

**Figure 5.11 Hanging/slung microphone**

Useful for area pick-up (audience applause, choir). But problems arise when people move around, or are at different distances from the mike (e.g. seated and standing).

## 5.20 Hanging or slung mikes

Sometimes the best solution to locating a microphone near enough to the sound source is to suspend it over them, e.g. above a choir, or part of an orchestra or an audience. Do not hang the mike by its own cable, but rig it securely with line (cord), using extra safety lines in case anything comes adrift and it falls down.

The hanging mike has several limitations. The mike will be visible in long shots (this may not matter). It usually has a fairly localized pick-up area (people may inadvertently move out of it). Its position cannot normally be adjusted during the production item. It may pick up quite a lot of extraneous noise. Its coverage of individual speakers in seated groups is poor. It can overhear and pick up hum from nearby lamps. It may cast a distracting shadow on the background.

## 5.21 Hidden mikes

When other methods of sound pick-up are difficult, a hidden microphone may be the solution to your problems. It can be concealed among a bunch of flowers on a table, behind props, in a piece of furniture, etc.

This idea too has its limitations. Although you can hide the mike, it may not be easy to prevent its cable being seen. Sound quality may be affected by nearby reflecting or absorbing surfaces. Because the mike covers a fixed localized area, you have to rely on a performer playing to the mike and not speaking off-mike.

# Controlling dynamics

## 5.22 Dynamic range

Everyday sounds can cover a considerable volume range. Fortunately for us, our ears are able to readjust to an astonishing extent to cope with these variations. But audio systems can't do this. If audio signals are larger than the system can accept, they will overload it and become badly distorted. If on the other hand sounds are too weak, they get lost in general background noise. So if we want to reproduce audio clearly, with fidelity, it has to be kept within the system's limits.

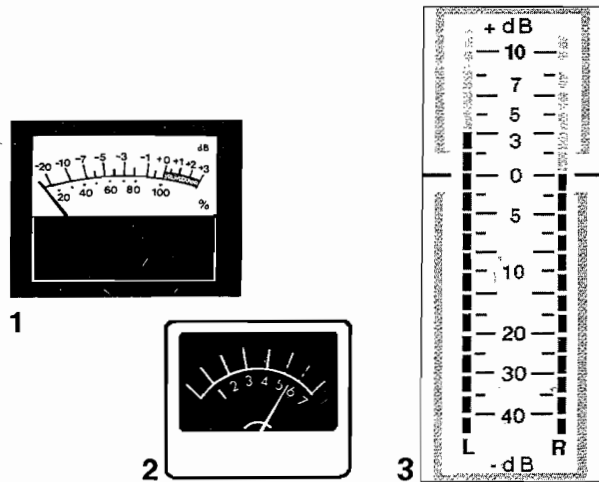
A lot of sounds pose no problems at all. They don't get particularly soft or loud; that is, they do not have a wide dynamic range. When you are recording sound of this sort, there is little need to alter the gain (amplification) of the system, once it has been set to an appropriate 'average' position.

But one has to record sounds that vary in volume from a whisper to an ear-shattering blast. And the latter will certainly exceed the system's handling capacity, unless you compensate in some way. The obvious thing to do is to turn down the system's audio gain so that the loud parts never reach its upper limit. But now the quiet passages may be so faint that they are inaudible.

So somehow or other, you need to control levels, unless the sounds happen to have a limited dynamic range.

## 5.23 Automatic control

As you saw earlier when looking at video cameras, equipment today often allows you two options – either you can let it adjust itself *automatically*, or you can control it *manually*.



**Figure 5.12 Volume indicators**

**1 Volume Meter (VU Meter)**

Lower scale shows percentage modulation, where 100% is system's maximum limit. Keep your sound peaks in 80–100% (12–0 dB), only occasionally over (+1 to +3 dB) in the red area. Readings are unreliably low for loud transient sounds (e.g. percussion). The upper scale marked in decibels (dB), is used for calibration and line-up (with steady tone). Normal range is -20–0 dB.

**2 Peak Program meter (European)**

Designed specifically to indicate sound volume peaks. The PPM has fast-rise/slow-return characteristics, so its needle fluctuates less than a VU meter. Its easily read seven-section logarithmic scale is akin to the ear's loudness response (unlike the VU meter).

**3 Bargraph**

Instead of a meter dial, this volume indicator shows a bargraph of LEDs (light emitting diodes), gas-discharge devices, or plasma displays.

In this example, both channels of a stereo system are monitored, showing the peaks of the audio signals. In more complex arrangements, twin bargraphs are used to indicate separate VU and PPM displays.

To avoid loud sounds overloading the audio system and causing distortion, most audio and video recording equipment includes *AGC* (*automatic gain control*) circuitry also called *AVC* (*automatic volume control*). When the sound signal exceeds a certain level, the *audio gain* (*amplification*) is automatically reduced. You plug your microphone in, and the circuitry looks after sound peaks or so we hope.

There are two situations here. In the first, you have a completely *automatic* system, which amplifies all incoming sounds to a particular preset level. It 'irons out' sound dynamics by preventing over- or underamplification. Quiet sounds are increased in volume and loud sounds are held back. You have no adjustments to make and must accept the results.

This can be an effective enough way of coping with occasional overloud noises, but if the sounds happen to be so loud that they are continually '*hitting the limiter*', the results can be very distracting from an unpleasant strangled effect as sound peaks are '*pulled back*' to moments when quiet background sounds are overamplified, and surge in persistently whenever there is a pause.

In a second control system you adjust the audio gain *manually*. The trick is to ensure that your gain control is set high enough to amplify the quietest passages without running into overamplification of the loudest sounds. The AGC circuitry only limits sound peaks as an occasional safety measure, depending on your gain adjustment.

### 5.24 Manual control

The other method of controlling the audio level is to listen continuously to the program ('monitor' it) while watching a *volume indicator*, or *audio level meter*. As you watch, you re-adjust the system's gain (amplification) whenever necessary, to suit the incoming audio signal. That does not mean of course, that one should iron out the dynamics, by making all the quiet sections loud, and holding back all the loud passages. 'Riding the gain' in this way can ruin the program.

Instead, if you know sounds are going to be weak, you anticipate by gradually increasing the gain, and conversely, you slowly take back the gain before loud passages. Then the listeners are unaware that you are making changes to accommodate the audio system's limitations.

