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Contents

1 Introduction

Michiel Kamp, Tim Summers and Mark Sweeney[1]

The last half-decade has seen the rapid and expansive development of video game music studies. As with any new area of scholarship, this sub-discipline is still tackling fundamental questions concerning how video game music can be investigated. This book suggests a variety of new approaches to video game music, but collectively we are more broadly concerned with the relationship between music and play – a domain of research that is now commonly referred to as "ludomusicology". A term coined by Guillaume Laroche and taken up by Roger Moseley (2013), ludomusicology, at its broadest, attempts to see our engagement with music, any kind of music, in terms of play. While our interests in this volume are confined to music in digital games, they are for a large part informed by the idea that there is a special relationship between playing video games and engaging with their music. Whether we are descending down a dark corridor in *Dead Space* and hearing dissonant strings swell up, or reconstructing Björk's songs in the *Biophilia* app, gaming involves more than passive listening. This book presents a variety of approaches to video game music through the lens of ludomusicology's emphasis on play.

A Short History of Video Game Music Scholarship

Two important and often-cited pioneering articles on video game music were penned by Zach Whalen (2004; 2007), but the true establishment of the field came in 2008 with Karen Collins's *Game Sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design*. As the title suggests, *Game Sound*'s scope is broad, including discussions of technological developments, compositional techniques, and more game-theoretical concepts such as immersion and interactivity. The same year saw the publication of *From Pac-Man to Pop Music*, a collection of articles edited by Collins, which integrated game music discourse into wider discussions of interactive audio, including studies on ringtones, music marketing and chip music. Another milestone collection, Mark Grimshaw's *Game Sound Technology and Player Interaction* (2011) more broadly covers sound effects and technology, but also examines soundscapes, diegetic music and procedural audio.

By 2012, an increasing number of students were pursuing higher education degrees in the field, and alongside this, a new current of musicological interest in video games began to emerge. Kiri Miller's *Playing Along: Digital Games, YouTube, and Virtual Performance* looks at video game music cultures, and contains two major case studies of music games (*Guitar Hero/Rock Band* [2005-]) and the *Grand Theft Auto* (1997-) series. Both cases heavily rely on player interviews and participant observation and, together with studies of players of *Dance Dance Revolution* (1998) by Jacob Smith (2004) and Joanna Demers (2006), should be seen as the first ethnographic forays into the field. Also in 2012, we founded the Ludomusicology Research Group and held an international symposium dedicated to video game music at St Catherine's College, Oxford. It has since become an annual conference. In 2014, the inaugural North American Conference on Video Game Music took place at Youngstown State University, and has also become a regular event.

In the last few years, the study of video game music has come into its own. Chapters and articles have started appearing in general music and media journals and volumes (e.g. Gibbons, 2011; Moseley, 2013; Lerner, 2013; Bridgett, 2013). Collins's second key contribution to the field, *Playing with Sound: A Theory of Interacting with Sound and Music in Video Games* (2013), is an attempt to offer an overarching theory of sound and music in video games through the central notion of interaction. Drawing in part on psychological and phenomenological approaches to sound in general, and in part on discussions of the role of music in broader gaming culture, it provides a theoretical bridge between sound studies and musicological approaches on the one hand (such as Collins's earlier work), and ethnographic approaches on the other, as used by both Miller and Demers, but also in William Cheng's more recent *Soundplay: Video Games and the Musical Imagination* (2014). Cheng's own (partly ethnographic, partly hermeneutic) contribution to the field is to embed musical engagements with video games in a larger musical culture.

Two recent edited collections serve as precursors to our project in this volume. Contributors to Peter Moormann's *Music and Game* (2013) map out the game music territory with particular focus on game music traditions, both historical and genre-based. *Music and Game*'s often survey-based approach is valuable for providing contextual understanding of game music. More traditionally analytical musicological approaches can be found in the collection of essays edited by K. J. Donnelly, William Gibbons and Neil Lerner, entitled *Music in Video Games: Studying Play* (2014). It addresses video game music aesthetics, music analysis and hermeneutics through a series of focused case studies. The present volume takes a theoretical "step back", taking an interest in methodology and the idiosyncrasies of video game music. Issues of modularity, textuality, interactivity, aesthetics and immersion have been implicit in many if

not all video game music scholarship, but the contributions to *Ludomusicology* are united in their explicit aim to address these thorny, underlying concepts. Taken alongside the recent developments in game music scholarship, this book is part of a coalescing body of research that is evolving into a fully-fledged sub-discipline with its own conventions, theories and debates.

Challenges and Approaches

In this context, certain significant issues loom large in the scholarly landscape, the most crucial of which are addressed by authors in the present volume:

1. conceptualizing and analysing game music (Chapters 2, 3 and 4)
2. how notions of diegesis are complicated by video game interactivity (Chapter 5)
3. video game musical culture and literacies (Chapter 6)
4. the distinction between game play and music play (Chapters 7 and 8)
5. the technicalities of game music production (Chapter 9)
6. the relationships between game music and art music traditions (Chapters 10 and 11).

The chapters in this book trace a course from broad models and methods to more specific cases. Both **Tim Summers** and **Isabella van Elferen** offer basic methods and models for game music research. Summers starts out from a very straightforward question: How does one go about analysing video game music? With any youthful field, certain vital issues concerning the practicality of conducting research into the topic quickly arise. Games demand that researchers engage with the text (playing and reading both with and against the grain) and video game scholarship challenges scholars to embrace and make obvious their personal engagement with the texts under scrutiny. The aim of van Elferen's chapter is to outline a research model for analysing game music through a systematic theorization of musical immersion. The chapter proposes three overlapping, music-specific concepts that lead to a comprehensive framework that charts the conditions for and mechanics of musical player involvement. This framework, the ALI model, shows how musical affect, literacy and interaction cooperate in a process of signification, identification and play leading to game musical involvement. The ALI model enables investigations of the separate areas of musical game involvement, but also offers room for their integration: player involvement is likely to be most intense where the three areas of the framework overlap.

Elizabeth Medina-Gray considers the dynamic qualities of video game music by placing it within a larger conceptual context of modularity. Medina-Gray's chapter provides the first thorough examination of modularity in video game music. Two aspects of game music, in particular, distinguish it from other types

of modular music: (1) a *usability* function and (2) a concept of *smoothness* (or lack thereof) between modules as they combine during gameplay. This chapter argues that by attending to the dynamic and modular aspects of video game music, we gain a more complete understanding of this music within the context of games and gameplay. **Michiel Kamp** asks what role video game music plays beyond gameplay. Drawing on narratology theory, Kamp describes how nondiegetic music has the unique ability to overarch game menus, cutscenes and other peritexts, and by doing so can affect our understanding of games as a whole. Kamp and Medina-Gray both examine how the smoothness and rupture of dynamic music can serve to de-emphasize or emphasize transitions both during gameplay and surrounding it. **Melanie Fritsch** goes one step further than a game's menus, presenting the argument that game musical literacy involves fan cultural discourse as well. Through a case study of *Super Mario Bros.: The 8-Bit Opera*, she shows that an understanding of video games and their music is a crucial component in the analysis of gaming culture as a whole.

