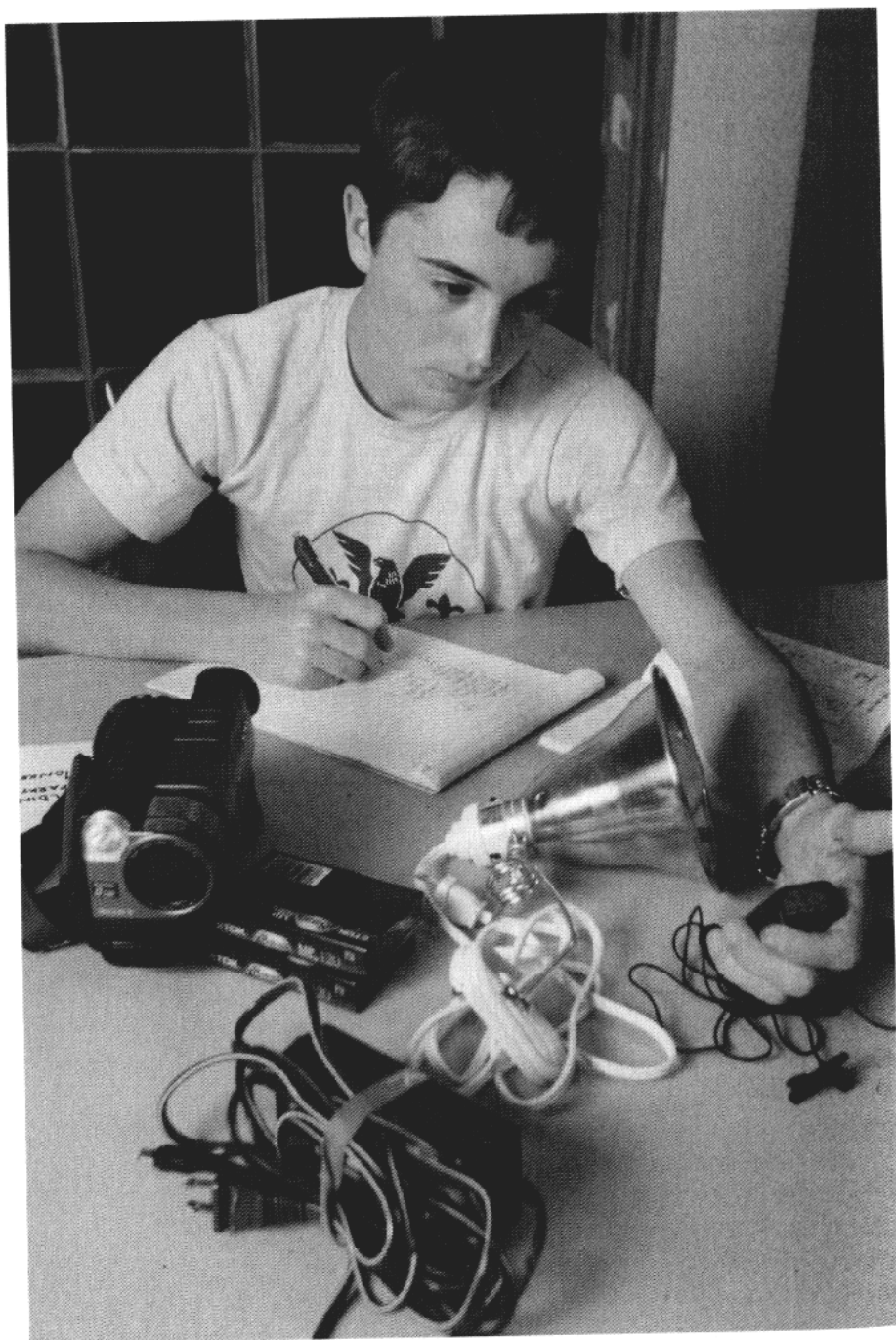
Preproduction

Preproduction involves everything up to the day or days of shooting: all preparation work, from deciding on a story to deciding locations. In preproduction, you must look for problems that could sabotage a project once it is in actual production. Preempting glitches in preproduction is part of having what are called high production values and avoiding failure. Check out sites thoroughly, even if you are shooting in familiar surroundings.

The tools used to produce—camera, batteries, support equipment, and additional lighting—are the same items that may cause defeat. If you are hesitant about camera operation or if your batteries are not charged, these things can ruin an otherwise well-planned shooting experience.

In preproduction, blank tape is purchased and all equipment is gathered. Using a checklist may help you keep tabs on your equipment and preparation. This is the time to create a budget and settle on a staff, too.

Cinematography requires work with a team. Many elements are planned to come together on the same day at the same time, and it is always best to have the basics planned so you can react to the unexpected.

Treatment

Whether you are planning a documentary, drama, or demonstration piece, put the story of your idea together and write it in a few paragraphs. This is called a treatment. It will make you focus on the idea and help to define your "artistic canvas." You will find that self-imposed limits on a project will make you work harder to produce smarter. Present the treatment to your counselor for review so you can move on to writing a script and making a storyboard.

Pages From Typical Shooting Scripts

Page 1

Voyage of the Sea Bird

VISUAL	SOUND
SUPER OUT OF BLACK "A Presentation by Meier International Travel"	
OPEN WITH SEA GULLS FLYING. THEN DISSOLVE TO SHIP, AND CUT TO WAKE OF SHIP IN WATER.	(MUSIC UP IN CLEAR AT FIRST, THEN BRING IN NARRATION.)
	NARRATOR—Sea bird, sea bird, where are you flying?
	FEMALE VOICE (SOFT)—To the lands of the North, with a good ship of the sea.
SUPER TITLE "VOYAGE OF THE SEA BIRD"	
	NARRATOR—What fair wind carries you here, and where do you lead us?
CUT TO ZOOM BACK FROM WATER TO SHIP'S BRIDGE. OFFICER HAS BINOCULARS, CUT TO SAILBOAT.	
	FEMALE VOICE (SOFT)—To a place where the sun burns at midnight. To the countries of beauty.
	NARRATOR—A fair wind, indeed, that brings us to this moment.

Page 82

EXT. DRIVEWAY. LATER THAT NIGHT.
Bill pulls up the car, without headlights, behind the VW. Then, ever so quietly, he and John get out. Bill opens the door to the VW, grins at finding it unlocked.

John is lifting a box from their car's back seat. It makes a metallic sound . . . like cans!

BILL

Shhhhhhh!

Yes . . . it is full of ALUMINUM CANS! As John moves away, we see the back seat is full of boxes, all full of cans!

BILL

(stage whisper)

I figure, two more trips!

INT. THE CAR. SEVERAL HOURS LATER.

John and Bill quietly close their doors and take a deep breath. They grin at each other with mutual respect—conspirators in a dangerous plot that they've successfully pulled off. Then John looks in the back seat.

JOHN

We forgot a box . . . .

BILL

There's no more room!

