

COMPOSING MUSIC FOR GAMES

The world's most authoritative and comprehensive guide for launching and maintaining a successful career as a video game composer.

Composing Music for Games is a guidebook for all those who aspire to have a successful career as a video game composer. It offers a pragmatic approach to learning, intensified through challenging project assignments and simulations. The principles and practices presented here have been tested and proven both in the classroom and in the professional world of game development. Through research, interviews and personal experience, author Chance Thomas begins with the foundation of scoring principles applicable to all media, and then progresses serially through core methodologies specific to video game music.

- In-depth exploration of music scoring for video games
- Powerful blend of aesthetic, technique, technology and business—all necessary components for a successful career as a video game composer
- Colorful case studies, tutorials and challenging tasks to keep you engaged from start to finish
- A companion website: www.focalpress.com/cw/Thomas that contains audio samples and video tutorials to demonstrate principles and techniques from the book, plus resources for classroom assignments, PowerPoint slides, and more!

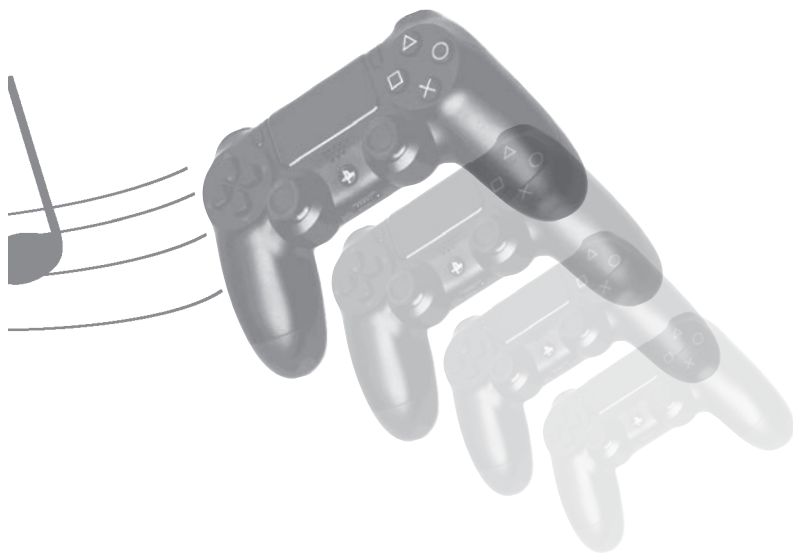
CHANCE THOMAS is a composer, educator and entrepreneur. His music has underscored blockbuster commercial success and critical acclaim, including an Oscar, an Emmy and billions of dollars in video game and film sales worldwide. Game credits include *DOTA 2*, *Lord of the Rings Online*, James Cameron's *Avatar*, *Heroes of Might and Magic*, Peter Jackson's *King Kong* and many more. As an educator, Chance works with universities, colleges and conferences to help students and professionals navigate the intersection of music scoring, technology and business. He has served on advisory boards for Full Sail University, Brigham Young University, the Game Developers Conference and the Game Audio Network Guild. His business interests range across studios, publishing and audio services, successfully supporting a music career spanning more than thirty years (www.ChanceThomas.com).



COMPOSING MUSIC FOR GAMES

THE ART, TECHNOLOGY AND BUSINESS OF VIDEO GAME SCORING

CHANCE THOMAS



CONTENTS

INTRODUCTION, ix

PERSPECTIVE

CHAPTER 0: THE LANGUAGE OF MUSIC SCORING, 3

PRINCIPLES

CHAPTER 1: TIMELESS PRINCIPLES OF MUSIC SCORING, 17

CHAPTER 2: DISTINGUISHING PRINCIPLES OF VIDEO GAME SCORING, 43

CHAPTER 3: APPLIED PRINCIPLES IN MUSIC DESIGN, 57

TECHNIQUES

CHAPTER 4: BASIC MUSIC SCORING TECHNIQUES FOR GAMES, 81

CHAPTER 5: ADVANCED MUSIC SCORING TECHNIQUES FOR GAMES, 107

PROCESSES

CHAPTER 6: THE PROCESS OF MUSIC COMPOSITION, 129

CHAPTER 7: THE PROCESS OF MUSIC PRODUCTION, 153

CHAPTER 8: THE PROCESS OF MUSIC IMPLEMENTATION, 179

BUSINESS

CHAPTER 9: TUNING UP FOR BUSINESS, 205

CHAPTER 10: HUNTING AND GATHERING, 225

CHAPTER 11: MONEY MATTERS, 245

CHAPTER 12: LIFESTYLE MANAGEMENT, 273

EVOLUTION

CHAPTER 13: DISRUPTIVE INNOVATION, 297

CHAPTER 14: CONTEMPORARY VANGUARDS, 309

CHAPTER 15: CAREER PHILANTHROPY, 333

APPENDAGES

ACKNOWLEDGMENTS, 349

ABOUT THE AUTHOR, 351

IMAGE CREDITS, 353

INDEX, 355

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

© 2016 Taylor & Francis

*CRC Press is an imprint of the Taylor & Francis Group, an informa
business*

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, please access www.copyright.com (<http://www.copyright.com/>) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. CCC is a not-for-profit organization that provides licenses and registration for a variety of users. For organizations that have been granted a photocopy license by the CCC, a separate system of payment has been arranged.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

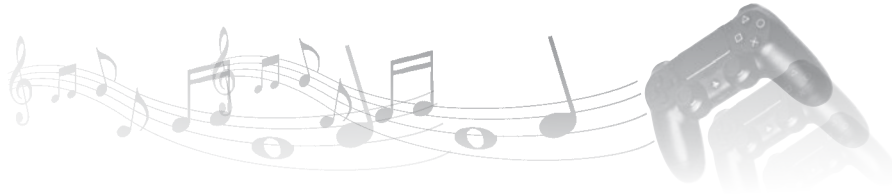
Library of Congress Cataloging in Publication Data
CIP data has been applied for

ISBN: 978-1-138-02141-9 (pbk)
ISBN: 978-1-315-77774-0 (ebk)

Typeset by Alex Lazarou

Visit the Taylor & Francis Web site at <http://www.taylorandfrancis.com>
and the CRC Press Web site at <http://www.crcpress.com>

This book is dedicated to my dearest and
most treasured mentors in music:



PATRICIA ANN THOMAS

The first and finest musical influence in my life

DORIS VAUGHN

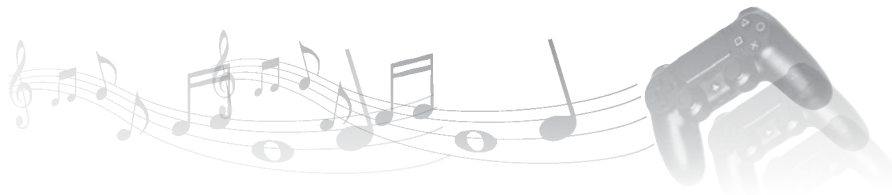
My devoted, tough and exacting piano teacher

MANTA AND CANYON

Rowdy, high school-era rock band mates

JIM ANGLESEY

The most inspiring college professor I've known



This book is further dedicated to all those engaged
in mentoring today's aspiring score composers.
Your influence will resonate for generations untold ...



