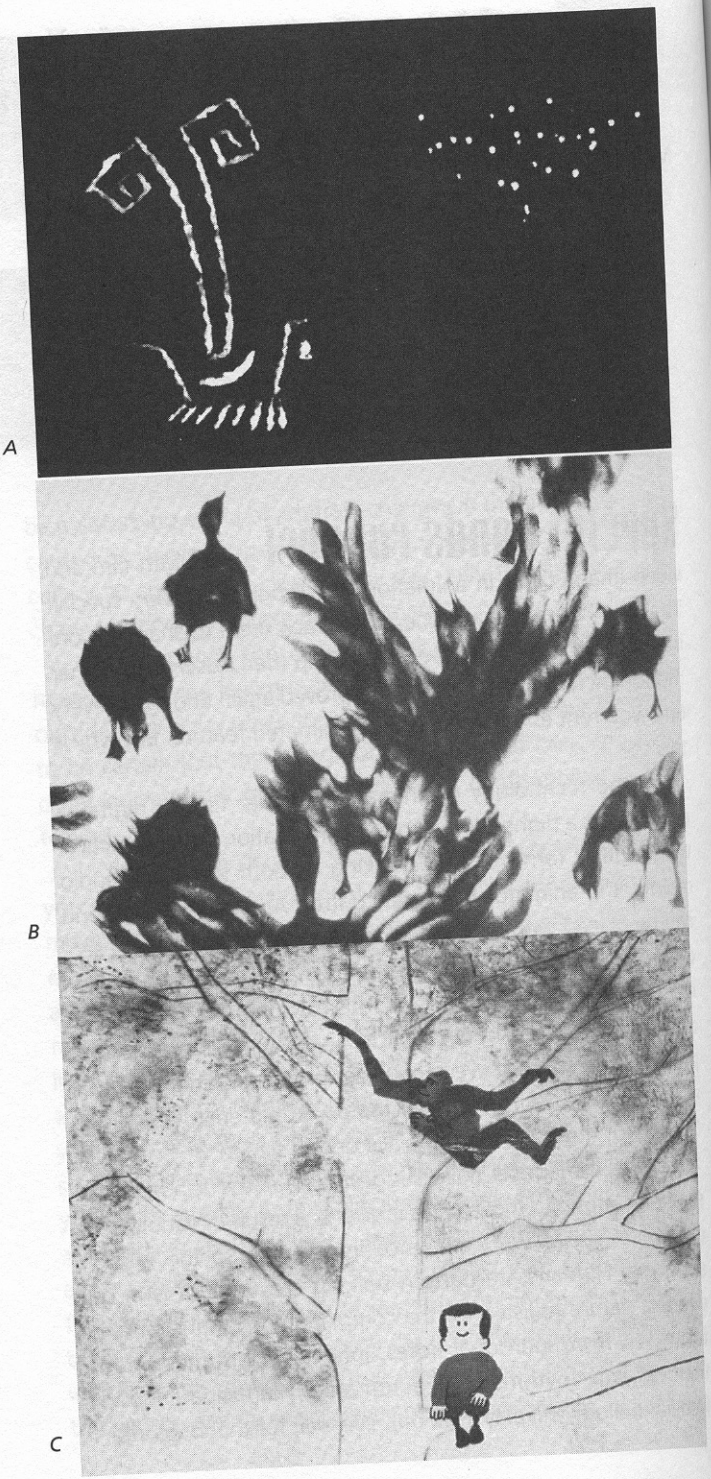
7 Working with Sound

WRITTEN WITH MICHAEL DOUGHERTY

Special bonds connect sound with film and video images. But in animation, these bonds are *very* special. The visual elements and the audio track seem to share a more intimate and more creative partnership than exists in any other motion picture form. This point is proved again and again every time you rent and then screen an animated feature. But *why* is this so?

The technology of animation—either film or digital—encourages a higher degree of synchronization than is practical within other forms of moviemaking. In both visual and audio realms, the animator has total control. An image or a sound can be placed with pinpoint accuracy down to tenths of a second. Furthermore, what you see and what you hear share common elements of structure. A musical tune, for example, is often characterized by a simplicity that is not unlike the simplicity of personality we recognize in cartoon characters. In many animated films musical tempo is related to the visual "beats" of the action taking place on the screen.

