MIDI in one channel, to multichannel dynamic audio in surround, with complicated approaches to sound playback. But the history of games, as shown, is itself nonlinear, influenced by industry, technology, and social needs, knowledge, and desires. As Jean-Louis Comolli wrote of film, it is a "stratified history, that is, a history characterized by discontinuous temporality" (cited in Belton 1992, p. 159). Technological developments throughout its history have influenced not only the ways in which game audio has been produced, but also the ways in which it has been received by its audience. As in early film sound, "The expectations of audiences—and what they perceived as 'realistic'—were changing year by year" (Belton 1999, pp. 234–235). Moreover, as in film, "each new technological development (sound, panchromatic stock, color) points out to viewers just how 'unrealistic' the previous image was and also reminds them that the present image, even though more realistic, will also be superseded in the future—thus constantly sustaining the state of disavowal" (Manovich 2001, p. 186). The development of game sound has represented an ever-increasing drive toward greater fidelity and higher realism, a subject I take up in chapter 7. However, the drive to realism is not the only determinant in the development of technology, as shown, and it is now necessary to examine in further detail the industrial, commercial aspects of the industry and the processes by which game audio is created.

CHAPTER 5

GAME AUDIO TODAY: TECHNOLOGY, PROCESS, AND AESTHETIC

What goes into making a game? How do the game's music and sound effects get implemented? Who is responsible for ensuring that the dialogue does not conflict with the sound effects? Who makes the decisions regarding how the game should sound? The roles and processes involved in developing a game can vary greatly from game to game, from platform to platform, and from company to company, but a general sense of the process at a large company will help to answer these questions and to explain some of the audio decisions that must be made that impact the game as a whole. Audio production is not merely a series of compromises dictated by technological and industrial constraints. It is also a series of compromises with a team of people who work collaboratively, which has important implications for its production.

At its widest level, the game industry is comparable in structure to the book publishing, film, or music industries. Much the same as publishers in the book industry, game *publishers* are generally the overseers of the entire development process. Publishers provide some of the financial backing for the project, may provide royalty advances, and are largely concerned with producing a marketable project. Publishers, therefore, may make some important decisions regarding the design or development of a game to ensure that they have a viable product that will sell worldwide; they ultimately have creative control over the product. At present the top publishers include (among others) Electronic Arts, Nintendo, Activision, Sony, Ubisoft, THQ, and Microsoft, showing the clear importance of the console manufacturers on the development industry.[1] Publishers typically command the *developers*, the company/studio/team that designs and produces the game. Developers may be specialized toward producing for a specific platform

or genre, or may develop for several markets. Developers are generally split into three divisions: third-party developers, in-house developers, and independents. Third-party developers usually work closely with one publisher in developing a project. In-house developers, also known as studios, are the subsidiaries of publishers. Rather than being contracted by the publisher, they are owned by and directed by the publisher. Independent developers, on the other hand, are not owned by or typically contracted by a publisher. They often rely on self-publishing, through the Internet, festivals, conferences, or word-of-mouth.

Within a development company, there are several important overseers to any project. The *producer* is generally in charge of the entire project's development process. These may be internal to the developer, or, in the case of third-party developers, external to the developer, hired by the publisher. The producer oversees all aspects of a game, including creative, legal, marketing, contracting, and so on. A *lead designer* then typically oversees the concept and design of a game, particularly the production of the design document (see below). The other major players include the lead programmer (overseeing the implementation and programming aspects of the game), the audio lead/audio director (see below), and the art director (overseeing the graphics aspects). Underneath these jobs are the support jobs, consisting of writers, programmers, level designers, sound designers, artists, and so on. The number of support jobs, of course, depends on the size of the company and the size of the game. Some jobs are contracted out to third parties, particularly in the case of audio (see box 5.1, "Audio Roles").

THE PROCESS OF TAKING A GAME TO MARKET

As with other aspects described below, the process described here represents an overview of one production model. Production varies greatly from company to company, from platform to platform, and from genre to genre (for more detail on the entire process, see Kerr 2006 and Manninen et al. 2006). Although mock-ups or initial prototypes may be created in the early stages of a game's development, the main pre-production phase involves the creation of a design document. The game design document represents the overall vision of the game, detailing the storyline, dialogue, maps, audio, graphics, animation, and programming. The entire team—including the audio team—works from this document during the production process, although each team may develop a more detailed document for their specific task based on the design document (see below), which describes the game in detail.[2]

Once the publisher has approved the design document, a team will be put together for the production phase of the development, which involves the creation of all of the different elements of the game (graphics, sound, cinematics)

Box 5.1
Roles of the Audio Team

The audio team of a games development company can vary quite significantly, depending on size and budget. Many smaller companies still have one audio person to complete all of the sound effects design, music, voice work, and implementation, while larger companies can have full teams of composers, sound designers, and voice actors all working on one project. Most development companies have in-house sound teams, but music jobs in particular are being increasingly contracted out. Although I have separated the main roles here, it is possible that these roles may be filled by the same person, or even be teams of people.

At the head of the audio team is typically the *sound director*. The sound director is responsible for the overall audio vision and design of a title. He or she oversees the design, defines and drives the creative and technical direction. Sound directors must coordinate schedules, budgets, staff, and technology, and manage outsourced asset creation personnel (casting, dialogue directors, mixers, engineers, and so on). They are responsible for organizing external contract work, as well as creating, editing, and mixing original content. They may also be responsible for the final mix.

SOUND DESIGNERS may also play this same role, creating an audio design document and managing the audio production pipeline. They will work with integrators and audio tool developers to create, integrate, and manage audio assets, and are responsible for sound effects libraries. This effects library may be purchased externally, contracted out, or developed in-house.

DIALOGUE/VOICE-OVER ARTISTS are, of course, responsible for providing the dialogue. They may be in-house, but it is more likely that these artists are cast externally for projects and managed by the audio director. The *dialogue director* oversees the dialogue process, often coaching the dialogue artists.

LICENSING/CONTRACTING DIRECTORS are responsible for obtaining rights to licensed IP, and contracting out work externally.

COMPOSERS are responsible for the music composition of the game. In smaller companies, they are frequently also responsible for the sound design. They may also be in charge of orchestration of their work, although on larger projects there may be teams of orchestrators working together. They are typically responsible for contracting out and overseeing live recordings.

AUDIO PROGRAMMERS or audio engineers are responsible for audio tools development, and integration of all audio assets in a game. In many cases they also play the role of sound designer. They will be responsible for developing in-house audio tools to work in conjunction with the game's AI, graphics, and physics engines.

and their integration into the game engine. At various stages in the development process, the game will undergo several quality assurance phases, which will test and validate the gameplay, user interface, and market needs. Once the game has been developed, it will undergo a debugging process to check for any problems ("bugs") in the programming or playback of the game. Once it passes the debugging, the game's documentation and manuals are produced, localization takes place (see below), and the game may be ported to the various platforms for intended release (for instance, a game developed for PlayStation 3 may then be programmed to work on Xbox360). When the game is released, attention turns to marketing, but there is still necessary upkeep or maintenance that may include releasing patches, or upgrades, to fix uncaught bugs and potentially to provide the user with new content.

Within this entire process, the audio team may become involved at any stage in the development of the game. Most often, the sound team does not join the process until very late in the project, when the game and its parameters have already been defined. At this stage, the audio team simply populates the game with sound (Selfon 2006). Other audio teams work more closely with the design and development of the game, to ensure that audio can play a significant role in a game's development. As with film, the ideal, suggested by famed film sound designers Walter Murch and Randy Thom, is that sound should be considered at the earliest (that is, the script/design) stage (Geuens 2000, pp. 197–198).

THE AUDIO PRODUCTION PROCESS

In some ways, the game audio production process resembles that of the film audio process (for discussions of the film sound production process, see Davis 1999, Rona 2000, or Kompanek 2004). There are similar recording techniques for live sounds and *foley*,[3] similar techniques for spotting, and many of the same tools in terms of recording and software are used. Comparing the music process of film and games, *LAIR* (Factor 5, 2007) composer John Debney elaborates,

> The process is similar. There are definitely scenes that one has to compose specific music for. A lot of the game play, i.e. the battles or the big set pieces, essentially has to be scored in some form or fashion. So that's all similar to a film.... Aesthetically the biggest difference for me in scoring a video game is that you don't have as much finished product. Much of the time I would be writing to a description of a battle ... literally just a one or two line description. I would also be writing to maybe twenty seconds of game play that in reality is going to become ten to twenty minutes of game play. That was the biggest difference for me. It was more about writing to a concept or description rather than writing to anything specific. (Cited in ScoreKeeper 2007)

However, there are also significant differences in the processes. Apart from dialogue and some production sound, film audio is generally a post-production activity that takes place after the film has been edited and the visuals *locked* (the final version set). A significant amount of time is spent balancing and mixing sounds in a film's post-production, which is a great distinguishing trait between film and game sound. In games, since (with the exception of the cinematics) timings are variable and the visual sequence is constantly evolving, "post-production" as the practice exists in film does not generally exist in game audio production, although there are a few notable exceptions, discussed below.

There are also other differences in the processes, and so it is worth spending some time describing the game audio development process in some detail. However, it should be noted that the production process in video games may differ significantly from what is presented here. Different genres have different types of recording needs: a simple puzzle game is not going to require dialogue, for instance. Moreover, different companies have different budgets and can spend more or less money on team size. Sony's *God of War 2* (SCEA, 2007) music team, for instance, consisted of four composers, three orchestrators, three ensembles (brass, string, and choir), a variety of ethnic soloists, and the development/implementation team (Bajakian 2007). Smaller companies may have one or two people who must perform the equivalent of all of these jobs. The platform can also affect the production process: PlayStation 3 games are going to require many months or even years of work, whereas for a mobile game, audio is typically given about a week for the entire process. I have, therefore, described a semilarge production, with separate composer(s), sound designer(s), orchestrator(s), voice actors, and programmer(s). I have broken the production phase into the three main components (music, sound effects, and dialogue) with a more specific discussion of pre-production, production, and post-production in each category. Further details on the production processes themselves can be found in Alexander Brandon's book, *Audio for Games: Planning, Process, and Production* (2005).

THE PRE-PRODUCTION STAGE

The first stage in the audio workflow is the creation of an audio design document. Supplementary to the game design document, an audio design document details the design and implementation of the game's audio. There may be separate music, dialogue, and sound design documents, but I have incorporated these here. An audio design document is also not necessarily a part of every game, and even when the intentions are there, a game's development does not always follow the plan. Damian Kastbauer, a sound designer working for a major developer,

commented that "while there is sometimes an overarching concept of how things should sound for a given project, such audio design documents are often a myth and the process becomes more about doing what is right for the game [at the time]" (pers. corr., March 29, 2007). An audio design document is designed to assist the audio team, as well as the programmers who will need the document to implement the sound into the game. Says Keith Zizza, Audio Director for Impressions Games, "Designers will want to absorb it, programmers will demand it, and producers, along with just about anyone else who is involved on the project, will want to at least skim it. Whether it's one page or one hundred, it should be as descriptive as it needs to be for you and your development team. The end result, hopefully, is a harmonious one—working with and enhancing graphics, writing, game design, and the overall gaming experience" (Zizza 2000).

An audio team who joins the production process early on may only have storyboards, concept art, crude gameplay, or character sketches from which to develop a design document. Nevertheless, there are many decisions that can be made at this stage, in order that work can begin on the sound early on in the process, and to ensure that audio plays a significant role in the game. First, it is necessary to determine the general game type, in terms of the theme and genre, to determine the style of sound design needed, and the type of music that would be appropriate. One common way of approaching questions of style in music is to create a *temp track*.[4] A temp track places preexisting music temporarily in place of the final composition, defining basic parameters from which the composer can work. Different composers, of course, have different approaches to their musical scores. Koji Kondo (2007), composer of the *Super Mario* and *Zelda* series, for instance, states that he likes to view the entire game as one composition, with each song within the game as part of a larger complete work. In dealing with franchise games or episodic content, it is also important to consider how the sound will relate to previous games, associated films, and so on.