In "Game and Play", **Anahid Kassabian** and **Freya Jarman** consider the ways that music as a central activity is represented in video games and smartphone apps, specifically those labelled "music games" or "music apps". Games present music as a task to be achieved, a disciplinary activity in which the player should "play" again and again until the game (and thereby music) is mastered, while apps allow for dipping in and out, for casual engagement as well as more intensive devotion, and for experimentation and creativity. While it is clear to any practising musician that the two styles of musical activity are inextricably intertwined, and cannot be pulled apart, music in virtual worlds seems only to be able to appear – or perhaps sound? – as one or the other, but not both. **Samantha Blickhan**'s case of Björk's digital album *Biophilia* (2011) perhaps best fits Kassabian and Jarman's "app" category. Due to the ambiguous presentation of player agency in the interactive versions of the *Biophilia* songs, the line between game play and music play can at times become blurred. By recognizing their own presence within a song as a collaborator, the listener engages the music on a strongly personal level, but do the varying results of interaction cause Björk's own recorded "fixed" version of each song to somehow matter less? This chapter facilitates discussion about where the line between creation and interpretation should (or even can) be drawn, and the possible challenges of presenting the manipulation of an original piece of musical art as a game. Blickhan ultimately asks how interactivity might affect the way we listen to music.

The final three chapters of this volume deal with aesthetics, both the aesthetics of game music and game music's relation to music-historical aesthetics. Composer and audio director **Stephen Baysted** focuses on the former

in his discussion of the compositional processes behind *Need for Speed Shift 2: Unleashed* (2011). He provides unique insights into the commercial tensions inherent in the production of a high-budget game franchise and their impact on creative musical interventions. **Mark Sweeney** provides a case study of Jason Graves's soundtrack for *Dead Space* (2008). He investigates a particular set of relationships between video game music, film music, and modernist avant-garde music, tracing the origins of the aleatory sound-world employed in *Dead Space*, back, via Hollywood, to the avant-garde music prevalent since the 1950s. **William Gibbons** continues the discussion of art music traditions in games through an examination of instances of remixed classical music in games. After theorizing about the remixing process, Gibbons describes how "reflexive remixes" serve as musical transgressive play. Through case studies of several games, including *Gyruss* (1983), *Boom Boom Rocket* (2007) and *Catherine* (2011), Gibbons reveals the way that the classical music remixes utilize and problematize the more general art versus entertainment discourse that exists both with respect to music and with respect to games.

This volume has been made possible through the generous support of many institutions and individuals. We are particularly grateful to the institutional hosts of the Ludomusicology Easter conferences, Peter Franklin, Anahid Kassabian and Stephen Baysted. While several conference keynote speakers have contributed to this volume, we also wish to thank those who have not directly written for this book, but whose work and involvement with the field has distinctly informed the scholarship presented within these pages: Mark Grimshaw, William Cheng, and particularly Kevin Donnelly, for their help, advice and advocacy on the part of the Ludomusicology project. Additional thanks are also due to James Barnaby, Huw Catchpole-Davies and Jemima Cloud for their efforts in organizing the events that led to the body of scholarship represented here.

Notes

1. Michiel Kamp is Junior Assistant Professor of Music at Utrecht University, where he specializes in teaching music in film and digital media. Michiel completed his AHRC-funded PhD in Music at Cambridge University with his thesis, "Four Ways of Hearing Video Game Music", which focused on phenomenological approaches to listening. As well as presenting his research at international conferences, he has also written for journals including *Philosophy and Technology*. He has co-edited a special issue on video game music for *The Soundtrack*.

   Tim Summers is a Teaching Fellow in Music at Royal Holloway, University of London. He has written on music in modern popular culture for journals including the *Journal of the Royal Musical Association*, *Journal of Film Music* and *Music, Sound*

and the Moving Image. He is the author of *Understanding Video Game Music* (CUP, 2016).

Mark Sweeney completed his D.Phil. thesis (entitled "The Aesthetics of Videogame Music") in Musicology at Hertford College, Oxford. His primary research interest is on aesthetic theory and video game music. He was previously a lecturer in Music at St Catherine's College, Oxford.

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2 Analysing Video Game Music
Sources, Methods and a Case Study

Tim Summers[1]

The academic study of video game music is at a transitionary phase in its life – it is developing from a punky juvenile scholarly newcomer into an adolescent marked by self-reflective critical angst about purpose, terminology and methodology. Polemic pleas for attention ("Why is this music being ignored?") have given way to more mature questions concerning how such investigation might proceed ("How can game music be examined?"). To continue the work of opening up the topic of video game music for analysis, this chapter will outline some answers to the question "How does one go about analysing video game music?" The purpose of this essay is not to prescribe a single solution of how video game music analysis should be conducted, and neither do the observations and suggestions offered here represent the entirety of the sources and methods available for analysts. Instead, what follows is intended to provide a starting point for those wishing to engage with game music.

The most straightforward approach to understanding how video game music might be analysed is through a consideration of the materials available to analysts, and how these may be used and interrogated. Traditional musicology has been justly taken to task for relying too much on the written score as the ultimate authoritative incarnation of a musical "work", but this legacy has not been inherited by game music studies. While such a state of affairs may be considered a generally positive aspect of the new field of inquiry, it has an unnerving effect upon those of us whose normal mode of analysis is very much score-focused. We may be at something of a loss when, in the absence of a score or a fixed sonic output, our familiar tools of the trade are not available to us. The analyst is thus left to ask, "What is the object of analysis to be and how is it to be analysed?" This chapter will outline some of the main sources of game music, the methods by which these sources may be interrogated, and some of the issues that analysts face.

In order to keep this analytical discussion grounded, I will be using a recurring example within this chapter and enact an instance of game music analysis. Much of this chapter will be written in the first person. This has the

advantage of allowing me to narrate my decisions and processes, hopefully illuminating the activity of analysis as much as the materials that are being studied. The game that I have selected for this chapter is a well-known one: *Halo: Combat Evolved* (2001), a first-person shooter (FPS) in which the player controls a cybernetically-enhanced space marine (Master Chief), who must battle aliens and investigate a mysterious, ancient, planet-sized, ring-shaped, artificially constructed world (Halo). The game was originally released as a flagship launch title for Microsoft's Xbox console (2001), and later adapted for PC Windows and Mac platforms in 2003. In 2011, to celebrate ten years of the *Halo* franchise, a remake of the game, *Halo: Combat Evolved Anniversary* was produced. The 2001 *Halo: Combat Evolved* launched a multimedia franchise (encompassing films, comics, toys and board games) that continues to be an important part of the cultural landscape of video games. As well as being positively remarked upon by reviewers of the game (Boulding, 2001; Fielder, 2001), *Halo*'s music has been taken to heart by gamers as a significant component of the experience of playing the *Halo* game. The score is firmly part of the canon of game music performed and re-recorded outside the game: music from *Halo* is a staple of game music albums and *Video Games Live* concerts.[2] *Halo* is a useful example for discussions of video game music analysis since, as a conventional mass-audience game, it illustrates many of the challenges that often come with investigating game music.

One of the first questions we have to answer is, "What is it that we examine when we analyse game music?" Video games are complex, multidimensional texts. As with most subjects of musical analysis, there are a variety of ways that any one text (game/piece of music/artefact) may be interrogated. The sources for video game music may be considered in two domains – those generated from within the game text and technology (in-game sources), such as game code and music data, and those that are outside the boundaries of the particular video game object (satellite sources) such as interviews, production documents, and so on. Each of these sources has the potential to provide information of a certain type about the game's music, subject to the advantages and shortcomings of the particular source, and approach, in question.