Music theorists have suggested that the fundamental power of music to move us as it does is a result of various psychological states we experience in listening to the music's structure. Humans are pattern-seeking creatures. It is in our deepest nature to listen for the completion of various patterns fashioned from individual notes, intervals, instrumentations, themes, and rhythms. We automatically anticipate how a familiar melody will play itself out. We wait for that outcome. If



A

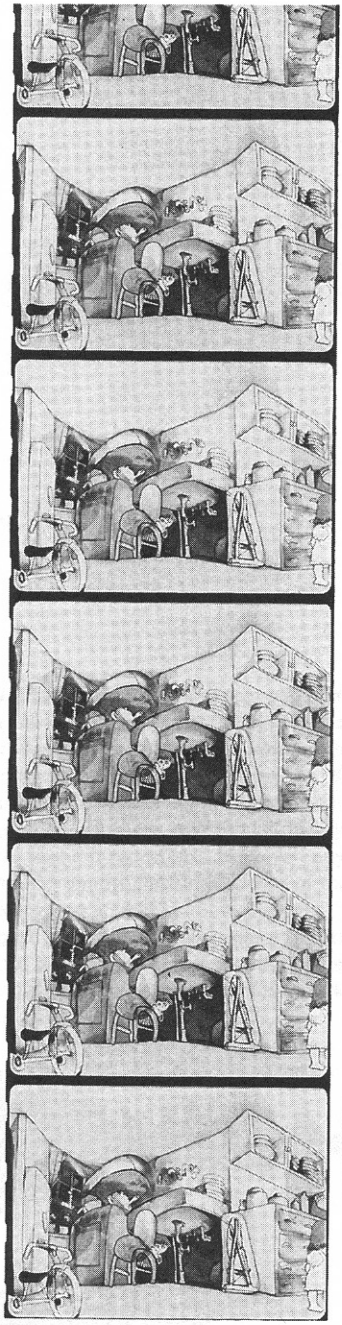
B

C

7.1 Great tracks: A selection of frames from cartoons with innovative sound tracks. In *Cockaboody, (D),* John and Faith Hubley informally recorded the conversations of their two small daughters at play and based the entire film on an edited version of that sound recording. Sound effects and dialogue by Eskimos constitute the sound track of Carolyn Leaf's *The Owl Who Married the Goose, (B).* Highly amplified natural sounds are featured in the track for *The Animal Movie, (C),* by Grant Munro and Ron Tunis. In Norman McLaren's *Blinkity Blink, (A),* the animator hand-drew both the images and the sound track directly onto 35mm black leader. *Courtesy of: (A), the Learning Corporation of America; (B), Pyramid Films; (C), the National Film Board of Canada; and (D), McGraw-Hill.*

the composition follows the pattern we are expecting, there is a satisfying sense of closure and "release." If our anticipation is thwarted, we are disturbed and our attention increases, and if we experience a familiar pattern that is embellished in a new and unexpected way, we are delighted. The gifted animator, along with the music director/composer and the editor, understands the psychology of musical design and seeks to trigger the parallel responses through conscious manipulation of various visual patterns: repetition and rhythm; the movement of characters and background; the predictability of a story; and the pacing and editing of the finished work. To the degree that animation can create a flow of patterns, the medium appears to mirror the nature of musical expression.

Theorizing aside, there's no doubt about the terrific power that exists when a close synchronization of animated images and sounds is achieved. No advanced degree is required to appreciate just how rich the relationship is—all you need to do is rent a copy of Walt Disney's *Fantasia* or George Dunning's *Yellow Submarine.* You'll hear it. You'll feel it.



D

THE STUFF OF SOUND TRACKS

It starts out in the quiet of your mind. The animator studies the possibilities for a sound track. The movie's theme, style, length, and technique are all factors in the audiovisual equation. At this initial stage, the goal is to select those audio elements that will best fortify and extend the visual components of the movie. The outcome of this original design phase is a *sound treatment* that identifies in detail all the parts of a film's anticipated final sound track.

There is no standard format for such a treatment. It can be written out or it can be a set of notes jotted onto a storyboard and script. It is important, however, that you consider each of the three basic sound sources.

Music. A particular piece of music can sometimes give birth to ideas for animation. Take yourself off to a music store that lets you sample albums. Check out the music collection at your public library. Allow yourself to listen to selections that may be far outside your normal musical tastes. Choose musical selections that you intuit as "working" with your upcoming project.