INTRODUCTION

It's all about the ones and zeroes.¹

Most video game programs start at address zero and increment up.² So it is with this textbook on music scoring for video games. While most books begin with Chapter 1, this book begins with Chapter 0. Why Chapter 0? Because Chapter 0 designates a point of origin rather than a first step on a subsequent ladder of learning. Chapter 0 is, in effect, ground zero for this topic. It offers no first principles of scoring. It enumerates no specific techniques or strategies. Rather, the purpose of Chapter 0 is to establish a perspective, a vantage point. It offers the reader a subjectively focused lens through which the remainder of the book may be best understood.

This is indicative of the didactic strategy employed throughout the text. Early chapters will establish a foundation of universal principles. Later chapters will teach specific methodologies and techniques based on those principles.

Aspiring video game composers who digest the underlying principles and philosophical framework in the early part of the text will find greater success in learning the applied techniques given later in the text. Such a grounded approach is calculated to give diligent readers a much needed competitive edge. Music scoring for games is a crowded profession. Thousands of hopefuls wash out. Thus, understanding the *why* of music scoring will more fully empower the educated composer to make superior selections of *what* and *how* when opportunity knocks. Getting those decisions right will make all the difference.

Given the importance of getting those decisions right, how can a student, professional or professor feel confident that this book will steer aspirants in the right direction? A word about the author's qualifications will be reassuring. Many textbook authors are brilliant academics but have limited experience applying their methods in the professional world. By contrast, this textbook is authored by a composer/educator who has personally researched, invented, tested, observed,

INTRODUCTION

absorbed, refined and applied these concepts in a dizzying array of commercial video game scores since 1996, from shoestring-budget indies to high-stakes blockbusters. Readers may be familiar with some of these scores: *DOTA 2*, *Lord of the Rings Online*, *James Cameron's Avatar*, *Monopoly Streets*, *Heroes of Might and Magic*, *Dungeons & Dragons Online*, *Champions Online*, *Littlest Pet Shop*, *Peter Jackson's King Kong*, *Disney's Ghosts of Mistwood*, *Dinosaurs 3D*, *Earth and Beyond*, *Marvel: Ultimate Alliance*, *War of the Ring*, *Left Behind*, *Unreal II*, *X-Men: The Official Game*, *Quest for Glory V* and many more.

Thus, the principles and practices offered here have been tested and proven, not only in the classroom, but in the furnace of crunch-time game development and the marketplace of competitive commerce. The depth, diversity and useful application of theory and practice brought to bear in this book is second to none in the world.

The bulk of this educational material is presented generally and objectively throughout the text. However, most chapters also contain focused excerpts from the author's own music scoring experiences. These first-person accounts appear in sidebar segments under the caption ***Peek Behind the Curtain***. Such personal windows into the trenches of game scoring are among the book's most unique and valuable features.

Having said that, no single individual possesses all the answers. That is why dozens of outside specialists have also offered their insights exclusively for this textbook. These distinguished experts, many of them the author's personal friends, are featured in special chapter subdivisions labeled ***Guest Lecture***. These guest lecture segments add rich layers of clarifying detail, specific application and color commentary to the principles and practices discussed.

Applied learning assignments and exercises follow handy summaries at the end of each chapter, offering students and teachers opportunities to test and put into practice each principle and technique taught in the body of the text. To assist with analysis and scoring assignments, copyright-free and cleared external resources are available at the book's online resource center. Links are included in the text of the book.

Any reader who makes a vigorous study and application of these materials will put themselves in an aggressive position to succeed as a professional video game composer. To all those who so embark, the author and publisher wish a prosperous journey and the very best of success!

REFERENCES

1. Richard Gregory. Digital Marketing Agency website: <http://richardgregory.co.uk/tag/gaming/>.
2. Craig Alexander. Email exchange with author. January 30, 2014.





CHAPTER 1

TIMELESS PRINCIPLES OF MUSIC SCORING

Ride the horse in the direction it's going.¹

There is ample room for originality in music scoring. But there is also much of convention. Convention is valuable in achieving the primary purpose of music scoring (or any other language), which is to communicate understanding. Convention does not prohibit creativity. Rather, it offers a comprehensible framework within which creativity can be concentrated, and through which it can have the most impact. Think of convention as a bang-for-the-buck proposition. As many music theory teachers have undoubtedly told their squirming and impatient music students, “You must learn the rules before you can break them intelligently.”

This chapter will examine several core conventions of music scoring. To lay the broadest possible foundation, many examples in this chapter will be drawn from movies, television, commercials and other forms of visual media, including games. Subsequent chapters will narrow the focus considerably, highlighting video games exclusively.

CATEGORICAL FUNCTIONS OF MUSIC IN VISUAL MEDIA

Diegetic Music

Prevalent among articles and texts on music scoring is the term *diegetic*. This is a highly specialized term which, as of the date of this publication, still finds no entry in *Webster's Unabridged Dictionary*. Yet the word is widely used by dramatic theorists and educators in the visual arts. It traces its origin back to the fourth century BC, to the writings of Plato. In his book, *The Republic*, Plato introduces the term diegetic to mean any type of entertainment (drama, epic poem, etc.) which is narrated, or described by the narrator.²

In modern music scoring, ***diegetic music*** has come to mean music whose source is visible in the narrative, or music whose source is implied to be present by

DIEGETIC MUSIC IN BIOSHOCK



BioShock's licensed soundtrack helped contribute to the immersive atmosphere of the game with real world licensed music reminiscent of Rapture's time period. Most of [the songs] came from the mid-Twentieth century and cast a feeling of the past in the ruins of a fallen utopia ... The licensed songs were designed to be source music as if heard by the characters emanating from radios, phonographs and jukeboxes rather than as incidental music heard from the game's score.

Audio director Emily Ridgway explains the choice to use diegetic music. "The songs themselves, there's a really interesting juxtaposition of ... a happy quirky musical ... razzle dazzle number and then ... how the world is ending ... It was supposed to mirror the optimism and the decay at the same time ... those two things sort of coexisting with each other."⁴

the depicted action.³ Framed another way, if characters represented in the narrative can hear the music, then the music is performing a diegetic function.

For example, a documentary depicts a down-on-his-luck, middle-aged man in a public square playing guitar. The guitar is emanating from the scene. The music source is part of the visual narrative. Other people appearing in the scene can hear the man playing his guitar. Therefore, the guitar we hear has a diegetic function in the documentary. Similarly, envision a young woman in exercise clothing selecting a tune from her docked iPod. The song emanates from a physical object visible in the scene. The music source is part of the visual narrative. The girl doing aerobics can hear it. The exercise music is performing a diegetic function.



In addition, sources of music which are implied but unseen in a narrative also perform a diegetic function. The ragtime piano music heard in the background of a honky-tonk bar scene is diegetic for the scene. Even if the audience never sees the musician tickling the ivories, the music is implied to originate from within the bar. The source of the music is assumed to emanate from within the scene itself.

As mentioned, the word *diegetic* is common in scholarly texts and educational materials. However, it would be uncommon for a creative director to ask a working composer to provide *diegetic* music. Instead, they would typically use the term *source music*. Even newcomers can grasp this term easily. The expression is reflective of its definition—music for which the source is visible or implied in the scene. These two terms, *diegetic* music and *source music*, may be used interchangeably.

Non-Diegetic Music

In most forms of visual media, the great preponderance of music is non-diegetic. While *diegetic* music requires a source which is visible or implied in the narrative, non-diegetic music does not. Thus, ***non-diegetic music*** is music whose source is neither visible to the audience nor implied to be present in the action.⁵ Non-diegetic music is never heard by the characters in a scene.