How quiet you allow the softest sound to be, can depend on the purpose of your program. If, for example, you are making a videotape that is to be used in noisy surroundings, or shown in the open air, it may be best to keep the gain up to prevent quietest sounds from falling below  $-15$  or  $-20$  dB. If you are shooting a piano performance, to be heard indoors, take care not to overcontrol the music's dynamics, and use the system's full volume range.

Because, unlike auto circuits, you are able to anticipate and make artistic judgments, the final effect can be far superior. The drawback to manual control though, is that you have to be vigilant all the time, ready to make any necessary re-adjustments. If you are caught out, results may be less satisfactory than the auto circuits would have produced!

There are several types of volume indicator, but the commonest on video equipment take the form of *visual displays* using bargraphs of LEDs (light emitting diodes) or *VU meters*.

A bargraph (Figure 5.12. Pt. 3) has a strip made up of tiny lit segments. This varies in length with the audio signal's strength. Calibrations vary, but it might for example have a decibel scale from  $-50$  to  $+10$  dB, with an upper working limit of about  $+2$  dB. You simply adjust the audio gain control so that the sound peaks reach this upper mark.

The VU (Figure 5.12. Pt. 1) meter is a widely used volume indicator. It has two scales: a 'volume unit' scale marked in decibels, and another showing 'percentage modulation'. Although accurate for steady tones, the VU meter gives deceptively low readings for brief loud sounds or transients (e.g. percussion). So one could accidentally let the system overload.

Maximum signal coincides with 100% modulation / 0 dB. Above that, in the red sector, sounds will distort, although occasional peaks are acceptable. The normal range used is  $-20$  to 0 dB, typically peaking between  $-2$  to 0 dB.

A further type of indicator, the *PPM* (*peak program meter*) is used only on certain professional audio equipment. It has a seven-section scale (4 dB per division), using 2–6 as its normal range. (Figure 5.12, Pt. 2)

We might summarize the situation by saying that if you need the audio system to look after itself, because you are preoccupied with shooting the scene, or are coping with very unpredictable sounds, then AGC has its

merits, for it will prevent loud sounds overloading the system. If you have an assistant who can monitor the sound as it is being recorded, and adjust the gain for optimum results, then this has artistic advantages.

There are special electronic devices, called 'limiters' or 'compressors', that automatically adjust the dynamic range of the audio signal, but these are only found in more sophisticated systems.

### 5.25 Monitoring sound

Monitoring sound for a video program involves

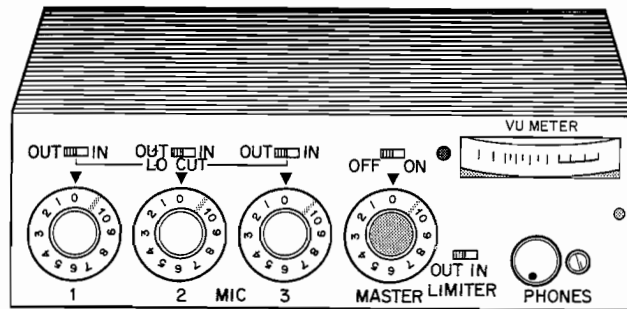
- *watching*: checking the volume indicator, and seeing that the microphone does not pop into shot inadvertently,
- *listening*: on high-grade earphones or a loudspeaker, to check sound quality and balance, and detect any unwanted background noises.

If you are going to tape a performance straight off, without rehearsal, as with an interview, you should ask a performer to give you a few words before they begin, as a *voice-level* or *level-test* at the volume they are going to use during the taping. Alternatively, if they have a preliminary chat with an interviewer, you can normally 'take a level' then instead. Otherwise, you can judge the volume and dynamics from a rehearsal.

As you monitor the sound, get an impression of its possible dynamic range, while watching its peak on the indicator. (Even if the system is using AGC, there is often an indicator to prevent your 'undermoding' by having the audio gain setting too low.) If the results are not satisfactory, you may need to ask the speaker to talk louder or more quietly, or to reposition the mike. Finally, on a prearranged hand signal, when the recording has started, you cue him or her to begin.

### 5.26 The audio mixer

You need an *audio mixer panel* whenever you have a number of sound sources to select, blend together and control (e.g. a couple of microphones, audio tape, CD, VCR audio output, etc.). The output of this unit is fed to the VCR.



**Figure 5.13 Portable audio mixer**

Used in the field, to mix up to three mikes, the overall output is controlled by a master fader. An optional bass cut can be switched into any channel (to cut wind-rumble and improve intelligibility). A VU meter provides a volume indicator. This mixer includes a limiter, to prevent audio overload. A phones check-jack monitors the audio.

On the front panel of the audio mixer, are a series of rotatable knobs (or sliders). Each of these 'pots' (potentiometers) or 'faders' can adjust its channel's volume from full, down to fade-out (silence). In some designs, you can also switch a channel in or out ('key it') on cue.

When you plug the sources into the patch panel (connector strip) at the rear of the unit, you can choose which pot controls which source. Some mixers also include *channel selector switches* that allow you to reselect the channel controlled by a particular pot (e.g. either mike-1 or mike-2).

In a larger panel, as well as these individual channel pots, there may be *group faders* (group masters, submasters). Each of these group faders controls the *combined* outputs of several channels, and it may have its own group volume indicator. You could, for instance, use one group fader for all the mikes on an audience.

Finally, there is generally a *master fader* that controls the overall audio strength being sent to line (e.g. on the VCR). This can be used to fade the complete mix in or out. A master volume indicator shows the combined strength of the mixed audio.

Larger audio mixers include a *cue circuit* (audition, pre-hear), that enables you to listen 'privately' on earphones or a loudspeaker to the output of any individual channel, even when its pot is faded right out. So you can hear to set up a disc or tape at exactly the right spot, ready to be started on cue, without this being overheard on-air. You can also use the facility to identify circuits, making sure that the person at the other end is ready with their contribution.

The larger mixer panel will also include an *intercom* (production talkback) circuit that allows the sound operator to talk to assistants, and the director to communicate with the production team on headsets.