EXT. OUTSIDE THEIR CAR. Bill gingerly removes the last box of cans and carries it across the yard.

CS. GARDEN HOSE ON GRASS. Bill's foot slides under it and . . . he stumbles and the contents of the box cascades out onto the ground . . . with as much noise as you'd imagine.

LIGHT GOING ON INSIDE HOUSE.

BILL. He flies back to the car, jumps in and backs out with wheels throwing gravel in all directions.

EXT. FRONT DOOR OF HOUSE. The man staggers out.

EXT. THE CAR HEADING DOWN THE STREET AND AROUND THE CORNER.

REACTION OF MAN. He steps from his porch, looking down the street after the mystery car. He shakes his head, assuming it is hot-rodding kids. He steps into a can and sends it clattering. This gets his attention. Now he notices the cans on his lawn.

CONT'D

Script and Storyboard

A script is made up of written or typed pages, while a storyboard has rough pictures to represent the scenes to be shot. A script or storyboard should clearly state the video and audio elements and what the characters will be doing. Write the script as if you were going to give it to someone else to direct: what will be said, along with some idea of what will be seen. Each scene should be numbered. Be sure everyone who needs a script has a copy well ahead of shooting and that all questions have been reviewed.

Make a simple but accurate storyboard, numbering each scene with those in the script. Use it as a guide during the filming process, but look for more and better angles and coverage while shooting.

The primary thing to remember with a storyboard is its purpose. You are creating a tool to help you in the *pro duction* of your movie. Use colored drawings and/or simple black-and-white stick figures. Visualize each scene in your mind's eye, then draw the scene in the approximate field size (wide, medium, or close-up shots).

The storyboard affords an objective preview of the finished project—in other words, what it will look like on the screen. For instance, you might want to insert a shot of the moon between two interior sequences to tell the audience that the second scene occurs at night. This also establishes a different time frame. A shot of a sunrise tells an audience that what follows occurs on a different day.

Inserted exterior scenes establish locations and time frames for interior action. They also add variety and depth to stories that take place mainly indoors.
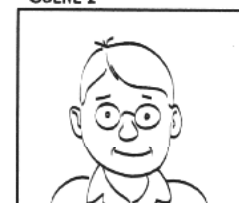
You might see from the storyboard that there are too many close-ups. Perhaps too much of the action takes place in the same location or from the same angle. Many potential problems can be worked out in preproduction by using a storyboard.
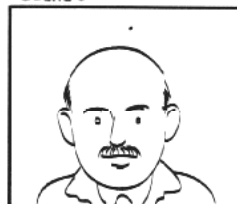
SCENE 1

DAD AND I
GO
FISHING

FADE IN OPENING TITLE
NOTE: USE PRESS ON LETTERS
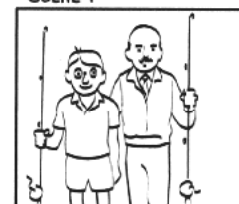AND POSTER BOARD.
MAKE FADE IN CAMERA.

SCENE 2

CUT TO: CLOSE-UP TOMMY
"HI, MY NAME IS TOMMY."
NOTE: GET DAD TO SHOOT
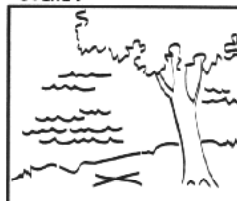THIS SCENE.

SCENE 3

CUT TO: CLOSE-UP DAD
"HI, I'M TOMMY'S DAD."

SCENE 4

CUT TO: MEDIUM WIDE TOMMY AND DAD
"AND WE'RE GOING FISHING."
NOTE: GET MOM TO SHOOT THIS SHOT.
PRACTICE SPEAKING TOGETHER ON
MOM'S CUE.

SCENE 5

CUT TO: WIDE SHOT OF FISHING
SPOT NEAR BIG TREE.
NOTE: SHOOT FROM HILL LOOKING
DOWN AT TREE AND LAKE.

SCENE 6

CUT TO: EXTREME CLOSE-UP
DAD BAITING HOOK WITH WORM.
NOTE: SHOOT VERY CLOSE SO
BACKGROUND IS OUT OF FOCUS.

Storyboard

Location

Professionals plan very carefully and scout locations before they shoot. Here are some of their concerns.

- Is the on-site power sufficient to run all the equipment?

- Can meals be served easily, and are bathrooms nearby?

- Can vehicles get in and out?

- Will traffic or airplane noise interfere with sound quality or the picture's time element?

- At what time of day will the location be prettiest, and when will the site be needed?

- What special problems will need to be solved? (The lighting director or gaffer might also come along to determine what special equipment, such as a bounce card or reflectors, will be needed.)

Audio

Even though a professional cinematographer is not responsible for audio, he or she often oversees other areas of production that will enhance the final product.

In audio, you have several elements and options:

- Music

- Narration (called a voice-over or V/O)

- Talking head (talent on screen talking in real time with the scene)

- Special effects (SFX)—sounds like thunder or footsteps

- Combination of any of the above

The simplest method is to use the audio that surrounds the scene you are shooting. But be sensitive to the continuity of the sound levels and background noises that may come and go; this could cause serious problems during editing. When recording a voice-over, the neatest but most complex method is to have your talent talk while he watches the recorded image. Blend this with sounds recorded during the scene with a simple audio mixing machine.

Here are a few more considerations pertaining to the soundtrack of a movie.

- The music you select to accompany your movie should, like the camera, not attract attention to itself but complement the visual story being told.

- Avoid popular or well-known tunes unless you have a strong reason for using them. They tend to distract an audience from visuals.

- Avoid repeating the same tune during the film. It can become boring.

- Mix the music at a low enough level so it does not cover up either the live sound or narration, but not so low that the audience has to strain to hear it. A little practice will enable you to judge the correct level.

- Avoid music that has pronounced loud and soft passages; it's hard to mix.

- Avoid music that contains many passages by instruments such as flutes that may cover the pitch range in which your narrator's or actors' voices fall and render them unintelligible.

- No law says a movie must have an uninterrupted musical accompaniment from start to finish. Fade it out when it seems desirable, and fade it back in when you think it helps the visuals.