In-Game Sources

Versions and Editions

Video games are slippery texts. Quite apart from the differences of musical output between play sessions, it is common for games to be produced in multiple divergent editions and versions. For what is ostensibly the same game, the audio experience of the player can vary significantly depending on the computer system (platform) and sound technology that is used to

play the game. The player of the PC CD-ROM version of *Quake* (1996), with a score by Nine Inch Nails, hears different music to the gamer who plays the Nintendo 64 (1998) version, which features music by Aubrey Hodges. In early sound-era PC games, the way that the music was rendered depended upon the particular sound hardware that the player owned. Game music can change between platforms, versions and regional localizations of the same title across the globe. Even software emulators of older consoles cannot always be relied upon to replicate the original audio with complete accuracy.

In the case of *Halo*, once the decision has been taken to analyse this particular game, the analyst must answer a question: which *Halo* should be analysed? Even after leaving aside sequels, I must consider which version I will use for my analysis, and through what sound technology to listen to the game. Should I use the version that represents the game experience of the largest number of players? If this is the metric to be used, then the Xbox version, with over 5 million copies sold (Bungie, 2005) is clearly the preferable choice, rather than the far less popular PC version. Given the game's sales and the relatively recent discontinuation of the Xbox console, the hardware and software are inexpensive and readily available.[3] However, if I believe I should use the version that most fully represents the producers' creative ambitions for the game (and its music), perhaps I should use the *Anniversary* edition, which includes re-recorded music and an improved sound programming. Despite these choices, I shall instead be using the rather less popular Windows PC version for this analysis.[4] My justification for this is based upon the greater ease with which the PC version of the game may be recorded and dissected (of which more later). As a result of this choice, it should be borne in mind that some of my conclusions may not always hold true for every other edition of the game. Much like the so-called "Bruckner Problem" (the hand-wringing by analysts about different multiply-valid versions of Bruckner symphonies; see Cooke, 1969), this issue highlights the fluidity of these musical entities.

Analytical Play

It is important to recognize that these texts and objects are games. Putting aside our anxiety about investigating what is supposedly "low culture", it is entirely necessary for the analyst to *play* the games and engage with them as a player and analyst simultaneously. It is not possible to be one and not the other when investigating this topic in an academic way. In order for the music to be sounded from this interactive media, the game must be played.

For this analysis of *Halo*, I have chosen not to use a bedroom-style television of the kind familiar to many an adolescent gamer, nor a large, high-quality television in a "home cinema" setting, but instead to use my Windows laptop's

in-built sound and graphics drivers, and to listen through headphones. Here, I am able to easily record my gameplay, using screen recording software. There are several excellent free open-source screen recording applications, such as Open Broadcaster Software.[5] I might choose to record the output of my soundcard while playing the game, by using a freeware wave sound recorder like Audacity. The recordings allow me to avoid the difficulty of attempting to both analyse the music and progress through the game at the same time. In order to investigate the different possibilities of play, multiple play sessions are necessary, which then can be easily compared using the recordings.

I have elected to concentrate on the first level of *Halo*, "Pillar of Autumn". I have selected this level as a case study primarily because of the interesting diversity of musical material heard in the level and the way that it sets up the musical associations and processes that are used throughout the game.

After playing the game for even a short while, the fundamental programming mechanic of the game becomes clear: the player's in-game actions and movements trigger programmed occurrences that facilitate progression of the storyline and mission – perhaps moving through a certain door will set off an alarm, or vanquishing enemies will prompt plot progression. By noticing the fundamental ways that the game's musical output changes with the gameplay (i.e. when music starts, stops and obviously changes), the basic programming of the music usually becomes clear. Karen Collins calls this kind of "changeable" music "dynamic music" (2008: 184) because it anchors musical prompts to events within the gameworld, which may be to begin or end a cue, or prompt a musical change. Quite where and how these musical changes and transitions are specifically anchored requires more investigation.

The level begins with a cutscene (non-interactive video clip) showing the titular Halo ring. A spaceship of human marines, led by Captain Keyes, is approaching the Halo, fleeing from an as-yet-unseen enemy. In a hanger of the ship, a Sergeant briefs a platoon of marines – aliens are expected to board the human vessel and the marines must be prepared to repel the invaders. Meanwhile, in another part of the ship, two crewmen are given an order to bring the Master Chief, the player's character, out of hibernation. After this video clip, the player gains control of the avatar, and is given instruction by one of the other soldiers about the basic game controls. As the aliens attack, the player must reach the bridge of the ship and then battle through the besieged vessel towards the lifeboats. Boarding a lifeboat prompts the end-of-level cutscene, which depicts the Master Chief travelling to the Halo, where the next level of the game will take place.

The duration of this level changes considerably based on the player's proficiency and familiarity with *Halo*, and first-person shooters more generally. Some players may complete the level in about ten minutes, but a more typical

duration of play, judging by my own performance, is closer to half an hour. While playing the game as the programmers expected is a representative way of experiencing the game, it is common (usual even) that gamers also sometimes play "against the grain" by deliberately subverting the game's instructions to, and expectations of, the player's actions. Gamers test the game construct in a playful and exploratory way: "What happens if I go the 'wrong' way?"; "Will the game let me do the opposite of my task?"; "Can I put my avatar where it is clearly not supposed to be?"; "When I am urged to move quickly, what happens if I don't move?"; "Can I shoot my comrades?" In the context of game analysis, this kind of "reactionary play" is useful since it has the potential to reveal much about the game construction that is otherwise less obvious – at moments when game rules are tested, the architecture may be revealed.

Playing *Halo* against the grain can reveal aspects of the game's music programming. Since the changes to the repeating musical material are apparently triggered depending on events in the gameworld, by progressing through the level slowly and listening to the audio output, it is possible to isolate the game activity that prompts changes to the musical material (start, stop, change loops, trigger ending segment, etc.). At the same time, if no musical or dramatic triggers are engaged for a long period of time, the music fades out, rather than risk annoying the player with continuous repetition. Thus the analyst-player has to play in particular ways to investigate the musical system in the game. Comparisons of multiple play sessions can be used to isolate the mechanics of the music programming. YouTube hosts a plethora of videos of recorded playthroughs of games – these may also be useful as additional evidence for other players' experiences of the game.[6]

In playing and analysing the game, we can begin to identify the musical material used in *Halo* and the situations in which it is heard. Listening to the game, I am struck by the markedly different stylistic features contained within the musical score. From this, I am led to a kind of informal topic analysis to understand the components of the score. *Halo* contains what I regard as three distinct musical elements: Gregorian chant (and other Western *religioso* materials), Hollywood-style underscore and action music, and exotic/"alien"-signifying musical elements, which includes a female solo voice singing what sounds like improvised non-Western music. The majority of the "Pillar of Autumn" level is accompanied primarily by the "action music" topic – score elements that consist of a variety of repeated drum patterns, fast-moving string ostinati and rising/falling melodic sequences. These elements are typically written in distinct musical layers, with instrumental choirs introduced in turn, playing in dotted dance rhythms in compound time, approaching a jig-like topic. The non-Western singing and the Gregorian chant are heard either in sections of music solely written in those styles (such as the "chant" menu

music) or as pronounced unusual inclusions in the Hollywood-style "action music".