## 5.27 Using the audio mixer

Whether operating an audio mixer is a straightforward matter of 'just fading up a microphone or two and controlling the sound levels', or a complex process involving edge-of-seat decisions, will largely depend on the type of production, and how the director decides to treat it. For example:

- A 'live' show, which is transmitted or taped 'as-it-happens', involves rapid decisions and simplified operations. There is inevitably a feeling of urgency, tempered with caution. When working on a production that is being taped 'scene-by-scene' there is time to set up complicated audio treatments. Anything that goes wrong can usually be corrected and improved.
- Where there are a number of contributory sound sources which need to be cued in at precisely the right moments, it will pose very different problems from a less complicated routine such as an interview.
- Is the program's soundtrack being compiled during performance, or later during a post-production session?
- Have the incoming sources already been controlled and prepared (e.g. as when using recorded material), or are you controlling live incoming sources which continually need to be individually monitored and adjusted (e.g. filtering and reverberation added)?

These are just a few of the issues that decide how complex your audio mixer needs to be, and how you will use it. Let's look at typical operations in some detail.

**1 Cueing in and out.** It is normal practice to cue a sound source, fade it in just before it begins (to the appropriate pot setting), and fade it out when it has finished.

If all the channels you want to cue are linked to a group fader (e.g. several mikes on a choir), this will control them simultaneously.

You can fade a source or a group in and out gradually (sneak in, fade-away) or rapidly (a straight fade-in, fade-out), whatever is most appropriate.

You should never leave a sound channel 'open' (live) when it is not in use. Apart from accidentally recording overheard remarks ('Was that all right?') and other unwanted sounds, it may pick up someone who is on another mike. Then you will have the sound from their mike, mixed with the 'off-mike' sound from the original microphone, which will produce an unpleasant echo effect.

**2 Program continuity.** Here we are concerned with selecting and introducing the right source at the right moment, and cutting each contribution as it is completed.

You can use either the channel pots for individual sources, or the group faders for a pre-balanced group.

As an example, imagine we are shooting a scene in a drama production. The audience sees a domestic interior, where music from the radio (*actually from a CD player beside the sound desk*) plays quietly. An actor is talking (*on live mike 'A'*) to another person (*on live mike 'B'*) who is out of shot. A nearby telephone rings (*fade up effects tape of phone ringing*). The actor turns down the radio (*we fade down the CD*) and picks up the phone (*from stop the effects tape*). Continuous background noises of a storm (*from another audio tape*) can be heard at a low level throughout the scene.

All these entries and exits would be carried out on individual channel pots. The different tape and CD machines may be operated by the person at the sound desk or by an assistant.

**3 Creating a sound balance.** If you are combining several sound sources, you will seldom want to add them all at their full original strengths. You will want to blend them for a particular overall effect.

Supposing you use a single microphone to pick up the sound from a musical group. With experience and good acoustics, this could work. But the chances are that it would pick up certain instruments much better than others. Loud ones would dominate; quiet ones would be lost. The overall balance would be poor.

Instead, you could use several microphones, devoted to different parts of the group. Then you would be able to increase the volume of weaker instruments (e.g. a flute) and hold back the louder ones (drums). With care, the result would sound perfectly natural and have a clearer overall balance.

Sometimes you will want to adjust the relative volumes of sounds to create an illusion of *distance*. If the sound of a telephone ringing is loud, we assume it is nearby; if it is faint, it must be some distance away.

You might deliberately *emphasize* sounds, e.g. by re-adjusting the pot controlling the crowd noise, to make it louder at an exciting moment, and give it dramatic impact.

The final balance you decide on is always a blend to suit your production.

## 5.28 Sound complexity

Preparing program sound can be simple and straightforward, or a highly complex business. It depends on the type of program you are making, how you decide to treat it, and how you go about the job. If you want to point

your camera with its attached mike at the scene, and edit in camera, to get a finished product, you can do so, within certain limitations. But this is a very restrictive technique.

You do not have to have expensive, sophisticated audio equipment, to develop an effective, interesting soundtrack. With a certain amount of imagination, patience and careful organization, you can often achieve impressive effects cheaply and successfully with everyday facilities. But it is liable to be a longer and more laborious process. That is the price one has to pay.

### 5.29 Live sound

Practically speaking, there are really two live sound pick-up situations:

- The *repeatable performance*, in which you can re-record a sequence until it is just as you want it.
- The *once-only event*, in which you have just the one shot and must get it right first time.

The latter is the time when it may be wise to have a second microphone and a duplicate audio recording. If for example you are taping an important once-only speech, you could always at a pinch use track from the standby audio recorder together with audience shots ('cutaways'), rather than have an embarrassing gap in the program at the moment someone knocked the camera or pulled the main mike cable!

When you are recording an item 'live', as it happens, you need to monitor the program carefully, keeping a lookout for any errors or defects. It is too easy for something to go wrong, and remain unnoticed until afterwards. A fault that may be easily corrected at the time can be impossible to gloss over later, if you discover on replay that the sequence is unusable!

### 5.30 Recorded inserts

The great advantage of recorded material is that you know exactly what is in it – its contents, quality and durations. Even when there are unwanted sections, you can usually avoid them.

It can be more convenient, and a lot simpler, to audio tape an item beforehand ('pre-recording'), than to wait and include it live in the main taping session: piano music, for instance, played in the background of a scene.

Apart from various sound effects, recorded audio inserts have some less obvious uses too. In a drama for instance, you can play audio tape, to provide the voice of 'someone speaking in the next room', or at the other end of a phone 'conversation', and avoid using an extra microphone to take just those few words live in the studio. Audio tape can provide the 'voice-over' of a commentator or an announcer. Your audience will not notice the difference, whether the inserts are live or pre-recorded.

It is possible to manipulate recorded sound in many ways. You can cut bits out, play only selected portions, change the order of sections – even alter its speed or play it backwards if you really want to! And of course, you can add filtering, echo and distortion with a full knowledge that if anything goes wrong, you still have the original recording to go back to and try again.

There are several tricks you can play with recorded effects, to enable them to fit your particular needs. For instance, if you want to insert a recorded sound effect, but find that the version you have is too brief, you may be able to extend it by re-recording it several times in succession; so you could

extend the drawn-out sounds of wind, seawash, a mob, machinery, traffic, etc. But watch out for any easily recognized feature though, such as a shout or the bleep of a car horn, that would become repetitious if repeated over and over.

You can create an illusion quite economically, by mixing suitable sound effects together. For instance, wind + rain + thunder + an automobile engine, can suggest that the car is traveling through a storm, although all the audience can see is the people inside it, and water on its windows.

By taking small parts of several effects, and joining them together, you can create the sound of something that does not exist! Thus you might combine the sounds of several different kinds of machinery (jet engine, sewing machine and slowed-down truck) to make the sound of a 'time machine'. A prehistoric monster might be contrived from the sound of several wild animals blended together, reversed, with speed changes.