- If you intend to use a narrator, select one with care. Make sure the narrator has seen your movie and read your narration script aloud several times before you record. Doing so will enable the narrator to give proper voice emphasis to those passages that require it.
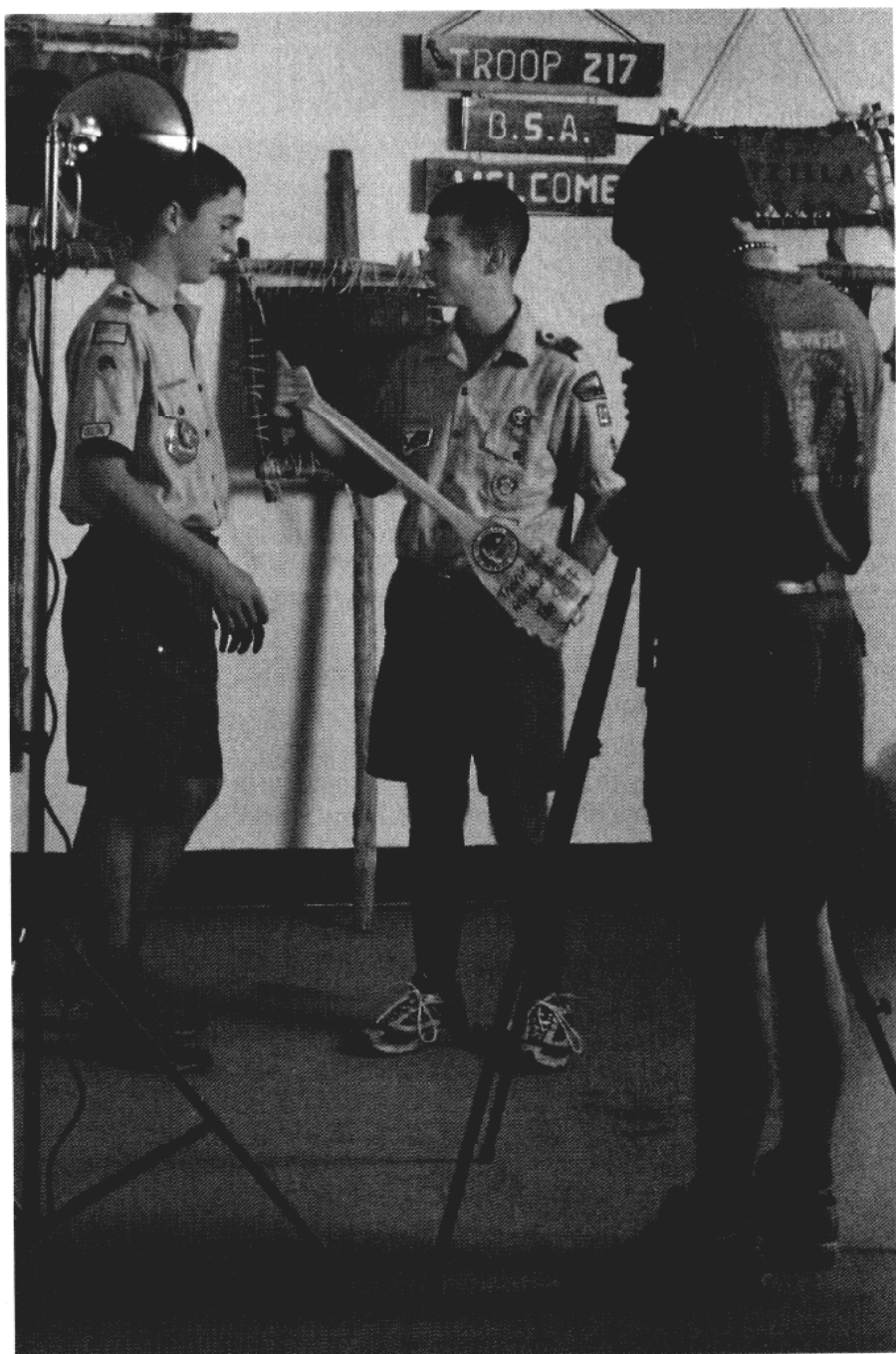
The Rhythm of a Film

Every well-made cinematic story has a definite *rhythm*, or development of the story or action, and *syntax*, a harmonious arrangement of parts or elements. When the rhythm is smooth, an audience is comfortable and knows what to expect. When the rhythm becomes rougher, the audience becomes vaguely uneasy in new and possibly unfamiliar surroundings. This means the cinematographer has a responsibility to introduce the audience to a new place without turning them off. Here are some points to consider.

Cinematic Elements

During the past century of cinematic development, certain practices in moviemaking have become *de rigueur*—standards and techniques that are easily understood parts of the language of film.

The 180-Degree Axis Rule

Imagine entering an elevator where two people are already in conversation. The individual on your left is looking to your right. The other is looking to your left to respond. If you were filming this conversation in close-up shots, only one person might be seen speaking at a time. If he changes the direction he is looking, the audience will be confused as to who is talking to whom.
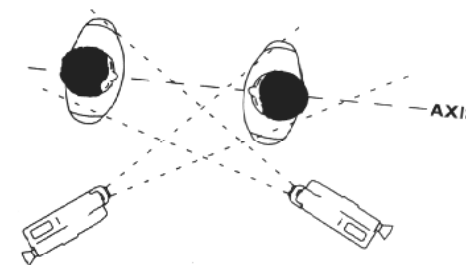
When you develop a scripted conversation between two actors, there is an imaginary line called the axis line. A scene will be easier for an audience to follow if the camera position does not cross this line. Think of what might happen if the camera "crossed the axis" during a football game. Imagine the ball carrier running from screen left to screen right. If a director were to cut to a camera angle on the other side of the "axis," the player will look like he is running right to left, which would be inaccurate and confusing. The illustration shown here will give you a better understanding of the axis line.

Lighting

If your story is dark and mysterious, unnatural shadows (created by aiming lights upward from below the subject, for example) may work well, but if you are documenting a live event, light images so they look natural.

Camera Movement

The camera functions as an invisible observer of scenes. Camera movement follows and frames the action and helps the viewer become aware of the environment and understand new information about the story being told. Unless the concept of your movie is different, handle the camera so it will attract as little attention as possible. Use a tripod to avoid shaky pictures that will distract an audience.

A well-framed, stable shot will provide an audience a solid point of reference from which to start. A frame that nervously searches the scene as a result of an unsteady, handheld camera will signal your audience to be nervous, too. If your intention is to make the audience uncomfortable, use the camera like this. Otherwise, keep the horizon level. Take care to level the camera on a tripod by adjusting its legs to conform to the slope of the ground every time you position a new setup. It is easy to accidentally tilt the camera.
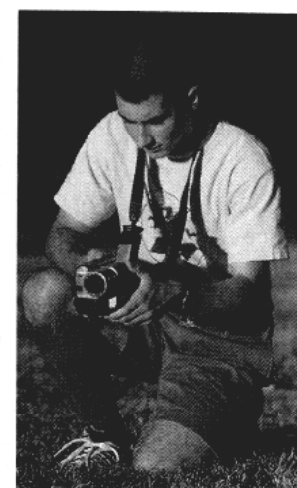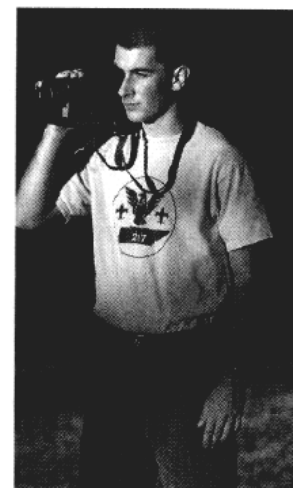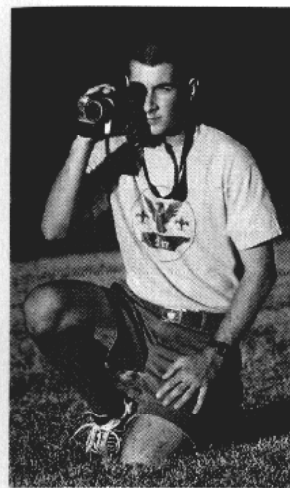
Keep both eyes open as much as possible when you shoot. This allows you to better follow the action.

