

# The Cinematic Symphony of Sound: An Analysis of the Music and Sound Effects in "Tenet"

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**Abstract:** This article presents a thorough dissection of the sound design within the film "Tenet," investigating the crucial role of sound in narrative cinema, and how judiciously chosen sound elements can amplify the emotional resonance of a film. As technology has raced forward, film scores have embraced an eclectic mix of musical styles, including neosymphonic, minimalist, pop, and jazz influences, increasingly blurring the lines between electronic music and other sonic sources. Director Christopher Nolan is celebrated for his unique artistic framework and his penchant for non-linear narratives, while composer Ludwig Göransson has infused the score with avant-garde electronic music styles and techniques to articulate the film's complex temporal narrative. The analysis underscores the exactitude in sound selection, the consonance between musical themes and the cinematic story, the alignment of character idiosyncrasies with the temporal and spatial context of scenes, and the indistinct boundaries between sound effects and music. Moreover, by melding electronic music technologies with Wagnerian leitmotif methods, the film is endowed with a distinctive auditory style. The article's ultimate goal is to transpose these cutting-edge creative concepts into the realm of music composition for various media formats.

**Keywords:** Film Music, Film Sound Effects, Cinematic Thematic Motifs.

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## 1. Introduction

Sound serves as a pivotal medium in the completion of a film's narrative, acting as a vessel for the creator's emotional expression and delineating cinema from other art forms. Over a century has elapsed since the era of silent films to today's digital cinema, witnessing incessant innovation in the content of film soundscapes, along with the orchestration of scores and sound effects. Film music has evolved into a diverse symphony of genres, embracing grand orchestral scores inspired by neo-symphonism, minimalism, pop, jazz, and more. With the rapid advancement of technology, the use of electronic means and electronic tonalities in film scoring has become increasingly varied, blurring the lines between them and other sound sources in cinema.

Christopher Nolan, the director of "Tenet," is renowned for his distinctive artistic structure in filmmaking. He is predisposed to disrupt linear thinking, preferring a nonlinear approach to reconfigure scenes. Utilizing a complex interweaving of time and space, interspersed with flashes of reality and illusion, he layers narratives within narratives, compelling audiences to delve into the intricate tapestry of the story and its interconnections. This is evident in "Interstellar's" dimension-hopping nested narratives, "Inception's" dream-within-a-dream montage, and the polyphonic narrative technique employed in "Tenet," which piques a deeper exploration into the plot. In "Tenet," every frame, dialogue, musical score, and sound design is infused with temporal vectors, both forward and reversed in nature. Even in some character names, palindromic techniques are used—for instance, "Sator" as the antagonist's name and "Rotas" as the name of a shipping company in the film's freeport; "Opera" for the opening sequence's theater and "Arepo" as the pseudonym of a forger of paintings.

Ludwig Göransson, the composer for "Tenet," mirrored the film's logical approach in his musical creation, employing

compositional techniques, effectors, special sound treatments, and noise to convey Nolan's complex temporal narrative. His score is characterized by a minimalist yet rich tapestry that defies the conventional symphonism of John Williams or the minimalism of Hans Zimmer's team. Under Zimmer's stylistic guidance, Göransson further embraced modern electronic music styles, enriching the texture with varied rhythms and electronic timbres: he subtly adjusted tempos, broke down rhythmic patterns in alignment with the on-screen emotional tension, granting momentum to the visuals; his restraint in sound choice and track layering, orchestrating motifs without altering their pacing, created a score where chaos and order coexist, mirroring Nolan's desired representation of the film's thematic depth; sharp, metallic timbres introduced a modern technological sensation, a cool soundscape perfectly aligned with the visuals, offering an auditory freshness and avoiding cliché; ambient music provided a non-intrusive backdrop, highlighting motifs in parallel with the narrative, directing the audience's auditory experience; the structured layering of noise, with its varying frequencies and forms, crafted under a stark reverb, imparted a chilling sensation, enhancing Zimmer's foundational score.

Additionally, Göransson utilized Wagnerian leitmotif techniques, assigning distinctive musical motifs to each character or special event in the film, differentiating through intervals, tonalities, sound effects, rhythm, and the use of effectors. In the era of rapidly evolving electronic technology, electronic music has risen swiftly in the media industry, disrupting traditional orchestral arrangements and becoming an indispensable creative mode. This analysis examines the interplay between score and visuals in "Tenet," the exchange and infiltration between sound effects and music, and the fusion of electronic technology with Wagnerian leitmotif techniques, exploring the versatility of electronic music in media and novel approaches to scoring. Through this multi-faceted analysis, the aim is to apply cutting-edge creative

concepts to music composition across various media formats.