After determining style and mood, the second most pressing issue is to deal with the functionality, or the game-specific behavior of audio—in other words, how the sound interacts with the gameplay. Will music be merely incidental, or will it be a dynamic score? What role will sound design play in the interface? Here the rules for interactivity are defined, since the game design dictates the sound design. *Spotting* is the next major element in the audio's development. At this stage, it is determined which parts of the game should have ambient sound and music. Specifically, this involves defining cue point entrances, exits, play-ins/play-outs, and game state changes, as well as deciding if game variables (such as player health, surface properties, and so on) will be used to change sound parameters. Kondo (2007) suggests keeping in mind the rhythm of gameplay in determining the structure of sound. For instance, in *Super Mario Bros.*, the rhythm of the hi-hat was used to emphasize the internal rhythm of the game,

BOX 5.2
The Music Cue Sheet

Music cue sheets help the composer to organize and design the soundtrack, as well help the programmer to know how to implement the files into the game. Many composers have different approaches to cue sheets: some organize by emotion, some by instrumentation, for instance. Organizing where the game needs music is a great first step to arranging the time needed, orchestration needs, recording sessions, and other important aspects of creating the game's score. The cue sheet below shows a section from Jeff Simmons's music cue sheet from the 3D MMORPG *Earth Eternal* by Iron Realms (2007).

TABLE B5.2
Sample music cue sheet

Area Cues				
File no.	File name	Action	Time	Notes
1	dungeon_01	Nonlooped	2:07	Slightly dramatic or dark mood
2	Caves_01	Looped	1:37	Scarier, more foreboding than dungeon but less somber than King's Grave
3	Desert_01	Nonlooped	1:57	Egyptian/vaguely Arabic
4	Mystical_01	Nonlooped	1:49	Places meant to be very mystical
5	Gothic_01	Nonlooped	2:00	Darkness filled with metallic elements

and melody was used to bring that rhythm to life. It is also important to consider the controls and how these should influence that sound aesthetic: if buttons are rapidly pushed and the gameplay chaotic, the sound should reflect this physical activity of the player.

For the music, a cue list can be created with preplanned and "to-be-determined" cues (see box 5.2, "Music Cue Sheet"), breaking the script into acts or chapters or segments, defining what is happening dramatically, and creating an *emotion map* for the game, as well as for each individual level (see figure 5.1). Does the level end in a boss? Are there mini-bosses? Do we find a key item? Where are the significant points of tension and release?

As composer Charles Deenen has described, there are six basic audio emotions: happiness, sadness, surprise, disgust, anger, and fear, and each of these can be mapped to major scripted events.[5] Composer Scott B. Morton (2005) writes,

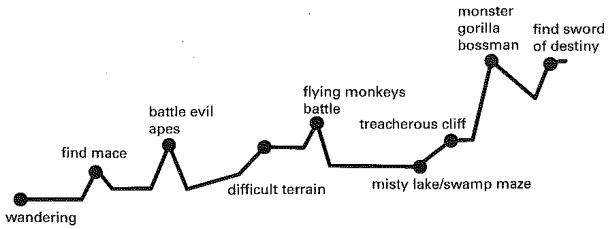

FIGURE 5.1
Emotion map for game's level tension and release patterns.

> This musical arc is often more important than the literal events themselves because it can infer deeper meanings ... more than simple actions on the screen can.... Composers should start thinking beyond "What does this level sound like" to "What role does this level and its characters play in the grand scheme of the game and the plot? How do I portray that with the music I write? Where do I place the music within the level to bring this across in the most effective manner?" ... Create a musical climax in your game. Don't use your most intense music until you've reached critical points in the game's dramatic arc. Is the final boss battle more important than the miniboss battle? Show it in the music. A player should be able to subconsciously interpret the importance level of events based on the music that accompanies them.

In terms of sound design, style will also be explored during this preproduction phase, taking into consideration genre, sample rate, resolution, prioritization, and other sound considerations. As with music, spotting the game and creating a list of assets needed is the first step in the sound design of a game (see box 5.3). This involves a reading of the script or design document, looking to spot for objects, actions, environments, pace, tension/release, characters/personalities, and so on. Spotting the game in terms of the emotional needs of sound design is also important: generally, there is a rhythm or movement within a level or game in terms of emotional peaks and valleys. As with music, an emotion map of tension and release points can help the sound designer in deciding which sounds need emphasis, which sounds may interfere with one another, and which sounds are secondary in importance. Asset lists are often based on descriptions of levels, and are broken down into sound types (weapon sounds, ambient sounds, menu sounds, foley, and so on). The asset list can then be used to track recording in order to be able to reproduce sounds at a later stage, if necessary. In addition to sound effects and foley, ambient sounds are a key part of a game's overall feel. This may include music, or ambient dialogue, or it may include outdoor environmental sounds. Creating a mood (of safety, of excitement, and so on) can be used

BOX 5.3
Dialogue Cue Sheet

Since dialogue lines have increased to several thousand per game, it is becoming increasingly important to track dialogue sessions. The dialogue cue sheet can track as-recorded files, any DSP effects on the voice, format, file size, and so on.

File name	Character	Location	Dialogue	As recd.	DSP FX	Notes
Sh001	Sharon	Level 3 cave	"Help!"		Reverb cavex03	
Kev001	Kevin	Level 3 cave	"Hang on! I'm coming!"	Hang on!	Reverb cavex03	
Mons001	Monster1	Level 3 cave (just outside)	"Grrrauh!"			Still to add DSP
Kev002	Kevin	Level 3 cave	"What was that?"		Reverb cavex03	

to prepare a player for a particular situation, or to trick the player into thinking an area may be safe when it is not (Kutay 2006). Says Steve Kutay (2006), sound designer at Radius360:

> The psychological impact of ambient sounds can add much to the onscreen imagery, though not physically present in the scenery. For instance a distant, sustained cry of an infant suggests vulnerability or insecurity. A broken fence rattling in the wind of an abandoned city, suggests to the player a previous traumatic event. These are subtle examples used to arouse awareness in the player. More obvious sounds should be used to cue the player of his direct proximity to danger. Dark drones or muffled enemy vocalizations will prepare the player for fierce combat ahead. Fear, anticipation and anxiety are easily evoked by the careful placement of ambient sounds.

It is important, however, that ambient sounds not rely on looping. The player will quickly pick up on any distinctive sound that repeats. One solution that was incorporated into the soundtrack for *Halo* (Bungie, 2001) was the idea of permutation weighting, as described by Marty O'Donnell and Jay Weinland (in Fay, Selfon, and Fay 2004, p. 423):

> We had multiple tracks playing in many cases (such as an outdoor ambience plus a wind track), each with multiple permutations in the "main" loop tag, as well as detail sounds that could be randomly triggered and were placed randomly in 3D space. One technique to highlight (which was used extensively in the music tags as well) is permutation weighting. Permutation weighting is the ability to assign different probabilities to each permutation to control how often a given permutation is played. For example, there are six permutations of a "main" loop in an outdoor ambience with lengths varying from two to eight seconds and 27 seconds of material. In one of those loops, there is a distinctive owl hoot, which would be repeated every 27 seconds if the material was played back in the same order each time.... Given the randomness of our permutation playback, you actually might hear it on average every 27 seconds but sometimes a little less and sometimes a little more frequently. If that distinctive hoot is still heard too frequently, we can use permutation weighting to assign a high skip fraction to that one permutation that tells the audio engine to skip this permutation x-percentage of the time. We adjust this number until we hear the distinctive hoot at a frequency that seems natural.

With these music and sound design decisions made, a list of required sound assets can be assembled, with separate asset lists for sound design (including, for example, weapon sounds, characters, user interface sounds), music (different modes/levels), dialogue, and additional audio content (for marketing/promotions, cinematics, etc.) (Brandon 2005, p. 21; see box 5. 3, "Sound Design Asset List"). As Zizza (2000) describes, "Reference a separate list of all audio content for the game, including those for demos, marketing, your web site, and so on. If you like having everything in one document, and the content list is on the small side, it's probably fine to include the master list here. In any case, it's good idea to include a general outline of content, well before there is enough detail to have an actual, formal list."

As this stage, it is necessary to determine the technical limitations of the systems being used, including, for instance, how many channels of sound will be used, whether the delivery will be in surround sound format, and what production values the sound will have. Finally, implementation must be considered, including the tools and technology available and required (to be built or bought), such as platform, sound engine, and playback engine. Composer Richard Jacques described that it may be useful to think as the programmer, in creating simple if–then statements, using examples from *Sonic 3D* (Sega, 1996), which used Redbook audio tracks cued dynamically:

Example 1, Level 1, Act 1: Play Green Grove Act 1 music
IF Sonic picks up speed shoes
THEN play "speed shoes music."
IF Sonic picks up invincibility icon
THEN play "invincibility music"

IF Sonic has collected 100 rings
THEN play "100 rings jingle"[6]

In this way, the programmer can see exactly how music or other audio elements are to be implemented, and the composer or sound designer can get a feel for what will work in the game. Finally, a schedule and budget typically follows, including time for design, asset creation and production (including recording sessions, and so on), re-dos, implementation, and testing/quality assessment.

THE PRODUCTION STAGE

If the game was not spotted for music cues during the pre-production phase, the spotting of cues will take place from a solid, playable form of the game, if one exists. If a playable does not exist at this stage, composers may create a series of *scratch tracks*, or rough drafts of cues. Composers typically have their own way of creating music at this stage, and the music's creation also depends on the size of the company: smaller companies are unlikely to use orchestras, and so synthesizer tracks can be created, which are more affordable and more easily reworked when changes need to be made. In a large company, once scratch tracks have been approved, temporary melodic assets, or multitrack splits will be delivered to orchestrators, who will orchestrate the songs. Charts are taken to ensembles and pre-records (of synthesized versions and soloists) are delivered to the orchestra. Recording sessions are undertaken and then mixed, mastered, and *sweetened* (altered with layering, effects, and so on).

The production of game sound can typically take place in a number of venues. In the recording studio, stock sound CDs or sound effects libraries are commonly used. Oftentimes these stock library sounds are manipulated and layered to achieve a desired effect. In the studio it is also possible to record custom sounds with the use of various props. Some companies have dedicated foley studios or foley pits, which are designed for in-studio recording, such as footsteps or clothing noise. In addition to in-studio recording, many companies incorporate some field recording—that is, recording outdoors or in various locations other than the studio. Once all of the sound assets have been gathered, typically sounds are manipulated in the studio, treated with various effects, or sweetened to create a more exciting sound and to distinguish the sound from other games that may be using the same effects libraries. This usually involves layering sounds, adjusting various elements of the sound, equalizing and compressing the sound, or using various digital signal processing (DSP) effects (see box 3.1).