If the camera must be handheld:

- Practice until you find a stance that provides the easiest shooting and best results.

- Position your eye firmly against the viewfinder eye cup.

- Assume a comfortable, stable position.

- Relax your shoulders.

- Put your elbow firmly against your side to help stabilize the camera.

- When kneeling, keep one knee firmly on the ground for the most stability.

- Keep both eyes open when you shoot. This allows you to better follow the action and anticipate other movements in the scene.

- Remember that wide-angle lenses and the wide-angle position of zoom lenses minimize camera shake because of their wide fields of view, while telephoto focal lengths amplify camera shake.

- Whenever possible, lean against a tree, the side of a building, or something else stable when shooting.

Pan and Tilt

Camera moves advance a story. Use pan, tilt, and zooms only to "frame" the action in the scene. If there is no action to follow, resist using the camera to "point." To make an audience look to a particular window in a wide shot of a building, stop the camera, reframe with a longer lens, and then roll. This "cut" will provide the same emphasis to the window as a zoom would but will keep viewers from becoming "seasick." The pan should begin with a static shot of a well-composed A scene and end with a static shot of a well-composed B scene. Otherwise, the pan is incomplete. The same is true for tilts and combinations of the two. Use your pans and tilts to reveal story elements and not as much to establish environments.

Limit the number of pans, tilts, and zooms. Too many can distract an audience, particularly if they are made too fast. Shoot them half as fast as what seems to be the right speed, and they will seem about right on the screen.

There is nothing wrong with letting actors walk into a frame, play their parts in front of the camera, then walk out. You don't have to pan with them. However, if you are panning with a moving object, such as a running animal or a sports car, keep the subject centered in the frame; don't get ahead of it or behind it.

Frequently change the shooting angle to add interest to scenes. For example, shooting down on someone from a stepladder makes that person seem less significant cinematically. Shooting up at someone from near floor level makes that person seem dominant, perhaps even sinister or threatening. Use camera angles to enhance your shots, but be careful not to overdo it.

Use a dolly when you want to move a camera along with actors or better define an environment. Because pictures are two-dimensional, full depth of a scene is often lost without camera movement. For instance, when looking at a forest with hundreds of trees, a dolly move will show the foreground trees moving through the frames more quickly than the distant ones—a powerful

effect when a complicated environment must be defined. A busy office will look and feel much more hectic if the camera moves and gives the viewer the benefit of depth.
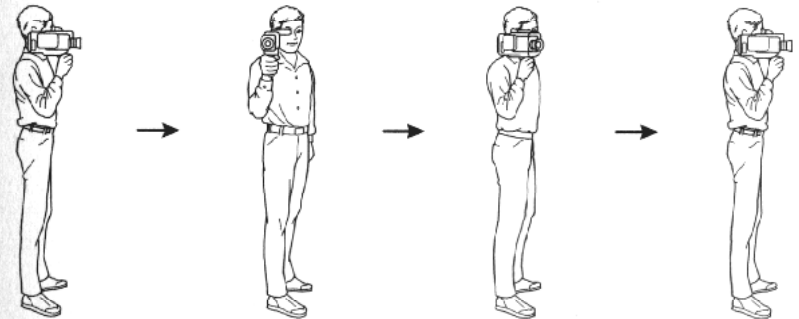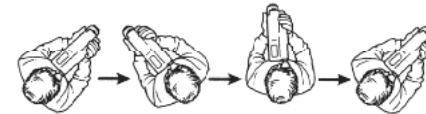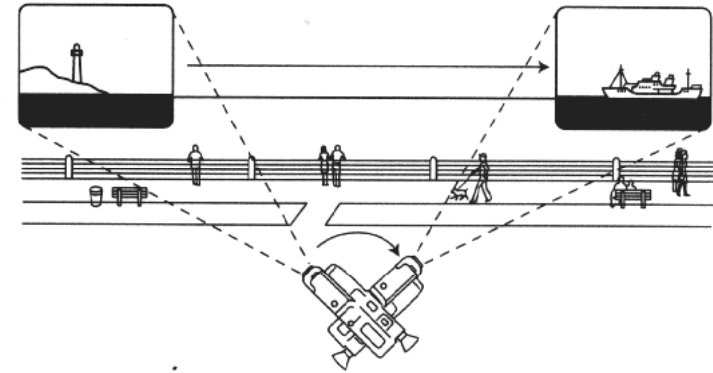
Panning

To make professional-looking handheld pans:

- First, stand so you face in the direction where the pan will end.
- Without moving your feet, rotate your upper body so your camera faces the direction where the scene will begin.
- Start shooting. Rotate your body slowly to the point where the pan will stop.
- Hold your breath while panning; the result will be much smoother.
- Avoid repeated pans of the same scene.

The pan shown in the illustration might not be very interesting if it were not for the people walking in the foreground. Use a tripod for panning when possible and, for best results, lock it to prevent tilt.

Framing and Composition

Cinematographers use a combination of focal length, camera angle, and composition to visually frame stories. There is no right or wrong way to shoot a scene, but there are always stronger or weaker shots as they relate to telling a story.

A visual story of a troop's court of honor will benefit from an opening, or establishing, wide-angle, or long, shot.

The long shot (LS)

- Defines the environment

- Establishes the participants

- Helps the audience get a feeling of the overall mood

Follow the wide angle with a shot of what your eye has been drawn to in the wide angle. You might look at some portion of the room, say, a group of people or objects that seem more interesting than the overall scene. In moviemaking, this is called a medium shot. It could be a shot of the color guard during the Pledge of Allegiance or a shot of the honors table gleaming with awards waiting to be presented to deserving Scouts.

Then, you could zero in on one person or object in the group that seemed for some reason to be the most interesting. In moviemaking, this is called a close-up (CU). If it were a special night to honor grandparents, then the strongest close-up might be their faces beaming with pride.

Shooting a statuette of Baden-Powell from an angle
below (an "up" angle) will honor tradition, while shoot-
ing across the statuette toward the award's recipient will
connect that Scout with the tradition. Both are excellent
angles, but the second may be a more compelling and a
more telling shot of a court of honor.

These techniques establish the rhythm of a film. In
general, each sequence in a movie consists of long shot,
medium shot, close-up; long shot, medium shot, close-
up; and so on. Frequently it is necessary to break up this
sequence to tell a more interesting story. The variety of
shots is what keeps an audience interested.