What we might call "analytical play" (repeated play and reactionary play) also allows the discovery of glitches in the game's music system. Midway through the level, upon reaching the bridge of the ship, a cutscene is shown during which the ship's captain provides further details of the plot backstory and instructs the player's avatar to try and escape the ship. As the cutscene ends and the gameplay resumes, a low string drone is heard. This loop is programmed to fade out once the player's avatar passes a subsequent location in the level. During many instances of play, however, the drone does not fade out as it should, but instead is abruptly and immediately silenced.[7] While this is obviously a misfiring of the system, it nevertheless clearly indicates the trigger-point and demonstrates conclusively that musical changes are sometimes anchored to the avatar's position in the virtual world.[8]

Analytical play is a way of allowing analysts to determine how the music is encountered by players and it usually gives a good indication of how music is programmed and deployed. In essence, it reveals the musical mechanics and material of the game. Through repeated play of the "Pillar of Autumn" level, I can work out (to a reasonable degree of accuracy) where the trigger-points for musical transition are located. I can investigate how far I progress through the level, in terms of virtual geography and events, before a new piece of musical material is heard. I now know the contexts in which particular pieces of musical material are heard by players. I have also ascertained how long the music will continue to sound without a player-triggered change, before it fades out (five minutes). These conclusions help me to form a mental musical model or map of the level, to understand the common processes that unite the individual play sessions. Like many players, I can learn to predict the moments of musical change and the stages of the musical experience of the level.

Analytical play, while an excellent way of investigating the musical experience of a game, can often not reveal the particulars of the music programming, especially in very complex systems. At this stage, I am uncertain whether *Halo*'s music is stored as MIDI-style "note data" files, recorded audio files, or another format. From the loop glitch, the smooth musical changes, and the inclusion of sung material, my suspicion is that the score consists of fragmented audio files that are looped and silenced by the music programming, but I must try another mode of investigation to support this hunch.

Code and Engine

Video games are programmed using machine-interpretable code of one kind or another, but rather than programming every game from scratch, developers

produce "engines", which create the architecture of the gameplay – effectively a programme for controlling the game construct. While types of engine vary greatly, a typical engine might contain components for generating 3D/2D graphics and textures, calculating in-game physics and generating artificial intelligence. Engines may include, or be exclusively concerned with, controls for sound and music. The engine does not create the content of sounds or art, but provides the framework for these to be used in the game. Just as a game artist can design a texture that the engine will apply to a surface, so a musician can create music the engine will control. The (music) engine starts, stops and changes this music, as and when appropriate, depending on the gameplay. Game engines create particular gameplay conditions, and, similarly, each sound engine presents different possibilities for game music. Engines are often customized to achieve particular musical-interactive functionality. Engines dedicated only to music are more properly called "middleware". Certain music middleware systems have become particularly widely used, such as the Miles Sound System, Microsoft DirectMusic, FMOD and Wwise. These tools allow great flexibility in the way in which the music is formed and deployed within the game.

For the analyst, understanding the music middleware/game engine or the programming of the game can be essential to the work of predicting the musical outputs. Rather than working from play instance to play instance and attempting to differentiate out the processes behind the musical output in each example, the rules that govern the deployment and sound of music can be discovered by investigating the game engine and music code. The difficulty of interrogating the music code of a game can vary significantly, depending on the programming of the game. In *Rome: Total War* (2004), which uses the Miles Sound System, for instance, the music code is stored in a text file, "descr_sounds_music.txt" and one can plainly read the coded instructions that explain the game mode (e.g. "BATTLE MAP"), game state (e.g. "state MUSIC_BATTLE_MOBILIZE") and the list of .mp3 sound files (e.g. Mobilize2-Warrior_March.mp3) that should be played during that state. Not all games have such clearly accessible and interpretable code. Nevertheless, the widespread culture of modding games (the practice of modifying commercially-released software) has resulted in a large number of fan-made tools for deconstructing games. For the analyst, these allow extraction of music data and programming. Unfortunately, the legal status of modding is ambiguous. Most games, including *Halo*, demand that the user does not decompile or disassemble the game as part of the licence agreement. While this contract clause is less concerned with modding activity than with pirating and the replication of proprietary software engines, nevertheless, this kind of investigation is legally unclear. Should one wish to deconstruct a game, however, a plethora of applications quite often make this

activity straightforward. Some of these programmes may be created for use with a certain game, while others are more general tools for extracting data from video games. The mined musical material might then be matched to the recorded gameplay, so that the specific musical cueing of the game (and the particular level) can be accurately understood.

Some game companies actively encourage adaptation and customization of games. In the case of *Halo*, Gearbox Software, which adapted *Halo* for the PC, did just this by releasing a version of the game called *Halo: Custom Edition* (2004), together with a toolkit for editing the levels. These tools, which include the option to control how music is deployed in the game, allow analysts a way to understand the game through experimenting with the programming architecture. By using the software tools developed by gamers and the *Halo* fan community, I can find a large list of audio files in the *Halo* programme. While the audio files contain speech and sound effects as well as music, in the case of *Halo* it is easy to discount the irrelevant sounds, leaving me with the music. Listening to the files, I may identify the music used in the "Pillar of Autumn", and begin to reconcile how these fragments of music are deployed by the game through a comparison with the recordings I made of the game being played, leading me to draw conclusions about *Halo*'s programming.

The music that accompanies the main gameplay in *Halo* is stored in brief audio files (some only a few seconds in length) that can be repeated or cued to play, based upon the player's actions. The majority of in-game cues are assembled by the randomized ordering of a selection of short musical fragments. This results in a very flexible music system. The large-level cues are usually formed in three sections: starting and ending musical sections bookend a set of repeating fragments. A set of variations on the main repeating fragments may be triggered at a certain point in the level. By listening to the musical output, reviewing the recordings I made earlier, and examining how the audio files are cued by the game, the musical architecture and its relationship to the gameplay may be specifically divined. What we have not been able to glean from this programming analysis are the motivations of the programmers and composers. For this information, we must turn to satellite sources such as interviews and statements from the game's producers (examined below).

Musical Material

So far, the analytical processes I have discussed have focused on the deployment of the musical material, rather than the sonic contents of these units. Now that I have started to understand how the audio files are triggered by the game, I can examine what musical material is heard and in what circumstances. Such analysis comes hand in hand with interpretative considerations. In tandem

with understanding when the music sounds, we should also consider how these musical elements are heard to "mean" in the context of the game. What interpretations can be readily drawn from the deployment of the musical material?

Upon starting the game, after the company logos, the player hears what stands as *Halo*'s main musical identity: a vocalizing male choir singing what sounds like *a cappella* Gregorian chant. Behind the menu is an image of Halo, and the chant theme recurs most often in the game when the mystery of Halo is being discussed by characters, or discoveries are made about the object's origin and purpose. Gregorian chant seems an unusual way to begin a science fiction FPS, but this startling musical material is fundamental to establishing the focus of the game. To interrogate the construction of this chant, transcription seems like a good way to represent and examine this material. Because of the randomization processes in the score and the temporal uncertainties related to triggering, it is obviously not possible to create a straightforward transcription of the entire score, or even a single recorded soundtrack that holds for all cases (see Elizabeth Medina-Gray's chapter in this volume). Nevertheless, transcribing excerpts or motifs from the score that form part of the modular construction of the audio output may be useful. Working from an audio capture of the game's audio output, I can transcribe the motif, as shown in Figure 2.1. Since this is obviously presented to the player as significant musical material, and is used as the basis of musical variation later in the game, it seems wise to make a record of this subject.