Effects. Look up from the book for a moment and listen. Now what'd you hear? Whatever it was, whether it was birds chirping in your backyard, a dog barking in the distance, the hum of your computer fan, or an ambulance screeching down the road, they can all be recorded and used in your animation. Anything that can be recorded, or is already recorded on tape or CD, is easily imported into your computer and used to build a soundtrack. Later in this chapter you'll find more about gathering those Ker-Plumps, Ka-Pows, Zaps, and Zowees.

Voice. In a given film, there can be character dialogue or narration voice-over. There can be speech that is lip-synchronous or non-lip-synchronous. Because lip sync can be tricky when starting out in animation, you might want to look for creative ways of avoiding those scenes that call for precise lip synchronization.

It's important to sit down and think of what overall type of track you want to build. Is your animation similar to the classic cartoons of yesteryear, chock-full of sight gags, exploding dynamite, and falling anvils? Get ready to look for some compact disc featuring stock sound effects. Is your piece more abstract and trying to communicate a mood and feeling instead of a story? Chances are you'll want to experiment with altering everyday sounds or stock music until they fit your needs. Write a list as long as your arm of whatever type of sound comes to mind, no matter how small or insignificant it might seem. Take yourself inside the project you will be making. Imagine every little chirp, rustle, footstep, sigh, or breeze you might hear.

Here's a practical tip that can unleash a wealth of creativity. When thinking about your next 'toon, think about creating a sound track that is entirely original—from voices to sound effects to music. It's not just that there is something nice in the idea of using your own resources. There can be legal complications if you don't. You'll have no problem if you want to use prerecorded sound for a project that will be used only for your own personal enjoyment. But if you anticipate any commercial use of your animation through sale, rental, or admission charges from a public viewing, then you'll eventually have to acquire the rights to any and all prerecorded materials you use. And that costs money!

WHICH COMES FIRST? SOUND OR PIX?

It is often debated whether the sound track or the animation should be created first, and the truth is, there's no real answer.

If you're working in the classic cartoon style where you need accurate lip sync, then you'll definitely want to record a voice track first, analyze it, and create the animation using the voice track as reference. Many other types of projects benefit from following one or more elements from the sound track.

For most people starting out in animation, the picture comes first and accompanying music, sound effects, and voice elements are usually added once the picture itself is completed or "locked." Starting out with a locked-down track can actually be an impediment if your project is experimental or abstract. In such cases it's smart to make the visuals compelling before starting track work. If you can make your piece work without the benefit of any audio, bank on the fact that it will be even more powerful once your sound has been added. A truth whispered among animators is that 70 percent of a show's impact comes from the sound track.

It's usually a good idea to take the time early in a project's creative development to create a very rough sound track, or *scratch track*. Think of this as a loose outline, a first draft. A scratch track is usually built at the same time the storyboard is completed. In fact, it's common practice to fashion a scratch track as the audio portion of an *animatic*—a piece of film, tape, or computer animation that shows storyboard panels in sequence and that runs the same length as the anticipated project. An animatic's track will often have large "plugs" of silence

7.2 Waveforms: These two odd forms are the visual, digital expression of what sound looks like when it is worked with on a computer. *(A)* is a thunderclap and *(B)* is music. There's not a human alive who can look at one of these images and discern what sound it represents. However, anyone can tell from the flattening down of the spikes when a sound ends and silence begins. And that particular piece of intelligence proves hugely useful when you are using digital tools to create sound tracks for your animation.

where music or effects will subsequently be placed. But even if there are only a few known elements—perhaps some lines of dialogue, a piece of music you like, a few important sound effects (even if laid in as rough vocals)—whatever elements you can slug into the scratch track will provide valuable guidance as you work on the timing of scenes and go about animating them. You'll find more about animatics and their cousin, the Leica reel, in the following chapter on storyboarding.

TRACK BUILDING

Now let's talk about tools and techniques that allow you to harness all that audio. Toolwise, the major focus here will be on digital technology, for that is the easiest and best way to undertake the process of creating a track for your animated movie—starting with the first scratch track and going all the way to the final mix. At the end of this chapter you'll find some information about the film-based technology that computers now replace.

Here's a breakdown of the track building process.

Separation. Each track is recorded separately and kept as its own entity. Only at the very end of a project's completion will these tracks be mixed. Sometimes two or three individual tracks are recorded, sometimes as many as ten or more. With digital technology, the recording process is easy and it begins by using any audio tape recorder. Even the least sophisticated personal computers have some sort of sound-generating capability—how else would you hear that annoying *quack* or *beep* every time you screw something up? Playing sounds on computers has been around for years, long before playing motion image clips became an everyday feature, and as digital technology has evolved, so have the audio editing and manipulation features. Today it's a common practice to completely create, mix, and output a high-quality sound track using only a desktop computer.