One of the most important advances in sound technology on next-generation consoles is more powerful DSP, including the processing of DSP in real time (that

is, while the game is actually being played). Being able to add DSP effects onto sounds in real time in the game saves a lot of recording time. For instance, previously, to get the effect of footsteps to change when walking from, say, a stone path into a cave, the effects would have to be pre-recorded onto the footsteps sound file. Each different location would have to have a pre-recorded sample of the sound. Now, DSP filters can be set for locations, and so selected sounds can be processed in real time in that location. Only one set of recorded footsteps is needed to create potentially unlimited sound effects from that one original recording. In other words, with real-time DSP, audio can respond to physics graphics engines to create more realistic-sounding effects in the game during real time, as Sotaro Tojima, sound director for *Metal Gear Solid 4* (Kojima, 2007) describes:

> For example, in the scenario where a bottle falls off a table, hits a metal shovel, and then rolls onto a carpet, conventional sound processing would have the bottle make the same sounds regardless of the environment, or what it collides with. That same scenario on the PlayStation 3 might have the bottle make a metallic tink when it hits the shovel, and then create a muffled rolling sound as it travels across the carpet. If the room had its own sound variables, the bottle's sound might get take on some echo if in a bathroom, or get slightly quieter if in a bedroom. Then you have to factor in on-the-fly surround encoding, which would make the bottle pan from front to back or side to side in your room, depending upon the way it rolled. (Cited in Shah 2006)

The audio team also typically oversees the production of dialogue (voice-over), since this must be mixed with the other audio in the game. In the early days of game dialogue, friends of the audio developer were often drafted to record voice parts, but today professional voice actors are commonly used and the process is much more in-depth. Dialogue can be an important part of a game's overall sound, as Marty O'Donnell and Jay Weinland elaborate in a discussion of *Halo*:

> The dialog in *Halo* was one of the areas that helped to give *Halo* a unique flavor. There are two types of dialog: cinematic dialog that is a traditional linear script and dynamic dialog. As you play through *Halo*, your Marines will dynamically alert you to what is going on around you, warn each other and you of danger, chastise, apologize for allies getting shot or killed by friendly fire, and generally amuse you. This aspect of *Halo's* audio could not have succeeded without the hard work of AI (artificial intelligence) programmer Chris Butcher who gave us many possible AI states in which a character might say something and controlled how much was said to make it all seem natural.... The cinematic dialog also works well due to both a great storyline by the Bungie team and excellent writing by Joseph Staten. Scripts for the cut scenes and other interior scenes during gameplay were written and storyboarded so that we could clearly deliver the plot to the player. There is about one hour and 15 minutes of cut scenes in *Halo*, and that puts this part of *Halo's* production on par with a short feature film. (Cited in Fay, Selfon, and Fay 2004, p. 428)

Dialogue events can be separated into several distinct types: ambient dialogue (also known as *walla*, background ambience for environments where there are background people, such as crowds at a baseball stadium, shop, or market); scripted events (which are in-game scenes in which the player can typically walk away, but if he does so, he or she will miss some important information); cinematics; AI cues (also known as *barks*, which are nonverbal lines such as screaming); voice-over narration; and the in-game lines (see Chandler 2005). Together, these dialogue events can represent thousands of lines of script. *Halo 2* (Bungie, 2004), for instance, had more than sixteen thousand lines of dialogue.

Much as it is necessary to organize assets for sound or music, dialogue assets must be carefully cataloged. A script can be broken down into a dialogue sheet by character or scene (see box 5.4, "Dialogue Cue Sheet"; see also Chandler 2005). Casting must take place for each localized area (if the dialogue is being localized; at times this is not possible and subtitles are used). Generally, studios will cast one actor for several roles. It is therefore important that a cue sheet is carefully organized, so that actors do not end up in the same scene, "speaking to themselves" in a game. Studios will record by character, rather than sequential order, so recording sheets for each separate actor must be produced. Details regarding the As-Recorded Script (ARS), which are changes made to the script when recorded, must be described. Dialogue is often recorded in an ADR studio,[7] which is designed for film over-dubbing, but is very suitable for games dialogue work. The *dry files* (raw, unaltered) are delivered and checked for quality. These files are then cut into single asset files for integration and treated to various effects or editing as necessary. Once audio editing is complete, audio is set to video clips of the game, particularly in cinematic sequences. Additional recording sessions and retakes are often part of this process.

An increasingly complex component of game audio is localization. Localization is the process by which a game is adapted for a specific territory or target market. Typically this includes the major European languages (French, German, Spanish, and Italian), and may include Asian markets as well. Localized versions are either completed at the same time as the original version (known as *sim-ship*, or simultaneous shipping, for worldwide release), or *post-gold*, which is a remake of the game with localized assets after the original version is complete. Ensuring a wide market in terms of distribution helps to minimize some of the financial risks involved in producing a game. To some extent, localization is genre-specific, as the Game Localization Network (2005), a company specializing in localization elaborates: "Shipping a game with a translated manual (a 'doco' version) might be considered sufficient for a [*sic*] arcade racer but it will not engage and assist players of a story driven RPG. An RPG that is targeting a large language market might benefit from a 'full' localization (user interface, in-game text, spoken audio, manual and support documents), a similar game targeting a smaller market might be better shipping as a 'sub-titled' version (user interface, in-game text, manual,

Box 5.4
The Sound Design Asset List

The sound design asset list tracks the assets needed for the game, and can be adapted to also function as an audio report, which can detail where the sound came from, any DSP effects it was treated with, and so on. These asset lists can be as simple as the one presented below, or incredibly detailed including take number, audio channel information, equipment setup notes, and information regarding equipment used to record, along with SMPTE time codes, track numbers, file names, or other identifying information. The cue sheet below shows a section from the sound effects asset list from Jeff Simmons's cue sheet from the 3D MMORPG *Earth Eternal* by Iron Realms (2007). Used by kind permission of Jeff Simmons and Iron Realms.

Hits and Impacts		
Swords		
File no.	File Name	Time
50	sword_flesh_impact01	0:01
51	sword_flesh_impact02	0:01
52	sword_flesh_impact03	0:01
53	sword_leather_impact01	0:01
54	sword_leather_impact02	0:01
55	sword_leather_impact03	0:01
56	sword_wood_impact01	0:01
57	sword_wood_impact02	0:01
58	sword_wood_impact03	0:01
Staffs		
File no.	File Name	Time
59	staff_flesh_impact01	0:01
60	staff_flesh_impact02	0:01
61	staff_flesh_impact03	0:01
62	staff_leather_impact01	0:01
63	staff_leather_impact02	0:01
64	staff_leather_impact03	0:01
65	staff_wood_impact01	0:01
66	staff_wood_impact02	0:01
67	staff_wood_impact03	0:01

and support documents), thus contributing to the bottom line by saving the cost of audio recording."

Localization is necessary to create a realistic game environment, no matter what the player's language, but it is more than just straight translation: the user interface must be intuitive to that market, the story must be as polished in the translation, and the audio must be as realistic and engaging as the original (see Game Localization Network 2005). Localization may include changes in controller layouts, animation sequences, or frame-rates that may require adjustments in audio. What's more important, there may be significant cultural differences in the various territories that require changes in gameplay. Different music may need to be selected for different target markets.[8] Legal or cultural issues can arise from the different ratings systems in various territories, owing to censors and public opinion. For instance, Germany has very strict laws regarding violence, which for audio may mean toning down the sound effects to reduce the impact of violent sequences. When the narrative of the game is significantly revised for another culture, this is known as *blending* (Thayer and Kolko 2004, p. 12). Blending can involve writing new narratives to target a specific culture, and therefore might also require new graphics and new sound. Examples of blended games include, for instance, *Crash Bandicoot* (Naughty Dog, 1996), in which the main character underwent an appearance change for the Japanese market, and *Half-Life* (Valve, 1998), which had to replace human characters with robots to satisfy different rating standards in violence (Thayer and Kolko 2004, p. 17). Obviously, changing a character from human to robot involves significant changes in audio.

The final stage in the audio production process is the integration of the music, sound effects, and dialogue. Integration of audio into the game involves much more than writing a few lines of code. Describes Marty O'Donnell, "The implementation side of it is really huge ... it's not just about, 'We need a sound.' It's all about 'Here is this vehicle or here is this weapon, which has many different components and many different ways it needs to act in a 3-D audio environment'" (cited in Hanson 2007, p. 49). O'Donnell even goes so far as to suggest that implementation is responsible for at least 50 percent of the final audio result. It is, after all, the ways in which audio is integrated into a game that will have an impact on the effectiveness of that audio. Integration typically determines how audio will be cued or triggered in a game, as well as what aspects of the audio may be changed by the game state or game parameters (see Whitmore 2003). For instance, music or ambient tracks may be triggered by location, by game state (such as player health, or enemy health), by time-ins or time-outs, by players, or by various game events.

The music files the composer writes must be able to be integrated into the game in a variety of ways. Integrating the music, for instance, may involve cutting the music into *splits*, *loops*, or *chunks* in order to create a more dynamic score. As John Debney, composer for *LAIR* described (in ScoreKeeper 2007), "There

was almost two hours of music which in the scheme of games is not a lot. They'll take that two hours and cut it up and turn it into hours and hours of music.... the mechanics of writing music that they could cut really easily was important. A lot of the action oriented pieces are, by design, pretty rhythmic so that they could cut it very easily."

In addition to the actual cues being cut for integration, various musical elements may be altered in real time in the game engine, such as DSP effects, tempo, or instrumentation. Middleware tools, such as *ISACT*, *Wwise*, *FMOD*, and others are increasingly being used to decrease production time and costs, and to integrate a more dynamic score into the game. Canadian company Audiokinetic's middleware solution *Wwise*, for instance, allows audio developers to prototype the integration of audio in a game simulation before the game is even finished. Environmental effects can be rendered in real time, and occlusion and obstruction effects can be managed within the software, mixing up to four simultaneous environments per object. Sound prioritization for real-time mixing is also included, as is randomization of various elements for effects such as pitch or volume, to enhance realism. Real-time game parameter controls can also be set, to adjust sound properties based on parameter value changes in a game. So, for instance, if a player's health is running out, music could be sped up, or could increase in volume. Also important, the software allows the user to validate audio profiles for each platform, to manage the performance in terms of CPU and memory usage, in order to adapt and adjust performance before the final integration.

An equally important part of production is the placement of sounds in the three-dimensional space. Use of high-definition (HD) format in television and the adoption of 5.1 have led to a growing consumer demand for surround sound in games. All next-gen consoles are compatible with Dolby Digital's discreet surround 5.1 (see box 4.1). With capabilities of 7.1 in some games systems, surround sound is rapidly becoming the norm, and indeed is expected, particularly as consumers upgrade their home-theater equipment. Spatial positioning of sound is increasingly becoming an integral part of gameplay. Surround sound is used to help create a more realistic and immersive environment in games, as Richard Dekkard of HammerJaw Audio describes in the use of surround in *Auto Assault* (Net Devil, 2006):

> Anything that moves in the game is panned dynamically in the surround field. This includes all vehicles, enemies, explosions, etcetera. There are also stationary sound-emitting objects that are panned dynamically. There are many "George Orwellian" propaganda towers all around that you will hear panned interactively. In addition to these interactive elements, we have six levels of "prebaked" surround sounds. These include weapon sounds, music, weather, environmental audio, interface sounds, and your own vehicle explosion is in surround sound. We have taken it to every extreme we could. (Dolby.com n.d.)

Surround can be useful for more than just its immersive quality, however; it can be used as an audio cue. A basic example is the use of surround in the gameplay of the Shadow Mario character in *Super Mario Sunshine* for the Nintendo Game Cube (Nintendo, 2002), in which the positioning of audio indicates to the player where the translucent Shadow Mario would pop up. Similar use of surround sound to position enemies was seen in the stealth and first-person shooter games discussed in chapter 4. Another interesting use of surround sound can be heard in *Onimusha 3: Demon Siege* (Capcom, 2004), in which the player is given the option of adjusting his or her "listening position," setting the perspective of the audio as either that of the player or camera. Surround sound, therefore, can play a variety of important roles in games, as Marty O'Donnell and Jay Weinland elaborate for *Halo*:

> Knowing that a Marine "had your back" just over your right shoulder brought a sense of security, just as hearing a Hunter's metal armor behind you would bring a sense of impending doom. There were many audio elements in the game that received 3D positioning, such as weapon sound effects, bullet impacts, speech, mechanical objects, particles such as flying dirt or sparks, and outdoor detail ambiences, such as wildlife, rivers, and waterfalls, to name a few. In essence, everything you hear in *Halo* that is not music or an ambient bed is 3D positioned ... All 3D audio is subject to occlusion, obstruction, Doppler, and HRTF. Anytime a solid piece of geometry gets between the player and a sound source, it is occluded and obstructed. A good example of this is in the hangar bay of the alien ship where there is a dropship with the engine running. As the Master Chief steps behind a column, the sound of the engine is occluded, rolling off both the gain and the high end of the sound ... HRTF (Head-Related Transfer Function) also adds to the audio experience by filtering sounds, depending on which direction the character's head is facing. You can hear it affect the dialog in the cinematics as well as in the sounds that play during combat. Probably the best way to hear this effect, however, is listening to your own footsteps. As you move the Master Chief around in *Halo*, listen to the sound of his footsteps on various surfaces. Then run through the same areas looking down toward his feet rather than straight ahead and listen to those same footsteps; the difference is stunning. (Cited in Fay, Selfon, and Fay 2004, pp. 424–425)

Sounds are mastered individually. Mastering of separate sound elements (dialogue, effects, etc.) helps to adjust the sounds' dynamic ranges. At present, there is still too little dynamic range within games (see Bridgett 2008). With real-time mastering, unwanted audio information can be removed in favor of a much more realistic, cinematic dynamic range. As Alexander Brandon elaborates, "another delusion held by all audio folk who gleefully cling to their BBE Sonic Maximizers is that all sound needs not be normalized to überhigh levels, in some cases creating a WAV file that in *Sound Forge* looks like a solid brick ... proper balance of dynamic and frequency range is vital to avoid butchering the ears of

the average listener" (Brandon 2005, p. 46). Bridgett (2008, p. 129) argues that one reason for this loss of dynamic range was perhaps the fact that "video games were born in arcades where they had to compete with the sounds of other nearby games consoles" and as such, as noted earlier, sounds had to be loud to attract attention. He goes on to argue that the cinematization of games is changing their "cultural positioning" and thus leading to an aesthetic that is closer to film or classical music, in which sounds demand a certain "listening etiquette," in which they are "expected to be listened to in isolation and given the audience's undivided attention, they are not expected to compete simultaneously with other [environmental] sounds."