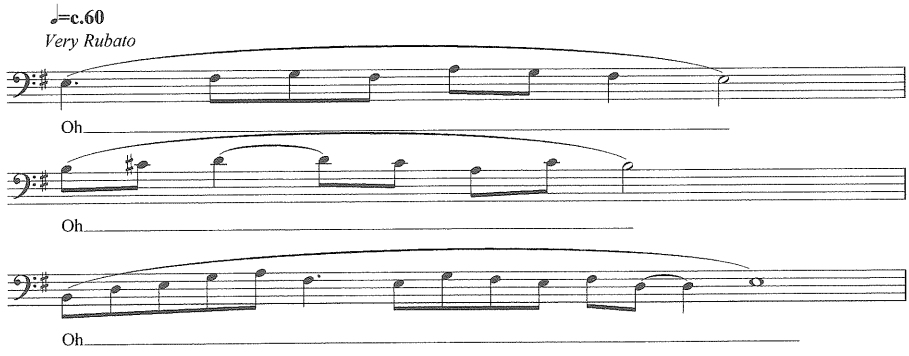

Figure 2.1 Halo's "chant" theme, male chorus

Traditional Western notation may be only able to signify certain limited dimensions of musical material, but it is well-suited to representing melodic relationships. Figure 2.1 reveals the motif's chant-like phrase structure, modal tonal design (dorian mode) and an ambiguous metre that serves to invoke medieval religious practice. From this transcription, I can input the notes into the Global Chant Database's musical search engine to give an indication

as to whether this is a chant quotation, or a stylistic emulation. The search did not find any specific results, but several gesturally similar phrases. Either the phrase is not a genuine chant, or it is taken from a source sufficiently obscure so as not to be covered by the database. In all likelihood, the chant is a new composition, though it is a successful imitation of the style.

The quasi-mystical Halo object needs to be described as appropriately ancient and mysterious. While Gregorian chant is not "ancient" in the prehistoric sense (as is the Stonehenge-like Halo) it is nevertheless a useful signifier for traditional religion and, for the majority of listeners, sounds indeterminately old.[9] As Western recorded musical history is mapped onto human history, this oldest of preserved Western musical traditions (religious chant) is aligned with undefined ancientness. The chant topic is not marked as geographically alien; it is historically-othered. (Exotic/geographical alterity is reserved for the present-day alien antagonists.) These chanting voices may evoke the mythic past, or the oral tradition of the telling and retelling of epic tales. Gregorian chant has not been extensively appropriated by Hollywood or games, so the use of this type of music helps to create a distinct and unusual identity that differentiates the game from its genre siblings.

The *Halo* score engages in both musical topic-based connections and more specific motivic relationships. In the "Pillar of Autumn" level, the unusual musical elements are included as markedly "different" to the Hollywood-style underscore. One variation, as briefly described above, adds a female singer vocalizing in a non-Western style (rhythmically free and improvisation-style gestures, pitch-bends, limited scale) over the looping drum patterns. This most obviously "exotic" musical material is associated with the alien creatures and environments. While it is heard only fleetingly in this level, the signification is more clearly cemented when the Master Chief encounters creatures and alien environments with this musical topic later in the game. The Western religious topic is associated with the Halo object and the heroic Master Chief through the inclusion of male voices or a pipe organ. This is appropriate, not least because of the religious overtones of the character – the resurrection-like sequence in which Master Chief is revived from cryogenic sleep almost implies immortality. The reverential presentation of the superhuman character, who is legendary, heroic, ageless, timeless and summoned to save the (mere mortal) humans, invokes messianic narratives. Reverential, religious music positions the Master Chief as a demigod, asserting the epic/heroic element of the character/role.

The religious topic is heard in the "Pillar of Autumn" level, with male voices sounding both the "Halo motif" from the main menu, and new chant-like material. The "Halo motif" from the menu recurs in voices during the cutscenes when the Halo ring is discussed and/or the Master Chief is the

focus of attention. Material clearly derived from the "Halo motif" is heard in both instrumental and vocal parts during the gameplay, connecting the cutscenes and the main gameplay. Indeed, rather than signifying one entity, the motif serves to create connections between entities, binding together the disparate elements of the game: it is heard in association with the presence of the Halo object, plot exposition about the Halo, the Master Chief, and the game identity itself. To analyse the way that the Halo motif is developed and woven into the musical fabric of the game, we can make use of the thematic transcription prepared earlier. Using Figure 2.1, I can identify when rhythmically augmented versions and fragments of the theme are used. Towards the end of the "Pillar of Autumn", a horn variation uses the "Halo motif" at the original pitch, first rhythmically augmenting the opening phrase, before using fragments of the third phrase in rhythmic diminution to create a descending sequence. For less clear musical processes, further transcriptions are needed. Figure 2.2, for example, shows a choral variation that sounds during the first gameplay stage. When I heard it as a player, it seemed familiar, but it is only when I analyse the variation with Figure 2.1 that I identify how this similarity with the "Halo motif" is generated: the variation uses the opening two pitches of the motif as an alternating accompaniment to a rising gesture that maintains the dorian mode and stepwise contour of the chant theme. We can thus see the musical-developmental processes used in the composition of the game's music.

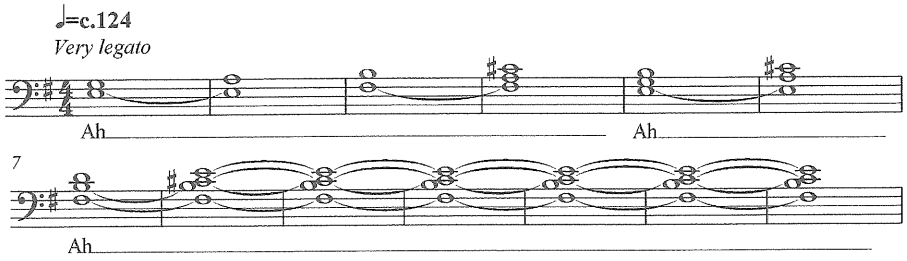

Figure 2.2 Variation on *Halo*'s "chant" theme, male chorus

Examining topic deployment, recurring materials and motivic development, in tandem with an understanding of the musical mechanics of the game, allows grounded, sophisticated interpretative connections about the game's use of music – not least the signification of "otherness" in the non-Western musical material which serves as a counterpart to the faux-Gregorian chant.

We have seen that we can glean information from analytical play, investigating the game's programming and transcription/analysis of the musical material. To develop this analysis further, we can draw upon materials outside

the boundary of the game text. We can find information from the musicians and programmers who created the game. Like many high-budget games, *Halo* received an extensive marketing campaign that included a considerable number of interviews. Even for lower-profile games, it is common for composers and audio directors to give interviews or report their experiences working on the game (such as in production blogs or through presentations at industry conferences). Such interviews can be found through simple internet searches or on composers'/game developers' websites.

Satellite Sources

Interviews and Presentations

Interviews about *Halo* are particularly useful in two dimensions – first, they shed light on the production and construction of the game's music. Secondly, they often reveal the aesthetic goals of the game's music producers. Martin O'Donnell, as audio director, had ultimate responsibility for the audio of the game, and composed *Halo*'s score (along with Michael Salvatori). O'Donnell has given interviews and presentations that explain the thinking and implementation behind *Halo*'s audio.