Sound Effects and Music Libraries. When watching your favorite cartoons or TV shows, chances are that what you're listening to is really a lot of the same sound effects repeated over and over again. Think of the classic whistle you hear during Wile E. Coyote's plummet off a cliff, or the metallic smash of an anvil as it lands on a character's head. This repetition of sound effects between one show and another exists because

struction sites, trying to capture that unique grind, grunt, or groan.

If you choose to record your own effects, you'll have entered a time-honored domain of animation called *foley*. At the big feature animation outfits in Hollywood, there are foley studios, where sound designers use whatever means are necessary to create that perfect sound effect needed for a particular animated sequence. This often means taking everyday objects like old pairs of shoes, metal trash cans, rocks, doors, or even fruits and vegetables and manipulating them to create a distinct and effective sound. Foley artists have manufactured stabbing sounds by cutting a melon, punching noises by slapping a side of beef, and the sound of a neck breaking by snapping a stalk of celery. Fun, huh?

Recording Voices. If your animation will involve voices, whether in the form of dialogue or voice-over, you'll need to record these as separate elements from the sound effects and music. The best approach is to use a good-quality microphone and hook it up to a tape recorder or your computer. Try to find a secluded, quiet, soundproof room so that no excess or unwanted noise pops up while recording. Many schools and TV stations have recording booths you can borrow. The rental fees for commercial sound studios are surprisingly modest and these facilities always help the voice talent and director get the best performance.

CAPTURING SOUND IN THE COMPUTER

Once you've gathered all the sound effects, music, and voices for your project, these elements must be "captured" into your computer and stored as sound files. This process is sometimes called *digitizing* and has become extremely easy now that almost all computers come with multimedia features that let you record, play back, and edit.

If you're pulling music or a series of effects off a CD, the process is a breeze. It usually takes nothing more than putting the disc in your CD-ROM drive and dragging over the icons for the desired tracks from the CD to your computer's hard drive. Or you can use special sound-handling software to record the sound effects while you play the CD. Either way, the resulting

digital file can be named and saved for subsequent use in your sound track.

The process is easy, too, if your source sounds have been recorded onto audiotape. Most of today's tape decks have either an earphone jack or an audio-out jack in the back. These jacks can be used to connect the tape playback machine to your computer's microphone jack using a standard RCA stereo wire. Once you've hooked your tape player to the computer, any sound played on the tape will be sent to the computer, ready to be digitized. To capture sounds you've recorded yourself, a sound editing or capturing application is a necessity. Both Macs and PCs usually have a built-in sound recording program that is crude but effective.

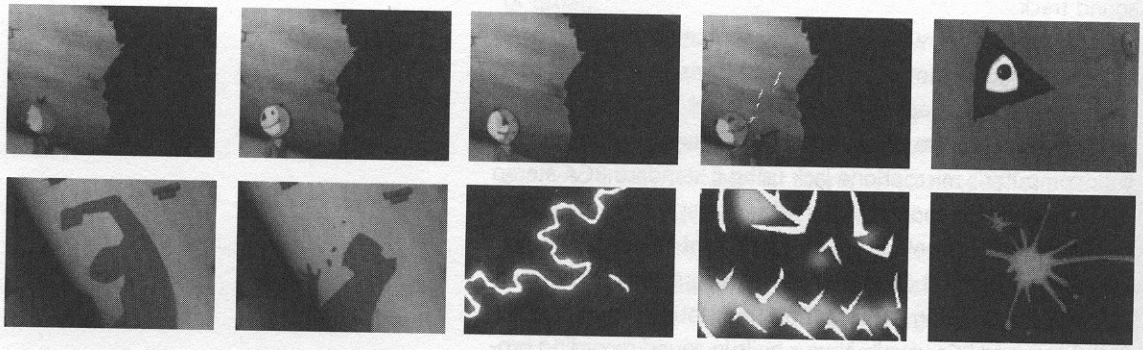
TRACK LAYOUT AND MIXING

Let's say that every voice, sound, and piece of music needed for your animation has been gathered and captured in your computer. Now comes the task of carefully placing each clip where it belongs and then mixing all those ingredients together to create a beautiful and moving sound track. Thanks to the recent evolution of desktop video and multimedia tools, there are a number of terrific sound editing programs on the market. These range in expense and complexity (see Chapter 23: Computer Software) and have been designed to meet the needs of individuals at different skill levels, from fledgling animators to seasoned pros working in multitrack recording.