This is another term with frequent mention in textbooks and scholarly articles, but not much usage in the professional world. Among directors and score composers, non-diegetic music is simply referred to as *underscore* or *soundtrack*. *Underscore* typically implies instrumental music which supports the visual presentation. Soundtracks may include instrumental underscore but frequently also includes vocal songs. As a side note, when a voice (or voices) behaves like an instrumental color in the orchestration rather than a focal point for lyrics, then the vocals are considered part of the underscore.

When professionals use the term *music score* they are almost always referring to non-diegetic music in support of a visual presentation. In this book, non-diegetic music will be referred to as *music score* or *underscore*. Likewise, the process of creating such music will hereinafter be referred to as *music scoring*.

Since the preponderance of a composer's work for visual media is focused on music scoring, the balance of this chapter will be dedicated to its exploration.

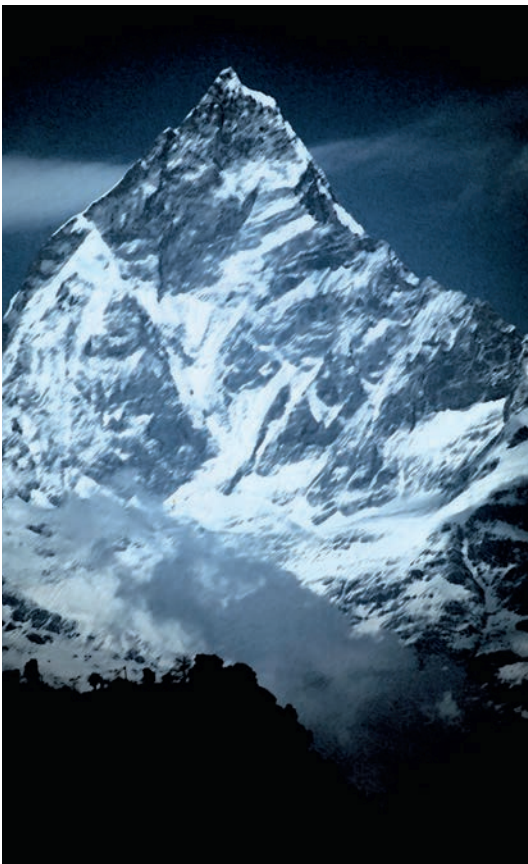
CONVENTIONAL FUNCTIONS OF MUSIC SCORING

Everyone loves a great music score. But what is music actually doing within the context of a visual presentation? What are its various roles and functions? Conventional purposes of music scoring can be distributed among six broad categories—*setting the mood*, *heightening emotion*, *propelling the action*, *providing contextual clues*, *enhancing the aesthetic* and *contributing to structural unity*. Each of these functions will now be examined in some detail.

Setting the Mood

Many film and game directors will use an establishing shot to quickly orient their audience to a particular sense of place and time. In a similar way, composers use underscore to orient their audience to the proper emotional tone for the scene. This is called *setting the mood*.

An establishing shot for a medieval tale might open showing a grassy field with a hilltop castle looming in the background. The sky is cloudy with a light rain falling. Scattered trees show the faint tint of gold and red on their leaves, telegraphing the onset of autumn. A column of mounted soldiers comes snaking its way out of the castle, down the hill and toward the foreground. This opening image offers the audience many facts about the narrative.



But how should the audience feel about it? Are the soldiers friendly or adversarial? Is the situation mundane, triumphant or grim? Perhaps everything is altogether ambivalent. An establishing shot can communicate many facts about the scene, but may tell the audience very little about how to interpret the scene at an emotional level. Without a device for introducing emotional narrative into the scene, an audience may be left in the dark.

Cue the strings. Underscore is a wonderful device for priming the emotions. The right music can instantly tell an audience how to feel at the opening of a scene or game level. It can draw out the human emotion and lead people along toward the director's intent. This power of underscore to narrow, focus and delineate the intended mood or feeling (among many possibilities) is one of the most rudimentary and indispensable functions music performs in visual media.

Consider this example. In the Disney film *Frozen*, an early scene opens with a wide establishing shot showing a twisted mountain peak in the foreground. Blizzard conditions are evidenced by darkened skies, swirling winds and heavy snowfall. A fierce and rugged mountain range is visible in the background.

Yet, when the music score enters, rather than broadcasting ominous threat or epic adventure, it draws the audience toward a feeling of tender loneliness. A piano sounds gently on a series of soft, minor riffs turning major at the end of the phrase. A bit sad, a bit lost, with a glimmer of hope for the future. With this musical introduction, the audience is perfectly primed to hear the scene's main character express her feelings of isolation, confusion, determination and freedom. The music score has narrowed, focused and delineated the intended emotion among the many possibilities. It has properly set the mood for the scene.

Heightening Emotion

Entertainment often presents an amped-up version of reality. Sometimes this is taken to the very extreme. Consider the Terran soldiers in *Starcraft*. They aren't just big, tough and muscular. They are enormous, virtually indestructible and almighty. Their hand-held guns aren't just large. They are the size of a living room entertainment center. Everything about the Terran soldier is completely over the top.



Exaggerating reality isn't limited to video games. Projecting a close-up of an actor's face on a 50-foot-wide movie screen (even more for IMAX) is exponentially larger than life. And dressing a Wagnerian diva in a shield-bra is nothing if not hyperbole.



Thus, not surprisingly, music scores in such amplified versions of reality serve to intensify the experience *even more*. And while CGI and cinematography work at the visual level, music scoring goes straight to the heart. Whatever an audience may feel when playing a game level or watching a scene in silence, the right music score will multiply. This function of music scoring is referred to as **heightening emotion**.

To illustrate, a gamer who explores the shadowy depths of Sschindylryn in *Dungeons and Dragons Online* with the sound muted may experience some feelings of anxiety and anticipation. But by adding the growling dissonance of a dark orchestra and distant chanting, the composer can raise the emotional stakes significantly. Now, instead of anxiety, the player experiences fear. Instead of anticipation, she feels excitement mingled with dread.

Nowhere is raising the emotional stakes more important than in an action score. In this role, underscore elevates human biological response, drawing an audience into the visual media akin to actually being there. The pulse quickens. Respiration increases. Mental focus narrows. According to a growing body of evidence from peer-reviewed scientific research, "Stimulating music increased plasma cortisol, ACTH, growth hormone, and norepinephrine level . . . The brainstem interprets

[such] music as signals related to survival, and then initiates corresponding physiological responses.”⁶ For reference, ACTH stimulates the secretion of adrenal cortex hormones. As many a game designer knows intuitively, action music really does get the adrenaline pumping.

Thus we see that action music tricks the body into releasing a cocktail of hormones comparable to what it would secrete in an actual fight-or-flight situation. This intensifies the impact of a visual representation, super-charging the emotions. This functionality makes action music a key factor in creating the sense of immersion, or suspension of disbelief, which directors pursue and audiences crave.

Propelling the Action

When music is added to a visual presentation, it has the ability to bring a new sense of movement and pacing to the program. This is called ***propelling the action***, and is another conventional function of music scoring. There are many ways in which a music score can move action forward in a visual presentation. One way is by adding a pulse to the scene or level. Human physiology and movement are both rhythmic in nature, as is music. Connecting these to a story or gameplay activity taps into an innate sense of drive, giving a sense of propulsion to a dramatic sequence.