While corporate confidentiality agreements typically limit the detail with which composers can discuss or demonstrate the technologies they use, O'Donnell has described *Halo*'s engine in some depth. He has discussed the engine in interviews and lecture-style talks, and he has co-authored a book chapter on the use of the Microsoft DirectMusic engine in the game (O'Donnell and Weinland, 2004). Figure 2.3 is taken from a presentation about *Halo* audio given by the game's audio team (Johnson et al., 2008). This diagram matches the model of *Halo*'s audio that was deduced from the investigative play and the examination of the game content. In particular, notice the alternative layer of musical material (alt), which allows variation passages to be used. The selection of properties attached to the "tag" (read cue fragment) along the bottom of the diagram illustrates the flexibility of the system, from the "bored now" command, which fades out the music after a fixed period, to the "crossfading" from one music element to another. If we had found that we had mis-interpreted the engine from analytical play or the investigation of the engine, these kinds of documents can help to set us right.

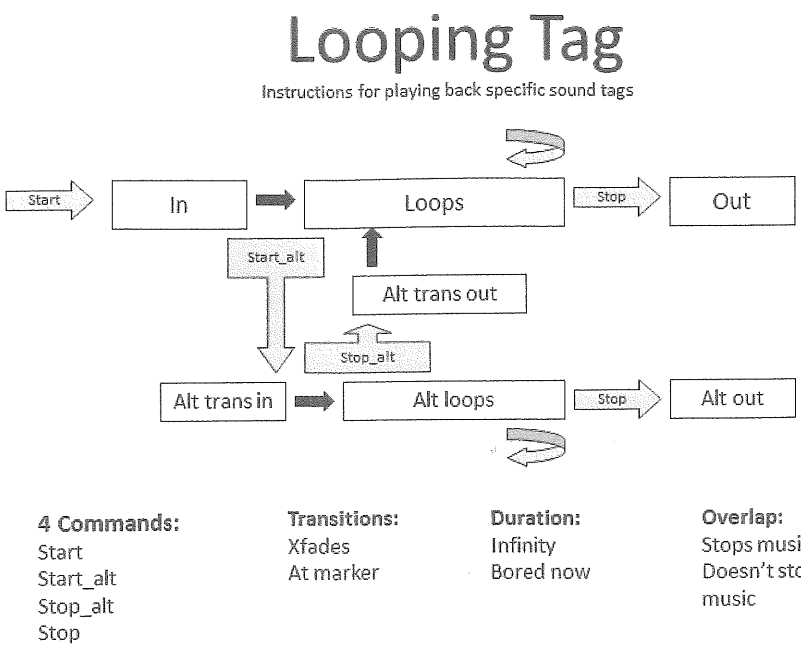

Figure 2.3 O'Donnell's diagram of *Halo*'s music implementation system (source: Johnson et al., 2008)

As noted above, even if we can accurately investigate the music engine, we are not always able to reliably predict the motivations and aesthetic goals of the creators. Interviews give us an insight into this aspect of the game's music production. O'Donnell explained that *Halo*'s audio was designed to

> give the player information about what is happening (especially things that can't be seen) and make the world seem more alive and real. Music should provide a dramatic component to game play . . . in addition to underscoring story and cinematic sequences. (O'Donnell, 2002a)

O'Donnell here describes his ambition for the music to convey information about the context of play and contribute to the creation of the fictional universe, as well as supplying dramatic import. *Halo* seeks to create what might be referred to as a "retrospectively-scored" aesthetic – the music should be so carefully and seamlessly matched to the gameplay that it gives the illusion of being scored like a film, after the fact, with a fixed score, rather than music reacting to the player's actions: "When [the players] look back on their experience, they should feel like their experience was scored, but they should never be aware of what they did to cause it to be scored" (O'Donnell, c. 2007). O'Donnell is

concerned that a music system in which gameplay-directed music changes are obvious could be distracting for the player (Waugh, 2005), jeopardizing player immersion. O'Donnell implements strategies so that even if the start and end of cues are obviously synchronized to in-game events, triggers for the development of material are hidden. In being less directly predictable, and programming score transitions to occur at musically appropriate moments, O'Donnell creates the quasi-magical effect of music that "just happens to fit" the game action.

The interviews also allow insight into the influences of composition. The non-Western vocal topic that was identified earlier, for example, O'Donnell describes as "an improvised Qawwali chant voice over the top to help reinforce the 'alien' nature of the environment" (2002a).[10] It seems as though my hypothesis concerning the Western/non-Western othering of the score was similar to O'Donnell's own thinking about the music. While we should not always defer to the author's intentions when analysing a piece of music, it is nevertheless useful to at least consider their own reports on the work in question. Here, we could interrogate the extent to which the "Qawwali chant" in the *Halo* score is an accurate replication of that musical tradition, we could hermeneutically investigate how this music inflects the representation of the aliens in the game, and we could compare this example to other media texts that use non-Western music to signify alien otherness.

Recordings, Liner Notes, Scores

Game soundtracks are a significant part of the promotion and marketing of a game. Audio CDs are still produced for high-budget games, but digital music platforms even more readily disseminate game music recordings for consumption outside the game. The usefulness of game music soundtrack recordings varies on a case-by-case basis. For *Halo*, the "score" as presented on the soundtrack CDs lacks one of the central aesthetic goals of the game: O'Donnell's dynamic post-scored implementation system. At the same time, the soundtrack CDs may be useful satellite texts for *Halo*. As noted earlier, these recordings represent a significant mode of encounter with the game's music: the music as formulated on the CD is the main way that players hear the music when it is encountered outside the game – it is usually the case that YouTube videos of game music are taken from soundtrack albums, where such albums exist. *Halo* players reflect and reminisce about their time playing the game with these recordings, which may come to stand for the game soundtrack in a concrete way. As we are here primarily concerned with the music in the game (as opposed to the broader cultural life of this music), the usefulness of the soundtrack CDs as musical representations of the game is limited.

Many soundtrack albums include liner notes that can provide useful insights, similar to interviews. From the *Halo: Original Soundtrack* CD liner notes we learn the histories of particular themes: The original Halo chant was written in 1999 for a Macworld industry trade show, while much of the music from the "Pillar of Autumn" level was written in 2000 and 2001. From the credits, which name the vocalists performing on the soundtrack, I must conclude that at least some (but probably not all) of the vocal material in the game is non-synthesized. This factual information is interesting, but does not enlighten us about the musical experience of the game. However, O'Donnell also writes,

> Themes, moods and even the duration of these pieces will change and adapt with each player's *Halo* experience . . . Perhaps a piece of music that you remember hearing won't be found here [on the CD]. That might be because you played *Halo* in a way I never anticipated. (O'Donnell, 2002b)

Using the playthrough recordings and the extracted data, we could use this comment to identify the themes that are not included in the CD recording. This would not only reveal the themes and motivic material that O'Donnell deems to be most significant, but also tell us about the way that the game was anticipated to be played by the majority of players. Analysing game music (both soundtracks and music heard in the game), therefore, may inform understanding of more general aspects of the game's design.

Another interpretive stimulus might come from the *Halo: Anniversary Edition* soundtrack liner notes. Remake audio director Paul Lipson explicitly states that *Halo*'s music should be understood in a post-9/11 context. He argues that this "sound of hope" (he uses the phrase twice) defined a post-2001 heroic identity:

> While the tragic events of September 11th lingered, the visage of a new hero marked America's return to the next generation console landscape. Master Chief had arrived, not with the sound of bright trumpets and fanfare, but with tribal cellos and the solemn chanting of monks in space. Nothing would ever be the same in the wake of this powerful, noble new music . . . [This album] is a tribute to that first sound of hope; and a reminder of what connects our community as we move forward. (Lipson, 2011)

This rather surprising and impassioned perspective on the score could lead us to any number of hermeneutic investigations: we could compare *Halo*'s musical construction of heroism with more traditional musical signifiers of heroism, or other contemporary post-9/11 popular military-themed games or films. This highlighting of the historical/geo-political context of the game's music suggests an uncomfortable allegorical aspect to the musical "othering"

of the aliens that attack the humans, particularly when the composer identifies the material as an Islamic musical style. Of course, critical-interpretive investigations do not demand reports from the musical authors or producers, but nevertheless, these kinds of comments open "hermeneutic windows" (Kramer, 1990: 6) for us. Such activity is particularly significant when academic critical interpretations of game music are only beginning to be in evidence (see Cheng, 2014).

