Groove in the Mix:

Spatial Manipulation in Groove-Based Popular Music

1970–Present

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Abstract

This thesis analyzes the manipulation of virtual space in groove-based popular music, primarily the genres of funk, disco, and hip hop. The thesis is organized into two major parts, the first focusing on 1970s funk and disco and the second on 1990s hip hop. These three genres are united by their historical relationship and a multitude of other similarities, such as their use of groove as a primary musical parameter, and by how the latter grew out of the prior two. In this thesis, I show that mixing can highlight the unique cultural practices within Black American music, through reference to concepts such as Henry Louis Gates's "Signifyin(g)," Samuel A. Floyd's "Call-Response," and Olly Wilson's "Heterogeneous Sound Ideal in African-American Music."

Groove is an element of music that can be made more apparent and effective through the manipulation of space. In simple terms, a groove is a cyclical musical construction that invites listener participation through syncopation and/or cross-rhythmic patterns that oppose and contrast with the metrical beat. Depending on where instruments or vocals are placed in space, these rhythmic relationships can be emphasized to varying extents.

In chapter 2, I discuss disco and funk music of the 1970s, where a strong sense of groove is created between many different melodic and percussive instruments, I discuss a spatial recording technique I call the "spatially marked opposition." Instruments at the far left and right extremes of the recorded space are strongly spatially marked and are heard against each other, creating a kind of aural counterpoint. Compared to more centrally placed instruments, these oppositions often feature increased syncopation and rhythmic density, as well as contrasting timbres. The use of a wide stereo image in many 1970s disco and funk records enables listeners

to attend to both the metrical beat at the center of the recorded space and the syncopated elements mixed further out on either side, heightening their sense of groove.

In chapter 3, I discuss how the advent of hip hop led to different priorities in the use of space. Hip-hop producers often use samples from 1970s disco and funk artists; therefore, hip-hop producers must decide how much of the wide stereo mix to retain from the original records, and how to recontextualize the space of the sample within their new song. In the 1990s, sampled instruments were often constrained to the center, behind the rapped vocals, making the relationship between the vocals and drums the most prominent element of the recording. Later hip-hop producers with more advanced technology at their disposal were able to sample specific spatialized elements from older recordings and reinterpret them in a radically different context. The ways in which hip-hop producers spatially recontextualize their samples can exemplify the stylistic hallmarks of the genre itself.

Résumé

Cette thèse analyse la manipulation de l'espace virtuel dans la musique populaire basée sur le groove, principalement de genres funk, disco et hip hop. Elle est organisée en deux grandes parties, la première se concentrant sur le funk et le disco des années 1970 et la seconde sur le hip hop des années 1990. Ces trois genres sont unis par leur relation historique et une multitude d'autres similitudes, telles que l'utilisation du groove comme paramètre musical principal, et par la façon dont le dernier genre s'est développé à partir des deux précédents.

Le groove est un élément de la musique qui peut être rendu plus apparent et efficace par la manipulation de l'espace. En termes simples, un groove est une construction musicale cyclique qui invite l'auditeur à participer par le biais de syncopes et/ou de rythmes croisés qui s'opposent et contrastent avec le rythme métrique. Selon l'emplacement des instruments ou des voix dans l'espace, ces relations rythmiques peuvent être plus ou moins accentuées.

Dans le chapitre 2, j'aborde la musique disco et funk des années 1970, où un fort sentiment de groove est créé entre de nombreux instruments mélodiques et percussifs différents, et j'aborde une technique d'enregistrement spatial que j'ai appelée "l'opposition spatialement marquée". Les instruments situés aux extrémités gauche et droite de l'espace enregistré sont fortement marqués spatialement et sont entendus l'un contre l'autre, créant ainsi une sorte de contrepoint auditif. Par rapport aux instruments placés plus au centre, ces oppositions se caractérisent souvent par une syncope et une densité rythmique accrues, ainsi que par des timbres contrastés. L'utilisation d'une large image stéréo dans de nombreux disques disco et funk des années 1970 permet aux auditeurs d'être attentifs à la fois au rythme métrique au centre de l'espace enregistré et aux éléments syncopés mélangés plus loin de chaque côté, ce qui accroît leur sens du groove.