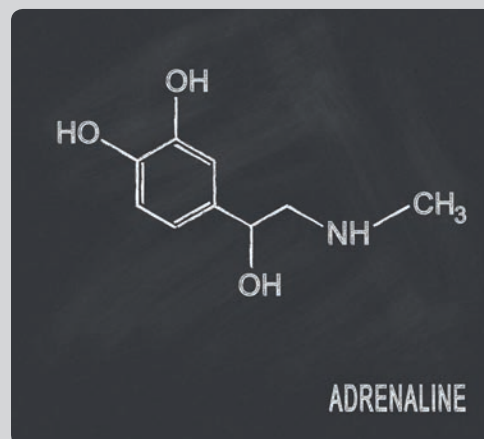
Another way music propels action is by providing through-narrative or, in other words, by attaching an emotional meaning to the visual action. Music can take a horrific scene of battle and make it feel noble, heroic or tragic.

The action-propelling function of underscore can also help to carry an audience through mundane

PEEK BEHIND THE CURTAIN

Music Score as Adrenaline

Many times developers will hire me to add an adrenaline rush to the game. I like to go back to the early twentieth-century Russian masters for my inspiration—Stravinsky, Prokofiev, Shostakovich. The non-traditional orchestral techniques they pioneered are incredibly effective at provoking fear, fire and unease in a listener. I call on them generously in my work!





stretches of visual slog. In the movie *Ben Hur*, several minutes of film are devoted to watching a group of men row back and forth while confined to the galley of a Roman ship. Although the editor worked in many cuts to show different angles, close-ups and otherwise inject variety into the scene, without music it remains several minutes of seeing men push wooden sticks back and forth. An old adage comes to mind about watching paint dry . . .

Enter the music score. Miklos Rozsa propels the action forward with a relentless piece built on trombones and low strings. The music matches the rowing speed as the hortator hammers out the tempo. The pace of rowing quickens as the scene unfolds. The music synchronizes with the action beat for beat. Counter motifs in the cello rise and fall against the driving repetition of the score, like so many waves crashing against the hull. The score and scene are mesmerizing together, almost hypnotic in their combined effect upon the mind. This action-propelling function of underscore completely transforms the experience. A scene which would otherwise be tedious becomes riveting instead.

Providing Contextual Clues

Contextual clues connect something an audience is currently experiencing with something else they need to understand outside the boundaries of the current scene. Underscore often offers this function through the use of leitmotif, a musical phrase tied to a character, location or other important element of the drama. In Peter Jackson's film *The Fellowship of the Ring*, the score by Howard Shore performs this function throughout. When the One Ring is picked up, the underscore offers a hint of Sauron's sinister theme. When Frodo stops to gather strength or perspective by reflecting on his homeland, the Shire melody returns. When the Uruk Hai are coming, Saruman's industrial war-complex leitmotif plays to alert the audience and trigger their bodies' ACTH response (see *Heightening Emotion* above).

Contextual clues can also be provided through instrumental palette choices. Just as the use of an establishing shot was discussed as a visual tool, so the composer's instrumental palette can clue the audience to time and place through music. As a case in point, consider that any pure nature scene (no manmade elements) is historically neutral. Similarly, many fantasy game levels could be interpreted through any number of cultural filters. The selection of instruments used in the underscore can provide useful contextual clues about dramatic framing, time period, culture, etc.

Enhancing the Aesthetic

Aesthetic is a human judgment of input from the surrounding world, with a resulting appreciation for that which is esteemed to fit a pleasurable ideal. The natural senses and developed sensibilities can respond with deep satisfaction to that which charms a person's aesthetic. Food, art, clothing, architecture, furnishings, automobiles and entertainment are all evaluated in part based on their aesthetic appeal. Even a person's initial response to another human being is influenced by aesthetic.

AESTHETIC APPEAL



The smell of cinnamon rolls baking in the oven. Ocean surf pounding against a rocky shoreline. A gentle touch on soft skin. A fiery sunset. Miles of tall, green trees. Each of these reach the human sense of aesthetic. Entertainment, like nature, offers a staggering array of flavors for the consumer. There is something essential to our humanity about an appreciation of shape, color, form, cadence and so forth. Entertainment may be judged as boring, thrilling, offensive, touching, engaging or otherwise based largely on its aesthetic appeal.

Given its pervasive reach, little wonder directors and producers of visual media devote such significant resources to developing what they believe will be an appealing aesthetic for their products. Actors and actresses are chosen in part based on their good looks. Art direction is meticulously contrived to convey a discernible style which audiences can detect, connect with and respond to. Camera placement and movement, color correction, pixel density and many other factors are scrutinized for their contribution to the overall aesthetic of the final product.

With the notable exception of opera and musical theater, the music score typically arrives at the end of this process. At that point, the essential aesthetic of a production is generally well established. The function of the music score now is to enhance the existing aesthetic. For example, long shadows and Dutch angles in a horror game are enhanced by using dissonant harmonies and abrasive textures in the underscore. The bright colors and clean surfaces of a commercial for bathroom cleanser are enhanced with major chords and bouncy rhythms. In this function, music enhances the existing aesthetic, rather than trying to supplant it. The music score is always in the service of the visual content.

Contributing to Structural Unity

Structural unity has to do with the harmoniousness of individual components to an overarching main idea. The greater the cohesiveness of all contributing factors to a central point, the greater the structural unity. This includes the interplay of both micro and macro elements, as well as considerations of within and between. Macro elements may include geographic locations, set pieces or world designs. Micro elements run the gamut from rivet patterns on machinery to minding the axis of action. Within and between are best understood as within the same production (for example, acts one through three of the same play) and between different but related productions (sequels, expansions, etc.).

Music can help connect the dots between all of these disparate elements in at least three important ways. First, by matching the visual aesthetic. Second, by keeping an appropriate continuity with the emotional narrative. Third, by maintaining cohesiveness within the score itself. A brief look at each follows.

First, music contributes to structural unity by matching the visual aesthetic. Cultural connections offer an obvious way in which music can match a visual aesthetic. Consider a jungle setting. Structural unity between the visual and the music would typically call for tribal rhythms, ethnic woodwinds and chanting of some kind. Does this mean all jungle narratives will end up having the same score? Of course not. As

a case in point, the alien jungle of *James Cameron's Avatar* and the prehistoric jungle of *Peter Jackson's King Kong* drew out very different scores from their respective video game and film composers. Though all four scores include tribal rhythms, ethnic woodwinds and chanting, each has its own distinct aesthetic which matches its respective visual content. Consider that the uplifting chant for *Avatar* is lyrical, fully orchestrated, tightly performed by a female chorus and lightly South American in its flavor. By contrast, the chanting provided for *King Kong* is vicious, primitive and accompanied only by furious drumming. Even though both approaches match their respective jungle-themed visual aesthetics perfectly, they could hardly be more different from each other.

Matching the visual aesthetic can also be accomplished through stylistic mirroring. The bright and playful sound of *Super Mario 3D World* is a perfect match for the game's primary colors, bouncy action and innocent gameplay. On the other hand, a futuristic cityscape may find its stylistic mirror in a purely electronic score. Thus the intuitive pairing of Giorgio Moroder and Skrillex for Disney's 2015 *Tron* video game.

Second, music can contribute to structural unity by keeping an appropriate continuity with the emotional narrative. Emotional narrative is the subtext, the path along which the director or designer intend to take the audience's feelings. To cite an archetype, consider the romantic comedy. Two people meet and begin dating. Some kind of conflict/misunderstanding/event-out-of-their control breaks them apart. Overcoming some weakness/challenge and gaining understanding brings them back together. The emotional narrative follows a simple path, similar to an uppercase letter "N". Things look up, then they go down, then they go up again. In the end everything works out, a modern equivalent to happily-ever-after. Effective music in romantic comedies supports this structure, tending toward pleasant and hopeful without ever taking itself too seriously. This kind of score matches the emotional narrative and contributes to the overall structural unity of the film.