THE POST-PRODUCTION STAGE

"Post-production" in games typically involves some degree of mixing. Mixing adjusts the interplay of all audio components in a game to ensure that there is no overlap between frequencies, including deciding which elements should be emphasized and which should be deemphasized in the mix. The mixer must listen for what Charles Deenen calls *believability gaps* in the audio: awkward silences, too much repetition, an unnatural imbalance (in EQ, dynamic range, and so on), or unrealistic dialogue.[9] Integration may also involve dynamically mixing a score, such as in *Grim Fandango* (LucasArts, 1998), which adds or drops instruments at certain key moments or environments. Mixing is, therefore, ideally something that should be considered throughout the whole audio design process, although this differs from developer to developer. As Ed Lima, audio director at Gearbox Software, elaborates: "I think about the mix throughout the entire design process. I generally try to bake some slight equalization curves or tendencies into families of sounds. For instance, explosions might be bottom-heavy, voice-over might occupy a higher band or the music might be designed with specific instruments and frequency bands in mind" (in Henein 2007, p. 56).

At present, sounds in games are, in a sense, competing with each other—dialogue, sound effects, ambience, and music all inhabit the same aural space. Particularly since dialogue and the sound effects of, for instance, combat, are often in the mid-range, there is a constant risk of creating what film sound designer Walter Murch calls a "logjam" (in Oldenbourg 2005). For instance, if a player's character is in an open field, talking to a nonplaying character, and is supposed to hear a gunshot in the distance, if the composer has chosen to include a lot of mid-range activity in that cue (e.g., snare drums and guitar), the gunshot, the conversation, and/or the music is going to be obscured. Whereas this has always been problematic in film sound and other linear media, in games the added unpredictability of where these events may occur makes the mixing far more difficult a task.

Real-time mixing in games now allows for sounds to be prioritized. As such, if the player must hear the dialogue to know what the next stage in the game is, the music or that explosive sound can drop down in the mix, as Rob Bridgett, sound director for Radical Games, describes:

> Ducking music and FX when dialogue occurs is a very basic way of achieving a more cinematic effect in games, and also of ensuring that essential information is conveyed and is clearly audible. The interactive mixing process can identify a whole slew of prioritised sound effects that need to be heard at designated moments in game play and sometimes dropping a sound entirely is the best option. Ducking importantly allows subtraction of sounds so that you don't just have to make everything louder in order to hear it.... Dynamically carving out frequencies from a music track when dialogue is playing for example is a great way of generatively allowing space in the music to exist when a dialogue event occurs. (Bridgett 2006)

As Bridgett (2008, p. 127) argues, previous attempts at mixing in games meant that a group of sounds had to be "limited and compressed to extremes in order to compete with other sounds and music," or, in cases where simple mixing existed, implementation (via text file) was awkward and not "artistically useful." In some ways, Bridgett (2008, p. 131) argues, it was almost beneficial that these older systems could not handle a significant amount of audio information at any one time, which limited the amount of simultaneous sounds:

> With the increased memory and available voices of next generation consoles and more sophisticated audio compression codecs, such as Microsoft's *XNA* and Sony's *ATRAC* allowing for a reasonable quality sample rate at roughly 10:1 compression, the amount of sounds that can now be played simultaneously has increased roughly ten-fold. This means a heavily increased role for in-game run-time mixing in order to prevent a cacophony of sound effects from playing back during run-time. Assigning a finite amount of available voices is one particularly crude way around this, but there emerge problems of really important sounds not being played back because other important sounds are also playing. Mixing in video games, as in cinema, is concerned with sound removal and subtraction rather than pushing volumes up. In mixing, it is often very subtle fader ducking that is required to allow a more important group of sounds to be made prominent above others.

There are still several necessary procedural stages and technical aspects to be explored by game audio designers. In particular, the psychological aspects of mixing can be a challenge, because the most effective mix may not be the most realistic: "For example, consider any number of movies where the protagonist walks down a busy city street, and the audience hears primarily the interior monologue of the character's thoughts, not the traffic sounds" (Grigg et al. 2006). It has been proposed that what is required is a "smart audio engine" that could

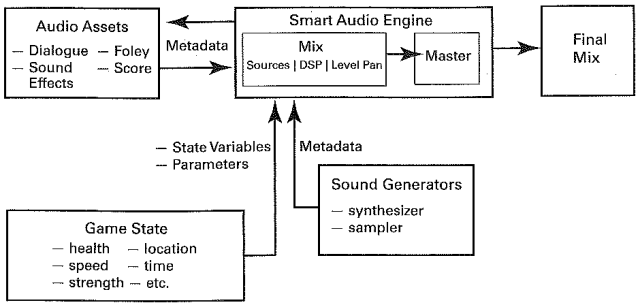

FIGURE 5.2
High-Level Smart Audio Mix Engine, adapted from Project Bar-B-Q (Bajakian et al. 2006).

take various sound assets, filter them with DSP according to various in-game parameters (game states, for example), perhaps synthesizing the sounds themselves in some cases, mix and pan within the engine in real time, master in real time and then send the sounds out to the player, as in figure 5.2.

There are different models for audio mixing in a game, including a post-production model as outlined by Bridgett (2007). Typically, post-production mixing has occurred in games only in cinematic sequences, in which the visuals can be locked down. Bridgett, however, working with Randy Thom on *Scarface*, created a model of "snapshot mixing" to mix sound, music, and dialogue by breaking the game down into several types of mix, including generic gameplay actions, locations, and specific events. Different mixes were developed for different areas of gameplay.

It is also possible dynamically to reduce or eliminate various frequencies from a music track in order to avoid a logjam with the dialogue. Describes Jay Weinland of the game *Halo* (in Hanson 2007, p. 51):

> One of the things that's pretty cool about our code engine is that we actually have real-time ducking in our game.... So that we can control any individual sound, we can control how we duck it under cinematic or other types of dialog, which is our biggest challenge. If the character is giving you some very important information, and all of a sudden three grenades land at your feet and blow up, you don't want that line to get stepped on. We have real-time parameters where we can say, "we'll duck this sound nine dB over two seconds and let it ramp back up after the dialog is done, over the course of another second and a half." So it allows us real-time control over the volumes in the games, and it helps us to make sure that we can always hear the important dialog and other things that are important.

Such prioritization of sounds, though necessary, can mean that the mixer is making decisions that affect the ways in which the player hears and interprets sound. The composer may believe that the music at a particularly dramatic point in a game should have priority, in order to draw the player emotionally into the scene, while the dialogue may feature a *reveal* (a plot point that will guide the player); while the sound designer might have also spent much time unnecessarily prioritizing the sound of a key dropping off a desk on the right-hand side of the soundscape, for instance. Each of the sound assets may be thought by its creators (or indeed, the player of the game) to require priority. The mixer, then, must make difficult decisions regarding which sounds the listener should hear, potentially altering the intended impact of the audio, and the ways in which the audio information is received by the player.

CONCLUSION

It is important to note that there are specific differences in the production processes between film and games that impact the final sound of the game. For instance, in film sound, ambience is often recorded in the production space: if not at the time of filming, then typically on the same day, in order to "corroborate, for the spectator, the original inscription of the character's speech" (Geuens 2000, p. 219). Argues Jean-Pierre Geuens in his book *Film Production Theory*, "ambiance is the cement which holds the entire aural construction together" (ibid.). But of course, as with animation and some CGI-heavy live action films, there is no production space in games. There is no ambient background in which actors perform. As such, the sounds are all dubbed in. Dubbing used to be viewed as a last resort by filmmakers, since a good recordist working with a good mixer could get up to 70 percent of the production track into the finished film (ibid., p. 212). Geuens (ibid., p. 216) argues that in dubbing, we "falsify the space" since the original context of place is lost, resulting in an unnatural sound. It is "a procedure to be avoided because newly recorded tracks invariably sound flat and dead in contrast with the location recordings" (Michael Rabiger, in Geuens 2000, p. 212). In games, however, all sounds must be created in the studio or in field recordings, and then built up to sound real. Without a real reference point for the space that is being created on-screen, these sounds are inevitably in some ways "less than real," and as such, in many ways sound designers compensate by creating a "more than real" sound in the studio (a topic I take up in chapter 7).

At the same time, the issue of mixing is much more complicated in games, which must take into account not only real-time changes in gameplay, but changes in the player's positioning of the character. Mixing in film is based on the assumption that the audience is static, an unmoving, passive receiver of

the sound. Mixing in games must be based on the assumption that—though the player's actual position may not change—the player's character (and, by extension, therefore, the player) is constantly changing position. Planning to mix a surround-sound game, therefore, requires a set of skills that are becoming increasingly specialized.

As game audio develops, the roles involved are becoming more and more specific and dedicated. Whereas one person used to be responsible for all aspects of audio production and implementation, there are now teams of people with a variety of levels of artistic and technical skills. What needs to be stressed is that game audio is a collaborative process; the programmer cannot implement without the music, and the music, as was shown, depends to a significant extent on how it is implemented. Sound design must take into account the dialogue, and so on. The teamwork involved in creating game audio suggests an important reconstruction (or reduction) of the notion of "author." As shown, sound design, dialogue, and music are as much about integration as they are about composition, and the ways in which the sound is implemented greatly affect the ways in which these sounds are received. To some extent such a relationship exists in film, but it is taken to an extreme in games. Music must adjust to the player's actions, in real time, to other audio in the same scene, and so on.

Moreover, when musical splits or "chunks" do not exist as a single linear track, there is no single "musical text," and the author is to some extent the player/listener, whose moves affect the playback of these audio chunks, as is the composer, who is responsible for composing them, and the programmer, who chops them up and places them in a game. Cultural theory has for several decades been dealing with the notion that audiences themselves may construct meaning from texts, and the notion of text itself has become increasingly blurred. In games, these concepts become even more indistinct, as the player becomes an active agent of change, and the text is malleable and impermanent. This is taken even further in online games, for which there is no scripting, and no final version. Localization also further disintegrates the notion of games as a "text" or complete "work." Not only is every game different owing to the participatory interactive nature of games, but games may be altered significantly for different markets, raising the question of what is the "authentic" version. This reduction of text and authorial power may even have an impact on the future development of popular music in general, as popular songs increasingly are licensed for games, a topic discussed in the next chapter.