Simple Waveform Editors. The most basic audio editing program should let you open up an audio file, look at its *waveform,* and do simple cut-and-paste jobs on it, moving sound effects from one part of the track to another and pasting in other sounds. Even these simple audio editors will usually let you add special effects such as fade, echo, dissolve, reverse, and amplify. The finished audio track can then be saved as a new sound file or, better yet, as a QuickTime movie that can later be laid down with a video track. You'll find that manipulating sounds and music is great fun. Give yourself time to experiment. Everyone gets a kick out of making their voice sound like a chipmunk or hearing how different things sound when played backward.

The drawback to basic audio editing software is that it

7.4 CASE STUDY: Digital Sound



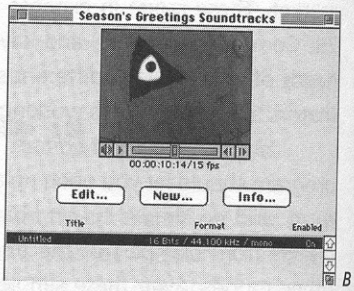
A

Season's Greetings is a 16mm cel animation film created by Michael Dougherty as a student film for the NYU Animation Program. It tells the macabre story of a child trick-or-treating late one Halloween night. The project was completed in just under a year and later went on to win awards from the Student Emmys, the Student Academy Awards, and several other film festivals. The story is told with eye-catching visuals that portray a young innocent who is being followed by a menacing stalker. The movie's track was created digitally once the film itself had been completed in 16mm format. To emphasize the frightening story and help build the terror and suspense that climaxes in the scene studied here, an original musical score and effects tracks were created by Evan Chen, an NYU student studying musical composition. Ten key frames from the sequence are shown, *(A)*. Michael Dougherty's comments follow:

Importing into SoundEdit 16

The audio design process began once the film had been digitized and imported into SoundEdit 16, a sound editing application from Macromedia, *(B)*. The 16mm work print was transferred to 3/4" format video at a postproduction house in New York City, then digitized by playing back the tape into a QuickTime clip on a Macintosh.

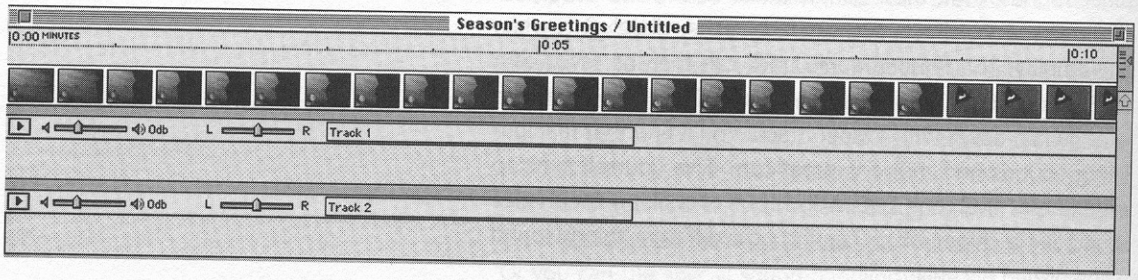
The resulting QuickTime clip, *(C)*, was imported into SoundEdit 16, but still lacked audio. Icons representing the animation are displayed at the top, serving as a guide for where to place sounds. You can see the empty tracks, waiting to be filled.



B

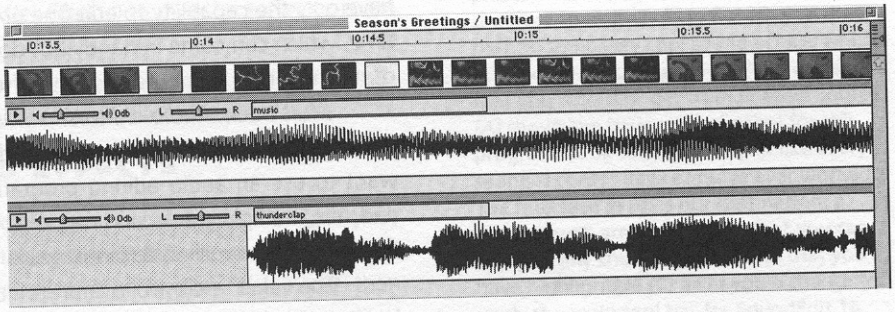
Laying Down Tracks and Scoping Waveforms

Two tracks were then added: the musical score and the sound of thunder, which was used as ominous foreshadowing of a (mostly) off-camera fight and murder, *(D)*.