### 5.31 Sync and non-sync sound

If the sound coincides exactly with the action in a picture, it is said to be *synchronized*, or 'in sync' with the action. This effect is most apparent when you can see anyone's lips as they speak, or their finger movements as they play an instrument, or watch actions that create noise (hammering or footsteps).

If after the picture and sound are recorded, they become 'out of sync' for any reason, the effect is usually distracting, annoying or comic.

If your audience cannot both see the action and hear its associated sounds simultaneously there can be no synchronizing problems. If someone's face is turned away from the camera as they speak, or we cannot see their finger movements as they play an instrument, or we do not see their leg movements as we hear them walking, sound and picture do not have to match at all accurately. We cannot judge whether the sound is accurately synchronized or not.

In fact, what we see and what we hear in the final program need not even be related! The back-of-head shot may be a mute 'cutaway', and a person at the piano may only be pretending to play, as the music comes from a recording. If you are using a piece of mute film or tape (no sound track, or with inappropriate audio) it is possible to simulate synchronization. A sound operator makes the appropriate noises in time with the original picture; a process known as *spot effects* or '*Foleying*'.

### 5.32 Why alter the soundtrack?

If you are shooting someone making a formal speech, the most appropriate technique may be simply to make a straightforward recording of what is taking place. But for many types of programs, this approach would be far too austere and ordinary.

You want to make your subject interesting, hold your audience's attention, give it a persuasive, convincing quality. And to do this, you may need not only attractive, well-chosen pictures, but carefully selected sound effects and music.

Let us take a dramatic example. Supposing that, at the time you were shooting a night scene, the location was disappointingly silent. Rather than leave the recording that way, you could make it more effective by introducing the sounds of night creatures such as owls, frogs, crickets, or even a quiet wind to build up a suitable atmosphere. Depending on what you

choose, the same picture could be made to convey peaceful rest, anxiety, even impending doom – whatever is dramatically appropriate.

There are situations where, by altering the soundtrack, you can remedy what would otherwise be a disaster. Imagine shooting a documentary on the seashore, and finding that the speaker's words are regularly interrupted by persistent blasts from a nearby foghorn. The program seems ruined.

But all is not lost! You could take the videotape, and omit any shots that show the speaker close enough to reveal moving lips. You then get him/her to re-record the lecture (perhaps using the original videotape soundtrack to derive a script). Add the general, unsynchronized sound effects of sea-wash (without foghorns!), and use this new version to replace the original soundtrack. You now have a complete, unblemished program.

If you are showing a series of pictures that are really somewhat disjointed – various views around a city perhaps – you can link them together, and create a sense of continuity, by having the same background of sound effects or music behind the entire sequence.

### 5.33 Making the changes

When a video production is being shot in a studio you have the option of building up the program as you go (i.e. mixing in any recorded picture and sound inserts with the live pick-up from the studio microphones as you shoot), or shooting one sequence at a time, and combining them all during a later editing or post-production session.

The first approach has the advantage that you end up with a *complete soundtrack* on the video recording at the finish of the taping session. But there is a major disadvantage too. Any subsequent videotape editing will be interrupting a *combined* soundtrack. So, if for instance, you are videotaping a dance routine, and it is later decided to cut out 'the bit where a camera lost focus', or to put in an extra cutaway shot of the audience to hide a clumsy picture mix, the music soundtrack accompanying the dancers would change abruptly at that point. In the first case it would jump several bars while in the second there would be momentary silence!

To avoid such dilemmas, many directors prefer to keep their options open, and wait until they have *finished editing the pictures* before finalizing the soundtrack. And that involves detailed post-production work after the taping session.

However, where you *do* need to picture-edit a videotape program that already has a soundtrack with its pictures, there are two basic methods of doing this:

1 The simplest is to make a modified copy (a *dupe* or *dubbing*) of your program on another VCR.

To do this:

- (a) Cable the *video* output of the replay machine to the video input of the record VCR. That will enable you to copy the original picture.
- (b) You also feed the *audio* output of the replay VCR to an *audio mixer*. Other audio sources carrying effects or music are plugged into the audio mixer too.
- (c) The output of the mixer is taken to the *audio* input of the record VCR. This will be carrying the original soundtrack, blended with the sound effects/music you are adding.
- (d) Now you are ready to begin. Start the replay VCR, and the recording (dubbing) VCR, and introduce the extra audio sources as you go.

It is an easy, foolproof method, and if at first you do not succeed you can try again. The result is a *second-generation* copy of the original pictures, and a new composite soundtrack.

Because no copy can ever be as good as the original recording the picture quality on this version will inevitably have deteriorated somewhat during the copying, but it may not be apparent. However, you still have the original videotape with its 'first generation' picture and sound should you need it.

2 Another method of changing the soundtrack uses a facility called *audio-dub* on the VCR. This allows you to replace the original sound-track on a videotape, but leaves its pictures untouched.

You *lift off* the original soundtrack, make a new version, then *lay this back* in place of the old one, as follows:

- (a) First you play your videotape program, making a copy of just its soundtrack, on an audio-tape recorder (from 'audio out' on the VCR).
- (b) You then replay this audio-tape copy, through a mixer, blending it with the effects and music recordings you want to add. From the mixer's output, you record the new *master audio track*.
- (c) Check this new track.
- (d) When you are satisfied with the result, you load a VCR with your original videotape (set back at its start), and switch the VCR to *audio-dub*.
- (e) Now you simultaneously play the new master audio track and record on the VCR. This will only affect the soundtrack of the original videotape. The result will be your new composite audio recorded alongside the original pictures, in place of the old sound.

The great advantage of this technique is that you have the original picture. So if you want to make copies of this program for distribution, you will get the best possible picture quality. (However, unless you keep an audio copy of its original soundtrack, you will have lost it during the 'audio-dub' process.)

There is a major snag though, if the program sound needs to synchronize exactly with the picture, e.g. close-up of people talking. Unless you are very careful(!) to ensure that the composite track starts at precisely the right moment, as you lay it back, you will get sound-sync errors.

Fortunately this situation is not as discouraging as it seems, for a surprisingly large number of programs do not contain (or can avoid) accurate sound sync.

At stage (b), instead of using a further audio recorder, you could have dubbed the mix straight back over the videotape's old audio track, but the method outlined is more flexible.