## 2. Music and Sound Effects in Movies

Cinema is a byproduct of the advancement of modern industrial technology. Tracing the history of film, it has undergone four significant revolutions: the first revolution materialized in 1895 when the Lumière brothers of France invented the motion picture, thus giving birth to cinema; the second upheaval transpired in 1927 in the United States with the debut of "The Jazz Singer," heralding the era of sound films over silent ones, followed by the synchronization of sound and image a year later, gradually refining the auditory art of cinema; the third revolution was catalyzed in 1935 by the progress of the chemical industry, transitioning films from black and white to color and expanding the screen from standard to various widescreen formats; the fourth revolution occurred around 1990 when digital technology, computer graphics, and multi-channel digital surround sound began to evolve and apply themselves, bringing the artistry of film expression to maturity. In television, radio, and films, sound effects constitute an indispensable part of the narrative, imbuing the visual storytelling with an immersive experience that infuses the films with vitality and an authentic ambience. In cinema, sound effects are categorized into five types: hard effects, foley, ambient effects, electronic sound (effect elements), and sound design effects. The development of the auditory language of film is intimately intertwined with each industrial innovation. The evolution of film music is inextricably linked with the progression of cinema itself, with nearly every revolution in the medium's form precipitating a transformation in the sonic landscape. Currently, cinema is in the midst of its fourth revolution—the digital revolution.

As the demographic of moviegoers trends younger, the latter half of the 20th century saw film music being predominantly represented by popular music, with symphonic music witnessing a decline. Compilation scores, comprised of a selection of existing songs (mostly popular music—especially rock, art songs, and opera), challenged the convention of traditional original scores. These compilation scores were influenced internationally, incorporating a wealth of regional music beyond the West into the compilations, thereby offering audiences new modes of cultural identification. It wasn't until the release of "Jaws" in 1975 that symphonic music re-entered the public eye. John Williams' neo-symphonic style redirected the trajectory of film score composition back towards the symphony. Despite the prevalence of Williams-esque scores henceforth, electronic music remained immensely popular. Since the 1980s, the majority of film composers have had to be adept in both traditional orchestral scoring and electronic music, and with the advent of digital systems, the characteristics of music and sound effects have become increasingly interchangeable, making the techniques of film scoring more diverse. Contemporary film music integrates elements of orchestral, electronic, popular, and ethnic music and has begun to incorporate sound effects and noise into the scores. With the support of computer technology, the use of and fusion between electronic music and sound effects will continue to evolve in film scoring.

Film sound sources are commonly divided into three forms: human voices, music, and sound effects, which are designed to complement and unify with one another. At times, a single element may embody all three qualities, blurring the distinction between voice, music, or sound effect for the

audience. However, in the audiovisual relationship of cinema, there is no distinction made between music, sound effects, and voices. Collectively referred to as the sound sources of the film, they serve as the auditory perception within the cinematic experience. Vocologists believe that there are two principal characteristics within the sound perception system: the narrative space of reality (the real world) and the narrative space of imagination (the artistic space). Yet, as cinema is a multimedia fusion of auditory and visual elements, these two spaces sometimes interweave in the narrative presentation. Music and sound effects can share similar sonic characteristics in certain contexts, and when attributes such as rhythm, form, frequency, and rhythmic patterns intersect, unique sound effects can be elevated to musical elements and coexist in harmony.

The emulation of sound effects in music necessitates the disruption of its intrinsic organized and structured characteristics, such as tonality, timbre, pitch, form, and rhythm, endowing the musical work with distinct aural traits when it undergoes sound effect transformation. In early cinema, sound designers utilized the transient nature of a piano key strike or the glissando of strings as effect sounds, yet these sonically modified musical pieces lacked a comprehensive system, presenting themselves as relatively independent entities akin to sound effects.

The advent of modern electronic technology has shattered the traditional musical confines, including timbre, rhythm, tonality, and instrumentation, thus deepening the exploration of music's conversion to sound effects. Initially, the musical transformation into sound effects was achieved through isolated notes or sequences, aiming for a point-to-point sound design. In today's era of ubiquitous effect processors, through modulation of various live recordings, synthesized sounds, or electronically altered timbres, sounds can serve not only as fleeting effects but also as enduring elements in sound design through myriad transformations expressing unique auditory experiences.

The 1956 scientific film "Forbidden Planet" was the first film score to be entirely realized with electronic music, composed by the duo Louis and Bebe. The film's soundtrack was crafted using magnetic tape without any traditional live instruments. This couple constructed electronic devices such as ring modulators and utilized them to create unpredictable, strange sounds, marking a true revolution in the history of film music. Since then, even the most bizarre sounds could be generated electronically, blurring the lines between music and sound effects.