Third, music can contribute to structural unity by maintaining cohesiveness within the score itself. Recognizable form, such as theme and variation, is an effective application of this principle. The sustained use of Marty O'Donnell's iconic theme throughout the Halo franchise comes to mind. Each time this theme plays, the player is instantly connected to their memories of the game and their experiences in that universe. Themes are powerful tools for building continuity between a production and the audience.

Another manifestation of cohesiveness in the score and its contribution to structural unity is through stylistic continuity. A score should sit within its defined stylistic



STRUCTURAL UNITY

Hulu's 2009 Super Bowl commercial featuring Alec Baldwin (www.youtube.com/watch?v=W5j961bMrfl) playfully mocked every cliché about the bad effects of television and turned them into selling points. The music score also hit a grand slam in terms of structural unity.

1. *Matching the visual aesthetic.* The commercial's visual setting is a direct knock-off of the *Men in Black* HQ. The music score takes on the same cryptic playfulness of the MIB movie scores, offering an effective connection to the visual setting.
2. *Keeping continuity with the emotional narrative.* There is a duality in this emotional narrative. At one level is the MIB parody, with the idea that television is a secret alien plot to create mushy, edible brains. But at another level, it portrays a smug friskiness through the alien spokesman's matter-of-fact mocking commentary. The music dances at both levels, offering enough wonder and suspense to support the alien plot, but also bouncing around with enough mickey-mousing motion to suggest the cartoon-like premise.
3. *Maintaining internal cohesiveness within the score.* The score retains its palette and personality from top to bottom. Celeste backed by orchestra runs throughout. A harmonic motif of minor triads moving by half steps opens and closes the spot. Start-and-stop scoring is continuous. With consistent palette, harmony and scoring approach, the music remains internally consistent. The structural unity of the spot is supported by the score every step of the way.

parameters, whatever they may be, in order to retain its cohesiveness. It is almost easier to make this point by considering its opposite. Imagine the sense of disconnect an audience could feel if a film score were divided into thirds—Alexandre Desplat takes the opening act, Trent Reznor scores the middle and Alan Menkin brings it home!

There is an additional form of continuity in media that is more logistical than philosophical. Games sometimes pause to load the next level. Films may have flashbacks, montages and edit points. Plays have scene changes and intermissions. There are any number of operational limitations that can cause an interruption or shuffling of the narrative flow. In quality entertainment, every effort is made to minimize such disruptions of continuity and their impact.

Music score is an element that can ameliorate such moments of interruption or discontinuity. "Music can tie together a visual medium that is by its very nature, continually in danger of falling apart."⁷ By playing through load screens and across scene changes, music can mask disruptions and help keep the consumer engaged. Music can also provide a through-thread that links disruptions in the dramatic flow to overarching themes or previous connections.

Score gravitates to moments when narrative continuity is the most tenuous, to points of linkage on which the narrative chain depends: the transition between sequences, the flashforward and flashback, parallel editing, the dream sequence, and the montage . . . Music [score] responds to potentially disruptive shifts in space and time with its own continuity, often in the form of continuous playing and frequently through reliance on extended melody.⁸

CONVENTIONAL TOOLSETS USED IN MUSIC SCORING

Each of the music scoring functions examined above inform a composer's purposes. They define the end. But what of the means? What resources are available to the score composer to facilitate his success in generating music to fulfill those functions? Attention now turns to an initial exploration of several conventional toolsets at the composer's disposal.

Palette

The **palette** for a particular score is defined as the collection of tonal colors and sonic textures utilized in that score. Palette includes a broad range of variables, including whether to use acoustic or electronic instruments (or both), ensemble and/or solo instruments, performance ranges, recording approach and mixing style. Anything which impacts the tonal color or sonic texture of a score becomes part of the palette of that score.



Palette is the first toolset many professional composers will grab when beginning a new score. Ramin Djawadi, composer for the television series *Game of Thrones*, is one. "At the beginning of each project I like to create a palette of sound for that particular project."⁹ Beginning with the palette selection helps to set up another type of framework

PEEK BEHIND THE CURTAIN

Structural Unity in LOTR Music



In 2001, Vivendi-Universal Games announced their license from Middle-earth Enterprises (formerly Tolkien Enterprises) to develop video games based on the writings of the late J. R. R. Tolkien. Preserving the integrity of the IP was a contractual priority in the license, manifested in the hiring of a franchise Music Director, a franchise Design Director and a franchise Art Director. These directors were tasked with creative vision and guidance for five different development studios in four different states working on six different games. I was hired to be the Music Director. My mandates were to preserve quality, authenticity and continuity.

I needed a strategy to ensure the structural unity of music scores to the original source material and across all the different games. I had spent several years studying the Tolkien works, and had a good handle on the story, setting and characters. But to ensure structural unity in the music, I needed much more than that. I needed source data about music in Tolkien's

PRINCIPLES

world. I resolved to go meticulously through each book, making note of every reference to music, instruments, song, voices, sounds—even registering the impact of music and sound on the surrounding world. I found hundreds of such references and inferences in the literature. After culling them from the books, I correlated each reference by race, so that we would know authoritatively what kinds of instruments Hobbits played, what constitutes the vocal range of a Dwarf, and how Elven singing can effect people and surrounding environments. These findings were codified in a detailed document called the Tolkien Music Style Guide. Everyone working on music for these games received a copy.

Lord of the Rings is such an iconic fantasy creation. All of the music had to be just right. I began to wonder if even a thoroughly researched Style Guide would be enough. To prevent a proliferation of incompatible scoring approaches, I felt I should take the strategy one step further. We needed thematic continuity as well.

With this determination, I created a cycle of themes for the key races highlighting important locations in the lore for each race. The themes incorporated and embodied all of the authoritative references and resulting creative direction outlined in the Style Guide. These theme cycles became audible musical examples of the Style Guide's textual directives. Every development studio received finished mixes of the theme cycle for each race, plus extensive stems and underlying MIDI files.

The music was well received. VUG registered over a million downloads of the themes from its website. That was back in 2004 when a million downloads still meant something. But more than popularity, the continuity we crafted helped to keep all of the games orbiting around an authoritatively based musical center. I'm happy to report that the themes have held up remarkably well. In 2012, I composed a new score for the *Riders of Rohan* expansion to *Lord of the Rings Online*. Parts of this expansion put players in the roles

within which creativity can find expression. It also boosts productivity.

Convention often informs the composer's choice of palette. Audience expectations are well developed from years of media immersion. Recalling the auditorium exercise of chapter zero, music students tended to call out ideas for a score's palette first. Perhaps palette choices are the most easily recognizable and quickly envisioned components of a score. For example, in looking at an image of an ice planet, it may be much easier to recommend bowed cymbals than it would be to select specific notes for a fitting melody. Likewise, a rainforest scene calls to mind ethnic woodwinds and tribal drums more readily than a specific tempo or metric. Cultural expectations regarding palette come quickly to mind and are deeply ingrained. The wise composer will take advantage of these expectations.