### 5.34 Discontinuous shooting

Most video programs are made up of a series of shots, taken in whatever order is most convenient, and edited together later to form the final program. This approach has both advantages and drawbacks. As far as the program sound is concerned, there are several complications.

First of all, although the various shots in a sequence have been taken at different times, you really want their quality and volume to match when they are edited together. Otherwise there will be sudden jumps whenever the shot changes. If, for instance, you take a shot of a person walking down a hallway, using a close mike, and then a side view of the same action using

a more distant mike, the difference in the sound, on cutting from one viewpoint to the other, could be quite noticeable. The overall effect would draw attention to the editing.

When you are editing together a sequence of pictures shot at different times you may find that their background sounds do not match. Supposing we stop shooting for a few minutes to reposition the camera, adjust a light or to retake the action. Background noises often change quite considerably, but we do not notice for we are busy with the job in hand. When we start again, they are now different.

So sounds that we became accustomed to while shooting the scene, such as overflying aircraft, farm equipment, hammering or typing, can have a nasty habit of instantly disappearing and reappearing when the shots are joined together.

When you are on location, it is a good habit to record some general background noise on a separate audio tape during the shooting session. It is surprising how often this unsynchronized *wild track* comes in useful during audio editing, for use as background sounds.

Even when you are shooting under what seem to be quiet conditions, there is a certain amount of background noise from air-conditioners, equipment hum, etc. A wild track of this *atmosphere* ('atmos') can be used later, to cover any moments where there is a break in the soundtrack during editing.

There will be times when you decide that the sound you are getting on location is not really suitable for your particular program. It may be too noisy, too quiet, or you may find that you cannot get good sound pick-up. In these situations you may decide not to record it (to shoot 'mute'), or to replace the available sound with others you have recorded at some other time. A suitable wild track can be extremely useful here.

Perhaps, for example, you have shot scenes in a street market, and find later that instead of a general atmospheric hubbub you want to go behind (lay under) a commentary, your sound track is dominated by a few intrusive noises. You can replace the original sound with more appropriate wild track instead.

Wild track can help during those awkward moments when background sounds in successive shots do not match. It can serve as a bridge to disguise when silent and sound shots are intercut.

You might be cutting from someone speaking, to a silent shot ('mute') as they walk away. Wild track behind the entire sequence would give it continuity.

Even when the shot contains action that would seem to need synchronized sound (e.g. people walking around in the booking hall of a bus station), a wild track recording made at different time (or a different bus station!) will be quite convincing.

When we see and hear the finished results of all this trickery, the whole thing appears quite real and natural.

## Getting organized

### 5.35 Preparations

So far we have been considering the nature of sound pick-up, and what you are aiming to do. Now we come to the very practical business of organizing

exactly how you are going to tackle the job in hand. Even if your video program only involves one seated person speaking to camera, it is as well to anticipate, before you go ahead.

### 5.36 Working single-handed

If you are program-making single-handed, and have to operate the camera *and* arrange sound pick-up, you cannot control the sound manually. But the AGC circuits of the video recorder will prevent the soundtrack from being overloaded ('over-mod'). Where you have an audio gain control, take a sound level test beforehand, and check on the volume indicator.

Whether you are using a separate VCR or a camcorder, you can check the audio as you shoot with an earpiece plugged into a monitor-socket on the camera. (In some designs, there is a small in-built monitor loudspeaker in the side of the camera unit.)

As to the method of sound pick-up you use, a lot depends on whether you are shooting continuously or discontinuously (intermittently); whether you are editing the recording or not; and whether the talent remains still or is moving around.

If you are going to break the action down into a series of separate takes, and shoot *discontinuously*, you can obviously reposition the camera and the microphone to suit each shot, editing either in camera or afterwards. When you are shooting *continuously* though, sound pick-up may pose some problems – but there are several solutions.

### 5.37 Practical methods

At first sight, a camera microphone provides the simplest method of picking up program sound (Section 5.10):

- The microphone is there on the camera and doesn't require a second person to look after the audio.
- Wherever the camera points, the microphone will follow.
- There are no problems with microphone boom shadows.

But the camera microphone has a number of drawbacks too:

- Integral camera microphones seldom provide high-quality sound.
- The microphone is often too far away from the subject for the best sound. Its position is determined by the camera's shot; not by the optimum place for the microphone.
- The microphone's distance is the same for all shots. The camera may zoom in to a close viewpoint, or take a wide-angle shot, but the sound level remains the same.
- Where there are strong sound reflections from nearby walls, or loud background noises, the microphone really needs to be placed closer. However, if you move your camera nearer to achieve this, the subject will now appear much too close. Then the only remedy is to widen the lens angle to reduce its apparent size. But close shots with a close wide lens angle noticeably distort people and exaggerate space.
- The camera microphone cannot follow somebody if they turn away from a frontal position; e.g. to point to a nearby wall map. The sound's volume and quality will fall off as they move *off-mike*.

A properly positioned individual microphone will usually provide much better sound quality than a camera microphone. And where you have an experienced interviewer using a hand mike well, sound pick-up clearly

presents few difficulties (Section 5.11). However, do not assume that you will get equally reliable results if you give a hand mike to an inexperienced person. Typically, they will feel ill at ease, and hold it incorrectly. You will usually see a similar response if you place them in front of a stand microphone. Remember, standing with a hand mike, or at a stand microphone is a very artificial, 'staged' situation, and in fact, this approach will not always be the appropriate solution.

A *desk microphone* is often the best form of sound pick-up where someone is seated at a table or desk (although rather less effective if they are standing). Whether you leave the microphone clearly visible, or hide it behind something on the desk-top, is up to you. Be warned though, against putting the microphone *inside* anything lying on the desk, for it will reduce the top (upper notes) and degrade the sound quality. If the speaker is going to turn to side, as well as face the camera, place the desk microphone midway between the head directions, so that the sound is similar for both directions.

As we saw earlier (Section 5.14), a *personal mike* is a very convenient method of picking up the sound for people who are not going to move around to any extent. It is best clipped on the clothing (tie, lapel or shirt front) whichever side the person is most likely to turn.

A cable can be a menace if the speaker is going to do anything energetic, or move in and out of a series of obstacles, e.g. within various pieces of sculpture in an art display. A wireless mike overcomes this dilemma, but of course it is a much more costly solution.

Whereas you can place a desk mike in position beforehand, you have to wait for the speaker to arrive to fit a lavalier/tie-clip mike. People who are unused to personal mikes may feel awkward and tied down by this unfamiliar appendage.