C

More tracks were added, *(E),* to go with the scoring and thunderclap sound effect. Isolated in its own track, the waveform shows precisely where the scream begins, making it easy to place the sound against the animation.



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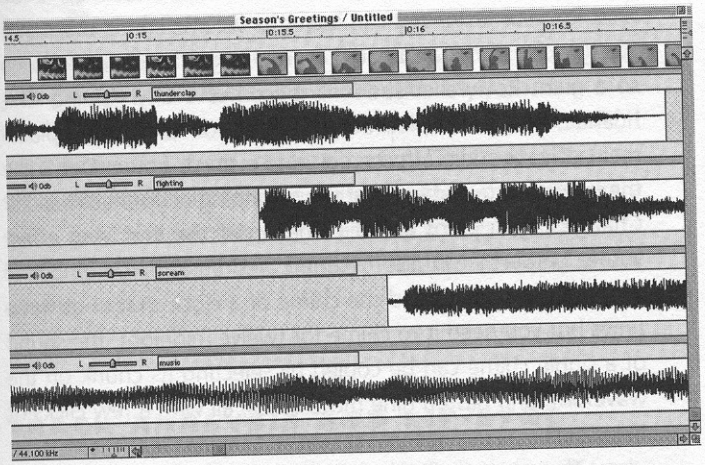


E

The waveform is a visual representation of a sound. The longer and louder the noise, the longer and higher the peaks appear on the waveform. If there is a moment of silence, the waveform will appear as a straight line. One of the great things about working digitally is that it's so easy to slide a sound element one way or another, testing to see where it works best against a picture. Each track can be manipulated independently to allow for the addition of special effects like echoes, fades, and changing the pitch or tone.

Mixing Down

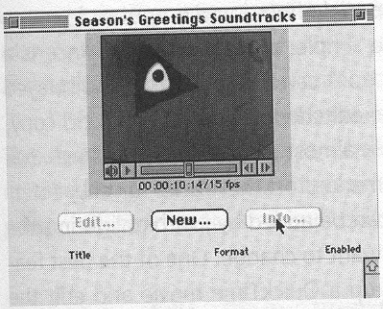
Once all the tracks were added, manipulated, and placed at proper times, the multiple tracks (a total of four in this project) could be mixed down to a single sound track that is represented by one waveform, *(F).*

F

SoundEdit 16 displays the "stats" of the sound track in the space below the movie's sample frame, *(G).* In this case, we created a 16 bit, 44.1 MHz mono sound track, which is close to CD sound quality and suitable for presentation on video.

Because I wanted to have a traditional 16mm film complete with an optical track, I transferred the mixed track to Digital Audio Tape (DAT), which was taken directly to the lab with the film negatives, turned into an optical master, and married to the negatives to create the answer print. After screening and approving the answer print, several release prints for distribution were made.

Voilà! A finished film with a killer track.



G

Credits: **Directed and Animated by:** Michael Dougherty **Music and Sound by:** Evan Chen **Backgrounds Painted by:** Dan M. Kanemoto **Faculty Supervisors:** Kit Laybourne and John Canemaker

rarely lets you mix and manipulate multiple tracks. They usually have only the capability to edit one or two tracks of audio at a time, which can come in handy but doesn't allow the flexibility of mixing larger numbers of sound effects and music together.

Multitrack Audio Editors. For ambitious sound tracks that combine effects with music and dialogue tracks, you'll want to use an audio editing program that can import, edit, and mix multiple tracks and can cut, manipulate, and distort each sound in a million different ways.

The value of control over individual tracks is obvious. If a barking dog effect you've gotten off a sound effects CD is too loud for your taste, you can lower its volume so it's more of a background noise. You could even change the pitch and tone so a giant Rottweiler suddenly becomes a tiny yipping Chihuahua. Using multiple tracks also lets you control the placement of your audio effects, down to a single frame. Don't like the thunder effect starting at the beginning of your animation? Change the in point and it comes in at the end. Any effect you've gathered can also be duplicated an infinite number of times. If you've recorded the chime of a clock that rings three times but you need it to chime for twelve midnight, the sound of a single chime can be copied by selecting its chunk on the waveform and pasted nine more times, all with a few clicks of the mouse.