Music, an organized and patterned series of sound waves, encompasses fundamental elements like pitch, timbre, rhythm, harmony, and mode. When imitating musical notes as sound effects, it's imperative to capture certain characteristics of the notes, such as rhythm, pitch, or a pleasant timbre. These unique sounds, once organized and artistically processed, acquire the capacity to convey emotion as powerfully as music. In films, brief sound effects can blend with the rhythm of music, special timbres as effect sounds can integrate into compositions, and expansive effects can underpin the musical backdrop—techniques that present sound effects with a musicality. Soviet filmmaker Dziga Vertov was among the first to focus on film soundtracks, prioritizing all sounds within a film, not just the music. In his 1930 documentary "Enthusiasm: Symphony of the Donbas," he employed a continuous score, transforming all sounds—including the noise of tractors and other machinery, people's singing and

shouting, and radio broadcasts—into the documentary's soundtrack, a highly avant-garde scoring method at the time.

Following the "Art of Noises" manifesto, there has been a gradual integration of all perceivable sounds into music. The progression of technology and thought has allowed many artistic techniques to be realized through new technologies. The development of digital audio technology has opened up limitless possibilities in sound creation, with film audio increasingly leaning towards an integrated approach. The modulation of effect processors has significantly enriched sound complexity, and through electronic technology, sounds from various live recordings, imitations, and synthesizers can achieve an extraordinary array of aural variations. These sounds exist not only within the music itself but are also increasingly utilized in the amalgamation of the three sound sources in cinema: dialogue, music, and sound effects.

The emergence of Dolby Stereo has markedly elevated the status of film sound quality. Supported by an ultra-wide frequency range and sound field, the rapid development of sound has meant that when audiences experience the audiovisual spectacle, the interaction between the senses is far from a simple sum or equivalent relationship. The demand for a more profound expression of audiovisual details in films and the stimulation and multisensory interaction brought by audiovisual integration have risen substantially.

### 3. Sound Design in "Inception"

The film "Tenet," released in 2020 and directed by Christopher Nolan with a score by Ludwig Göransson, is a science fiction masterpiece. It garnered the 93rd Academy Award for Best Visual Effects and was nominated for Best Original Score at the 78th Golden Globe Awards.

The central motif of the film revolves around the fluidity of time, with Nolan employing a polyphonic narrative technique to portray temporal entanglement. Inevitably, this results in a visual representation of actions that appear reversed due to the backward flow of time. The sound design intricately mirrors this reversal not just in effects but also as a recurring sonic theme, resonating through the music, sound effects, noise, and dialogue.

The film's score is an innovative amalgamation of minimalism, ambient soundscapes, and Baroque imitation, distinctly modern and reflective of an evolution from Hans Zimmer's minimalist style. It is refreshingly contemporary, characterized by an eclectic mix of modern electronic genres such as Techno, Trance, Jungle, Drum N Bass, and Dubstep. These styles, woven into repetitive rhythms and enriched with metallic timbres, instantly evoke notions of modernity, science, darkness, futurism, and cyberpunk in the collective psyche.

The film's sole exterior scene, set against the picturesque Amalfi Coast in Italy, is scored with a unique, Baroque-style piece that stands in defiant contrast to the rest of the music. As the protagonists converse amidst a landscape adorned with castles, mountains, and water, the score delicately weaves a Baroque tapestry with the pizzicato of cellos, electronic sounds imitative of violins, and arpeggiated harp sequences. This tranquil backdrop constitutes the film's sole haven of serenity.

Alongside minimalism, ambient music also plays a significant role in the film's score. This atonal and non-functional harmony sets a backdrop to the narrative and character interactions, using high-pass filters and extensive reverb to craft an atmosphere. These elongated and

functionless harmonic lines, particularly during the portrayal of enigmatic substances and pivotal plot points, captivate the audience's attention to the on-screen narrative. The score subtly integrates traditional strings in the lower frequencies of the ambient pieces, creating an ominous, hollow, and suspenseful effect. As visual information unfolds on screen, corresponding motifs emerge, elegantly narrating in parallel through sound and sight.

(1) The opening of "Tenet" unfurls with a cohort of masked brigands storming an opera house to purloin a briefcase containing an enigmatic artifact, taking everyone hostage. The protagonist, referred to only as "The Protagonist," and his team also covet this mysterious case. However, their mission ends in failure, and for his staunch refusal to divulge information, The Protagonist is entrusted with an even more vital mission pivotal to humanity's survival: to trace the origins of the substance known as "entropy." Under the tutelage of the scientist Laura, he comprehends the nature of entropy—a substance that can invert time—by observing bullets retracting into their gun barrel. He learns that the entire world is imperiled by the entropy sent from the future. To thwart the terminally ill magnate Andrei's collusion with future forces, intent on orchestrating a cataclysm to share his fate with the world, The Protagonist joins forces with Neil, Kat, and their team to infiltrate Andrei's stronghold. Together, they endeavor to obliterate the temporal bomb, crafted from an assemblage of ten algorithms, thereby averting global annihilation.