Size the Scene
Mix long, medium, and close-up shots. Continuous
use of long shots or close-ups gives a movie a monot-
onous, flat impression.

Framing People
Basic shots for framing are as shown. Experience dic-
tates that shots framing people different from this do
not have as pleasant an effect. *Upper left:* even if you
cut off the hairline, don't cut off the chin. *Upper right:*
when shooting a profile, leave the space in front of the
face to create a "sight line." *Center left:* bust shot
(chest and above). *Center right:* waist shot (upper hips
and above). *Bottom left:* knee shot (knees and above).
Bottom right: full shot (entire body).

Close-Ups

Close-ups are important, and audiences love them. However, certain guidelines are as reliable in filming close-ups as a compass and a map are to hiking and backcountry camping.

- In a close-up of a person's face, it's permissible to cut off the frame at his or her hairline, but not at the person's chin or mouth (exception: extreme close-ups, or ECUs, showing eyes only or lips only).

- If shooting the action of hands, such as picking up an object or using a tool, use a medium shot and then repeat in a close-up, making sure the action overlaps and progresses accurately to make for a smooth cut. For example, if a Scout is hammering a tent peg into the ground, a medium shot would establish his swing and hit, and the close-up would emphasize another swing and hit. Resist editing out a portion of the action —called a "jump cut"—because it will feel unnatural to the audience.

- Calling for eye contact with the camera in a dramatic story is rare, but a camera-aware Scout or presenter is always preferred to a speaker who never makes eye contact.

The Two-Shot

An effective way to capture dialogue scenes between two actors is the two-shot: shooting A over B's shoulder and B over A's shoulder. The two-shot should be acted out completely twice, with both actors giving all their lines. First shoot A over B's shoulder, then play the scene again, shooting B over A's shoulder. To be most effective, a two-shot should be preceded by a medium shot of both actors together in the frame as they give the first couple of lines of the dialogue. This establishes their relationship in the scene.

When you edit, you can audio-dub the entire dialogue first (record it on the standard track when you shoot it), then insert the proper video shots showing first the medium shot of both actors, then A over B's shoulder, then B over A's shoulder, then back to A, and so on. The scene can be closed with another medium shot of A and B going off to do whatever they are going to do next.

A two-shot is quite easy to edit in film, but in video it may take several tries to keep things lip-synched unless you are fortunate enough to have access to two VCRs that can be locked together synchronously.

Rehearsals help when working out staged action. If you know where the actors are going and what you want to accomplish with the camera before you roll, rehearse "the take" and your results will usually improve. You will learn a lot about the speed at which actors want to walk or the terrain they have to climb. After the rehearsal, make adjustments to smooth out the action, but be careful not to make so many adjustments that actors feel like robots on a track.

If you are shooting a documentary and are unable to re-create or repeat a scene, use your instincts to anticipate good camera movements and framing techniques. Documentaries are all about camera position. You want the camera to be in the right place when the action moves in front of the lens.
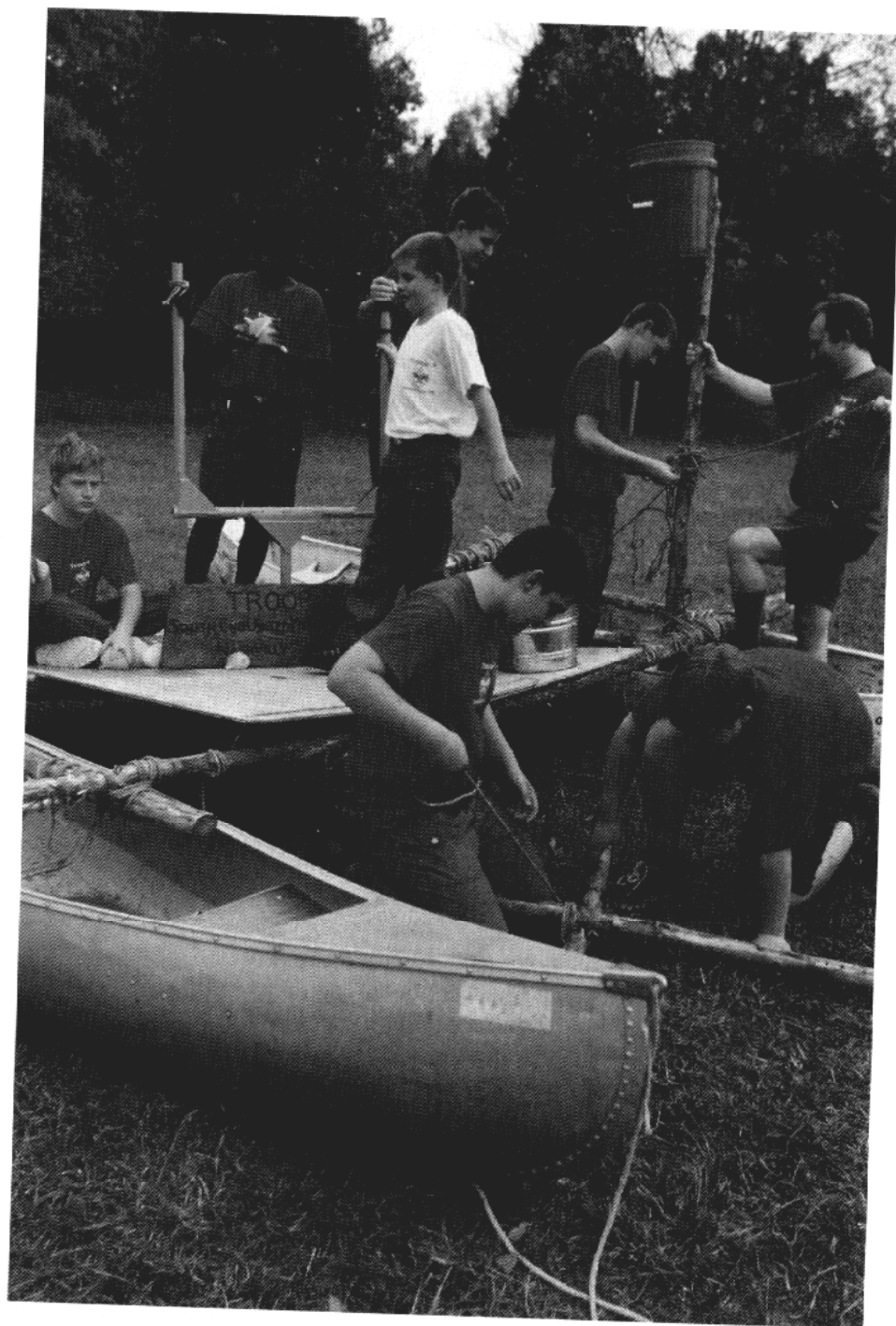
Shooting a Story

You have read bits and pieces that apply to shooting a story (for example, the need for a tripod or dolly, lighting, budget considerations, preproduction). Here are some other basics to remember:

- Break down and organize your script ahead of time and shoot the common scenes together, even though they may not run together in the final piece. This saves valuable time. As you shoot each scene, mark it as it is done.