The case study that begins in Figure 7.4 has been designed to introduce you to the workings of one of the major sound editing applications serving both Windows and Mac computers. *SoundEdit 16* is a simple-to-use, midlevel piece of software that allows you to create and edit multiple tracks, apply a large number of special effects, and output to fourteen different file formats. The simple, customizable interface is a snap to learn. Each audio track can be labeled and is displayed as a waveform that can be edited with the standard cut, copy, and paste functions seen in almost all software packages. Cue points and notes can be marked on the tracks for easy reference, and special effects can be added by just highlighting the part of the waveform you want to change. One of the best features is its ability to open up a QuickTime movie and edit the existing sound track or create a whole new one for it. It has become a standard software package used in the multimedia and digital video industries for CD-ROMs, the Internet, and video productions. The folks at Macromedia who program and

publish SoundEdit 16 have begun to employ *plug-ins* (like Adobe Photoshop and After Effects) to give the software room to grow.

DIGITAL AUDIO EFFECTS

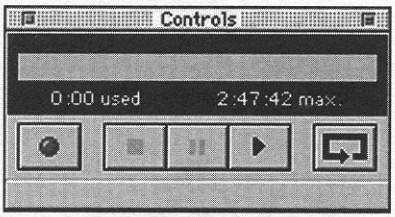
Applying a special effect to your audio tracks can give your sound track extra kick, taking a mundane noise and turning it into something new and vibrant. It involves little more than selecting the area on the waveform where you want the effect to appear and then using a pulldown menu where all your options are listed (see Figure 7.5). With such special effects you can turn the voice of a sweet old lady into that of a two-hundred-pound weight lifter or make music sound as if it were emanating from inside a cavern. Think of effects as the audio equivalent to image filters in Photoshop. They're a quick, easy, and painless way of altering preexisting sounds to create an effect that might be way, way too difficult to create on your own.

TRACK ANALYSIS AND LIP-SYNC

Once all the audio elements have been given their own track, you need to analyze them to see how they relate to each other and exactly where they occur. This is not so hard with a single sound effect that appears as a high-spike blip on its track. Using the waveform as a guide, the animator has a visual reference to locate exactly what time a certain sound effect occurs. Many software applications will let you place reference marks and notes right onto the computer screen.

It's more difficult to mark the rhythm of a piece of music. The effort is worth it, of course, when a piece of visual action is matched up to the cadence of music. Animators discovered the power of synchronous sound quite early and the phrase

7.5 Pull-down sound effects: These pieces of user interface from the software program SoundEdit 16 will show you the path to some very cool sound effects which, at a mouse click, you can apply to any sound that you record or get from another source. *(A)* shows the basic control panel for this program. Look familiar? It's just like every sound recorder device you've ever worked. The interface in *(B)* is our destination: a "pull-down" array of choices that you can apply to any chunk of waveform that you have highlighted. *(C)* gives you a chance to study the main tool bar for SoundEdit 16. This is a very versatile program with plenty of creative power. A longer discussion of it is included in Chapter 23.



A

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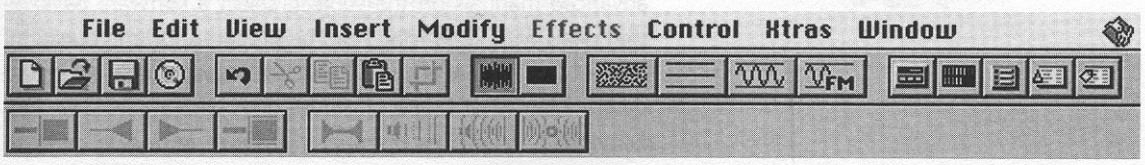


C

"Mickey Mousing" is still used to describe the effect when a character walks along with his footsteps perfectly in sync with a musical beat. It's generally impossible to discern rhythm from a waveform. Therefore, to do your own Mickey Mousing you will need to learn how the computer program you are using allows you to mark visual frames "on the fly," while the sound track is playing. If this capability doesn't exist or you can't figure it out, record your track and then experiment with placing marks on individual frames. By the process of trial and error, you will be able to find exactly which frame matches which beat or other place in the music track where you want to match picture and sound.

The precision with which it is possible to analyze a sound track enables the animator to locate individual words or parts of words. This makes it possible to create cartoon characters who move their lips with uncanny accuracy to the words delivered in the voice track. The effect, of course, is that the character actually talks.

