Paradigm Academic Press Art and Society ISSN 2709-9830 AUG. 2025 VOL.4, NO.7



Narrative Migration from Music to Film: A Study on the Cross-Media Function of Leitmotif in *Rebecca* and *Once Upon a Time in America*

Tianlan Wei¹

¹ The Experimental High School Attached to Beijing Normal University, Beijing, China

Correspondence: Tianlan Wei, The Experimental High School Attached to Beijing Normal University, Beijing, China.

doi:10.63593/AS.2709-9830.2025.08.004

Abstract

The leitmotif, a musical device, functions as a cross-media narrative strategy in cinema. This paper explores how leitmotif is applied in cinematic storytelling through Alfred Hitchcock's classic psychological thriller *Rebecca* and Sergio Leone's epic film *Once Upon a Time in America*. Given the discussion on recurring visual motifs, musical theme variations, and audiovisual narrative techniques and other leitmotif's symbolic manifestations in both films, it is found how this device reveals character psychology, advances plotlines, and intensifies thematic connotations.

Keywords: leitmotif, cross-media narrative, film semiotics, *Rebecca*, *Once Upon a Time in America*, nonlinear narrative

1. Introduction

The leitmotif, a creative technique intrinsically linked to specific characters, scenes, and emotions, plays a hand in how narratives unfold through sound. Richard Wagner, a German composer and conductor who is widely known for music dramas, did not invent this concept (Weber and others dabbled in similar techniques), but his epic opera cycle *Der Ring des Nibelungen* elevated it to an art form, where over two hundred leitmotifs were introduced throughout the work, advancing the plot through dual narrative. In a sense, Wagner is universally recognized as the pioneer of this technique due to his systematic innovations and far-reaching influence.

Cinema inherited this secret weapon. When stories jumped from stage to screen, the leitmotif significantly enhances the expression in accordance with cinematic demands. Now this device could fuse with visuals, creating psychological depth no playwright could match. Take *Rebecca* as an example. The recurring "R" insignia paired with a chromatic musical theme creates an omnipresent ghostly figure, constructing the protagonist's psychological repression and identity crisis. Similarly, Deborah's theme in *Once Upon a Time in America* undergoes harmonic, orchestral, and rhythmic variations, mirroring Noodles' nostalgic yearning and disillusionment with the past, thus serving as the emotional anchor of the film's nonlinear narrative. Further research confirms that cinematic leitmotifs preserve Wagner's tradition of symbolic musical themes, while unifying emotional metaphor and story structure through audiovisual narratives.

This study contributes to film narratology by expanding the theoretical framework of leitmotifs through analyses of *Rebecca* and *Once Upon a Time in America*, while focusing on its methodological significance in interdisciplinary narrative research. By examining how and why leitmotifs make a difference in cinema, this paper deepens understanding of filmic storytelling techniques and provides new theoretical perspectives for future researches.

2. What Are Leitmotifs? Start from Der Ring des Nibelungen

Proposed by music historian Wilhelm Ambros, the term "leitmotif" (from the German Leitmotiv) is closely

related to the musical concepts. After analyzing Wagner's operas and Liszt's symphonic poems, Ambros observed how these works achieved structural unity through recurring musical elements, and later termed "leitmotifs" for short, and recurring musical phrase. The concept was further developed by critic Hans von Wolzogen in his 1876 thematic guide to Der Ring des Nibelungen, where he defined the leitmotif as Wagner's signature technique: melodies, harmonies, or rhythms repeatedly associated with characters, objects, or ideas to embed symbolic meaning.

Der Ring des Nibelungen by Wagner has elevated this technique to unprecedented heights. Distinct musical signatures were designed for every character, object, scene, and even abstract concepts, which became a cohesive musical "language". Through this early attempt, Wagner introduced music and drama into an entirely new art form, redefining operatic storytelling.

Specifically, the leitmotif in *Der Ring des Nibelungen* is a musical theme representing both the physical ring and its curse through distinct harmonic tension. First introduced in *Das Rheingold*, this motif is composed of a compact melodic cell built on a diminished seventh chord in E minor, its inherent instability mirroring the destructive nature of the curse itself. Deryck Cooke, a British musician, musicologist, articulated in his book *The Language of Music*, proposes music functions as a language, where melodic contours, harmonic progressions and rhythmic patterns collectively convey psychological states. Given this, in this passage, the inner voices trace a chromatic descent and subsequent ascent through the minor scale, intensifying the musical unease.