- Plan the day or days of shooting and follow your schedule. Following this schedule helps keep volunteers motivated for the next shooting day or project.

- Try to stick to your scenes, but if you imagine a scene you had not planned, shoot it. The worst that could happen is that it is never used. The best that could happen is that the scene saves the day!

- Have cast and crew on the set at least an hour before shooting. Write down proper directions (if going to a site) and have timetables understood.

- Don't record people or business locations unless you have permission. (Secure these permissions in writing during the preproduction phase.)

- Have more than enough tape stock, batteries, cables, and light-reflective materials.

- Plan to serve any volunteers a meal or refreshments and provide beverages on the set. This keeps volunteers from wandering away.

Basic Techniques

A moviemaker wants to tell a story in a way that will hold the attention of the audience and keep them interested without any annoying distractions. Here are some points to consider relating to lighting and continuity.

Lighting

Strive to compose each shot carefully and make each as photographically beautiful as possible. Outdoors, you should usually keep the sun roughly beside you and the camera. Avoid shooting outdoors at noon; the high sunlight causes black shadows under trees and shrubs in scenics and under the eyes of your actors—very unflattering. If you are in a backlit situation, have a helper hold a reflector made out of white foam core or silver foil wrap so it reflects a little sunlight onto the actors' faces. But pay attention and don't overdo it.

When using sunlight as your light, move your subject until the sun makes an interesting source. Many times backlight is the most flattering for dramatic shots, but you may want the benefit of three-quarter-front light to effectively illuminate all elements of a demonstration.
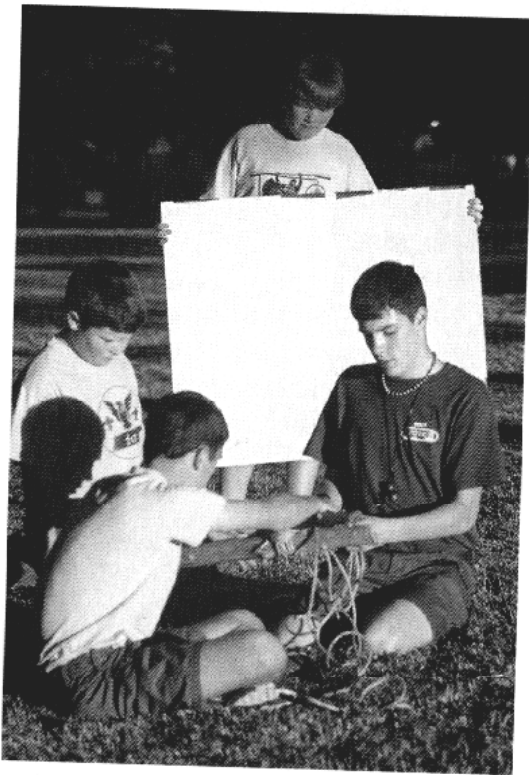
A simple reflector can soften harsh shadows.

If you can't get the natural lighting you need, shoot at a different time of day or add reflective lighting to compensate. Reflectors can be made from plastic mirrors, matte-white surfaces like foam core, aluminum foil, or other reflective surfaces.

When shooting indoors, set lights carefully. For most shots you won't need many—perhaps a single floodlight bounced off the ceiling of a room to pump up the overall level of illumination, with maybe a few low-wattage spots. Aim one spot on each actor's face and another on any object the actors might be looking at. Set the lights so the shadows they cast fall outside the scene; move them farther away or closer to the subjects to adjust the amount of light falling on them.

Know that a light moved twice as far from a subject cuts the light falling on the subject by a factor of four. (Make little scrims out of pieces of window screen and fasten them over the lenses of the spots with wooden clothes pins. In general, a single thickness of window screen will cut the intensity of the light by half an f-stop, while a double thickness will cut the intensity by half.) If you have a small color television set, patch it to your camcorder to see the effect of lighting before you shoot the scene, and adjust if necessary.

Lighting Terms

Intensity. Brightness (affects exposure).

Quality. Hard (shadow-forming) or concentrated; soft (shadowless) or diffused.

Contrast. A ratio between the lightest and darkest areas in the shot.

Proper Light Intensity Needed

The camcorder may not operate properly if

- There are low light levels.
- The lens aperture is too small.
- The filter being used is too dense.

Too little light may cause picture "noise," smearing, or trailing effects with some cameras.

High light levels can be compensated for by

- Moving the subject away from hot lights
- Changing the f-stop
- Using a filter
- Switching off lights
- Using a dimmer
- Placing diffusing material over a light (but not touching the bulb!)
- Bouncing the light off a wall or white surface

Continuity

To be effective, a movie must have the events flow in an orderly, logical manner. Continuity is one of the important reasons for preparing a script, storyboard, and scene log before shooting a movie.

Continuity errors can be either glaring or subtle. In either case, they create a distraction for an audience, and viewers are apt to lose their understanding of the story. A glaring continuity error may evoke laughter from an audience during a serious moment. A subtle continuity error may make an audience uneasy, distracting them from focusing on the story.

For example, if you establish in your movie that Scout camp is to the left as viewed on screen and the river is to the right, whenever your actors move from the camp to the river, they must always move from left to right across the screen. When they return to camp, they must always move from right to left. This is called screen direction. An error in screen direction is a subtle error that will almost always cause a sense of unease in an audience.

Similarly, if one of your actors is wearing a neckerchief in a long shot of a certain scene, he must still be wearing it in the following close-up unless the audience saw him remove it on camera. The same goes for inanimate objects that you show in a scene: If, say, an alarm clock is present on a bedroom nightstand in the first shot of a bedroom, it must be present and in the same position in each subsequent shot of that set. Likewise, if it is absent in the first shot, it must not appear as if by magic in subsequent shots.

The list goes on and on—the actors' clothing, the time of day as determined by the position of the sun in outdoor shots, cloudy versus bright days. To record in writing the content of each scene and help prevent continuity errors, a professional production employs what is called a script supervisor.

It is perfectly acceptable to use flashbacks in movies to establish events that led up to the situation being currently portrayed. But if you do so, the audience must be aware that what you are showing is a flashback (revealing a calendar with a previous year, for instance).