Dans le chapitre 3, j'explique comment l'avènement du hip-hop a entraîné des priorités différentes dans l'utilisation de l'espace. Les producteurs de hip-hop utilisent souvent des échantillons d'artistes disco et funk des années 1970 ; ils doivent donc décider quelle part du large mixage stéréo conserver des disques originaux et de quelle manière de recontextualiser l'espace de l'échantillon dans leur nouvelle chanson. Dans les années 1990, les instruments échantillonnés étaient souvent cantonnés au centre, derrière la voix rappée, faisant de la relation entre la voix et la batterie l'élément le plus important de l'enregistrement. Plus tard, les producteurs de hip-hop, qui disposaient d'une technologie plus avancée, ont pu échantillonner des éléments spatialisés spécifiques à partir d'enregistrements plus anciens et les réinterpréter dans un contexte radicalement différent. La manière dont les producteurs de hip-hop recontextualisent spatialement leurs échantillons peut illustrer les caractéristiques stylistiques du genre lui-même.

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Chapter 1: Introduction and Literature Review

Historically, the role of physical attributes of sound in the music listening experience has often been overlooked by analysts, theorists, and musicologists. Yet at the very foundation of listening to music is the *physical* sensation of experiencing sound waves as they hit the eardrums. Two of the major perceivable aspects of a sound wave are amplitude (loudness) and frequency (pitch). Due to their ability to be written down in Western musical notation, these two aspects of sound have been the primary focus of analysts who work with notated scores. However, amplitude and frequency can't adequately describe sounds in their totality, nor do they encompass the entirety of the listening experience. The human auditory system is source-oriented, meaning whenever a listener hears a sound, they try to identify what created it (Smalley 1997, Fales 2004). [1] Key to identifying a sound's source is its timbre, as the harmonics, noise, and amplitude envelope of an audio signal profoundly influence how it is perceived. Furthermore, this source-oriented auditory system is also concerned with spatial awareness, as listeners' brains are constantly calculating where a sound is coming from based on how it strikes their ears. In fact, according to Meghan Goodchild and Stephen McAdams (2018), timbre, spatial position, and pitch loudness are the first three perceptual attributes listeners utilize in sound source recognition, preceding any perception of melodic contours or rhythmic patterns.[2]

Timbre and space therefore play an equally foundational role in the perception of sounds as amplitude and frequency, though they are not very well represented in traditional modes of

[1] It is important to note at the outset of this thesis that my analyses and discussions of listener perception assume that "the listener" is not hearing impaired and is able to perceive the average frequency range of human hearing (approximately 20 Hz–20,000 Hz) in both ears.

[2] See Meghan Goodchild and Stephen McAdams's Figure 20.1, outlining auditory grouping processes. The perception of timbre, pitch loudness, and spatial position are a part of the first auditory grouping process: concurrent grouping, preceding sequential and segmental grouping. These authors' understanding of auditory grouping is based on Albert S. Bregman's "auditory scene analysis" as described in Bregman (1990).

notation. Luckily, the advent of recorded sound has enabled forms of music analysis that use sound itself as the object of study. Previously, score-based analysis was a simple necessity in that it was the only way an analyst could "re-listen" to a piece enough times to come to an informed analytical interpretation.[3] Recorded music makes it possible for an analyst to listen to the same performance of the same piece of music as many times as needed. There are also many forms of music that have never been score based, including most popular styles and genres, making recording analysis the only way to approach such repertoire.

This project was born out of and continues to be primarily about *listening to music.* My goal as an analyst is to make sense of not only what I hear, but *why* I hear what I hear. In recorded music, the parameters of timbre and space can be manipulated not only by the performers themselves, but also by audio and mixing engineers. Especially since the advent of modern stereo and equalization systems in the late 60s—which manipulate space and timbre, respectively—the physical representation of music in recordings has been just as highly influenced by the people behind the mixing desk as those in front of it.