In order to create lip sync, you must analyze each voice track so that you know the location of each vowel and consonant sound in a given piece of dialogue. With this information, you will be able to match each utterance with the appropriate mouth shape. Figure 7.6 shows six different mouth shapes and the distinct sound each represents. Naturally, the way a character is designed will require modifications of these basic shapes. The way Bart Simpson speaks is far different from the lip-sync style used for the Tick. And both of those are different from Buzz Lightyear or the Lion King!

Both track analysis and lip-sync drawing are laborious processes, as you can imagine. Doing it with computers is a lot easier than doing it with film tools. Doing it right requires patience and perseverance. A real mastery of lip-sync animation requires control of head, neck, and body movement and the ability to create gestures appropriate to the meaning of individual words, to the character's distinct personality, and to the dramatic requirements of the scene. If you are interested in pursuing this specialized technique, obtain one of the advanced manuals on the subject, select a software package that deals with lip-syncing, and be prepared for an education. It takes a lot of patience and practice to become proficient in determining what shape of mouth goes with a particular spoken sound. Animators often sit in front of mirrors in order to

study the shapes of their own mouths while they try to determine how to match an analyzed dialogue track. Lip sync needs to be accurate. Poor track analysis will result in mouth shapes not matching the voices and that will make your animation look like a bad Japanese monster movie.

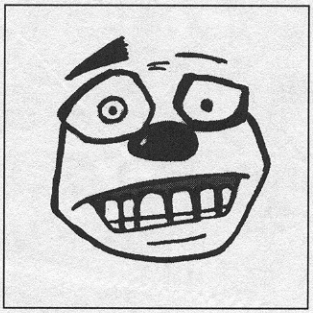
7.6 Mouth shapes: This lunatic face, created by animator Michael Dougherty, samples six mouth shapes that correspond to familiar sounds used in human speech. Chapter 14 shows other configurations of mouth shapes that animators use in making their characters lip-sync to spoken words and other guttural utterances.

FIX IT IN THE MIX

The creative juice of a sound track is always experienced as a surprising yet welcome jolt right at the end of the animation process, when individual tracks are mixed into a single track that goes with the finished piece. It's essential, of course, that the mix be done "to picture"—that your edited and locked visuals are viewed up against all the individual tracks you have painstakingly digitized and placed in their respective positions.

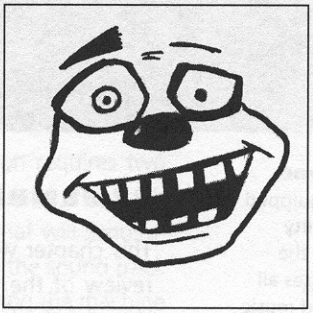
And the salvation! Those pieces of visual action and character shtick that never really worked as you hoped will suddenly live up to your highest expectations. Sometimes it is only in the final mix that you discover the need for one more effect—or that a piece of sound you've positioned now seems unnecessary and can be dropped.

If you are working in the digital domain and the final animation will live in videotape or on a computer file, the last step is simple. Typically your audio editing software, whether it's a simple waveform editor or a multitrack editor, lets you output your track to any number of sound file formats. The resulting file can then be brought into a video editing or special-effects application like Premiere, After Effects, or an Avid system and laid down onto your digital video version of the animation. If you've done everything right, the picture and sound will match beautifully to create your masterpiece.

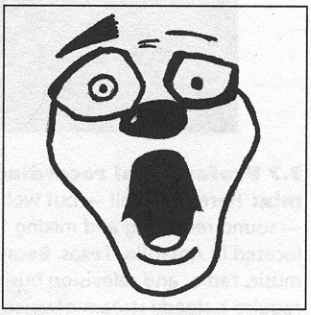


"c," "d," and other consonants not shown below

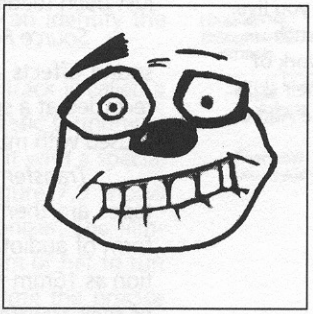
"o"



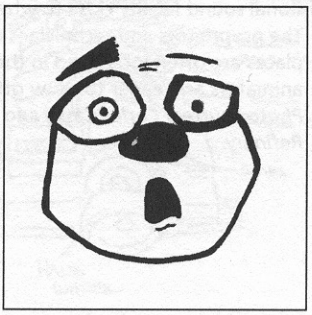
"e"



"u"



"f" and "v"



"w" and "q"