If someone is moving around over a wide area, you will not be able to cover them effectively with one static microphone. A very directional microphone, that is carefully aimed, could be successful, but this would involve a separate operator. So for the lone program-maker, the best solution may be to use two microphones, one for each action area. These are cabled to a small belt-worn audio mixer, and you fade from one to the other as the talent moves over to the respective mike.

### 5.38 Variations on a theme

As you will have realized by now, we need to be *adaptable* when deciding how to tackle a particular situation. If circumstances change, our method will often change too.

Supposing for example, there are to be a series of *live* events in a large hall. If you are shooting discontinuously, you could record the first, stop the recording, then reposition the microphone and camera for the second. When you are settled, you would recommence recording. This way, you could have a clean cut between the two shots.

Alternatively, to save time, you could keep the recording running, and relocate the shot and mike on the second event, and cut out the pause during post-production editing.

You can avoid editing altogether. At the finish of the first item (in sound and picture), you could widen the shot to reveal the new action area, where the performer appears busy preparing (mute). Move the camera in, and when the camera and microphone arrive, the person can speak on cue.

### 5.39 Anticipation or 'doing the obvious'

Anticipation comes with experience. When things go wrong, hopefully, one is prepared next time! You can be anticipatory in a number of ways.

#### Preparation

- Check through the script or any production planning sheet to ensure that you have all the equipment needed for that particular show.
- Check any audio recorded insert (music, effects, speech) you consider using, before the show. It may not be appropriate after all. Is the duration suitable too long or too short? Is the quality satisfactory? Will it require equalization (compensatory filtering to improve tonal balance, reduce wind noise, hum, rumble, etc.)? Is it damaged in any way (e.g. surface scratches on a disc)? Have you got the insert material arranged in the order in which it is to be used?
- Check all your equipment to make sure that it is working correctly. Don't rely on 'It was OK yesterday'! Is all equipment patching (plugging up) as you believe it to be? Confirm correct routing. Have someone at the audio mixer fade up each source in turn to confirm that all is well. Go to each microphone in turn, scratch its housing and announce its location (this is 'Boom A').
- Have a standby microphone ready in case the main microphone fails. If it is a special occasion, and you are relying on a lapel mike, it may be advisable to fit a second 'dual redundancy' clip mike too.
- Is the microphone cable long enough to allow the fishpole or boom to move around freely?
- Similarly, does anyone wearing a personal mike have it firmly attached with sufficient cable? (Don't forget to recover the clip mike and any transmitter afterwards!)

Of course these are all a matter of '*common sense*', but it is surprising how often the obvious and the familiar get overlooked. These are just reminders of regular routines, to which you will soon add your own.

#### In action

- Where are they going? What are they going to do there? Typical questions to which you want at least a general outline before rehearsals start. Without prior information, the most elementary mistakes are likely to happen. We learn from others.

An operator was standing to the left of the camera, poised with an extended fishpole. . . . but the talent walked in the opposite direction, way out of reach of the microphone.

An actor seated in a chair . . . stood up suddenly, banging his head on the close microphone.

These are real situations that happened to an experienced team. More than an embarrassment, unplanned action can waste a lot of time, bringing everything to a halt. If the subject itself is totally unpredictable (e.g. animals and children) there still has to be a plan of campaign, to cope with the unexpected.

As well as position changes, you need to be prepared for any *loud noises* that are likely to arise during the action. One of the worst dilemmas is when someone who is quietly spoken stands by a noisy machine, explaining how it is used. If you hold back the audio gain to accommodate the machine-noise, they become inaudible. A friendly word beforehand, asking them not to speak while the machine is on, may solve the problem.

Another approach would be to shoot the action, then record the voice of the demonstrator separately afterwards while watching a picture replay. You could tape this speech on a separate audio recorder, and mix it with a lower-level version of the machine sounds to form the final soundtrack, and use 'audio-dub' to place it beside the videotape pictures.

It is very hard to avoid unexpected noises interrupting the wanted sound at some time or other, and either over-peaking and distorting, or shattering the viewer's concentration. Even apparently inoffensive actions can sound very exaggerated, when picked up on a close microphone. All you can do, is to warn people in advance if they are likely to be hammering (lower the audio gain at that point), or ask them not to clatter kitchen-ware, etc. If the result is unacceptable, you may be able to retake the shot, or even cut it out of the soundtrack, if the worst comes to the worst.

#### 5.40 Improvizing

It might be argued that the more facilities you have, the greater your opportunities to do more sophisticated things. But many a hi-fi enthusiast has sufficient equipment to produce an interesting soundtrack for a wide variety of programs. And of course, with a little ingenuity, you can devise extra, useful facilities.

The same small electret microphone may be used in various ways:

- It can be clipped onto your subject, as a personal mike.
- As a table mike, its base can be inserted into a block of foam plastic if you do not have the right support.
- Attached to a thin vertical aluminium tube (isolated via a flexible joint) with a simple bottom weight, you have an improved stand mike.
- Held in a foam-plastic collar, clamped at the end of an aluminium pole, you have a 'fishpole'. (A monopole, or even a hand-held extended car radio antenna, has been used as an emergency fishpole, to hold the mike closer to the action.)
- Fix the electret mike facing into the center of a parabolic dish, and you have a narrow-angle reflector mike.

#### 5.41 Audio dubbing

*Dubbing*, or recording an existing recording (i.e. making a 'second generation'), is a regular way of creating more elaborate background sounds. Now although sound quality will deteriorate to some extent whenever you make such a copy – and will worsen further if you go on and make a copy of that copy ('third generation') – things are not as bad as one might imagine in practice. With modern audio equipment and tape, these losses need not be great, especially if increased tape noise is lost in the background effects.

So we can take advantage of this fact, and by multi-dubbing, create quite complex soundtracks with modest equipment.

Some audio stereo recorders have the useful facility that they can be switched from 'stereo', to record two independent tracks of 'mono' sound side by side instead. Using this facility, you can prepare a different sound effect on each track of the audio tape. When you replay the tape (in 'stereo replay' mode), the two tracks will combine, in sync, and give you a composite mono soundtrack.

Some audio stereo recorders also allow you to dub from one track to another, as you play the tape and mix the sounds into a composite. You can then transfer this composite track, mixed with a further sound, back onto the

first track, and so build up a detailed composite on one machine. All this takes time, but where you do not have several audio tape machines and an audio mixer, it does enable you to create very successful results nevertheless.