Soundtrack recordings arrange the music from the game into suites or long cues for pleasurable listening. Fans in the game music community, however, sometimes extract (and distribute) the music from the game in its raw, unarranged format. This music data is shared between fans and frequently applied to a video and uploaded to YouTube. Despite its ubiquity, this activity represents copyright infringement, even if taking steps to inhibit this action seems to be a low priority for games companies.

Apart from the recordings of music from games, it is sometimes possible to access musical scores. Occasionally, sketches and scores from recording sessions may be made public by game composers, as in the case of music for the *Halo 3* trailer, which was made available on the now-defunct *Halo 3* soundtrack website. More commonly, however, printed scores are either produced by music publishers or by the ever-industrious fan communities. Alfred Music Ltd publish a range of game music, including music from *Halo*, arranged for amateur performance, while fans of *Halo* have spent considerable time and effort transcribing the game's music (see, in particular, rampancy.net/sheetmusic). These sources must be treated very carefully: Both are usually second-degree derivatives from the soundtrack records of the game music, rather than from the primary source of the game, and both may deviate from the "as-heard" original without any indication. Still, since transcription can be a laborious task, having other examples with which to compare can be useful.

Reviews

Reception studies have had a long tradition in musicology, and, with the proliferation of game review websites and blogs, a huge wealth of popular criticism created by professional and amateur reviewers is available for analysis.[11] As well as investigating reviews specifically concerned with the music of a game, it can also be valuable to notice when general game reviews make special mention of the music and the terms in which they discuss their experience of the score. We can tell that, for example, the chant material was particularly striking, and reviewers identified it as "Gregorian-ish" (Ahearn, 2001), or "Gregorian Chant-style" (Boulding, 2001). O'Donnell seems to have been successful in his aims for the music system. While reviewers were not able to easily understand

the process behind the dynamic engine (Ahearn, 2001),[12] they found it to be well-matched to gameplay ("E Nomini Patri", 2002),[13] and communicatively significant (Boulding, 2001; Peters, c. 2001).[14] It is possible to use these kinds of reviews (and perhaps even informal reviews such as YouTube comments) to reveal how gamers listen to music in games, including how music is used to aid gameplay, and the assumptions that players hold about the conventions of video game music.

Presenting/Representing Analysis

Representing video game music is tricky. While written descriptions may be vivid and notated examples precise, the new media format provides the opportunity for experimentation with new forms of reporting game music analysis. Other chapters in this volume include enhanced online media and this kind of material might easily give way to video demonstrations or interactive models and simulations. As both a way of reporting music-game interactions, and as an analytical tool itself, I offer here a diagram of the "Pillar of Autumn" level, inspired by the diagrammatic film music analyses of John Huntley and Roger Manvell (1957). The full diagram is available as part of the online supplementary materials for this volume, available via the publisher's website and the Ludomusicology UK Research group website. A sample is presented below as Figure 2.4. This diagram attempts to connect the game action with the musical changes and the description of the music in a way that is flexible enough to accommodate notes about unusual or interesting musical features. I found that this diagram was a useful way to structure my self-reporting of the game experience, record notes about the music of the level, and force myself to be specific in the dissection of the level. This architecture could easily be adapted to include written notation, or in an interactive format, video clips and samples. I have also utilized this format as a way to direct readers of my analyses to specific sections of a cue or level without the need for long descriptions.

Each of the sources discussed below is able to provide particular information about the music of *Halo* (Table 2.1). Of course, there are a limitless number of analytical possibilities for any one game, and what is presented here sits alongside methods deployed by game music analysts in the other chapters of this book and elsewhere (see Donnelly, Gibbons and Lerner, 2014 and Moormann, 2013). However, whereas most authors tend to keep their analytical processes implicit, rather than explicit, this chapter has sought to interrogate methods of game music analysis by bringing them into the light for justification and critical evaluation. It is for this reason that I have narrated my activity (mostly in the first person), emphasizing the personal and performative nature of musical analysis.