In my extensive listening, a few genres have continuously stood out for the kinetic engagement they encourage, and for their ability to make me want to move. These include soul, funk, disco, and hip hop, the primary genres that I will discuss in this thesis. All of these genres are complexly intertwined, having been influenced and born out of each other through the continual evolution of Black American music over the course of the twentieth century.[4] One key component they all share is a musical phenomenon known as groove. A groove is an often-

[3] "Re-listen" is meant in the sense that the analyst would either hear the score in their head or play a reduction.
[4] Some of the sources I discuss in this thesis refer to these and other genres as "African-American," "African American," or "Afro-American." For the sake of clarity, when referring to a specific source I will use the term that the original author employs, otherwise I will adopt the terms "Black" or "Black American." I recognize that different readers may prefer different terms, and that the sensibilities surrounding these terms may change over time.

complex fabric of interlocking rhythms, typically undergirded by a strong metric beat against which various syncopations are heard. Given the sheer amount of rhythmic activity occurring at once in a groove, a careful spatial balance must be achieved by the mixing engineer so that the listener can hear all the elements of the song as intended by the artists. The result is an astounding *sound* experience, where the listener can feel at once in the middle of the groove and as a part of it.

The way groove-based genres are realized in virtual space will be the overarching topic of this thesis. While I am neither a performer of these genres nor an experienced mixing engineer, I have grown up listening to all the genres I will discuss and have done significant musicological and theoretical research into all of them. It is important to note that all the genres I will analyze are created and primarily performed by Black American musicians. As a white man of European heritage, I cannot attempt to speak for the lived experiences of Black Americans. Therefore, discussions of Black American musical and cultural influences are both necessary and extremely helpful in understanding groove-based music in its context and will pervade this thesis; it is my intention to integrate Black musical and academic voices as much as possible.

In this first chapter, I will discuss the primary influences on my work, focusing especially on previous studies of groove and virtual space, referencing both the origins of groove-based genres in Black American traditions and the importance of recording and mixing technology. Following the discussions of groove and virtual space, I will review theories of embodied cognition that allow better understanding of the effect spatialization has on the embodied experience of recorded music in groove-based genres. Finally, I will conclude the chapter with a discussion of my research methodology, an acknowledgement of my own subjectivity, and an outline of the other chapters within this thesis.

Groove

"Groove is something that's rewarding on a spiritual level, on a primal level, an intellectual level, and a physical level. You feel it."

–Nile Rodgers[5]

"Groove" is a nebulous musical term that, depending on context, can mean several different things. In terms of what is heard as a groove in most popular music genres, Mark Spicer (2001) has written that a groove is "the complex tapestry of riffs—usually played by the drums, bass, rhythm guitar and/or keyboard in some combination—that work together to create the distinctive harmonic/rhythmic backdrop which identifies a song" (10). Guilherme Câmara and Anne Danielsen (2018) broaden this understanding by giving multiple varying definitions and adding more context to the term. On a basic level, the authors write that groove is "the foundation and aesthetic qualities of African American rhythmic music" (272). This crucially limits the geographical scope of the term, in that they emphasize that groove is a term originated in African *American* music. The authors explain that while similar structures can be found in West African drumming traditions, the term is not typically used to describe this music and is not in the vernacular of that tradition. They go on to give three umbrella categories for interpretations of what a groove is: "Groove as Pattern and Performance," "Groove as Wanting to Move," and "Groove as a State of Being" (273–275). For the purposes of my study, their first category will be the most important, though all three will factor into this thesis.