(2) In "Tenet," the score employs minimalist music and atmospheric sounds, including Wagnerian leitmotifs representing characters. Each motif encapsulates the essence of its subject, like The Protagonist's "heroic" theme, Neil's metaphorical theme, Andrei's character theme, Kat's personality theme, and Priya's neutral stance. The Protagonist's leitmotif—a melodic leap of a third—signifies his "heroic" essence and first resonates when he resolves to join the Tenet organization. This motif, through its echoes and ascending minor third, symbolizes his tentative beliefs and the enigma of future events. Only in the final act, when The Protagonist recaptures the "algorithm" and prevents the apocalypse, does his complete theme manifest, transcending a mere motif. His theme recurs nine times throughout the film, each instance emoting a distinct sentiment.

For instance, in a scene where The Protagonist combats a bodyguard, the score utilizes low electric guitar for a pointillistic effect. The first note coincides with the hammer's descent, and 71 seconds elapse before the subsequent notes, following a similarly punctuated conceptual approach. At Freeport, the motif adopts rhythmic shifts in pitch, rendered with breathy sounds in the mid to high range to present motif A.

The Protagonist's secondary theme bears formal similarity to the first but exhibits more resolve rhythmically and shifts to a major key tonality, often accompanying action sequences, signifying his unwavering spirit and heroic deeds. For example, as he joins the Tenet organization, the mid-range strings follow his primary motif, the visual transition from cleaning a gun to exercising reflects his psychological shift from doubt to determination.

Kat's theme first emerges alongside her introduction, with a minor seventh leap portraying her indecision and fragile nature. The melancholic tone reflects sorrow and bewilderment. When The Protagonist first meets Kat, her theme is played slowly on mid-high strings with no rhythm,

intensifying when she recounts Andrei's atrocities aboard the yacht, evoking tension and fear with its sound.

Upon Neil's first full-face appearance, his electronic motif, with its systematic envelope changes, conveys the waveform and auditory effects seen. This endlessly symmetrical and cyclical sound design in both auditory and visual contexts hints at Neil's origin from the future and his entrapment in a loop. For instance, when The Protagonist first encounters Neil, the score exclusively plays "Neil's" motif, enhancing its distinctiveness and suggestiveness. As Neil discerns the enemy's trap and decides to venture back in time to warn The Protagonist, Neil's thematic sound merges into the rhythm of the grand battle.

When Andrei is first introduced, the accompanying sound design is characterized by the sound of labored breathing. Unlike the steady breaths of normal respiration, it resembles the strangled, pained breathing of someone gasping for air. High-frequency breath sounds within the 2000Hz-8000Hz range create an auditory discomfort, invoking a sense of tension and fear. For example, when the protagonist first encounters Andrei, alongside the reveal of Andrei's face on the screen, the motif of "breathing sounds" intermittently emerges amidst mid-frequency jet-like continuous noise, mimicking the rhythm of normal breathing; during the intense time battle scene, Andrei's sudden return to the yacht is heralded by the breathing sound, signifying his presence; and in the scene where Andrei converses with the protagonist, the absence of music, paired with intermittent but sustained breathing sounds and occasional low-frequency tones, crafts an atmosphere of unease.

Upon Priya's introduction, her theme melody also serves as an atmospheric underlay in the background. The recurring sound structures forming the dominant seventh ninth chords impart a sense of instability, much like Priya's morally ambiguous neutrality. The Tabla, a percussion instrument emblematic of India and matching Priya's nationality, accompanies the music, aligning with the temporal and spatial aspects of the film. For instance, during the protagonist's conversation with Priya in Mumbai, her theme emerges with a sliding electronic tone against the atmospheric music backdrop, while the addition of the Tabla accentuates the Indian temporal and spatial ambiance.

(3) In the score for tense or chase scenes, triplet rhythms are employed across various timbres and sound effects. This triplet rhythm serves three purposes in the film: firstly, it provides a flowing movement with harp arpeggios in soothing moments; secondly, its resemblance to a heartbeat adds suspense, even directly mirroring the rhythm of a heartbeat in action scenes; and thirdly, it facilitates smooth transitions through shifting emphases, which contributes to an unsettling sense of irregularity and accelerates the perception of time in the narrative. For instance, when the protagonist witnesses Andrei's illicit dealings, the first punch he receives is synchronized with eleven sets of triplet heartbeats at a tempo of 160 BPM; in the car chase within the forward-moving timeline, similar to the sound of driving, lengthy noise tones are fragmented and connected through triplet rhythms, leading to the scene where Kate is rescued, blurring the rhythmic meter and evoking a sense of disorder and accelerating temporal flow, heightening the audience's concern for Kate's safety.