On top of symbolic meanings, this leitmotif serves as the cycle's structural backbone. Its metamorphoses across the tetralogy provide audiences with musical signposts to track narrative developments and character dynamics. Through such attempts, Wagner inspired use of characteristic melodies or musical phrases to signal particular figures or objects in the on-stage action; and his leitmotif technique is widely adopted for narration in the films.

With analytical annotations, a detailed breakdown of the Ring's leitmotif notated in the score:

Musical Example 1. Ring Motif from Das Rheingold

The leitmotif changes according to different scenes, yet its core harmonic half-diminished seventh chord structure remains intact, providing an agreed musical theme for the entire opera cycle. This compositional approach epitomizes Wagner's music-dramatic innovation, where motifs function not merely as symbolic tags but as active narrative agents that guide audiences through complex character relationships and plot developments.

Likewise, the "Sword" leitmotif in *Der Ring des Nibelungen* embodies both Siegfried and his weapon Nothung. Built in C minor, its opening lowered sixth interval establishes a profoundly ambivalence between heroic and elegiac. This deliberate tonal ambiguity foreshadows Götterdämmerung's tragic conclusion, echoing Wagner's original conception of the cycle as *Siegfried's Tod (Siegfried's Death)*. Such prescient musical storytelling demonstrates Wagner's mastery of thematic foreshadowing, where motivic variations create dramatic tension.

The leitmotif's second phrase reveals Siegfried's essential feature through its ascending fifth leap to the tonic, then rising further to the minor third. This upward trajectory musically incarnates what philosopher Bryan Magee described as "heroism in its purest tragic form"; in other words, the courage to advance relentlessly despite knowing one's fate. The melodic surge toward the minor third particularly captures this paradoxical blend of radiant bravery and impending doom, sonically mirroring Siegfried's mythology where triumph and catastrophe prove inseparable.

With analytical annotations, a detailed breakdown of the Sword's leitmotif notated in the score:

Musical Example 2. Sword Motif from Das Rheingold

As John Blacking explores the role of music in society and culture in *How Musical Is Man?*, he finds that music operates not as a language to be deciphered, but as a metaphorical device for emotional communication. This expression can be sound and clear when contextualized within specific narrative frameworks.

The leitmotif's minimalist construction is designed for immediate recognition and mnemonic potency, and it has paradoxically created maximal adaptation across art forms. Nowadays, film music scholars have examined how these musical signatures function as cinematic semiotics, analyzing their dynamic relationship with the film as a whole. In cinematic scoring, the leitmotif emerges as an acoustic signifier, representing musical and dramatic elements that debut in opera before cinematic applications. Generally speaking, this narrative migration from music to film indicates leitmotif can be used to enhance emotional impact and provide deeper narrative

understanding.

3. How Does a Leitmotif Relate to the Character Rebecca?

3.1 Explicit Characterization of Rebecca

Rebecca (1940), directed by Alfred Hitchcock, was adapted from Daphne du Maurier's novel of the same name. The film is considered one of the Hitchcock classics for its sophisticated psychological descriptions and masterful narrative structure.

The story follows a young, unnamed woman (played by Joan Fontaine) who meets the wealthy widower Maxim de Winter (Laurence Olivier) in Monte Carlo and quickly marries him. Upon returning to his estate, Manderley, she finds herself haunted by the lingering presence of his first wife, Rebecca. Mrs. Danvers (Judith Anderson), the estate's devoted housekeeper, worships Rebecca's memory, intensifying the new bride's insecurity and unease. As the story unfolds, the audience gradually uncovers the truth about Rebecca, a sham rather than the idealized figure she appears to be. The narrative reaches its climax when Maxim confesses that Rebecca's death was no accident, but the accidental result of a fatal confrontation. This revelation marks a turning point, allowing the new Mrs. de Winter to finally emerge from Rebecca's oppressive shadow.

Rebecca, intriguingly, though never physically appearing onscreen—looms as a pervasive, spectral force between the protagonist and Maxim. Like a ghost, she haunts the young wife's psyche, her presence seeping into every corner of Manderley. The heroine's ignorance about Maxim's true feelings, the nature of his marriage to Rebecca, and the circumstances of her death traps her in a psychological limbo of self-doubt and imagined threats. Hitchcock keeps this tension through symbolic visual language and narrative restraint on purpose, turning Rebecca into an entity felt not just through story beats but through recurring motifs—both musical and visual—that enhances her oppressive aura.