Groove, as defined by Câmara and Danielsen's first category, is primarily a rhythmic phenomenon. While there are many kinds of grooves, there are some common rhythmic elements

[5] Quote from a 2013 interview about Daft Punk's *Random Access Memories,* for which Rodgers was a collaborator. See: Daft Punk, "Daft Punk - The Collaborators - Episode 3 - Nile Rodgers (Official Video)" YouTube video, 00:55, posted June 10, 2023, https://www.youtube.com/watch?v=_oHjtBlMMgA

that persist across groove-based genres. Firstly, a groove is typically cyclical, consisting of a 2–4 measure basic unit that can be infinitely repeated. Some grooves are designed to lead back into themselves seamlessly, creating what Timothy Hughes (2003) calls an "autotelic" groove, while others have a more abrupt shift at the moment of repetition, such as those created by the looping of a sample. Repetition itself, as emphasized by James A. Snead (1981), is an essential aspect of Black music and culture. Snead writes that, as opposed to in Western art music where repetition virtually always tends to *build* or *grow* to something else, repetition in Black musical culture is often used to create a state of circulative equilibrium, using smaller repeated units. Snead calls the moment of repetition the "cut," which he argues marks the repetition in Black music as overt and desirable:

> The "cut" overtly insists on the repetitive nature of the music, by abruptly skipping it back to another beginning which we have already heard. Moreover, the greater the insistence on the pure beauty and value of repetition, the greater the awareness must also be that repetition takes place on a level not of musical development or progression, but on the purest tonal and timbric [*sic*] level. (1981, 150)

The repetition inherent in grooves due to the continual use of the "cut" thus allows listeners to focus on more minute details at the "purest tonal and timbric level." Elizabeth Margulis (2018) echoes this idea as she writes that "in musical styles where the richest content lies … in the marrow of individual sounds—in timbre and microtiming, for example—repetition can shift attention below the surface, into the sonic grain" (195). In terms of recorded music, subtle spatial manipulations as well as timbre and microtiming can be made more obvious through a groove's repetitive nature.

Câmara and Danielsen go on to emphasize the importance of a strong, steady beat in a groove's primary repeated unit, writing that

> [g]roove is overwhelmingly associated with music that compels body movement in some form or fashion, and, as such, a regular beat is of paramount importance to it. Without a steady beat (also called "pulse" or "tactus") to guide dancers' feet or musicians' fingers, there can be no groove. (2018, 278)

This steady beat or pulse is almost always played by one or more instruments in a groove, most commonly by a drummer playing a 4/4 backbeat pattern where the kick drum hits on beats 1 and 3 and the snare drum on beats 2 and 4, though other metrical reference structures are also possible. What makes a groove *groove*, however, is not just the presence of a steady metrical beat but also the presence of smaller rhythmic subdivisions that are heard with and especially *against* the beat. These smaller subdivisions are often syncopated, creating a rhythmic opposition when heard with the metrical beat. Rather than causing metrical ambiguity, however, syncopation within a groove can strengthen the feeling of metrical regularity by "pointing out the significant beats of the pulse without accentuating them" (Danielsen 2006, 80).

The continual recurrence of syncopation in a groove can lead to the creation of a persistent counter-rhythm. As Câmara and Danielsen observe,

> should a series of syncopations repeat in a systematic and predictable fashion over the course of a basic groove unit, these syncopations may eventually cease to be perceived as local instances of momentary metric displacements, or unexpected accentuations of weak metrical locations, and instead become framed as characteristic "counter-rhythmic" figures in their own right. (2018, 280)

Again, rather than creating metrical ambiguity, counter-rhythms can become entrained to by listeners and therefore serve to reinforce a strong feeling of meter. Overall, then, Câmara and Danielsen define groove as a cyclical musical construction that invites listener participation through syncopation and/or cross-rhythmic patterns that are heard against a metrical reference structure.

Further clarification on how grooves invite listeners to move can be found in the work of Maria Witek, who has described groove as a "triangulation of rhythmic structure, embodiment and pleasure" (2017, 138). Witek writes that "it seems that rather than affording synchronized movement *despite* its syncopatedness, groove seems to elicit a pleasurable desire to move *because of* it" (143, emphasis original). This, she explains, is because syncopations leave a gap in the rhythmic structure that listeners inherently want to "fill in." The instinct of listeners and dancers is to complete the rhythmic fabric of a song when gaps, especially on strong beats, are left by syncopations (recall that Câmara and Danielsen argue syncopations "point to" significant beats). Even when all the strong beats are being sonically articulated by some member of the ensemble, Witek argues that "we still experience gaps in individually synchronized textural layers of groove, even if other layers fill them" (147). This embodied listening experience where listeners become *a part of* the music, especially when attending to an individual line within a complex texture, will be of utmost importance when discussing the spatial dimension of grooves.