(4) In "Tenet," the narrative framework does not follow a singular linear timeline, but instead interweaves between forward and reverse temporal directions. The film extensively

utilizes pitch shifting, reminiscent of the Doppler effect [which is the change in frequency or wavelength of a wave in relation to an observer who is moving relative to the wave source]. This effect is integrated into the score, employing metallic timbres, rhythms, and sound effects modified by volume shifts and subtle pitch variations, suggesting the non-linear jumps between two timelines. This oscillating metallic timbre pervades the film, enriching the narrative with an auditory dimension of depth. For example, during the Freeport heist, the metallic sounds are modulated with sixteenth note patterns and pitch shifts to accompany the unfolding events and emotions; in the climactic temporal battle, the fluctuating metallic melody connects the emotional states across scenes, preventing a disjointed feeling despite frequent transitions; and the long, noisy tones gradually ascending or descending in pitch convey the sense of inverted time, with the ascending noise mimicking the sucking sound of reversal and the descending noise implying a forward movement in time.

(5) "Tenet" centralizes on the intricate concept of entangled time. In its plot and visual design, director Nolan employs a polyphonic narrative approach, while composer Göransson incorporates "inversion" in sound effects, music design, character themes, and the organizational structure of the music, even using reversed sounds as part of the score, yielding a distinctive audio effect. For instance, in the inverted car chase, the protagonist travels back in time through a turnstile, and the scene's visuals represent all elements in reverse (with the protagonist in inverted time and the world moving forward), with no music, emphasizing the reversed dynamics; in the fight scene at the airport, the protagonist's actions, seen in reverse from the perspective of the three characters, are matched with inverted sound effects; during the final battle, the appearance of the blue team, moving through inverted time, is distinctively marked by reversed melodic sound waves, clearly differentiating them from the red team in forward time; and in scenes where both timelines converge in battle, the sound design is appropriately reversed at key moments.

## 4. Sound Design Summary of "Tenet"

The film "Tenet" explores the central theme of temporal peregrination, not only through its visual narrative and structural composition but also through its score. The deployment of various compositional techniques and sound processors not only cues the audience to the film's thematic heartbeat but also establishes a sonic coherence. The earnest collaboration between the director and the composer in crafting the film's auditory landscape elevates the role of music and sound effects from mere supporting elements to pivotal narrative devices, allowing audiences to perceive their indispensable contribution to the cinematic experience.

### (1) Continuity in Narrative

Cinema employs myriad techniques to facilitate seamless storytelling—ranging from character performances and dialogues to voice-overs, *mise-en-scène*, cinematography, and editing. However, one of the most potent narrative tools remains the synergy of music and sound effects. Amidst the film's editing techniques—like montage, flashbacks, slow motion, etc.—which segment the narrative into discrete visual fragments, the film's score establishes emotional continuity through rhythmic alignment or thematic links between the music and sound effects. This auditory coherence renders the visually fragmented spaces unified. For instance, the

transition between frames 12 and 13 juxtaposes an internal and external airport scene, where the continuity of high-frequency noise creates a temporal and emotional bridge between two disparate spatial contexts; in frame 29, during the "temporal warfare" sequence, the rhythmic continuity from the battlefield's percussive beats is mirrored in the metronomic ticking on the yacht, thereby sustaining element continuity and reinforcing visual coherence through rhythm.

#### (2) Emotional Resonance

The music and sound effects in a film can evoke a visceral emotional resonance between the silver screen and the viewer, manipulating the audience's emotions and guiding their response to the visuals. Designers leverage an array of musical elements—like melody, rhythm, tempo, harmony, orchestration, frequency, and dynamics—to steer the emotional reactions of the audience, as well as employing special effect sounds to symbolize thematic motifs associated with characters or events. For example, the character Andrei's leitmotif, indicated by the letter E, is characterized by the suffocating sound of painful breathing, evoking a sense of dread and alertness towards the unknown. In frame 21, the protagonist's rhythmic triplet motif on the highway during Kate's rescue employs syncopation with a shifting accentuation to engender a rhythmic irregularity that conjures a sense of unease, fragmenting and reassembling time auditorily to accelerate the temporal flow of the visuals.

#### (3) Temporal and Spatial Ambiance

In addition to language, attire, and architecture, music also hints at the film's historical context, creating a convincing ambiance of the depicted era. Each epoch and locale harbors its unique musical identity—different scales, orchestrations, rhythms, and harmonies signify the essence of a specific time period. To some extent, music acts as a microcosm of its era. For instance, frame 14's Mumbai scenes incorporate elements of Indian music, while the external shots set in Marbella, Italy, feature a score reminiscent of Baroque European music.