### 5.42 Anticipating sound editing

When you are shooting a scene, how can you anticipate and overcome the problems of sound editing?

- *Continuity.* Try to ensure that the quality and level of successive shots in the same scene match as far as possible.
- *Effects.* Keep a small audio recorder handy when you are shooting. It is good habit to record some general 'atmos' track, and typical background sounds (wild track) in case you need these later.
- *Sound effects.* If you have time, record any sound effects that crop up unexpectedly, that might be a useful addition to your effects library. Although you may be shooting a program on crops, any unwanted sounds of a passing fire engine, a police car, a dog barking, children playing, a shopping crowd or thunder, could all be used at the right moment in another program.
- *Question.* When you are shooting an interview, and the single camera and microphone are concentrating on the guest, the questions of the interviewer may not be audible on the videotape. So use your audio recorder to tape an interviewer's questions. These can be 'dropped into' the final soundtrack at the right moments, during the audio dubbing session.

This idea can be used too, to ensure sound continuity for *pick-up shots*, where a speaker moves from one location to another during unscripted speech.

Let's take an example of this last point. A lecturer has been telling us about the birthplace of a celebrity: '... he lived down there, at the bottom of this hill'. The scene changes, and the camera is now relocated inside the house. But in reality it took us half an hour to move the camera to the new location, and set up the lights. What were the lecturer's last words in the previous shot? Quicker than reviewing the videotape, we have the answer immediately on the audio recorder. When we are ready, the new shot begins: 'and in the kitchen of this house ...'. Obvious enough perhaps, but a good way of ensuring that you do not later find yourself trying to edit together scenes that have no speech continuity.

### 5.43 Music and effects track

When your program is to be seen by audiences who speak different languages, it is worth taking the trouble to make a special 'music and effects' (M&E) audio track. This includes all atmospheric sounds, effects and music, but no speech. Commentary or dialogue in the appropriate language can then be added to this track as required.

If the video recorder has stereo facilities, you can tape a mono version of one language plus the M&E on one audio track of the videotape, and a different language combination on its other audio track.

### 5.44 Filtered sound

You can make considerable changes to the quality of sound by introducing an *audio filter* into the system. It can be adjusted to increase or decrease a chosen part of the audio spectrum, to exaggerate or suppress the higher

notes, bass or middle register, depending on the type of filter system you use, and how you adjust it.

The simplest 'tone control' progressively reduces higher notes during reproduction. A more flexible type of audio filter has the various names of *audio bator*, *octave filter*, *shaping filter* or *graphic equalizer*. This can boost or reduce any segment(s) of the audio spectrum by changing the positions of a series of slider pots. The outline of these sliders shows the system's effective response.

Here are typical ways in which filtering can enhance the subjective effect of the sound:

- Cutting low bass can reduce rumble or hum; improve speech clarity; lessen the boomy or hollow sound of some small rooms; weaken background noise from ventilation, passing traffic, etc. Overdone, the result sounds thin, lacking body.
- Cutting higher notes can make hiss, whistles, tape noise, sibilant speech, and other high-pitched sound less prominent. However, if you cut them too much, the sound will lack clarity and intelligibility.
- If you cut bass and top, the sound will have a much more 'open-air' quality – a useful cheat, when shooting an 'exterior' scene in a studio.
- By slightly increasing bass, you can increase the impression of size and grandeur of a large interior.
- You can improve the clarity and 'presence' of many sounds, making them appear closer, by boosting the middle part of the audio spectrum (e.g. 2–6 kHz).
- Filtering can make the quality of sound recorded in different places more similar (e.g. shots of someone inside and outside a building). It can help to match the sound quality of different microphones.

### 5.45 Reverberation

As we saw earlier (Section 5.3) most everyday sounds we hear are a mixture of direct sound from the source itself together with '*colored*' versions reflected from nearby surfaces. The quality of that reflected sound is affected by the nature of those surfaces. If due to their construction or the material they are made of, they mainly absorb higher notes (e.g. drapes, cushions, carpeting) this reflected sound will lack 'top'. It may even be quite muffled. Conversely, where surroundings reflect higher notes more readily, these hard reflections will add harshness (edginess) to the final sound.

Where there are few sound-absorbing materials around there will be noticeable *reverberation* as sound rebounds from the walls, ceiling, and floor. If the time intervals between these reflections are considerable, we will hear a distinct repeat; i.e. an *echo*.

These are not just academic niceties. You are already familiar with how different a room in your own apartment sounds when emptied of furniture and when fully furnished. This is just a reminder of the way in which *room tone* will depend on its volume and shape, carpeting, drapes, easy chairs, etc.

Where there are *no* reflections as in open spaces away from buildings or other hard surfaces the resulting sound will seem *dead*. The only way we can simulate dead surroundings within a building is to use carefully positioned sound-absorbing materials.

In practice, you can enhance the appeal of many sounds by adding a certain amount of real or simulated *reverberation* to them. Music played in absolutely dead surroundings (e.g. an *anechoic chamber*) is not satisfying.

On the other hand, if there is too much reverberation, the result is a confused mixture of sound that reduces its clarity. A sound accompanied by rapid 'slap-back' echoes can be very disturbing to listen to.

A number of techniques have been used over the years to simulate the effect of reverberation by mixing the original sound with a reverberant version. The simplest method is the 'echo room' in which the sound to be treated is played over a loudspeaker in reverberant surroundings (e.g. a cellar, bathroom, corridor). A nearby microphone picks up the reverberating version. Cheap and effective, provided you do not also overhear unwanted sounds.

In *spring delay* systems the audio signal is routed to a transducer which vibrates a large spring. A pick-up head attached to the far end of the spring converts these vibrations into an audio signal. Large metal *reverberation plates* work on a similar principle.

In the most recent reverberation devices, *digitally stored sound* is re-read selectively over and over to give the impression of reflected sounds.

### 5.46 Program music

The role of music in film and TV programs is so established that we don't need to dwell on it here. Musical themes often remain in the memory long after the program itself has faded from the mind.

Music can have various purposes. For example:

- Identifying  
Music associated with a particular show, person, country.
- Atmospheric  
Melodies intended to induce a certain mood; e.g. excitement.
- Associative  
Music reminiscent of e.g. the American West, the Orient.
- Imitative  
Music that directly imitates; e.g. bird song.  
Music with a rhythm or melody copying the subject's features;  
e.g. the jog-trot accompaniment to a horse and wagon.
- Environmental  
Music heard at a particular place: e.g. a ballroom.