Some moviemakers utilize visual effect to join discontinuous segments of movies, and this can be effective. For example, a "lap dissolve"—the beginning of the next scene appears before the end of the last scene completely disappears—may be used to denote a change in time, and a fade-out or fade-in to denote a change in place. Many camcorders have automatic dissolves, or wipes or fades, that are used for this same purpose.
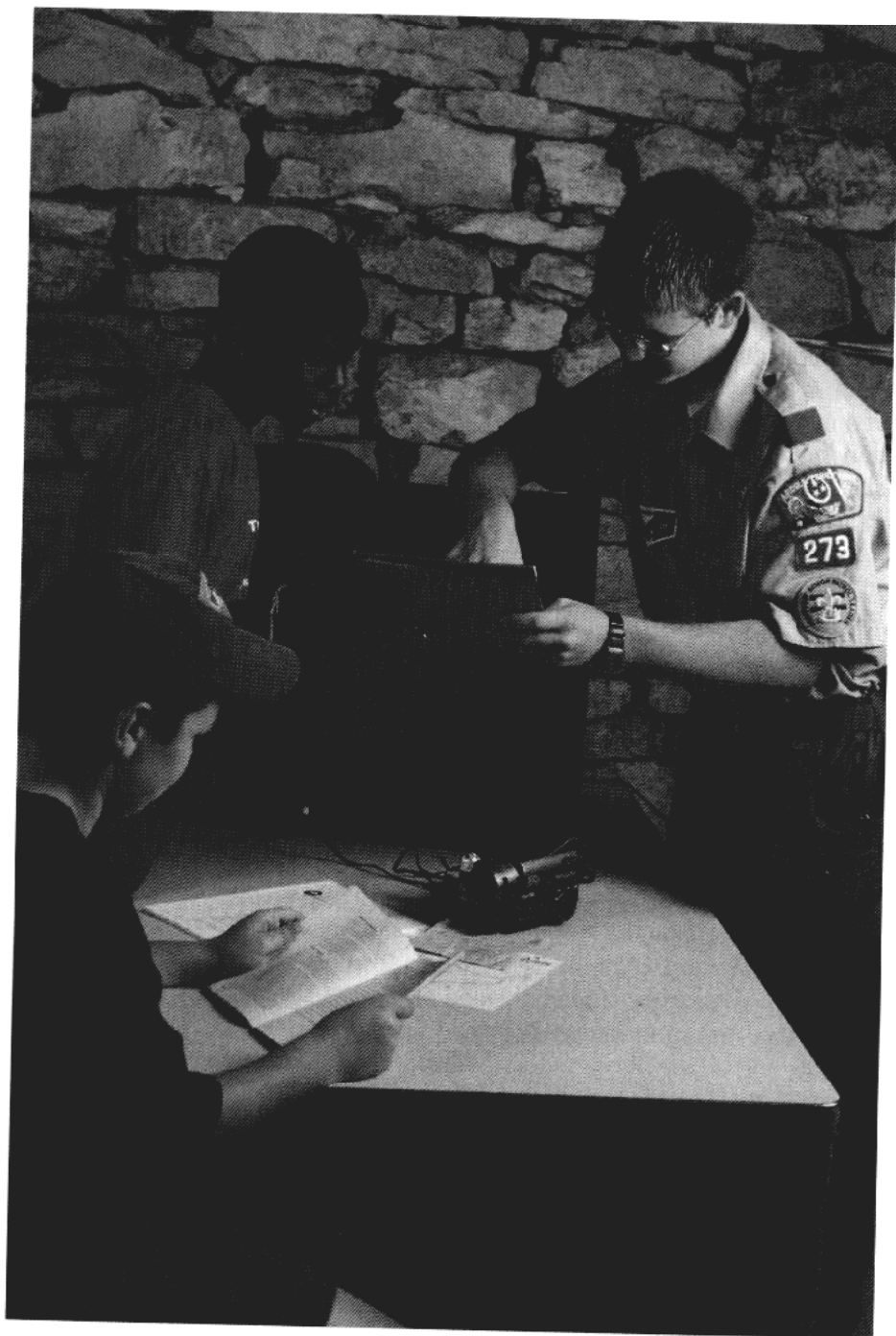
Editing

Editing is the last step in filmmaking before showing your finished work. Effective editing will give your finished video the result that you intended while keeping your audience absorbed in your story. In fact, you could think of the editor as the storyteller.

You probably have seen a movie you thought was too long or that included scenes that did not flow with the rest of the movie or that did not enhance the storyline. To create the finished video or film a skilled editor takes out all of this "fluff" footage, puts together all the important elements, and watches the film in the eyes of the audience.

The art of editing calls for attention to such things as

- Pace, tempo
- Mood, emotion, performance
- Lighting, color, tone
- Movement/motion, angle
- Sound and narration/dialogue
- Special effects
- Foreground, background
- Continuity, order

For your purposes, you might not incorporate some of these finer points of editing (that will come later, in future projects). However, in the end, your edited video should nevertheless capture and clearly communicate your message and entertain the audience.

Getting Ready to Edit

In simple terms, editing means taking information from one source and selecting pieces to go to another source, enhancing picture and sound quality, correcting mistakes, and assembling it all into a whole. In your case, individual shots and scenes are added one at a time to build a story. Think of it as putting a train together: first the locomotive, then the cars, one after the other connected properly, then the caboose. An edited videotape is no different; the idea doesn't move if the pieces don't connect.

Editing Discussion List

Before editing, look over the shots and log them. In other words, play back each tape on the first VCR and note what is in the shot and what "take" the shot is (one, two, three, etc.), and time the scene with the numbers on the time or lap counter or time noted on the VCR display. When you are done, you have a written history of what's on the tape(s), where each shot is on the tape(s), and how long each shot is in seconds. (If you don't have a time counter, use a stopwatch.) Mark each tape when completed as Tape A, B, C, D, and so on.

To build an editing discussion list (EDL), pick out the scenes according to your storyboard. Note the location on the tape of the shots that make a scene and write it down in log form. This "train" of scenes becomes the basis for your production.

Actual Editing

Just as a very simple example, say you shot a court of honor. You might have started with a wide establishing shot of the room (1); then followed the action of the ceremony with a series of medium shots (2, 3, 4, 5); then shot some close-ups of participants, awards, and merit badges (6, 7, 8); and finished up with another wide shot (9). To get those into standard order as suggested in this pamphlet—long shot, medium shot, close-up, long shot, medium shot, close-up—you will have to rerecord them on a blank tape in the second VCR. Your series 1, 2, 3, 4, 5, 6, 7, 8, 9 becomes something like 1, 2, 6, 3, 8, 4, 5, 7, 9.

Cue up the first shot of your EDL on the first VCR, then use the buttons to record it on the second, timing it to omit any mistakes or nonaction. You can see how shooting in sequence—long, medium, close-up—reduces editing time. A well-thought-out project, good preproduction planning, and creation of a more-than-adequate storyboard are important, aren't they?