Orchestration

Closely aligned to a composer's choice of palette is how the selected palette is utilized to bring color and character to the composition. Students will find that orchestration is meagerly defined by mainstream dictionaries. Most say only that it is arranging music for an orchestra or band. Certainly at the most elementary level, orchestration is that. But it is so much more than just that. As described by Samuel Adler in his book, *A Study of Orchestration*, "Orchestration and instrumentation . . . illuminate many important areas of music. After all, texture and timbre clarify the form as well as the content of a host of compositions. Furthermore, specific orchestral colors and even spacing of chords in the orchestral fabric give special personality to the music."¹⁰

For the score composer, **orchestration** involves the clothing, coloring and articulation of the score's components across all the available timbres of a selected palette. It may be instructive to compare a piece of music to a bare store manikin. Think of the head as the melody, the body as harmony, arms as counter melodies and ornamentation, and the legs as rhythm. In its bare state, the form and shape of the manikin are clearly discernible. But think how dramatically the impression is changed by clothing the manikin with a bright Hawaiian shirt, colorful shorts and a straw hat. For a contrasting look, change the color of the clothing to black, add dark sunglasses and remove the hat. The effect is markedly different. Many such transformations may be imagined. In each case, though the manikin itself is exactly the same, the impression is significantly altered by how it is clothed, colored and articulated.

of Frodo, Sam and Boromir, so I went back and quoted from the original theme cycle. The players loved it. My personal email inbox and the game's online forums lit up with bubbly comments from players who recognized the themes and felt the connection to their previous LOTR gaming experiences. Oh, how the human mind craves effective continuity and responds to it!



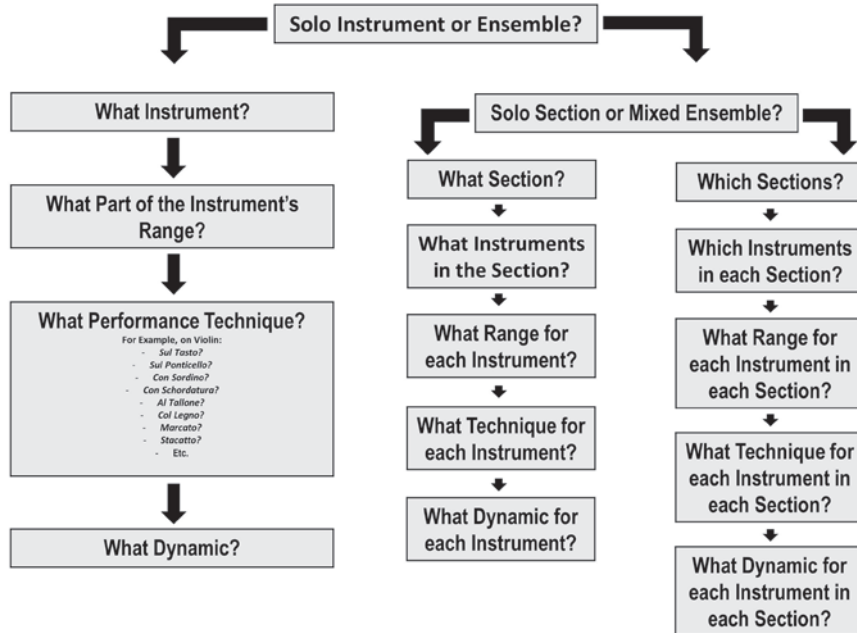
So it is with orchestrating a music score. Choices of instrumentation, range, voicing, dynamics and articulations all have a significant impact on how the body of music is perceived. Consider that Alexander Courage chose to introduce his ten-note fanfare for the television series *Star Trek* with a French horn section, repeated in

modulation by the trumpets. It could have been introduced by tuba and repeated by a bassoon ensemble instead. Although the notes, rhythm and harmony would have been unchanged, oh what a different impact that particular orchestration choice would have had!



Orchestration is a big job. There may be thousands of large and small orchestration decisions involved in a major music score. Even if the palette is small and specialized, such as a zydeco band, there are still many decisions to make. Which part of the rhythm goes to the washboard and which to the drummer? Will the accordion harmonize against a guitar melody, or vice versa? Will they switch roles? How, when and in what manner will the fiddle play? Probably the only question that doesn't need much consideration is whether the bass part will be played by the bass player.

Spreading the score across a full orchestra multiplies the composer's options exponentially. For a simple exercise, consider the following twenty-plus questions that need to be considered and answered to make even the most rudimentary decision for a single orchestral scoring cue: "How shall I introduce the melody?"



Harmony

Harmony is created by sounding two or more simultaneous but differing pitches. Pitches may be combined according to long-established or evolving conventions. Early classical harmony developed combinations of three pitches, or triads. Such triads include the tonic, third and fifth notes of a scale. Later classical harmony added the seventh. Jazz harmony expanded by allowing increasing numbers of simultaneous pitches and altering combinations of chord tones by half steps one way or the other (flat 5, sharp 9, etc.). Twentieth-century harmony went even further by creating large and unconventional note combinations referred to as polychords and clusters. All of these combinations and their resulting effects are available to the score composer.

As palette conventions are shaped by cultural expectations, so harmonic conventions are shaped by biological expectations. Simply put, humans are wired to respond in predictable ways to given harmonies. Researchers at Cornell, Tufts and McGill Universities have demonstrated specific and measureable physiological

ORCHESTRATING REVIEWS



Critics had a lot to say about the original video game score for *Peter Jackson's King Kong*. There was so much in the press about the game's music that it became possible to correlate multiple reviewer remarks with the specific score tracks they were commenting on. During this correlation it was discovered that adjectives selected by the critics could be reliably connected to specific orchestration techniques. The same pairings popped up again and again. Here are ten examples:

<i>What They Said</i>	<i>What It Means Musically</i>
Exciting	Rapid contrapuntal lines
Sumptuous	Added sevenths and ninths in the string choir
Atmospheric	<i>Sul tasto</i> , polychords, clusters
Menacing	Sharp dynamics in the low brass
Eerie	<i>Sul ponticello</i> , tremolo
Foreboding	Suspensions, low brass, low strings
Sweeping	Arpeggiated strings, unison lines, glissandi
Expressive	Effective dynamics and typecasting
Relentless	Repetitive lines against changes
Epic	French horns and classical choir

changes occurring in response to musical harmony which match the body's reaction to fundamental emotional states. For example, people experiencing sadness will evidence a lower body temperature, decreased skin conductivity, elevated blood pressure and a slowing pulse. When exposed to minor harmonies, test subjects evidenced the same physiological readings as those who experienced real sadness. Major harmonies produced respiratory changes and limbic system responses identical to happiness. Dissonant harmonies increased pulse rates and lit up areas of the brain associated with fear.¹¹

Future studies may find comparable correlations between more complex chords and additional emotional states. Mirrored physiological responses may even be discovered for progressions of harmonies. Composers and academics will no doubt benefit from additional scientific inquiry in the years ahead, yielding new evidence and findings to better explain the interplay between harmony and human physiology.

Meanwhile, one thing is clear. Harmony provides the composer with a direct path to the human nervous system. Such powerful, biologically ingrained connections are a composer's gold mine. They are also risky to ignore. Composers making selections against the grain of these conventions should only do so with careful consideration and deliberate purpose.

Rhythm

Rhythm is reflected in the speed, pacing and pattern of beats in a musical composition. Rhythm also exists in the speed, pacing and pattern of visual content. Of all aspects of a score for visual media, most careful attention must be given to rhythm to ensure that it acts in the service of the scene. Film composer John Williams has said, regarding rhythm, “My own belief is that the first and most important issue in scoring films is tempo. If the music is quicker than the editorial rhythm it may seem to slow the film down, and the reverse is also true. You need to get into the rhythmic ‘pocket.’ We know we’ve got it right when it’s riding with the action in an effortless way.”¹²

Rhythm also connects with human biology in ways the composer can take advantage of. People experiencing sadness are slow and sedate, listless even. Music scoring which imitates this slow rhythm can match the feeling. Happiness and excitement rev up the emotions with energy. Music scoring imitates this with energetic rhythms. The connections are scientifically proven.