CHAPTER 6

SYNERGY IN GAME AUDIO: FILM, POPULAR MUSIC, AND INTELLECTUAL PROPERTY

The global video games business represents an enormous cultural industry. The leading industry organization, the Entertainment Software Association, claims that over 75 percent of heads of households in the United States now play computer or video games.[1] Sales statistics fluctuate with the release of new consoles (approximately every five years), although overall statistics since the birth of the industry indicate an ever increasing incline in sales. Worldwide hardware and software sales are forecast at 46.5 billion dollars (based on retail sales) for 2010,[2] and are increasing at an average 11.4 percent compound annual rate (Kolodny 2006).[3] Despite these impressive numbers, the actual number of games that sell over one million units in a given year is only a handful.[4] Indeed, only a small percentage of games released ever make a profit, meaning that games software sales, much as in the music industry, depend on a few stars covering some of the costs for the many unsuccessful releases. Moreover, whereas the music industry today is being "democratized" by the exceptional quality available to the home "bedroom musician" and the distribution by Internet sites, independent game developers face increasing challenges.[5] Publishing a game on the Xbox360 or PlayStation 3 represents a development cost of 50 percent more than previous platforms. Because of the advances in capabilities, production and marketing costs are now averaging about twenty million dollars per title.[6] While independent developers can still enjoy some success—particularly in the casual, downloadable and portable games markets—their chances of success with a major title are slim. Profit margins are diminishing, forcing games publishers to reduce risks in several ways. The major companies—such as Microsoft and Sony—are increasingly developing their own games in order to ensure themselves exclusive

releases, thereby guaranteeing sales for their own hardware (Sony, for instance, employs over 2000 developers in fourteen studios).[7]

Relying on well-known intellectual property (sequels/episodic content, film or other market *synergy* or crossovers, and so on) is an important way to offset some of the risk. Music licensing in particular is becoming an increasingly essential element of a game's marketing strategy, as it helps to reduce some of the costs and risks of bringing a game to market (see Kerr 2006, p. 70). Synergy with mass media entertainment markets is so important that, as Aphra Kerr points out, some publishers have gone so far as to purchase other studios in order to gain access to intellectual property.[8] Anything that can be done to reduce the marketing costs—such as presenting already-known stars or intellectual property—is viewed as a surefire way to ensure a game's success. After all, the most expensive element of marketing (that of building awareness) has already been achieved when using preexisting IP (cited in Kerr 2006, p. 70). Of course, tying games to other intellectual property is nothing new, as can be seen in 1975's *Man Eater*, whose flyer advertised, "take advantage of the *Jaws* rage" (figure 6.1), and a similarly styled *Shark Jaws* (Atari, 1975), which was obviously capitalizing on the film, but could not get away with titling itself just *Jaws*, and so nearly hid the word "Shark" (figure 6.2).[9] Games based on film, as Jeff Smith (1998, p. 192) notes of the relationship between music and the movie industry, are important because "they not only presell the film project and thereby serve to minimize financial risk, they also provide a ready-made set of images and narrative elements that can be regenerated in any number of distribution channels." Smith writes, "By creating multiple profit centers for a single property, synergy spreads risk among several different commodities. A successful soundtrack album can help defray the production costs of an unsuccessful film, and vice versa" (ibid., p. 188).

In terms of game audio, the associations with known intellectual property sometimes come in the form of the use of star talent in voice recording. Having a star associated with a game assists in marketing, creates awareness, and generates buzz. For instance, well-known cult Hollywood actors, such as Mark Hammill and Malcolm McDowell, contributed voice acting to 1994's *Wing Commander III* (Origin). More recently, Rockstar Games had Ray Liota, Burt Reynolds, and Dennis Hopper record voice for *Grand Theft Auto: Vice City* (2007). Most major game releases, known as AAA or *triple-A* titles, will likely soon feature well-known voice actors. Writing about the increasing role of star talent dialogue in animated films, Joe Bevilacqua (1999) notes that the competitive nature and need to draw a wide audience is driving the increased use of celebrities, at the expense of experienced specialized voice actors. More important, there are aesthetic implications of such a choice, since unlike screen actors, specialized voice actors are specially trained in microphone techniques.

Like dialogue, sound design is also experiencing increased crossover with Hollywood, as franchise games are developed after the release of films (such as

FIGURE 6.1
Man Eater (Project Support Engineering 1975) arcade flyer.

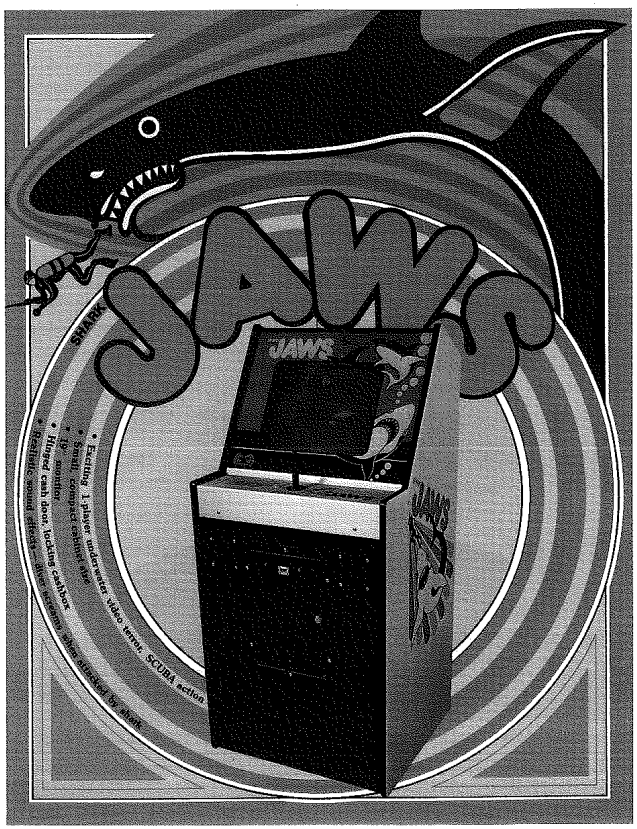

FIGURE 6.2
Shark Jaws (Atari, 1975) arcade flyer.

Scarface), or simultaneously (as in *The Chronicles of Riddick*). In the case of *Riddick*, sounds were often borrowed from the production/post-production film recording (Droney 2004). The film's sound designers at Soundelux were brought in to work with Swedish Starbreeze Studios on the game "to sonically tie together the opening and closing flashback scenes that reference *The Chronicles of Riddick*, as well as create a long list of sound design effects for use in game play" (ibid.). Sound effects, such as weapons, were shared between game and film. Supervising sound editor Scott Gershin describes:

> Part of what's intriguing about this franchise ... is that it's different stories in the same universe. For the game, David Twohy, Vin Diesel's Tigon Studios and Vivendi Universal wanted to preserve a sonic landscape with as much *Riddick* flair as possible. But stylistically, it's different. There's also a culture, of course, to video games. Sometimes, gaming people consider film sound designers to be too "Hollywood." ... With Riddick ... we connected the lines between mediums. We tried to develop a symbiotic thread, while stylistically going with the different media as their own entities. (Ibid.)

In addition to differing aesthetics, Hollywood sound designers and voice talent are relatively new to the games industry, unlike popular music, which has a longer history of synergy, or collaboration. I have broken down music's association with games into three major categories: popular music or musicians as the subject or narrative component of a game, popular musicians as composers for games, and the use of licensed popular music in games.[10]

POPULAR MUSIC AND VIDEO GAMES

There is a growing symbiotic relationship between the music industry and the games industry. Commonly, games are being used to promote and sell music, and recording artists are being used to market and sell games. Games with a musical subject or narrative, or rhythm-action games, have generally enjoyed great success, from the electronic *Simon* game of 1978 (Milton Bradley), to *PaRappa the Rapper* (SCEI, 1996) on the PlayStation, and more recently, music-based games like *Guitar Hero* (Red Octane, 2005), which won five Academy of Interactive Arts and Sciences Awards in 2005, and was nominated for seven D.I.C.E. awards,[11] as well as several Game Audio Network Guild awards. Games where music is the primary driving motive or narrative element can be roughly divided into three categories: musician-themed games, creative games, and rhythm-action games. It is possible for these categories to overlap; however, there are often distinct goals or intents behind these types of games.

In terms of musician-themed games, bands or artists can appear as characters in the games. The first band to appear in a video game was Journey, in the

1982 Atari classic by Data Age, *Journey's Escape*.[12] Engineered by the band's manager Herbie Herbert, the game contained just the song "Don't Stop Believin'" when it was originally released for the Atari VCS home console in 1982. The manual describes the game's objectives: "You're on the road with Journey, one of the world's hottest rock groups. A spectacular performance has just ended. Now it's up to you to guide each Journey Band Member past hordes of Love-Crazed Groupies, Sneaky Photographers, and Shifty-eyed Promoters to the safety of the Journey Escape Vehicle in time to make the next concert." The arcade version came out just a few months later with digital-camera photos spliced onto raster graphic bodies, and which played various Journey tracks, including "Stone in Love," and "Still They Ride" from their *Escape* album (1981), as well as a track from what was then their new album, *Frontiers*, called "Chain Reaction," which the game was intended to help promote. These tracks all relied on built-in sound chips, but during a special bonus concert scene, a hidden cassette player inside the arcade machine would play their hit "Separate Ways."

Since *Journey's Escape*, there have been countless musician-themed games, including Aerosmith in a side-scrolling shooter called *Revolution X* (Midway/Acclaim, 1994) and *Michael Jackson's Moonwalker*, released by Sega for the Genesis and the arcades in 1990. Unlike many musician-based games, *Moonwalker* was not released to coincide with an album—in fact, it relied on two older songs from *Thriller* ("Beat it" and "Billie Jean") and three from 1987's *Bad* ("Smooth Criminal," "Another Part of Me," and "Bad"), both put out by Epic. The game, then, as with that of Aerosmith, became less about the songs and more about Jackson's public persona. Some games, such as *Motown Games' Rap Jam* (Mandingo, 1995) for the SNES did not even feature music from the label, but did include several rap artists as characters, including LL Cool J, House of Pain, Public Enemy, Queen Latifa, and Coolio. More recently, various pop idols have been promoted in a kind of in-game advertising. Pink, Kylie Minogue, and Sum 41, for instance, have video clips spliced into Acclaim's *Summer Heat Beach Volleyball* (2003) at key segments of play after accumulating a certain amount of points. Rapper 50 Cent is featured in *50 Cent: Bulletproof* (Vivendi, 2005), which goes one step further with marketing, containing exclusive tracks and more than a dozen videos—making the game a "must have" for fans of the artist. These games have been primarily aimed at fans of the specific artists or genres of music, and the artistic personas are used as the key marketing element of the games. In a sense, the music is a peripheral or secondary aspect of these types of games, with the attention instead on the marketing power of celebrities.

There are also popular music-based games in which music plays a central role in the game's narrative and is a primary aspect of gameplay, including creative music games and rhythm-action games. Remixing, production, and composition of original songs are an important part of creative music games. *MTV's Music Generator* series (Codemasters, 2000), for example, began as what was essentially sequencing software with sequences provided and became a remixing project of various popular music songs. Users are given an editing bay of riffs, beats, samples, bass lines, and vocal sequences, and can assemble music from a variety of genres. In this case, players are given the opportunity to interact with and participate in various popular songs. *FreQuency* (Harmonix, 2001), and its sequel, *Amplitude* (Harmonix, 2003), also used sequences of popular music, but in more of a playful game environment than that of MTV's game. In *Amplitude*, for instance, there are several different modes—a "remix mode" of solo song construction, in which the player can create an avatar called a "FreQ" that will play along with the parts written, or a "duel mode" in which one player chooses a sequence and another player must duplicate it. In solo mode, the player must tap buttons along with the beat of the music, blasting musical elements (guitar, drums, bass, vocals, synth, and effects) from a science-fiction styled racetrack. The game therefore takes the elements of a composition game and crosses over with rhythm-action games, which require the player to coordinate actions to a beat or melody in a game. (See Juha Arrasvuori 2006 for more discussion on rhythm-action games.) Some rhythm-action games have involved original music, but more recently they have used licensed songs. *Guitar Hero* (Harmonix, 2005) featured thirty tracks of licensed music, including hits such as Deep Purple's "Smoke on the Water," Megadeth's "Symphony of Destruction" and White Zombie's "Thunderkiss '65." Many of these games have also included special controllers—Nintendo's *Donkey Konga* (2003) and Namco's *Taiko Drum Master* (1999), for instance. included a set of bongo drums or taiko drum, respectively, or ARC's *BeatMania* (1997), which included a DJ-style turntable controller. Similarly, dancing games, where the player must dance to the beat of a song, began with Nintendo's *Dance Aerobics* (Bandai, 1987), which included a special mat called a Power Pad. It was *Dance Dance Revolution* (Konami, 1998), however, that took dancing games to the masses.