A complex project shot in different sections on different tapes (e.g., interior and exterior) will take longer to edit, but the process is the same.
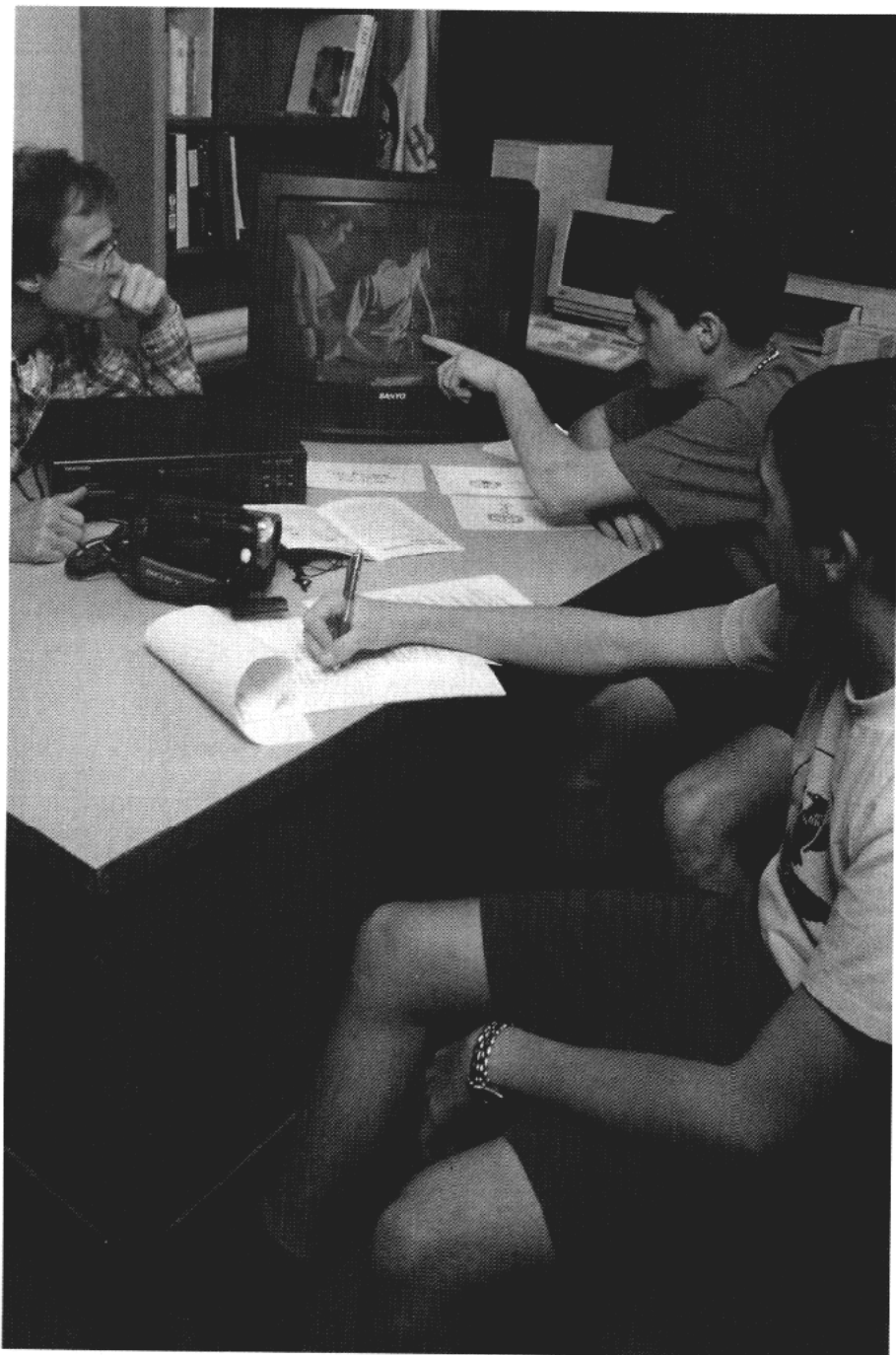
Your Showing

You must be prepared, as in the Scout motto, for the showing of your completed work. Consider the following steps.

1. Show your final tape to your parents and counselor. See if they spot any serious problems you might have missed. Correct or eliminate the problems if you can before the showing.

2. Write a brief introduction about the making of the tape to use when you introduce your work. Integrate events that occurred during production and specifically relate what you may have discovered about the art and science of cinematography.

3. Watch the audience closely and judge viewers' reactions to see if mood and environment are conveyed through your visuals.

Take negative comments politely. If they are from someone genuinely interested in your work, listen and learn for future productions. Don't ask "Did you like it?" or "How can I improve?" If people like it, they will tell you. If it has weak spots, your counselor will tell you.

Be proud of your work if you did your best.

Glossary

anncr. Announcer, the narrator.

BG. Background or "music under." With reference to music, under a narration.

crawl. A graphics effect whereby words scroll on the screen.

CU. Close-up. A tight shot on an element included in a longer shot, typically faces.

cut. The abrupt jumping from one visual to another, without a fade or dissolve. Also refers to a director's command to his crew to stop the action or to stop shooting.

depth of field. The amount of focus in front of and behind a subject being photographed.

dolly. A heavy cart or object with rubber wheels used to support a moving camera in a shot that "tracks," or follows, action or establishes a setting.

diss. Dissolve. A film or video term referring to one shot blending into another.

ECU. Extreme close-up. An extremely tight camera shot.

fade. When a picture or sound fades out or in.

FG. Foreground.

freeze, freeze frame. The freezing of a video frame or field.

grain. The often hazy quality of silver-emulsion film that is enhanced when it is magnified, or blown up.

lavaliere, lavaliere microphone. A miniature mike that can be clipped to clothing.

library music. Existing, copyright-free music that can be purchased for a fee.

LS. Long shot. Camera sees a wide field of view.

MCU. Medium close-up. Camera is in medium range of the subject.

mix. Refers to blending of various elements of a sound track, such as music, narration, and sound effects, into one master track.

nar, narr. Narrator, narration.

pan. Horizontal camera move on a tripod or support from left to right or vice versa.

postproduction. Work that goes on after the shoot until the edited master is finished.

preproduction. All the planning and budgeting necessary before production can begin.

roll, rolling titles. Words that move up or down across a picture.

set. A set can be in a studio or on location.

SFX. Special effects.

stock footage. Existing footage from a film library or commercial film source that can be inserted, or intercut, with live footage. Usually less expensive than shooting original footage.

storyboard. A series of simple sketches that depict a sequence of scenes for a production. Critical as a guide in production and postproduction.

supers, superimposition. Double-exposure of words over a video scene or film frame. A "lap dissolve" (short for overlap), for instance, superimposes a fade-out over a fade-in.

talent. People who appear before a camera or microphone.

tilt. Vertical camera move up or down.

track shot, dolly shot. When the camera moves along with the talent on a mobile tripod or actual "track."

V/O. Voice-over. Narration from off-screen, usually recorded independently from footage.

wipe. An optical cutting effect where one shot "wipes" another off the screen.

WS. Wide shot. Same as long shot.

zoom, zoom in, zoom out. Effect produced with a zoom lens, where the camera seems to come to or pull away from the action of a scene.

Resources

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