#### (4) Bridging the Silences

The narrative of the film ebbs and flows much like a musical composition, which mustn't be unvaryingly intense. In certain transitions of the story or within specific atmospheres, the use of neutral background music plays a pivotal role in filling the voids—essentially enhancing the scene. Such music can be devoid of strong emotions or large orchestral arrangements, subtly enriching the backdrop and allowing the audience to feel the presence of the music as if it were a mere whisper. "Tenet" utilizes atmospheric music extensively to bridge the narrative gaps, particularly during dialogue. For instance, in Frame 7, as the protagonist converses with Priya, the story progresses into a narrative phase where the background music heightens the audience's focus on the interaction. The intermittent motive F associated with Priya serves as a harmonic function, subtly indicating her neutrality.

#### (5) The Semiotics of Sound

The film's score holds secrets within its motifs, which often correspond to elements within the visuals, be they era-specific, character-based, or psychological. Auditory perception is more acute than visual, and the sound elements that emerge during viewing can link the audience with previously encountered scenes, achieving a synesthetic memory. Each character theme and motif is, in essence, a sonic symbol.

Music and sound effects transcend the constraints of time, space, and the cinematic screen, guiding viewers through the temporal and spatial shifts that the film presents, lending the

narrative a sense of temporality and cohesion. Hence, the sounds in a film possess their own temporal dynamics; they define the visual moments in time and space and make sense of the unnatural elements within the film. "Tenet," with its central concept of time inversion, inevitably includes both forward and backward actions. The composer crafted waveform-inverted sound effects to mirror these motions, creating a suction-like auditory sensation repeatedly used as an aural symbol. For example, the reversed sound effects accompany the inverted time sequences, as seen in Frame 1's theater shootout, Frame 13 where the protagonist fights himself, Frame 22's red-blue room interrogation, and Frame 29's climactic battle. With each recurrence, these auditory symbols enable the audience to connect the sounds to specific visual cues.

#### (6) Psychological Suggestion

When the concept or emotion to be conveyed surpasses what the screen can portray, the director is compelled to omit the minutiae. Music and sound effects often supplement the visuals and provide psychological description, serving the function of a voice-over or metaphor. In such instances, the continuous musical motion or specific tonalities of the score, along with sound effects acknowledged by the collective psyche—such as the heartbeat, stopwatch ticking, and breathing sounds in "Tenet"—induce sensations of tension and vigilance. For instance, the rhythmic pattern of the stopwatch sounds in Frame 25 (inversion) as the protagonist fights his doppelgänger and Frame 29's final temporal battle, are designed to instill a sense of urgency and accelerate the psychological passage of time within the viewer.

## 5. Temporal Representation Techniques

The narrative of the tale unfolds in a cyclical pattern, temporally and plot-wise. To differentiate between simultaneous timelines within the same frame, the reliance on visual storytelling is complemented by a symphony of music and sound effects. These auditory elements intricately guide the viewer through the layers of time within a singular spatial realm. Human auditory sensitivity surpasses that of the visual; the eye must discern spatial details for the brain to comprehend three-dimensional positioning, whereas the ear can instantaneously explore space along temporal points or continuums.

In "Tenet," the portrayal of time's bidirectional flow and cyclical nature is mirrored in the comprehensive sound design. The specific form and structure of the music and sound effects, along with their intrinsic meanings, are intelligible. We can decode the sound design through the basic modules employed by the designers, such as the temporal reversal implied by sound effects processors and the aural strangeness of a suction-like sensation. Regular incorporation of noise textures as a score, the sonic qualities of music as sound effects, and the rhythmic musicality of sound effects—these aspects elucidate the specific meanings within the visuals.

The storytelling focus of "Tenet" lies in the unfolding of the plot and the delineation of timelines. Its score adheres to the film's central motif—the ebb and flow of time, where rhythmic cadence repetitively echoes with the visuals like a canon in staggered timelines, orchestrating an orderly composition amid temporal intersections. This minimalist approach to music sidesteps character emotions, concentrating instead on the movement of the whole and the

timelines, viewing the narrative from a third-person perspective.

#### (1) Reversal of Melodic Sound

One of the roles of music in cinema is to cohere the sequentiality of visuals. In "Tenet," aside from the corresponding visual sound effect reversals, the composer has also engineered a reversal of melody to serve as an auditory mnemonic. Unlike the contrapuntal techniques in classical music, here entire measures are inverted and looped, employed at the film's start and end for thematic unity. This melody appears in a "played-in-reverse" auditory form and is exclusively heard when the visuals correspond to the inverse temporal direction.

Regarding the opera house shootout, the audio effect of the melody's inverted and looped measures, with its suction sensation, dovetails with the visual phenomenon of time inversion. However, the film's audio at this moment is peculiar and intense, instantly cueing the audience to the temporal inversion, thus guiding their reaction to the special visuals. The reversed envelope of "release-sustain-decay-attack" creates an auditory recollection, engraving this unique melodic and inverted motif in the audience's memory, powerfully influencing the narrative technique built upon these mnemonic points.