In addition to starring in games and being part of creative or rhythm-action music games, there have been many popular artists involved in creating original soundtracks for games. After the development of Redbook (CD) audio for games machines in the mid-1990s, it became much easier to hire popular musicians to compose for games, although a handful of game soundtracks were created by popular musicians prior to the use of Redbook audio in games. The most well known of these was probably Brian May's involvement with *Rise of the Robots* (Time Warner Interactive, 1994), an adventure-fighting game released for the SNES, Sega Genesis, and PC. The soundtrack combined electronics with a few repeated guitar chords from "The Dark," originally off May's *Back to the Light* album (Hollywood Records, 1993).[13]

With the arrival of CD audio, games manufacturers were quick to bring popular bands on board: Alien Sex Fiend's 1994 score for Ocean Software's *Inferno* was one of the first complete musical scores for a Redbook audio–based game

by a popular band, followed by Pop Will Eat Itself's soundtrack for *Loaded* (Interplay, 1996).[14] More famous, however, was Nine Inch Nails frontman Trent Reznor's involvement with *Quake*'s music and sound effects in 1996 (id Software). Excluding the first track, the disc was even playable in a standard CD player. Inside the game, ammunition boxes were branded with the Nine Inch Nails logo, just in case fans missed the connection between the soundtrack and the best-selling artist. More recently, Reznor has been involved with a new alternate reality game, *Year Zero* (42 Entertainment, 2007). It is difficult to separate the game from the music—as both are part of one large viral multimedia marketing campaign. The game (which, unlike a video game, takes place in real time in the "real world" and the players must uncover clues in tour merchandise, websites, and so on) is tightly integrated with the concept album, whose songs are written from the game characters' perspectives. The *Los Angeles Times* suggests, "*Year Zero* is a total marriage of the pop and gamer aesthetics that unlocks the rusty cages of the music industry and solves some key problems facing rock music as its cultural dominance dissolves into dust" (Powers 2007).

Artists are also re-recording some songs for integration into games—for instance, singing hits in the imaginary "Simlish" language for the *Sims* games series, as noted earlier. It is also increasingly common for various "exclusive" tracks to be released in games, or at least, to have an exclusive release several weeks or months ahead of an album release. One of the first games to exploit this idea was the soundtrack to *Wipeout Pure* (SCEE, 2005). As Sergio Pimentel (2006b), the music licensing manager for the game, describes: "The final soundtrack was made of exclusively composed tracks for the game or unreleased tracks that were completed with a *Wipeout* mix of the track." Such exclusivity ensures that the "completist" collector fans of the musician will purchase the game, while fans of the game may go on to purchase music by that artist. This process is helping to create a form of mutual dependence between the music and games industries.[15] With this increase in star talent infused into the composition area of games, however, come bigger risks in terms of production costs, and some games developers are still slow to warm to the idea of larger audio budgets.

Soundtrack underscores composed by game composers are increasingly turning up in iTunes and in retail stores and are being marketed alongside games. *Halo 2* (Sumthing Else Music, 2004), scored by Martin O'Donnell and Michael Salvatori, for instance, had a separate selling soundtrack with remixes by popular artists (Incubus, Breaking Benjamin, and others) along with in-game tracks.

More popular than having well-known artists compose original music for games, licensing existing music or exclusive remixes has become a mainstay of the gaming industry today. In the early days of video games, most composers of the music were in fact programmers working on other aspects of the game (graphics, storyline, etc.). Games were typically written in assembly language, making it

difficult for many musicians to become involved in songwriting. In some cases, songs would be written by a music composer and then translated by a programmer for the game, but in most cases budgets were tight and music was not viewed as an important aspect of the game (it was rare to even be credited for the composition). Since music then consisted of code, rather than sampled sounds, and there was therefore little understanding of copyright law in such cases, there was significant borrowing of music without copyright clearance. As composer Mark Cooksey explains, "At the time the copyright law was a bit of a grey area as far as computer music was concerned and we got away with doing cover versions" (in Carr 2002b). As such, many early video games used precomposed music, including classical and copyright-free traditional popular or folk songs, a few borrowings of popular artists, and in a small minority of cases, licensed music.

When the 16-bit machines became popular in the late 1980s and early 1990s, cover songs had largely disappeared from games music. By this time, "borrowing" popular songs also meant dealing with copyright and licensing issues, an idea that seemed to have been ignored in earlier games without consequence, but which would surely draw the attention of the music industry as improvements in technology continued, certainly with the rise of Redbook audio. A few examples exist of public domain use from this era—Beethoven's *Moonlight Sonata* as the title theme to *Adventures of Dr. Franken* (DTMC, 1993) on the Super Nintendo, for instance, as well as a few unlicensed but not public domain examples, such as Orff's *Carmina Burana* (*O Fortuna*) as title theme for *Dracula Unleashed* (Sega, 1993) on the Genesis. Although licensed music was rare on the 16-bit machines, there were a few exceptions, including *Rock 'n' Roll Racing* (Blizzard, 1994), which used George Thorogood's "Bad to the Bone," Deep Purple's "Highway Star," Steppenwolf's "Born to be Wild," and Black Sabbath's "Paranoid," in which a guitar sound takes on the part of the vocals. In most cases, vocal melodies were replaced by another instrument, and the original song construction had to be altered considerably to fit the constraints of the technology.

After the introduction of Redbook audio in the mid-1990s, it became far more popular to license precomposed music, even releasing the games soundtracks as separate CDs. One popular earlier example of this was *Wipeout XL* (Psygnosis, 1996), which featured many popular electronic acts, including the Chemical Brothers, Future Sound of London, Underworld, Fluke, Prodigy, and Daft Punk. The game was even cross-promoted by Sony, who delivered the soundtrack along with the game and PlayStations to popular dance club DJs in London and New York (see Kline, Dyer-Witherford, and de Peuter 2003, p. 234). Using games to sell soundtracks and music accelerated in the late 1990s and has continued ever since. The involvement of popular artists in game soundtracks has now become far too frequent to mention—in fact, it is almost at the point where it would be unusual for a hit game to be released by a major developer that does not have a popular artist involved in its soundtrack. Soundtracks to games sold

separately as music CDs have also become increasingly popular, even reaching platinum status, such as *NBA Live 2003* (Electronic Arts, 2002).

Today, "music is an essential part of the gaming experience and gaming is an essential vehicle today for music discovery," notes David Dorn (in Berardini 2004), Senior Vice President of New Media Strategy for Rhino Records, who have partnered with Electronic Arts. Video games have become a valid outlet for breaking new bands, and for gaining exposure for bands who are looking for a wider market, just as Jeff Smith (1998, p. 1) notes of the film *Wayne's World* (Paramount, 1992) as reviving interest in Queen. Some have even suggested that games are "the new MTV," although such optimism may be better tempered by saying that games are "*a* new MTV," notes music industry scholar Holly Tessler (2008, p. 25). Electric Artists (not to be confused with Electronic Arts), a music marketing agency, published a white paper on the relationship of video games to music after surveying "hard-core gamers," releasing such impressive statistics as: "40% of hard-core gamers bought the CD after hearing a song they liked in a video game"; "73% of gamers said soundtracks within games help sell more CDs"; and "40% of respondents said a game introduced them to a new band or song, then 27% of them went out and bought what they heard" (Electric Artists n.d.).

Games have indeed helped to bring publicity to new artists, such as Good Charlotte, whose song "The Anthem" brought them attention after being included in *Madden NFL 2003* (EA Sports, 2002). Chicago's Fall Out Boy sold 70,000 copies of their album the week after the music was released, after appearing in *Tony Hawk's American Wasteland* (Neversoft 2005), without ever having received any radio airplay (Charne 2006). Ghanaian reggae artist Selasee likewise saw great success after Electronic Arts bought a single, "Run," for *FIFA 2006*. According to the artist's public relations manager, Louis Rodrigue, "His career is rocketing because of the FIFA game."[16] Those in the games industry even see the use of their games as a way to promote bands that they enjoy; as Marc Canham, director of Nimrod Productions describes:

> I really do not care much about furthering the career of big bands. They already have the privilege of steering their own destiny so long as they keep hard at it. My aim for *Driv3r* was to create a soundtrack that was a collection of new acts from around the world that I liked, plus a selection of original material that I wanted other people to like too.... We had managed to obtain several exclusives on the soundtrack, meaning that we had new or unreleased tracks from the bands involved such as Phantom Planet and Hope of the States which was amazing marketing fodder for the music press. (Canham 2004)

What is particularly notable about these games is that, in part, the game becomes about the music; the soundtrack is the key selling and marketing aspect of the game. *Driver: Parallel Lines* (Reflective, 2006), for instance, used popular artists in its advertising and on its soundtrack. On the opening page of the game's website, a picture of Professor Griff from Public Enemy is featured. Video clips feature the various bands talking about the music for viewers of the website (such as Grand Master Flash, Suicide, Yeah Yeah Yeahs, Audiobullys, Paul Oakenfold), reinforcing the idea that the music is a key part of this game's experience. Moreover, some games companies are becoming full multimedia conglomerates and are aligning themselves with particular social groups and taste cultures, which are themselves often developed around genres of music. Rockstar Games, for instance, sponsors various club nights and owns a line of skateboarder clothing (see Kline, Dyer-Witherford, and de Peuter 2003, p. 235).

THE IMPACT OF POPULAR MUSIC ON GAMES, AND OF GAMES ON POPULAR MUSIC

In addition to marketing and industry issues, the use of well-known music in games raises many questions in terms of music's production and consumption. There are, for instance, semiotic considerations that come into play when popular music is used in games. Music in games is heard in highly repetitive atmospheres: to point to another statistic noted by Electric Artists (n.d.), "92% [of players] remember the music from a game even after they've stopped playing it." It has yet to be determined how this repetitive aspect of gameplay affects the reception of the music. As well, the intertextual references in the music (or game) likely help to connect the game or music connotatively to specific types of films, books, or social groups. Indeed, certain types of games have become associated with specific genres of music—the *Madden NFL* football series (EA Sports), for instance, features mainly hard rock and hip-hop. Driving games require "driving music" and are more likely to include dance music. Sergio Pimentel (2006a), music supervisor for *Driver: Parallel Lines*, for instance, commented that he drove his car around listening to many types of music until he found the right "feel." Expectations are being set for fans of these games, which can sometimes be limited by the availability of the tracks, as Toby Schadt, the composer for *Downhill Jam* found:

> In further efforts to differentiate *Downhill Jam* From the Neversoft line of *Tony Hawk* games we created colourful, fictional characters for *Downhill Jam*. Whereas previous titles featured an intimidating cadre of real-world skating talent, *Downhill Jam* instead pushes the humor envelope with stylized personalities that sock it to Tony Hawk during interview segments.... To further differentiate the characters from each other, we created unique music playlists for each skater. Our gothic skater, Jynx, was to have all the songs you would expect from the '80s goth catalogue: Bauhaus, the Sisters of Mercy, and their ilk. Gunnar, the Norwegian muscle-bound import, has a taste for cheesy hip-hop that matches his in-game lingo. Budd, the

> mellow hippie soul-searcher, loves reggae. Ammon, the revolutionary, was to have tracks from Rage Against the Machine and the Clash. In the end, we failed to get the music we requested from our licensing department. The music in the final version of the game is good, but it's just what you would expect from a Tony Hawk game, and we had hoped to do something more creative. (Schadt 2007, p. 37)

It is possible that such use of well-known songs or styles may be a deterrent to some players, and indeed may be a distraction for any player, distancing them from the attempted immersive aspects of the game. In a discussion of the use of precomposed music in film, Royal S. Brown (1994, p. 52) claims that the use of precomposed music can evoke Barthes's concept of the myth-sign, and that "the device of incorporating a song such as 'Dixie' or an anthem such as 'The Star Spangled Banner' into the fabric of ongoing music to accompany a film, as Breil did for *The Birth of a Nation*, is one of the strongest trump cards a film composer and/or arranger can play. For even the briefest recognizable snippet of such a piece ... can evoke in the listener an entire political mythology."