Indeed, grooves offer listeners a variety of syncopated/cross-rhythmic lines to attend and entrain to at any given moment. This relates to one of the central questions of groove studies, which is whether grooves are generally heard by listeners as a unified whole or as a more loosely organized group of divergent individual lines. Simon Zagorski-Thomas (2007) has raised this issue in relation to groove:

> This characterization of instruments in an ensemble as either sounding like individual agents or as combining with part or all of the ensemble to create a grouped agent would seem to be central to any study of musical activity that seeks to analyze meaning in terms of gesture, narrative and/or intention. (331)

Zagorski-Thomas here ascribes anthropomorphic agency to musical lines within a texture, in that a listener can hear various instrumental lines as being in conversation with one another, while also offering the idea that a groove could be heard as a grouped agent with unified gesture or narrative. While he does not go as far as to argue that grooves are *always* heard as a group of individual lines rather than as a whole, he does state that "creating a groove with a character requires a group performance that suggests a meaningful dialogue between the performers" (332) and relates the idea of individuals playing against others in the ensemble to Henry Louis Gates Jr.'s (1988) concept of "Signifyin(g)" in African American culture.[6] Hughes (2003) adds more nuance and context to Zagorski-Thomas's interpretation of the issue: "While the collective voice is certainly … emphasized in African-American music, it is not emphasized 'over the individual voice' because, in most African-American musical traditions, the collective voice is made of individual voices" (3). Thus, neither Hughes nor Zagorski-Thomas gives a clear answer as to whether listeners perceive grooves as a unified whole or as a group of divergent individual lines, suggesting that listeners' varying interpretations could potentially be shaped by spatial mixing that emphasizes individual strands within the groove texture to varying degrees.

To gain a better understanding of a Black perspective on what Hughes (2003) calls the "collective voice of individual voices," I turn to the work of Olly Wilson (1992), specifically his

[6] More discussion of Gates (1988) as well as Samuel A. Floyd Jr.'s (1991) adaptation of "Signifyin(g)" for a musical context can be found in Chapter 2, as it will have important ramifications for what I call the "spatially marked opposition."

concept of "The Heterogeneous Sound Ideal in African-American Music." As Gena Caponi observes: "Wilson conceives of the African sound ideal as a mosaic in which separate elements combine to form a whole, but the whole is not a unified blend of sound" (Caponi 1999, 157). Wilson thus agrees with Hughes (2003) in that the collective voice of individual voices exists, but he goes further in arguing that a "heterogeneous" sound is considered ideal. To support his argument, Wilson describes five common tendencies of African-American music making as follows:

1. The tendency to approach the organization of rhythm based on the principle of rhythmic and implied metrical contrast … disagreement of accents is the ideal, and cross-rhythm and metrical ambiguity are the accepted, expected norm . . . .
2. The tendency to approach singing or the playing of any instrument in a percussive manner . . . .
3. The tendency to create musical forms in which antiphonal, responsorial, or call-and-response musical structures abound. These responsorial structures frequently exist simultaneously on a number of different architectonic levels.
4. The tendency to create a high density of musical events within a relatively short musical time frame—a tendency to fill up all the musical space.
5. The tendency to incorporate physical body motion as an integral part of the music making process. (1992, 159)

Wilson argues that these characteristics are what define African-American music. Indeed, these characteristics are particularly salient and prominent in groove-based genres. For example, Wilson's first tendency is foundational to Câmara and Danielsen's (2018) definition of groove, and his fifth tendency relates to Witek's (2017) work on listeners' and dancers' involvement in grooves. His third tendency will become especially important in Chapter 2, where I develop a concept called the "spatially marked opposition," a spatially realized antiphonal structure.