Hitchcock materialized Rebecca's invisible influence through charged symbolic objects in the film. His brilliant semiotic strategy can be seen from the recurring appearance of item, such as personal stationery, lace handkerchiefs, and monogrammed pillowcases, with her embroidered initial "R". Each "R"-marked artifact is both forensic evidence of Rebecca's physical absence and psychological landmines triggering the protagonist's anxiety. Their cumulative effect makes Rebecca more palpably present than any physical portrayal could achieve. Through this, Hitchcock demonstrates how absence, when properly signified, can exert greater dramatic force than presence.



Figure 1. Rebecca's symbolic "R"

However, as a composite art form combining visual and auditory elements, cinema has certain inherent limitations in its expressive means when it comes to presenting static thoughts and abstract concepts. Compared to written language, films struggle to directly convey characters' inner monologues and abstract emotions. Since Rebecca's external actions and psychological activities cannot be depicted explicitly through cinematography, Hitchcock ingeniously uses music as a parallel narrative device, including dialogues, behaviors of other characters, and symbolic musical motifs, to indirectly portray this complex and enigmatic figure. To compensate for this, Hitchcock reinforces Rebecca's symbolic presence through the use of leitmotifs. The recurring Rebecca's leitmotif consistently paired with visual imagery, in which this symbolic representation is fully realized both visually and aurally. This audiovisual synergy strengthens the semiotic persuasiveness, while further elucidating its metaphorical connotation in the psychological state of the female protagonist.



Musical Example 3. Rebecca's Leitmotif

The *Rebecca*'s leitmotif is specifically constructed from ascending and descending chromatic progressions as shown in Musical Example 3. This chromatic melodic line, supported by equally chromatic harmonic language, embodies the haunting, curse-like presence of Rebecca's spectral figure. The chromaticism renders an unsettling emotional effect. In the meantime, through its unstable melodic structure, this musical design hints at the contradictions and complexity in Rebecca's character. Therefore, the motif successfully symbolizes Rebecca herself, and with repetition and variation, it pushes the narrative forward and intensifies the emotional buildup.

As previously mentioned, whenever Rebecca's name is mentioned or objects associated with her are highlighted on screen, this thematic melody resurfaces, growing more pronounced as the story unfolds. In the film's first half, Rebecca is portrayed as an elegant, flawless figure, her marriage to Maxim appearing blissful. However, as the narrative progresses, the audience gradually learns from Maxim the truth about Rebecca's character—a libertine with a demonic nature. This duality is reflected profoundly in the musical transformation of the motif. Early in the film, the motif is presented as a graceful, flowing melody, symbolizing Rebecca's façade of perfection, while in the latter half, dissonant intervals and intricate textures gradually expose her inner darkness and complexity.

The sonic quality of the *Rebecca* motif is performed on the Novachord, an early synthesizer, producing a timbre that is both nostalgic and ghostly. This sound suggests Rebecca's intangible presence, and builds up her lingering image on the characters. Even after her death, the motif lingers like a specter in every corner of Manderley, shaping the psychological states of the heroine and Maxim. This auditory design heightens the film's psychological tension while using musical language to further disclose the enigma and domineering nature of Rebecca.

Moreover, the motif, with distinct intervallic and rhythmic design, implies the contradictions within Rebecca's personality. For instance, its dissonant intervals and complex rhythmic patterns mirror her inner conflicts while musically reinforcing her psychological dominance over Maxim and the heroine. This compositional approach enables the Rebecca motif transcend the simple symbolism; its sonic impact shows her pervasive, unseen presence throughout the film.

2.2 Implicit Characterization of Rebecca

Classical Hollywood cinema uses psychological portrayal of characters in the narration, driving the plot forward. As an essential auxiliary tool in film storytelling, music can profoundly reveal characters' mental states, emotional shifts, and their impact on the narrative, thereby achieving implicit characterization.

Rebecca's Leitmotif recurs throughout the film in various transformed iterations throughout the entire narrative structure. Through variations in instrumentation, tempo, tonality, and textural accompaniment, the composer tightly integrates Rebecca's Leitmotif with the plot development. For instance, in the "confession scene", Rebecca's Leitmotif emerges in different forms, revealing her latent influence in the story.