Rick Altman (2001, pp. 24–26) expands on this idea, suggesting that the use of licensed music in film has a particular affect, and can serve a specific narratorial purpose through the establishment of mood: "Popular song depends on language, and is predictable, singable, rememberable, and physically involving in ways that 'classical' [orchestral] music usually is not." There are, therefore, significant semiotic implications of using precomposed music. Not only may the song alter the meaning of the game, but the game may alter the meaning of the song for the player.

The participatory nature of games, particularly in creative remixing and rhythm-action games, can also alter the reception of the music. For instance, in *SingStar*, a PlayStation 2 game published by Sony in 2004, players sing along with a selection of popular songs in a way rather similar to karaoke, although the game component comes in to play when the game scores the player based on the accuracy of their vocals compared with the original recording. A player may choose to have fun by not attempting a high score, by intentionally singing off-key or in an unusual way, potentially changing the meaning of the original song. Remixing tracks and fan compilations are becoming increasingly popular, with internet distribution and mini-stardom within remixing communities also altering the relationship to and the meaning of songs for players and listeners. In fact, the competitive aspects and the rhetoric of superstardom in the fantasy atmospheres of games are perhaps enough to change the meanings of the songs for the audience. Toru Mitsui has raised a similar question in regard to the "participatory consumption" of karaoke, which, he argues, "should be regarded as significantly different from older patterns of consumption" (cited in Théberge 1997, p. 252). It could also be argued, as Paul Théberge (1997, p. 253) indicates, that it is not merely issues of consumption that are at stake, but "the integrity of the musical

work and claims of authorship and originality," since players become an active agent of change in the music. If players are remixing sequences (whether individual samples, audio chunks, layered *stems* or *splits*) of an artist's music, does the remix artist have the right to distribute or sell their remixes?

One of the most significant ramifications of choosing licensed music in games is that there is limited adaptability inherent in most popular music, whereas games require songs that may need to adapt to gameplay states or player interaction. Licensed songs are (for the most part) designed as linear music, and therefore the placement of this music in a game is generally limited (to cinematics such cut-scenes, title themes, credits, and so on), as is the genre of game where such music may be appropriate (such as racing games, which have a more linear playback).

Explains Keith D'Arcy (2004), the director of music resources for EMI Music Publishing: "If you're working with a specific record label on licensed audio for a game, you may be able to obtain splits of tracks for developing adaptive audio, but the actual process may prove quite difficult." Artists generally do not want to provide splits (individual sequences or samples of their songs), since this opens them up to the possibility of piracy and reduces their creative control over the ways in which their music is played back. The songs are likely not going to be heard in the ways in which the artist had originally intended, and must be significantly altered to fit the available technology and the nonlinear aspects of gaming: they may be looped, cut, or have elements like vocals removed. This raises further questions about notions of authorship in such cases. Who is the author, and what is the "authentic" mix? Moreover, when dynamic splits designed for in-game playback are released to CD, the playback devices are not designed to handle the capabilities of adaptability and interactivity. For example, there is no "randomizer" for music splits built into the hardware (yet): what, then is the "right" playback version, and who makes this decision? And what happens to the reception of music when the well-known and well-used structural forms based on verse–chorus variations disintegrate in the face of games, where structures may be altered significantly in real time by choices made by the player?

Perhaps most important, in light of the popularity of games and the recent integration of games with popular music, it is conceivable that artists may develop new approaches to songwriting, keeping in mind the required adaptability of a song for games: how might this affect the ways in which popular music is composed? Film music scholar Charlotte Greenspan (2004) has noted that popular songwriters like Irving Berlin adapted their songwriting style for use in Hollywood film by creating longer, more complex, and more sophisticated music. Certainly, there are other examples of popular songs being adapted to the playback media throughout history, such as the length of a record, and later the 45 RPM single, and then LPs. Might the song structure of popular music soon adjust to the needs of the gaming industry?

In terms of playback, it may be that we will see games where users can insert and tag their own playlists. Users can already insert their own music into many games—all games on the Microsoft Xbox360—but as yet they cannot specify where they wish the songs to play back. Mood tagging, for instance, may allow players to choose what battle music they want to hear. Sound director Rob Bridgett of Radical Games in Vancouver has discussed the issue of user-generated playlists, concluding that a game soundtrack could in fact become totally user-defined and controlled, with separate playlists for combat, stealth, stunts, and so on:

> Further to this, one can imagine a situation whereby the content of a piece of music can be scanned and "beat mapped" by the console. It would be able to put the tracks into categories based on tempo, key or on "genre" fields for certain categories of gameplay. It could even transition seamlessly from track to track in much the same way the DJ software (such as Native Instruments' *Traktor DJ*) currently allows the user to overlay tracks of similar tempos. The sound implementers can be clever about how they set up the structures for any customizable content to fit into the game. They could automate the breaking up of any track.... Identifying intros, outros, high intensity looping sections, as well as calmer sections or sections from different songs in the same key, musically educate the console to transition in a "musical" way from a track in the same key to a related key. Programmatic stripping of audio data into useable chunks and re-appropriating of that data is ripe for exploitation in online consoles that allow for user defined musical content to be used in any game. The old notion that licensed music wasn't adaptive will become a long forgotten adage. (Bridgett 2005)

Could future popular artists even insert their own suggested emotional tags into their songs and provide transitional sequences? Bridgett also elaborates on the downside of such an approach to game sound, including the fact that the use of precomposed music in games has placed a new pressure on games companies to use big-name composers and exclusive content just to get players to listen to the intended music. Moreover, having user-defined playlists means that "the notion that a game is a complete cultural artifact, a *gesamtkunstwerk* (or 'totally integrated work of art'), in that its music, sound, performances, and visual style are all part of the experience" may be lost (ibid.). Unlike specially composed music, licensed music "remains a substitutable quantity: If the copyright holders want too much money, if the master recordings are lost, if there is an unavoidable delay in completing the track, game publishers will often either find an alternative song for the soundtrack, or simply do without it" (Tessler 2008, p. 22).

There are also economic consequences of the increasing crossover between licensed intellectual property and games. A reliance on a blockbuster model in the games industry has resulted in driving out independent developers and reducing creativity, since the purpose is no longer to create a great game, "but to generate a short-lived but omnipresent brand name whose contents can be exploited in as many venues as possible" (Geuens 2000, p. 7). Game developers are under increasing pressure to create a "mass market" product that can enjoy synergistic relationships with other media forms (Kline, Dyer-Witherford, and de Peuter 2003, p. 227). Moreover, the games must adapt to the demands of not just the market, but also the marketing. For instance, being associated with niche groups and subcultures may narrow a game's potential market, but it eases the pressures of deciding how to market the game. Moreover, "the incorporation of current musical styles potentially accelerates the speed at which a game's value is exhausted—if the music is outdated, the gamer gets bored—and this increases the turnover rate of game purchases" (Kline, Dyer-Witherford, and de Peuter 2003, p. 234). As Tessler (2008, p. 22) notes, the use of licensed music can place other constraints on a game's development: "Will a video game's market release be postponed if a given act is dropped from its label? If the band breaks up? If the album's release is pushed back by the label?" Indeed, working with licensed tracks may lead to legal quagmires whereby the game gets tied up waiting for the release of a song.

CONCLUSION

Although statistics appear to support the notion that games help to sell popular music, it remains to be seen if licensed music on games' soundtracks helps to drive those games' sales. Says composer Garry Schyman,

> Licensed music makes sense in games when it is appropriate. In sports games and racing games it's an obvious choice—it works and sounds right. In any game that needs source music, it would make sense to license the songs rather than have the composer write new ones. What I think is a big mistake is thinking that "kids" will buy a game because this or that band has contributed tracks to it. If a game is good they will come and if the songs actually are wrong creatively for the game then putting them in will make the game less appealing. Kids are smart and know intuitively when they are being condescended to. Songs do not entice people to buy a game and filmmakers have learned that lesson over and over again. When you look at the top 100 box office films over the last twenty years the list is nearly entirely populated with films with lush orchestral scores that droves of kids paid money to see. (Cited in Bridgett 2005)

Moreover, as Jeff Smith (1998, p. 196) discusses in regard to film, there are many competing interests at stake that may bring about conflict: soundtracks may be primarily promotional tools for games, whereas music publishers "derive their revenues from licensing fees and thus are more interested in pushing their

back catalog than in promoting work by new artists." But the record companies, who realize most of their profits from album sales, are more interested in breaking new talent than promoting a game. As such, inappropriate song selection may be made in order to strike deals with the music publishers. Although game composers may have a wary view of the use of licensed music in games, it is clear that, as long as it brings consumers to purchase games or music and eases marketing costs, licensing will remain an important part of the industry. The majority of games still, however, use specially composed music, which is dealt with now in the final chapters of the book.

CHAPTER 7

GAMEPLAY, GENRE, AND THE FUNCTIONS OF GAME AUDIO

As shown in the first chapters of this book, game audio has been significantly affected by the nature of the technology (in terms of hardware, software, production, and distribution technology) and by the nature of the industry (in terms of design, production, distribution, and marketing). Audio in games is also, of course, affected by the nature of games themselves, in terms of genre, narrative, the participatory aspects of games, and the functions that audio must fulfill. As shown in the previous chapter, one of the ways to reduce the risks connected with the highly competitive nature of the games industry is through an association with star talent and licensed intellectual property.

As Martin Campbell-Kelly (2004, p. 45) notes in his history of the software industry, before becoming associated with movie tie-ins and celebrities, the first conscious risk-management strategy for the games industry was genre publishing. He argues that the point of genre publishing was that certain categories of games appealed to specific user-groups and therefore "had less need to overcome market inertia," noting that "From their earliest days, videogames had been classified as racin', fightin' or shootin'" (ibid., p. 281). Genre in games is particularly important in that it helps to set the audience's expectations by providing a framework for understanding the rules of gameplay, thereby not only appealing to specific target markets, but also reducing the learning curve of the game. Within the context of genre, many games function similarly in terms of their user interfaces, their button functions, and their rules of gameplay. These similarities were particularly important in the arcades, when players would walk away from a game before investing their money in a game that was too complicated to learn. Genres are also constrictive in many ways, however, and consumers may lament

13. One person lamented, "Come on! In the days of CDs, only a moron would decide to use a format that should have died with the 80s." See http://www4.dealtime.com/xPR-Nintendo-Nintendo-64~RD-1241707.
14. Sega today continues to develop games, but has not announced any new plans to release another console.
15. Surround sound was simulated using Dolby Pro-Logic II, in 5.1, for instance.
16. It had 256 2D voices, or 64 voices using 3D positional audio, with five DSP units.
17. For a copy of the flyer, see http://www.atarihq.com/dedicated/touchme.php.
18. It had six stereo channels from a TI 76489 PSG and a Yamaha YM 2612 FM chip.
19. *Nintendo Annual Report* (2005): http://www.nintendo.com/corp/report/NintendoAnnualReport2005.pdf.
20. Channels 3 and 4 could also operate as 4-bit DACs to play samples.
21. "The Audio Advance: GBA Development for the Masses": http://belogic.com/gba.
22. See the Nintendo site, http://www.nintendo.com/techspecgba.
23. Wave options for pulse wave were 12.5 percent, 25 percent, 50 percent, 75 percent. The 4-bit envelope function allowed for fade-ins or fade-outs.
24. There are other forms of arguably "online games," such as downloadable episodic content, but for the sake of brevity I will focus on these two forms here.
25. For an excellent overview of the casual games market, see the *IGDA Casual Games Whitepaper*, at http://www.igda.org/casual/IGDA_CasualGames_Whitepaper_2005.pdf.
26. I am indebted to the IAsig's report on Internet audio formats for this section, notably "Interactive Audio on the Web," published at http://www.iasig.org/pubs/wawg-rpt.pdf.
27. See the *Warbears* homepage, http://www.warbears.com/missions.php?id=2.
28. The main percussive rhythm upon which the loop is based does change in a few key places.
29. Although even these are being sold as high-end items for gamers. Empower Technologies, for instance, sells a PowerPlay 5.1 Media Chair which can work with Xbox and PlayStation consoles, and includes a "tactile transducer" for players to feel as well as hear the effects. HotSeat Chassis, Inc. sells a similar immersive home surround sound racing system.
30. *Middleware* is software typically generated by third-party specialists to connect various applications with the game engine and offer cross-platform programming solutions. Audio examples are discussed below. Generally, middleware is licensed on a per-title basis, and can cost in the tens of thousands of dollars per title, per platform.