Melody

There is a charming saying ascribed to Oklahoma songwriter Woody Guthrie. It goes something like this, “Don’t sing me a sad tale about your momma. Sing me a happy tune.” When one thinks of singing a happy tune, they think of melody. When one thinks of whistling a tune, they think of melody. When someone complains about a song stuck in their head (“*It’s a small world after all, It’s a small world after all . . .*”), melody is always the culprit.

Melody is a succession of individual notes that form a phrase, a pattern or a musical sentence. Melody is



GUEST LECTURE CONJURING FEAR

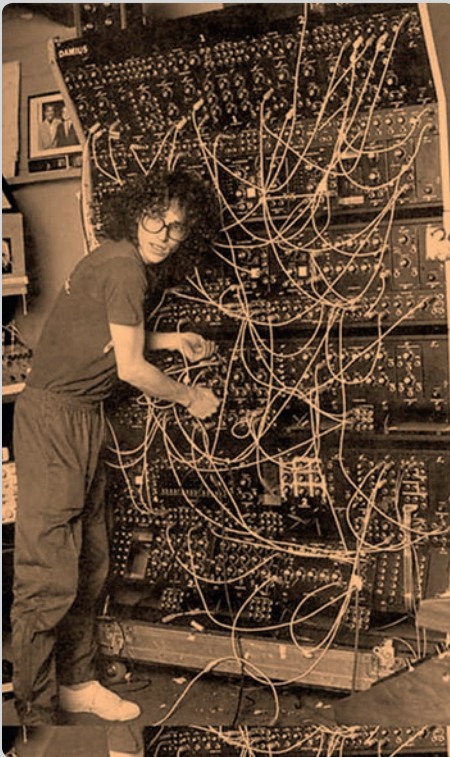
Jason Graves
(*Tomb Raider, Dead Space*)

Music is all about emotion, and fear is a very powerful emotion. So what scares us? More often than not it’s simply the unknown—the masked figure, the shadow in the hallway, the shark fin on the water. As a composer, there are very specific things that evoke fear. Anything that the human ear relies on for stability and a “home base”—specific key centers, constant rhythms, familiar sounds, even the very structure of written music—can be twisted and harnessed to throw the listener off guard. Randomness, otherwise known as “chance music” or aleatoric music, is often engaged. I try especially hard to create sounds that are unrecognizable and unfamiliar, very much along the lines of classical composers such as Krzysztof Penderecki and György Ligeti, who are the true pioneers in aleatoric music.

PEEK BEHIND THE CURTAIN

Manipulating Emotion

While the player is playing the game, a great music score is playing the player. Being a video game composer is like having access to a vast array of switches, knobs and sliders to seduce and manipulate the player's emotions, drawing them deeply into the experience. Harmony is probably the biggest knob on the panel. I use it relentlessly to manage the player's feelings. For any composer who wants to give each player the richest, most immersive and impactful experience possible, harmony is the perfect partner.



always monophonic. It may certainly be harmonized by one or even hundreds of supporting parts. But the melody is a musical sequence of specific pitches which could be sung (in some octave) by the human voice, the original monophonic instrument.

Tying a discussion of melody to the human voice is not only metaphorically instructive but may also be existentially revealing. The brain appears to latch onto melody similarly to how it latches onto a person's voice in conversation. This is not surprising. In thinking of music as a language, melody is that component which most closely resembles the rise and fall of human speech. It could be that because of this resemblance, the brain processes melody as it does speech, as if the melody were conveying the important rational information of a piece of music, or the facts. Thus, those parts of the brain which have evolved to interpret and capture important facts become most engaged when exposed to melody, improving recognizance and recall. It is only a hypothesis, but it is interesting to note how fiercely the mind locks onto melody. Perhaps future research will uncover more that can clarify the correlations between melody, language and physiology.

Theme

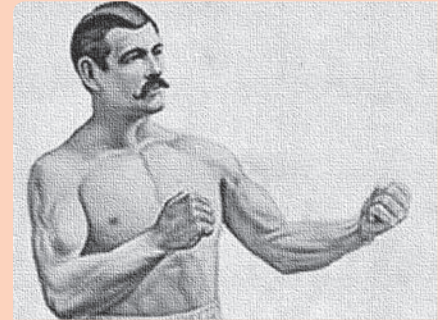
One specialized use of melody in music scoring is the theme. A melody becomes a **theme** when that melody is tied to a particular character, setting, dramatic situation or overarching idea. Themes provide contextual clues and reinforce struggles, conflict, payoffs. They are memorable, or become memorable through meaningfully targeted repetition.

In EA's *Monopoly Streets*, an energetic and infectious theme introduces the game and underscores the menu while players set up options and choose their characters. It is an exciting and catchy tune, portending good times to come. Versions of the theme repeat at strategic moments in gameplay to reinforce this feeling, such as when a player passes "Go" and whenever they earn a monopoly. When a player finally wins the game, their character is lauded on a victory stand accompanied by a full-blown celebratory version of the theme. The theme sets up expectations from the very beginning of the game, then delivers on those expectations throughout the experience to give the player a series of recurring and connected emotional payoffs, culminating in the climactic payoff of winning the game.

A character theme, also known as a leitmotif, can be equally effective. By evolving a character's theme across their story arc, the music heightens the emotional experience for an audience following along and identifying with a character's journey, struggles and ultimate endpoint. In the Broadway musical *Wicked*, composer Steven Schwartz introduces an ambitious, aspiring leitmotif for Elphaba which he refers to as the "Unlimited" theme.¹³ "Come with me, think of what we could do together," Elphaba says to Glinda, as her voice takes flight on the theme, "Unlimited, Together we're unlimited, Together we'll be the greatest team there's ever been." This melody returns during the song, "The Wizard and I" as the story unfolds and the witches' paths diverge. Elphaba's story is noble and tragic, as her ambitions fade and her trajectory veers wildly from early dreams. The theme makes its final tentative appearance as she sings in the end, "I'm limited. Just look at me, I'm limited." This recurring melody, this theme for Elphaba, adds a unifying thread to the musical and brings the character's story arc straight to the heart.

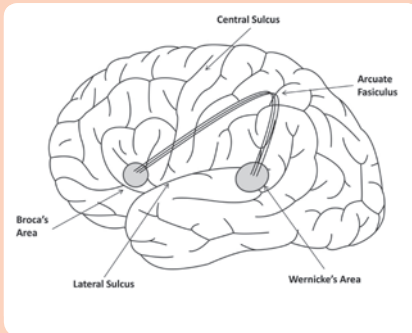
A great theme is a nifty memory hook for human emotions. When the players experience a great moment in the game and that moment is simultaneously underscored by a riveting and memorable theme—the moment becomes magical, a

RHYTHM AND HARMONY



For today's score composers, rhythm and harmony are the music scoring equivalent of "the old one-two punch". Rhythms reinforce the body's biological responses to harmony. Some of the scientific research cited earlier about harmony also mentioned rhythmic stimuli. Not surprisingly, similar results were discovered. Slow rhythms reinforced the body's reaction to sadness. Upbeat rhythms have a predictable correlation to happiness. And so on. Because of their immersion in the scoring language for many years, most music students and young professionals already know this intuitively.