In the climactic "temporal war," two teams operating on different timelines—the forward-moving Red Team and the reverse-moving Blue Team—confront the adversary. The scene brims with multifarious elements: characters, actions, helicopters, trucks, and diverse temporal vectors—all within a complex setting. In such a chaotic tableau, delineating clear timelines and coherent narrative is paramount.

When the reverse Blue Team appears on screen, their melodic sound also adopts the "waveform inversion" technique to signify the temporal reversal. At a tempo of BPM=95, an 8-measure melodic sequence is played forward, then inverted—a loop that resonates with the Blue Team's counterchronological actions.

The melody introduced at the film's outset, serving as an auditory focal point, is extensively utilized throughout, reinforcing the existence of the inverse timeline with repeated sound effect reversals. These recurrent markers create a strong audio-visual memory, concentrating the audience's attention on the visual trajectory, preventing disorientation amidst the visually chaotic and fast-moving finale. With each appearance of the inverse Blue Team, the music and sound effects switch temporal vectors, alerting the audience to the timeline transitions and presenting a clear narrative.

#### (2) Reversal of Sound Effects

The entire film revolves around the concept of time, within a world of intersecting temporal movements; accordingly, its sound effects have forward and inverse temporal vectors. The application of sound effect reversal is pervasive throughout scenes related to the inverse timeline. In forward-timeline scenes, the natural sound carries a forward vector, while in scenes of temporal inversion, the sound effects are correspondingly reversed. Notably, in frame 23, when the protagonist first traverses back in time via the time machine, everything in his view is reversed—birds flying backward, puddles undeforming with each step, and steam retracting—all indicative of the temporal inversion.

## 6. The Special Application of Sound Effects

#### (1). The orchestrated regularity of noise

In certain scenes, such as Andrei's threatening confrontation with Kat, the score eschews traditional instrumentation in favor of a tapestry woven from noise of varying shapes and frequencies. This sonic landscape is devoid of reverberation, creating an intimacy that is both unsettling and immediate. Segment A features a bass-heavy noise, ranging from 80Hz to 250Hz, delivering a palpable intensity that mirrors the onscreen violence, each strike seeming to reverberate directly within the viewer's chest. Segment B, with its descending tonality from 250Hz to 8000Hz, mimics a wail of agony, while segment C emulates a faltering heartbeat with a low-end rhythm between 125Hz and 200Hz, engendering an auditory illusion of a skipped beat. Devoid of melody or harmonic progression, the composition employs these rhythmic noise elements to conjure a sense of dread and oppression, amplifying the menace of Andrei's assault on Kat.

#### (2). The hyperreality of high-frequency noise

In the cinematic soundscape, fidelity to original sounds is not as vital as the emotional truth they convey post-artistic processing. In the Freeport sequence, the external shot is prefaced by a prolonged roar of an airplane engine lasting 2 minutes and 29 seconds. The high-frequency noise inflicts an aural discomfort and pressure, heightening the viewer's attention. As the scene transitions, the audience is already in a heightened state of concentration, and the sudden alarm further escalates their vigilance. The toxic gas release from the ceiling features an amplified high-frequency jetting noise, which, alongside the persistent alarm, builds tension over the course of 70 seconds. This clarity and proximity of the sound source thrust the viewer into a breathless state of anticipation. The hyperreal quality of these high frequencies provides a wealth of detail and information that significantly enhances the sense of presence, realism, and emotional engagement within the film.

## 7. The Alchemy of Music and Sound Effects in Cinema

As the film's opening credits commence, the appearance of the studio logo is underscored by a crescendo of sound that grows from faint to robust over 40 seconds, introducing the film's title. This segues into the opening visuals—a bustling theater crowd from wide to close shots—finally settling on the orchestra pit. At the conductor's cue, the "noise" ceases. This soundscape envelops the audience in an aura of the unknown, which only becomes clear when the camera focuses on the orchestra pit, revealing the "noise" as the string section's tuning. Whether one discerns the music within the sound depends largely on cultural familiarity; some recognize it as the symphony's opening tuning, mentally conjuring images of a concert hall, while others may mistake it for an electronic sound or even mundane noises like a ship's horn. The composer ingeniously uses the orchestra's tuning sounds as a transitional device for the opening sequence. Leveraging the tuning's similarity to sound effects in terms of independence and elasticity, as well as the suspense wrought by the sustained notes, the escalating 40-second string crescendo gradually directs the audience's gaze from the opening to the exterior and interior of the theater, and

ultimately to the stage, where the story begins with the cessation of the tuning.

#### (1). The Triplet Rhythm of a Heartbeat

The inclusion of a heartbeat sound is a common technique in film sound design, especially in genres requiring substantial emotional color, such as science fiction, action, or horror. Particularly in action movies, a rhythmic heartbeat can elevate the tension. During a scene where the protagonist fights against his past self, the composer has opted for a continuous heartbeat rhythm set at 155 BPM—a pace that borders on discomfort. The heartbeat's introduction notably intensifies the on-screen tension and, devoid of reverb, brings an immediacy to the audience's auditory experience.