Musical jingles have been a highlight of many advertising campaigns. But music is regularly misused too! Here are a few reminders of how music can get between the program and your audience.

- Music that is played too loud (particularly opening music) causing listeners to grab for the volume control.
- Musical themes that are selected from standard classical works need to be chosen with care. Music lovers may resent hearing dissected globs of their favorite works.
- Some directors economize by repeating the same short musical passages over and over during a production.  
Even attractive melodies quickly pall.
- Try to avoid passing fashions in program music:
  - Loud repetitive percussion (hopefully intended to engender excitement).
  - Background music with lyrics containing a word or phrase that have just a tenuous connection with the program theme.
- Music that is continually fading up and down as the scene changes.

Probably the most elusive use of music is as a '*space filler*'. Where there is no sound to accompany the pictures (i.e. no dialogue or environmental sounds) there is a tendency to arbitrarily introduce music to '*fill the soundtrack*'.

A similar situation arises when there is '*voice-over*' dialogue but no apposite pictures; e.g. during explanatory narrative which is giving the audience background information on a topic. Because no pictures are available or appropriate, the director resorts to a montage of vaguely associative shots of views of countryside, townscapes, etc., or shots of shadow patterns, reflections, textures, trees against the sky, etc., that have nothing to do with what is being said, but overcome the alternative of a blank screen! These are often termed '*wallpaper shots*'! It is easy to dismiss the practice lightly, but where the picture or the soundtrack dominates this can be a real predicament for the director and the editor.

### 5.47 MIDI systems

You are probably familiar with the way in which *MIDI systems* enable us to 'play' a wide range of musical instruments and sounds from a portable keyboard linked to a suitable computer program.

MIDI programs provide an impressive diversity of digitally sampled musical instruments; from various types of guitar, organ, drums, brass and woodwind to such fascinating instruments as the *bonang*, *oud*, *shamisen*, *gender* that are unfamiliar to most Western ears.

By altering the attack and delay times of an instrument you can considerably modify its sound quality. But when these musical instruments are played way outside their normal scale range they become totally unrecognizable. High-pitched timpani, a low-pitched piccolo, very low-pitched tubular bells, for example, take on a quite different character. They may even be combined to create sound effects!

Standard MIDI voices also include a wide selection of synthetic sounds with such intriguing voice names as '*shwimmer*', '*crystal*', '*popcorn*', '*planet*', '*stardust*', '*glisten*'. Carefully selected, they can add strangely evocative qualities to background or introductory music that are simply asking to be explored.

### 5.48 Sound effects

Appropriate sound effects give an unbelievable realism to an environment. It is an ironic fact that if you shoot a scene at an authentic location *but* everyday noises are missing the end product may appear artificial and contrived. Shoot the same scene in a well-designed studio setting, but accompanied by well-chosen sound effects, and the effect is totally convincing! The barely heard sounds of a clock ticking, wind whistling through trees, bird song, passing traffic, the barking of a distant dog, (or whatever other noises are appropriate) bring the scene to life. It is '*the real thing*'!

Sound effects can be so persuasive that even a diagram or model of a volcano, for instance, can make a stronger impact if accompanied by '*subterranean rumblings*'!

Your sound effects can come from a number of sources:

- *The original sounds recorded during a scene*: e.g. a person's own footsteps accompanying the picture, which may be filtered, reverberation added, etc.
- *Re-used original sounds*: e.g. the sounds of wind, traffic, children at play, which were recorded during a scene, are copied (*dubbed*) and mixed with that same scene's soundtrack to reinforce the overall effect.

- *Substituted 'identical' sounds:* e.g. introducing sounds of your own footsteps for the original ones; keeping in time with those in the picture.
- *Audio effects library:* Effects from a commercial audio effects library on tape, disc, or CD.
- *Imitative effects:* Created manually, computer generated, or musical imitations.
- *Processing:* Taking any existing sound effect, and changing its character by filtering, speed changes, reversal, added reverberation, etc.
- *Sound sampling:* A system in which a sound is digitally recorded, and its character modified by shaping, stretching, reversing, repeating, etc.
- *MIDI:* MIDI systems offer a useful collection of digitally recorded everyday noises of varying pitch and duration. Even if your productions give you few opportunities for such novelties as 'Jingle Bells' rendered by the melodic voices of barking dogs, the MIDI vocabulary includes such practical opportunities as:

Rain; thunderclaps; wind noises; stream; dog barks; horse's hooves; bird twittering; telephone ringing; door squeaks; door slamming; a car engine . . . starting . . . stopping . . . passing . . . crashing; siren; train; jet plane; laughing; screaming; a punch; heartbeats; footsteps; machine gun; explosion; fireworks; applause; helicopter; breaking waves.

In this age of sophisticated electronics you should not overlook some of the traditional methods of creating sound effects. Basic but effective! Here is a wide field for experiment: the sounds of pouring sand, crumpling paper, plucking a stretched rubber band, flapping an umbrella. . . . Played slowly and/or backwards, filtered, they offer many surprising opportunities.

Why not try out the following?

*Hollow muffled sounds.* Either speak into, or use a small loudspeaker directed into, an enclosure such as a tumbler, basin, pan, tin box, plastic pipe, oven or cupboard.

*Echo.* Replay sounds into a tiled bathroom or empty room, re-recording them on another machine.

*Fast repeat sounds; echoes.* On many audio recorders a separate replay head lets you check the track as you record. (Others only have a single dual-purpose head.) There is a brief time lag as the tape moves past the record head to the replay head. So if you mix a little of this replayed sound with the incoming sound that is being recorded (i.e. 'Replay out' to 'Record in') you can get effects ranging from an 'echo' to a 'stutter'.

*Low-pitched powerful voices.* If you are using a multi-speed audio recorder (reel-to-reel) a further range of effects becomes possible through speed changes. Make an audio recording, speaking quickly, and replay the tape at a slower speed to create the voices of giants, monsters, etc.

*High-pitched 'miniature' voices.* Make an audio recording, speaking slowly and distinctly, and replay the tape at a faster speed to create the voices of tiny creatures, chipmunks, etc.

*Threatening rumbling, thunder.* Experiment with playing low-pitched taped music slowly backwards or disc slowly rotated by hand.

*Low metallic gong-like sounds.* Hold a suspended metal sheet, metal coat-hanger or fork against the microphone, and tap gently. (Perhaps replay the recording at a slower speed.)