MELODY TELLS THE STORY



Melody may be considered as the storytelling device in music. For a given musical composition, melody takes the role of narrator. It has been postulated that melody engages those parts of the brain that filter, process and retain language (shown above). Thus the phenomenon can be widely noted that melodies remain in the minds of even the musically untrained. Further research is needed to confirm and codify the correlation.

seminal memory that the player never forgets. Places like Azeroth and Middle-earth don't really exist. But fear, longing, nobility, striving, honor—these do exist. The composer's job is to underscore these feelings at the right places in the game so the player becomes immersed in those emotions. The game is just a fantasy, but the emotions called forth by the theme are very real, thus impressing the experience indelibly upon the player. It could be said that the video game score composer's job is to find and awaken the real within the surreal.

Having a theme alone won't ensure magic. It must resonate with zen clarity, or as John Williams once said, it must sound "inevitable". A great theme should also be deployed just enough throughout the game, but not too much, and in the most impactful context.

Genre

When a particular recipe of ingredients selected from among palette, orchestration, harmony, rhythm and melody yields music of a distinctive and serviceable flavor, that combination of choices can create a musical *genre*. Genre is a French word meaning kind, sort or style.¹⁵ The word genre may be used interchangeably with the word idiom, as presented in the previous chapter on language. When used in music scoring, genre can represent a template of musical components available to the composer again and again to reliably score visual content of a matching style.

Scoring genres come into the professional consciousness when musical and visual elements combine in some distinctive way that resonates with a broad audience. Scoring genres can also come into their own when such a combination finds resonance with a narrow but especially responsive audience. These explain popular genres and niche genres.

Just as there are many different musical idioms, there are many scoring genres. The human appetite for variety is enormous. Diversity of flavor is a hallmark of the natural

world, and a deep source of pleasure and satisfaction. Running in parallel to the appetite for variety is the brain's penchant for categorizing and making sense of variety. Scoring genres are effective musical shortcuts to comprehension.

Think of scoring genres as musical recipes or templates. Or to use another analogy, liken scoring genres to the snapshot function of a mixing console. When a mixer finds a given combination of settings that work well together to deliver a mix of a distinctive color, the snapshot function preserves that combination of parameters for quick and effective use in the future.

SUMMARY

Diegetic music originates from within a scene or a level. It functions as part of the visual narrative. It is more commonly called source music. *Non-diegetic music* has neither a visible source nor is implied in the scene or level. It is generally referred to as underscore. Six conventional functions of non-diegetic underscore in visual media are to *set the mood, heighten emotion, propel the action, provide contextual clues, enhance the aesthetic and contribute to structural unity*.

Robust and reliable toolsets are available to help the score composer deliver on the conventional functions required for visual media. They include *palette, orchestration, harmony, rhythm, melody, theme and genre*. Both human physiology and cultural bias inform the meaning and effectiveness of choices made using these toolsets.

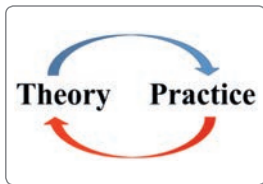
There is no need to reinvent the wheel. Scoring fundamentals may be applied in nearly limitless creative combinations to deliver both

GUEST LECTURE LEITMOTIF

Gustavo Constantini,
Professor of Sound Design,
University of Buenos Aires

What is a leitmotif? First things first. Wagner leitmotifs were both a complex form of codification and a way of producing subtle sensations and associations in the listener. It was not mere chance that film music opted so strongly for the Wagnerian approach. According to *Grove's Dictionary of Music*, leitmotif (leading motif) is "a theme, or other coherent idea, clearly defined so as to retain its identity if modified on subsequent appearances, and whose purpose is to represent or symbolise a person, object, place, idea, state of mind, supernatural force or any other ingredient in a dramatic work, usually operatic but also vocal, choral or instrumental." Wagner's flexible way of using musical themes enabled musicians to resolve a lot of problems when films began to include sound. First, to find a structure for organizing musical material. Second, to link characters and situations by means of music. Romantic music entered the film sound field associated with all these technical, psychological and formal aspects, helping narrative film to aim higher. People were aware of the musical code, and the associations with characters and situations allowed directors to delineate and complete plot ideas through sound.¹⁴

understanding and delight. Convention does not inhibit creativity. Used with skill and imagination, it offers a comprehensible framework within which creativity can be concentrated where it will have the most bearing. Rules must be learned before they can be broken intelligently. Music scoring is a rich and powerful language of expression, a masterful tool in the hands of the well-educated and inventive composer.



APPLIED LEARNING

1. Find or cite ten examples of diegetic music (source music), two each from video games, films, television shows, theatrical plays or opera and commercials. Describe the contributing role each plays in the visual presentation. Postulate why the director chose to use source music in each instance.
2. Select a video game, film, television show, play or opera of your choosing. Analyze and describe how the composer addressed the six conventional functions of music scoring outlined in this chapter: *setting the mood*, *heightening emotion*, *propelling the action*, *providing contextual clues*, *enhancing the aesthetic* and *contributing to structural unity*.
3. From the same selection, analyze and describe how the composer used the toolsets of *palette*, *orchestration*, *harmony*, *rhythm*, *melody*, *theme* and *genre* to address and fulfill these functions.
4. Watch or download the short film *Masterpiece* from the website associated with this book. (www.FocalPress.com/cw/Thomas). Using the principles learned thus far, describe in writing the principles, functions and toolsets you would apply in scoring this visual work.
5. Create a mock-up of the score you described in #4.

REFERENCES

1. Secondary source, quoting Werner Erhard, in Lynda Obst, *Hello, He Lied: And Other Truths from the Hollywood Trenches* (New York: Broadway Books, 1996), p. 73.
2. Plato, *The Republic*. Book III, 392c.
3. FilmSound website: <http://filmsound.org/terminology/diegetic.htm>.
4. http://bioshock.wikia.com/wiki/BioShock_Licensed_Soundtrack#cite_note-0.
5. FilmSound website: <http://filmsound.org/terminology/diegetic.htm>.

6. Mona Lisa Chanda and Daniel J. Levitin, "The Neurochemistry of Music". *Trends in Cognitive Sciences* (April 2013), 17(4): 186.
7. Roy D. Prendergast, *Film Music A Neglected Art: A Critical Study of Music in Films* (New York, W. W. Norton, 1992), p. 221.
8. Kathryn Kalinak. "Music to My Ears: Teaching the Soundtrack". *Indiana Theory Review* (Spring/Fall 1990): 9.
9. Victoria Ellison. "'Game of Thrones' Composer Ramin Djawadi: I'm Just Trying to Create Something Magical (Q&A)". *The Hollywood Reporter* (April 15, 2013).
10. Samuel Adler. *A Study of Orchestration* (New York, W. W. Norton, 1989), p. 3.
11. *The Economist*. "The Biology of Music" (February 12, 2000), also available online: <http://www.economist.com/node/329414> . See also Tufts University: <http://ase.tufts.edu/psychology/music-cognition/emotion2009.html>.
12. <http://www.dlwaldron.com/JohnWilliamsbio.html>.
13. Carol di Gieri, *Defying Gravity: The Creative Career of Steven Schwartz from Godspell to Wicked* (New York, Hal Leonard), Chapter 20.
14. Gustavo Constantini. FilmSound website: <http://filmsound.org/gustavo/leitmotif-revisted.htm>.
15. <http://www.etymonline.com/index.php?term=genre>.