Scene	Depiction of Rebecca's Leitmotif	Instrumentation	Тетро	Key	Background Texture	Symbolic Meaning
"Everything is over, the truth is revealed."	Increased rhythmic tension	Low strings	Lento	С	Harmonic combination with repetitive single notes	Foreshadows that the revealed truth is about Rebecca, carrying a sense of ominous premonition.
"People think I am the most	Complete statement of	Middle-range flute	Adagio	Е	Tremolo in strings	Highlights Rebecca's

beautiful and glamorous woman in the world."	Rebecca's leitmotif					deception, presenting her as elegant but ultimately insubstantial
"You thought you could defeat me, didn't you?"	Complete statement of Rebecca's leitmotif	Repeated low-pitched tremolos in the piano	Adagio	F# minor	Low-pitched tremolos in the piano and strings	Gradually exposes Rebecca's deceptive nature and reveals her dominance.
"I suggested that I was pregnant, and Maxim couldn't tolerate it."	Motivic transformation	Low strings → transition to high-range section	Andante	D# minor	Ostinato figures in the low strings → intense harmonic texture	Represents Maxim's growing psychological collapse under Rebecca's manipulation
"You hate me, don't you?"	Motivic transformation	Low strings	Adagio	F	Sustained tremolo chords	Marks the revelation of Rebecca's true death.
Maxim's confession about Rebecca's death	Final variation of Rebecca's leitmotif (most intense form)	Low strings and dramatic brass strikes	Adagio	F	Harmonic progression and climactic strikes	Uses deep and intense tones to express the devastating impact Rebecca had on Maxim

Furthermore, the complete Rebecca's Leitmotif further presents its core characteristics. As the melodic line is fluid yet tinged with an ominous quality, particularly in the low-register string section, repetitive figures create a sense of tension heightened by arpeggiated ascending phrases, intensifying the suspense and reinforcing Rebecca's presence.

The harmonic treatment in Rebecca's leitmotif which carries profound symbolic significance takes the second place. To be specific, in its original iteration, the motif employs a minor tonality, and the use of augmented sixth chords imbues the music with instability; which is a direct metaphor for Rebecca's character. Her existence exerts a persistent influence over Maxim and Manderley, an influence that persists even after her death. The film score also utilizes tempo modulation to accentuate the transformation of Rebecca's leitmotif. During climactic moments, the motif's tempo gradually accelerates, coupled with an increase in dissonance, fabricating an oppressive circumstance that mirrors Maxim's breakdown and aggravates the narrative tension.



Music Example 4. The complete Rebecca's leitmotif

The critical turning point in the narrative, also the golden ratio point of the film, is that Rebecca's leitmotif often

resurfaces in varied forms. In particular, when the protagonist Mrs. de Winter enters the boat house and Maxim recounts Rebecca's story, revealing the truth about her death, the shifting music mirrors the escalating tension of the scene. In the first half of the film, Rebecca's motif primarily manifests as a mysterious, lingering melody, with low-register strings lending her presence an eerie and elusive quality.

As the plot progresses, the motif becomes increasingly fragmented with heightened harmonies, rhythms, and dynamic shifts in pivotal scenes to illustrate her invisible yet pervasive control over the characters. The composer applies diverse textural techniques to render Rebecca's leitmotif—such as introducing low strings with timpani in the latter half of the film, creating a rhythmic intensity that underlines Maxim's eventual breakdown and the revelation of Rebecca's sham. In addition to depicting Rebecca's characterization, these musical elements propelled the story forward.

Though Rebecca never physically appears on screen, her leitmotif permeates the entire film as the driving force behind the plot. Those transformations in different scenes have shown her changes from enigmatic and elegant to cunning and manipulative, and finally to its devastating climax. In the film's crescendo, her motif reaches its most dissonant iteration, punctuated by the tremolo of low strings, allowing the audience to viscerally grasp her enduring impact on Maxim and the very foundations of Manderley.

The leitmotif in Rebecca transcends its traditional role as mere musical accompaniment, becoming instead a vital narrative force that breathes life into the story. Rebecca's haunting theme functions as an invisible yet effective storyteller, crafting her enigmatic presence while driving the film's dramatic momentum. Through subtle manipulation of instrumentation, pacing, harmonic color and musical texture, the score paints Rebecca's complex character in shifting hues that reflect the evolving plot. Though never appearing onscreen, this musical embodiment renders her the most unforgettable and unsettling presence as a ghostly specter whose influence permeates every frame in the film.