As the music evolves and more voices are added, the composer integrates the heartbeat's frequency, timbre, and rhythm into the bass drum pattern, achieving a seamless blend. This interplay between music and sound effects broadens the film's auditory dimension, utilizing similarities in timbre, envelope, and frequency to allow the sounds to imitate and transform one another, creating a richer and more complex audio-visual effect than either could achieve alone.

In a particular fight scene's sound design, the composer first presents a high-frequency sustained note, paired with the intense moment of the protagonist aiming a gun at his future self. The addition of a mid-high frequency stopwatch sound also adheres to a triplet rhythm. As the protagonist's bizarre fight against time begins, the stopwatch sound morphs into a reversed effect, and the muffled heartbeat follows suit, enhancing the emotional rendering in a triplet rhythm, as shown in the diagram.

The contrast between the high-frequency sustained tones and the low, staccato heartbeat rhythm creates not only a dichotomy in form but also a gap in the mid-range frequencies, which accentuates the odd sensation of the protagonist battling against himself, as depicted between two starkly different and "cold" sound lines.

#### (2). The Concatenation of Music and the Sound of a Stopwatch

In the film's climactic battle, two concurrent scenes in different locations unfold simultaneously. The scenes are distinct in setting and content, with direct cuts between them, requiring structural, narrative, and emotional continuity, where sound editing becomes crucial. The composer extracts the triplet rhythmic element from the emotionally charged battle scene, which continues as the camera abruptly cuts to a close-up of Kate on a cruise ship. For 45 seconds, the ticking of the stopwatch in mid-high frequency envelops the entire cruise ship scene. When the scene switches back to the battlefield, the triplet rhythm transitions from the stopwatch's ticking to a low-frequency rhythmic component.

The film's sound montage does not create obvious auditory cuts. Instead, it extracts targeted, meaningful sound elements from both scenes and uses montage techniques to link these elements, maintaining coherence in both the perceptual and cinematic language. Even with a fragmented visual narrative, the consistent use of a single element smoothly extends the emotional arc from one shot to the next, also metaphorically paralleling the "false" calm of Kate and Andre's conversation with the underlying turbulence of the battle in another timeline.

The stopwatch sound also recurs in the protagonist's fight against himself, employed as a continuation of the triplet rhythmic motif. Its introduction, layered over high-frequency pad sounds, emphasizes the audience's focus on the dialogue

and movements of the two protagonists. As the action of their fight unfolds, the stopwatch's triplet rhythmic element is sustained by the low-frequency heartbeat sound, further immersing the viewer in the cinematic experience.

## 8. Conclusion

In-depth examination of the auditory landscape in "Tenet" has yielded several key findings:

1. The selection of auditory components within a film's frame must be executed with precision, ensuring each sound contributes meaningfully and avoids excess. Music chosen for its thematic content should resonate with the film's fundamental story, mirroring it in its aural narrative. The distinctiveness of the characters – their traits, visuals, and behaviors – should be reflected in the thematic sounds, which may also harmonize with the timing and location of specific scenes. These choices transcend traditional attributes like timbre, pitch, or genre; rather, they embrace a broader palette of sound motifs. "Tenet" exemplifies this through its inventive use of altered breathing sounds and balanced volume fluctuations that step beyond conventional musical patterns.

2. Specific sounds carry an innate power to trigger collective emotional or psychological reactions in an audience. For instance, a pulsating heartbeat can convey suspense and unease, while amplified high frequencies can sharpen focus, and the rhythm of a ticking clock might suggest a quickening of time. These kinds of sounds, with their psychosomatic influences, are potent tools in cinematic storytelling, capable of coloring scenes with complex emotional layers.

3. Acknowledging the intrinsic musicality of sounds blurs the lines between soundtrack and sound effects, forming a unique acoustic environment. Sound effects, with their inherent properties – pitch, tone, frequency, contour, and rhythm – can transition into musical elements. This is achieved by creatively manipulating these features, thereby endowing sound effects with a lyrical quality. In contrast, deconstructing a piece of music to highlight one or two of its characteristics can transform it into a sound effect. For example, an isolated musical note can function as a sound effect, while certain sound frequencies can emulate noise. This synthesis of sound design and musical elements fosters the innovative integration of certain effects into the score, promoting the continuous evolution of both domains.

4. The rapid advancement of electronic technology has eclipsed the traditional progression of film scoring, which has seen a period of stagnation. Incorporating cutting-edge electronic advancements and contemporary musical styles into film scores offers a revitalized auditory dimension. Such an approach distinguishes a film's sound, setting it apart from scores of the recent past and saving it from sounding antiquated or too traditional.

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