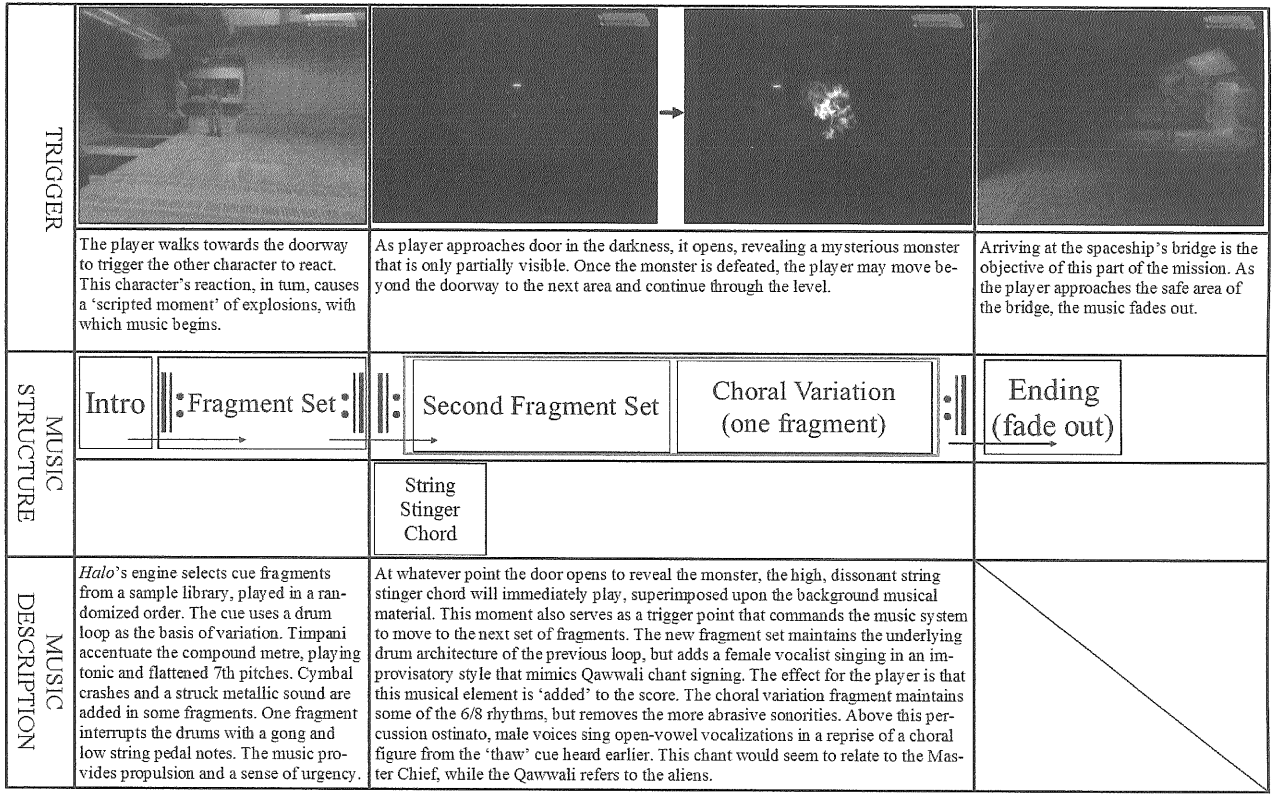

Figure 2.4 Diagrammatic representation of part of the "Pillar of Autumn" level

Table 2.1 Sources, data, analysis and conclusions from *Halo*

Source	Raw Data Format	Analysis Methods	Examples of Conclusions Drawn
Analytical Play	Experience of play; captured play recordings	Playing with and against grain; critical listening of musical material	Topic-based scoring significant (esp. alien and hero characterization); complex dynamic music system based upon trigger-point programming; recurring thematic material and motivic development
Code and Engine	Music deployment code; programming tools; technical data	Find trends of musical material and game deployment; consider rationale of musical-dynamic processes	Music anchored to gameworld locations/event triggers; variation possibilities of cues; start/loop and variation/end structure; even some cutscene cues not entirely fixed duration – allows flexibility
Music Data	Audio wave files; note-data files; samples	Comparison with deployment in captured play; survey of musical material used in game; traditional musical-analytic techniques (see also below)	Storage in small clips to allow variation
Notated Transcriptions	Staff notation (via transcription of audio material, perhaps converted directly from music data)	Raft of traditional musical-analytic techniques (motivic, harmonic, topic analysis, etc.)	Motivic repetition links cutscenes with in-game music through recurring themes; textual elements connected by repeated themes that accompany more than one character/object; some motivic processes in evidence

Source	Raw Data Format	Analysis Methods	Examples of Conclusions Drawn
Interviews/ Presentations	Transcriptions; presentation files; audio/video recordings (autobiographical, historical, technical information)	Identify composers' intentions (compositional ideology); extract technical information about game; integrate historical information	Dynamic music system deliberately obfuscatory; DirectMusic programming; straightforward leitmotivic scoring rejected; concern with emotional-communicative dimension of music; complex randomization procedures; attempt at "retrospectively-scored" aesthetic effect; inspiration for non-Western vocal music from Qawwali tradition
Recordings	Audio data (often assembled into cues, rather than as heard in-game)	Comparison of recordings with music as heard in-game; trace after-game life of music; identification of main themes	Assumes quick player progression through "Pillar of Autumn" level; popularity of *Halo* music listening outside the game
Liner Notes	Written prose (technical information; historical-biographical information)	Interpretive prompts; identification of important factual information	Historical progression of musical material – some themes predate majority of game content; some vocal material performed by live musicians; *Halo* can be read in terms of post-9/11 heroic identities
Scores	Staff notation or other representation	Raft of traditional musical-analytic techniques (motivic, harmonic, etc.); comparisons with transcriptions; identification of significant themes/cues	Musical material popular enough to prompt commercial and amateur arrangements – especially "Gregorian" topic and certain other cues, including menu music and "Lament for Pvt. Jenkins" cue; transcriptions generally accurate

Source	Raw Data Format	Analysis Methods	Examples of Conclusions Drawn
Reviews	Written prose	Reception (meta-) analysis; identification of trends; major interpretive themes; positive and negative criticism; reporting of how players' interpretations match composers' intentions	Music structures the game and creates the rhythm of gameplay; "Gregorian" topic commonly identified; musical identity unusual for FPS games; specifics of musical-dynamic engine remains ambiguous to players

I began this chapter by discussing the development of video game music studies: a domain of scholarship undergoing an exciting period of growth. It is an essential part of the maturation of this discipline that we begin to discuss the methodologies and scholarly techniques underpinning our research. This chapter has been an attempt to begin that discussion. It is important that these considerations occur in an explicit way; it improves accessibility to the field, facilitating engagement by new researchers, providing a "way in" to game music studies, and simultaneously, it prompts us to be critically reflective about our research methods and to ensure we are aware of what precisely it is that we do when we analyse video game music.

Notes

1. Tim Summers is a Teaching Fellow in Music at Royal Holloway, University of London. He has written on music in modern popular culture for journals including the *Journal of the Royal Musical Association*, *Journal of Film Music* and *Music, Sound and the Moving Image*. He is the author of *Understanding Video Game Music* (CUP, 2016).
2. Music from *Halo* games features on *The Greatest Video Game Music* (X5 Music X 5CD114, 2011), *The Greatest Video Game Music 2* (X5 Music X 5CD118, 2012), *Video Games Live: Volume 1* (EMI/Angel #5087302, 2007) and *Video Games Live: Level 2* (Shout! Factory 12324, 2010).
3. The Xbox's successor console, the Xbox 360 (2005–) is selectively backwards compatible. In the case of the *Halo* games, certain regions and copies of the game will work on the Xbox 360, though glitches and problems are rife.
4. The game sales website Vgchartz (2015) estimates the PC sales of *Halo* to be in the region of 20,000 copies.
5. There are also many widely-available options for recording console output. The popularity of YouTube videos of game footage has provided a market for a plethora of commercial hardware and software products for capturing console

play using a PC. Manufacturers including Elgato, Nvidia and Roxio have produced technology specifically for this purpose.

6. YouTube videos may be useful sources for a great variety of game music analysis, such as, for example, documentation of different types of play and musical reaction, players' reception of the music, and so on. Relying only on player-uploaded videos as evidence of a game's musical mechanics may be dangerous, since, to cite just one reason, these videos do not afford the ability to experiment and test musical reactivity with the same precision as playing the game oneself, opening up the possibility of erroneous conclusions such as misinterpreting co-incidental musical changes as casual events.
7. This glitch is more evident in the PC version of the game than in the Xbox or *Anniversary* editions.
8. The fade-out error may be conceptualized in two ways, either as a fade-out that is not triggered, or as an instruction for musical silence that is triggered too early/in the wrong position. Based on the music programming (see later), it is far more likely that the problem is caused by the ending fragment of the cue, which contains a recorded "fade out", not playing.
9. On musical histories in games, see Cook, 2014.
10. "*Qavvālī* . . . is the musical assembly held by Sufis throughout the year . . . The term *qavvālī* denotes the Sufi song itself, and only by implication the occasion of its performance . . . *Qavvālī* normally combines group and solo singing and is accompanied by drum, harmonium and hand-clapping . . . [The *Qavvālī*] formal scheme combines metric group refrains and rhythmically free solo improvisations, including rapid melismatic passages" (Qureshi et al., 2014)
11. Websites can be notoriously volatile with content changing and evaporating without warning, though projects like the Internet Archive (https://archive.org/web/) have helped to preserve some websites. *Music4games.net*, one of the premier game music criticism sites, ceased to function in 2009, but much of the content (including valuable composer interviews) was saved by the Internet Archive project.
12. "It's amazingly hard to explain how or why the music does such a good job of setting the mood for each and every scene that you are presented with, but it does, and does it very well" (Ahearn, 2001).
13. The music "comes on at the right time" ("E Nomini Patri", 2002).
14. "[I]t can hit with a bang to let you know there's something significant coming up" (Boulding, 2001); "In times of action it really gets you pumped up and ready to kick some ass" (Peters, c. 2001); "The soundtrack is epic, kicking up just at the right times to help create a sense of tension" (Riach, 2001).

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