3. What Does Deborah's Theme Represent in *Once Upon a Time in America*?

This section focuses on Ennio Morricone's score for Sergio Leone's 1984 film *Once Upon a Time in America*, exploring the use of thematic motifs and the unique role of music in shaping the film's temporal structure, psychological characterization, and emotional storytelling. This part analyzes the recurring themes like "Deborah's Theme" and the evocative use of instruments such as pan flute, trumpet, and harmonica, the discussion reveals how Morricone employs variations of leitmotifs to narrate Noodles' lifelong journey of memory, regret, and disillusionment.

Ennio Morricone's Deborah's Theme, the central musical motif of *Once Upon a Time in America*, holds profound nostalgia, lost innocence, and unattainable love. With his distinctive musical language, Morricone constructs an auditory space of memory that resonates with the fragmented narrative, deepening its meditation on time, remembrance, and sorrow.

Composed in E major, Deborah's Theme subverts traditional Western classical associations with this key. While works like Liszt's *Mephisto Waltz* or Charpentier's *Te Deum* often employ E major to evoke brightness, grandeur, or triumph, Morricone cleverly defies such expectations. Rather than infusing the theme with exuberance or vitality, his orchestration and harmonic progression imbue it with a profound melancholy and yearning.



Music Example 5. Deborah' theme (the leitmotif)

At the opening of the composition, the recurring Deborah's Theme emerges through sparse orchestration, with strings delicately conveying the main melody in restrained tones. The slow harmonic rhythm combined with sustained pedal tones creates a sense of suspension, as if the music drifts from a distant, unreachable past. This treatment works in concert with the narrative structure of the film, allowing memories to surface through fragmented imagery and evoking a dreamlike fluidity of time and space.

Deborah's Theme transcends its role as mere character leitmotif; it also represent the emotions of the protagonist

Noodles (Robert De Niro) and his memories. Throughout the film, the theme traverses the 1920s, 1930s, and 1960s alongside Noodles' recollections, strengthening the meditation on time passage and irretrievable loss in the film.

The nonlinear narrative of the film finds its counterpart in the theme's musical treatment. Variations in instrumentation, texture, and harmony reflect the subjectivity of memory. In early flashbacks, the melody appears light and unadorned, symbolizing Noodles' youthful idealism. As the story progresses, the theme grows richer and more dissonant, its destabilized harmonies mirroring his shattered illusions. This musical evolution not only maps Noodles' psyche but also deepens the major tension between past and present in the film.

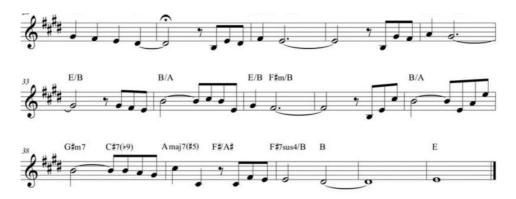
Across the three key eras, namely 1920s, 1930s, 1960s, Deborah's Theme undergoes distinct transformations. These variations chronicle both temporal progression and Noodles' psychological metamorphosis, with each iteration a palimpsest of longing and regret.

The 1920s marks innocence and first love. In Noodles' childhood memories, Deborah's Theme makes its first appearance. Here, the melody is carried by a solitary violin or light string ensemble, its tender timbre adorned with lyrical vibrato to create a dreamlike warmth. This musical treatment symbolizes Noodles' budding infatuation with Deborah and his idealized visions of the future.

The 1930s witnesses disillusionment and harsh reality. As the narrative shifts to Noodles' adulthood, the theme undergoes a transformation. The string textures grow denser, the rhythm deliberately sluggish, while unstable chromatic harmonies seep into the progression—mirroring his descent from innocence into complexity. During the violent car and other pivotal emotional clashes, the theme resurfaces in the lower register: darkened in timbre, weighed down with anguish, sonically amplifying the wreckage of shattered love.