5 GAME AUDIO TODAY: TECHNOLOGY, PROCESS, AND AESTHETIC

1. Ranked in terms of annual revenue figures, average aggregated review scores, number of releases, and anonymous developer surveys regarding milestone payments, pay and perks, and producer quality. The full "2006 Top 20 Publishers" listing, including statistics and analysis is available in the October 2006 issue of *Game Developer* magazine.
2. Games design is a complex process that is outside the scope of this book. There are many ways to produce a design document, and many excellent resources on games design and development, including Richard Rouse's *Game Design Theory and Practice* (2005), which provides sample design documents and further details on each stage of the document writing process.
3. *Foley* is the term used for recording sound effects in the studio using a variety of props. It is often specifically used for the everyday natural sounds, rather than special effects. In nearly all games studios, the foley artist is also the sound designer (who is also often the audio programmer).
4. "The 'temp track,' a temporary mock-up of a film's soundtrack, is assembled from pre-existing music prior to the real, commissioned score being composed" (Sadoff 2006, p. 1).
5. Audio boot camp, Game Developer's Conference, San Francisco, Calif., 2007. Others have divided emotions in different ways—see for instance mood music libraries or photoplay music books.
6. Keynote talk presented in the audio tutorials track day at Game Developer's Conference 2007.
7. *Automated dialogue replacement*, or ADR, is voice recording performed in a studio after the visual film scene has been shot. This was originally done as a last resort to replace poor production sound, but is now used more often than not.
8. As was seen, for example, in *Biometal* in chapter 3, which had different soundtracks for European/North American and Asian markets.
9. In a talk given at Game Audio Boot Camp, Game Developer's Conference 2007, San Francisco, March 6, 2007.

6 SYNERGY IN GAME AUDIO: FILM, POPULAR MUSIC, AND INTELLECTUAL PROPERTY

1. Entertainment Software Association, "Top 10 Facts," http://www.theesa.com/facts/top_10_facts.php.
2. As cited on "Computer and Video Game Market Sales": http://forum.pcvsconsole.com/folder.php?fid=23.
3. Available at *BusinessWeek Online*: http://www.businessweek.com/innovate/content/jun2006/id20060623_163211.htm.
4. In 2004, the number was only twelve, with fifty-two games selling more than 500,000. Kerr 2006, p. 45.
5. Although there are attempts, with software like *Torque* or Microsoft's *XNA*, to make at least casual gaming more available to an independent market.
6. According to *Screen Digest* research, as cited at "Profitability in video game industry" (February 26, 2007): http://compsci.ca/blog/profitability-in-video-game-industry.
7. Ibid.
8. Kerr (2006, p. 68) gives the example of Infogrames' purchase of Shiny for $47 million in 2002 to obtain access to the *Matrix* film licensing.
9. Thanks to Dan at the Arcade Flyer Archive for scanning the originals for me. See http://www.arcadeflyers.com/?page=flyer&id=1290&image=1.
10. It is worth noting that there are two important areas that I do not discuss here: games as subjects of popular music (the aforementioned "Pac-Man Fever," etc.), and games or game sounds as instruments or samples in popular music (from chiptunes to the experiments of artists like Alec Empire and Beck): in these instances, the main sales or marketing "object" is the music, whereas my focus here will be on those associations where the game is the primary component.
11. The DICE awards are the Design, Innovate, Create, Entertain convention awards, sponsored by the Academy of Interactive Arts and Sciences (AIAS) game-development association.
12. Bands promoting games in advertising began as early as 1982, when Activision hired the Tubes to write the theme song for *Megamania*, and featured in the television commercial.

13. There seems to be some debate as to what exactly was contributed outside of "The Dark" by May, but the game does not include details. Bits from "Resurrection" were used, but most of the tracks ended up on the sequel, *Resurrection: Rise 2.*

14. As with other games discussed here, there are many more examples than what I present. Another example was Psykosonik's soundtrack for the SNES game, *X-Kaliber 2097* (Activision, 1994). Part of the Wax Trax!/TVT roster, Psykosonik enjoyed moderate success with a few dance hits in the early 1990s, and subsequently wrote the music to *X-Kaliber* before falling into obscurity. Negativland's Chris Grigg was quite well known as a Commodore 64 composer, and the band's Mark Holser also at one time programmed games music for Epyx in the 1980s.

15. There are also increasing numbers of Hollywood composers who are trying their hand at games, including Danny Elfman (*Fable*, Lionhead, 2004), and Howard Shore (*Soul of the Ultimate Nation*, Webzen, 2007). As Radical Entertainment's sound director Rob Bridgett points out, however, these composers do not necessarily do all the work. In the case of *Fable*, Elfman provided a theme that was worked on by the in-house composers. Bill Brown cited in Bridgett 2005.

16. Cited at http://www.runningdream.com/news.htm, under January 2006.

7 Gameplay, Genre, and the Functions of Game Audio

1. Industry categories have been critiqued for being too reliant on representational characteristics, rather than on interactivity. See, e.g., Apperley 2006. Genre distinctions also change over time. A look back at *SNES Force*, a UK magazine from the mid-1990s, divides the genres into eight categories: arcade, adventure/RPG, beat-'em-up, platform, puzzle, shoot-'em-up, sports/racing, and sims/strategy. *SNES Force* 1/9 (February 1994). Platform games have almost disappeared altogether from today's consoles, however.

2. See Galloway 2006 (p. 5) for an alternate division of diegesis through distinguishing what he calls the "operator action" (that enacted by the player) and "machine action" (enacted by the machine), so that "locating a power-up in *Super Mario Bros* is an operator act, but the power-up actually boosting the player character's health is a machine act."

3. And could be subdivided further, for instance, as Michel Chion (1994) has elaborated in his discussion of the diegetic–nondiegetic divide; Gorbman's "metadiegetic" subjective sound categories (1987, p. 450), and so on. Although the use of the division of diegetic–nondiegetic is called into question in contemporary film studies because of its inability to deal with these other categories of sound, I do not wish to further complicate the issue here. My point is that the relationship of the audio to the player and to their character in games is different from that of film because of the participatory nature of games.

4. Cut-scene cinematics require "a dramatic score to grab a player's attention and motivate them to make it through the next level to see the next movie. These offerings often serve as a reward to the player, where they are able to watch the on-screen action and inwardly pride themselves for making it happen" (Marks 2002, p. 190).

5. Stockburger provides a fairly extensive analysis of what he terms the "spatialising functions in the game environment," focusing on what he has called the "dynamic acousmatic function," which, he elaborates, is distinguished from film by the "kinaesthetic control over the acousmatisation and visualisation of sound objects in the game environment" See Stockburger 2003: http://www.audiogames.net/pics/upload/gameenvironment.htm.

6. However, the active involvement of the player with a game also has other repercussions that can lessen the immersive quality, such as the player's fumbling with the controller, for instance. Even after playing a game for several hours, for example, I find that I forget what function some of the buttons have, and this can cause the immersive effects of the game to recede.

7. Others have provided similar divisions, such as Brown and Cairns (2004), who categorize immersion into "engagement," "engrossment," and "total immersion."

8. It is perhaps ironic, then, that of the top five of the "Top 100 Games Ever," only one is from a recent generation, and three of the top five are from much older (16-bit) technology. This seems to suggest, then, that realism is not entirely relevant, at least in comparison to gameplay and narrative, except perhaps as temporary novelty. The top five are (in descending order): *The Legend of Zelda* (Nintendo, 1992), *Super Metroid* (Nintendo, 1993), *Resident Evil 4* (Capcom, 2005), *Chrono Trigger* (Nintendo, 1995), and *The Legend of Zelda: Ocarina of Time* (1998). IGN (2006): http://top100.ign.com/2006.

9. Nintendo DS headphones: "Outstanding sound quality will make your games come alive," http://www.toysrus.com/sm-nintendo-ds-headphones-black--pi-2453563.html. Creative Sound Blaster Live!: "With Sound Blaster Live! 24-bit ... make your games come alive," http://www.gamepc.com/shop/product.asp?catalog_name=GamePC+Online+Products&category_name=Sound+Card&product_id=SBLIVE71&cookie%5Ftest=1. Creative speakers: "make your games come alive with life-like sound," http://www.discount-alienware-computers.com.

10. "The emerging hierarchy between essential sounds and mere noise grew in authority throughout the 1930s. Concurrently, it became the norm not to match visual and acoustic 'scale,' not to locate the microphone with the camera, not to respect the acoustics of the space of production, and not to offer a perceptually based 'coherent point of audition' from which the spectator could identify" (Lastra 2000, p. 188).

11. See, e.g., their website: http://www.eastwestsamples.com/details.php?cd_index=1009.

8 Compositional Approaches to Dynamic Game Music

1. From the LucasArts press release, "Indy Game Features Euphoria Technology" (April 27, 2006): http://www.indianajones.com/videogames/news/news20060427.html.

2. The composers for the game were Morten Sørlie, Tor Linløkken, and Lagim.

3. Moreover, techniques were developed in which, with slight adjustments in playing (that is, using staccato, tremolo, and so on), the piece's affect could be altered (Altman 2004, p. 263).

4. Fay, Selfon, and Fay (2004) provide detail and examples from the composition. I use the "Gravity Ride" track for this discussion. The game is part of the XP Plus package offered by Microsoft.

5. The layout of my transcription is borrowed from Garcia 2005, though the blocks of bars are basically laid out in much the same fashion as sequencing software. The passage of time is followed from left to right, with each block representing one bar of music. Each vertical layer in the stack of blocks represents a new instrument sound.

6. See Spicer 2004, who argues that a similar "accumulative" form gained considerable use in popular music in the 1970s, particularly after the introduction of electronic instruments.

7. Glassner (2004, p. 240) suggests the term *resequencing* for a narrative in which the order of presentation of parts can be reordered.

8. An "X" means the moment is "neutral"; it gives and receives no *Einschübe*. If the arrow has a figure two above it, it means "next-but-one moment" or "last-but-one moment." A plus and minus sign above the arrow means that the moment being referred to is to be played twice, first with the *Einschub* and then without it. See Smalley 1974.

9. There are certain obvious drawbacks to this system. Since the music samples are set to change only at certain points during playback, it takes a few seconds to change into a different layer. As long as the music is playing within the same layer, everything is fine. This is especially evident in combat music. In certain cases, the music will keep playing a few seconds after the enemy has been killed, or if the player has been killed, the combat music will keep going for a few seconds before changing into the "death" layer.

10. See Spicer 2004 (p. 33) where he defines accumulative form and claims that the "technique of building up a groove gradually from its constituent parts is often the defining feature of smaller formal units within larger compositions."