The 1960s sees ghosts of memory and irretrievable loss. By the 1960s timeline, Deborah's Theme no longer appears as a complete melody but flickers intermittently in the background like a half-remembered echo. The orchestration turns skeletal, dynamics hushed to whispers; at times, the theme fractures into brief string sighs, sonically mimicking the remoteness and fragmentation of memory. When Noodles finally reunites with Deborah, the theme returns transposed higher, a gesture of emotional sublimation that paradoxically points out the irreparable void between them.

The defining feature of Deborah's Theme lies in its progressive melodic transformation—throughout the film, the motif undergoes continuous variation, with its orchestration expanding from intimate string solos to full symphonic textures, while its dynamic intensity gradually amplifies. Notably, when the theme reappears in the film's final act, it is performed an octave higher than its original pitch. It symbolizes the elevation of emotions, and at the same time intensifies the sense of unbridgeable regret felt by the characters.



Music Example 6. The Complete Deborah's Theme

In the middle section of the film, Noodles returns to his old neighborhood. Here the theme reappears with richer orchestration. The dense symphonic textures heighten the music's dramatic impact, drawing viewers deeper into his subjective recollections; thereby, the film constructs, with repetitive iterations of this motif, a cyclical memory structure that indicating Noodles' confinement to the past.

Morricone's Deborah's Theme goes more than a character motif. It embodies the very soul of *Once Upon a Time in America*. Its tonal ambiguity, orchestral development, and cyclical recurrence mirror the fragmented storytelling in the film, transforming the music into an active narrative force rather than passive accompaniment. By subverting traditional tonal expectations and applying skillful orchestration to cultivate emotional depth, Morricone conceived a musical idea that simultaneously represents Deborah herself and symbolizes the central

themes: it is an elegy for vanished youth, a lament for relentless time, and a poignant nostalgia for an America that no longer exists.

4. Conclusion

First, leitmotifs function as a cross-media narrative strategy in these films, where visual symbols and musical themes work in concert to establish emotional undertones and narrative logic. In *Rebecca*, the recurring letter "R" and the chromatic Rebecca motif reinforce each other, transforming an unseen character into the central driving force of the story. Similarly, in *Once Upon a Time in America*, Deborah's Theme, through variations in instrumentation and tonality, links Noodles' fragmented memories into a cohesive emotional story.

Second, leitmotifs play an intangible yet pivotal role in characterization. Both Rebecca and Deborah, though physically absent, become fully realized through their motifs' symbolic repetitions. This technique demonstrates the aesthetic value of blank space in film art, highlighting leitmotifs' unique advantage for psychological depth.

Finally, the variations of these motifs serve as metaphors for temporality and memory. In *Once Upon a Time in America*, the non-linear narrative accompanied with each recurrence of Deborah's Theme, such as shifting orchestration, tempo, and tonality, mapped Noodles' changing emotional states toward the past. Such music-narrative interaction elevates leitmotifs beyond mere background elements, making them an integral part for thematic expression.

This study aims to expand the theoretical exploration boundaries of the dominant motivation in film narrative, and also provides some new perspectives for cross-media narrative studies. As we enter the digital-intelligent era, further exploration into the evolution of leitmotifs, particularly their potential applications in interactive narratives or virtual reality film-making, has become both urgent and necessary.

References

- Chion, Michel., (2019). *Audio-Vision: Sound on Screen*, (8), 148-152. Translated by Claudia Gorbman, Columbia University Press.
- Hayles, N. Katherine, (2000). How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics, (1), 47. University of Chicago Press.
- Kang, B. Y., & Xu, L., (2019). Orchestral analysis of the "Gold" leitmotif in Das Rheingold. *Home Drama*, (4), 70.
- Miao, W. W., (2022). On the Relationship between Leitmotiv, Its Variants and Movie Tableaux. *Journal of Xi'an Conservatory of Music*, 41(4), 130-135.
- Ruan, C. S., (2022). The narrative logic and moral logic in *Once Upon a Time in America*. *Procuratorial View*, (1), 98.
- Yan, C. J., (2022). Visit and Ponder on the Past of Life: Once Upon a Time in America. Journal of Humanities Across the Straits, (2), 79-86+163.
- Yang, J. H., (2005). My Opinion Upon The Leitmotiv of The Nibelung's Ring by R. Wagner (Part 1). Huangzhong (Journal of Wuhan Conservatory of Music), (1), 75-84.
- Zhou, S. M., (2012). The symphony of art and philosophy: A brief discussion of Wagner's musical philosophy. *Academics*, (5), 195-200.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).