Also at the core of Wilson's essay is the same central problem of groove discussed above in relation to Zagorski-Thomas and Hughes, namely "the paradoxical combination of the collective and the individual" (Hughes 2003, 119). Another point discussed by Wilson is the tendency to use a variety of heterogeneous timbres within a musical texture, which adds a further

layer of complexity to the issue raised by Hughes. Based on Wilson's essay, which argues that heterogeneous timbres can in some cases still be heard as a collective, I argue that listeners do not perceive grooves as *either* one grouped agent or as a group of individuated agents, but rather that grooves, and their perception, exist on a spectrum between these two points (see Ex. 1.1 for my own schematic representation of such a spectrum). As grooves move rightward on this spectrum toward fully individuated agents, Wilson's described tendencies of African-American music are present to a greater extent as there is more rhythmic disagreement of accents, more rhythmic density, more percussive instrumental playing, and more timbral heterogeneity.

Example 1.1: The groove spectrum, a schematic representation of the perception of grooves based on Wilson's (1992) tendencies of African-American music making and Albert Bregman's (1990) "auditory scene analysis."

The question of how grooves are perceived can be further understood through Albert Bregman's "auditory scene analysis" (1990). According to Bregman, listeners tend to group sounds that feature similar timbres and come from a similar spatial location. That is because sounds possessing these qualities are perceived as coming from the same source, or as Goodman and McAdams write: "The auditory system expects a sequence of events produced by a single sound source to behave similarly in terms of its spectral content, intensity, and spatial position" (2018, np). Therefore, the question of *where* on the groove spectrum a groove is perceived as being is very much related to how a song is mixed. The level of spatial distance between

instruments and the level of timbral heterogeneity achieved in the mixing process can greatly affect a listener's perception of a groove, as will be explored in later chapters of this thesis.

One final element to mention in relation to grooves is the issue of microrhythm, as many early academic studies on groove focus on microrhythmic deviations from the beat, and how these deviations affect the "feel" of the groove. These studies are based on the idea that beats are infinitely small, fixed points in time—as Fred Lerdahl and Ray Jackendoff (1983) describe in relation to European tonal music—and that all deviations from a strict meter are heard in relation to these time points. Charles Keil's (1995) theory of "participatory discrepancies" is a basis for many studies of timing in relation to metrical grids based on fixed time points, even though Keil himself acknowledges that: "Abstract time is a nice Platonic idea, a perfect essence, but real time, natural time, human time, is always variable" (3). Yet some groove-related research has fallen into the trap of measuring exact timing discrepancies from a metrical grid, despite the fact that even Lehrdahl and Jackendoff argue that their infinitely small time points are practically never realized in human performance. Later research has emphasized that performers of groove-based music do not necessarily play within a strict metrical grid or on *exact* beats, but rather that they play within what Danielsen (2019) calls "beat bins" (colloquially known as playing "in the pocket"). In the theory of beat bins, anything that falls within a certain range can be perceived as being *on the beat*. Fred Hosken (2020) suggests that these "beat bins," or what he calls "pockets," can be tighter or looser depending on the performer, the listener, the musical context, or all of the above.

Based on this research by Danielsen and Hosken, any reference I make to a metrical grid in this thesis is not meant to imply the existence of a strict, metronomic pulse underlying any of the songs that I will analyze, as beats may fall anywhere within a certain range. Along with

rhythmic events falling within a range instead of on certain points, a constant pushing and pulling of the tempo and timings is also common; one need only compare the tempo at the beginning of some tracks to the end to see evidence of such tempo fluctuation (consider Earth, Wind & Fire's 1978 classic "September").

Groove, then, is a multifaceted element of music that is the foundation of many Black American musical genres. Many of its aspects, such as its antiphonal nature, its complex texture, and its expressive timings, make it a musical phenomenon that can be enhanced and deeply affected by a careful use of space. In order to ground my discussion of groove in space as experienced by listeners and created by mixing engineers, I turn now to theories of virtual space.

Virtual Space

Virtual space is the imagined physical space listeners hear in recorded music, which may or may not relate to a real-life equivalent. In recordings of orchestral music, for example, mixing engineers will often try to mimic the sound of an actual concert hall and will place each instrumental section in their "correct" location in the virtual space. In this arrangement, listeners would expect to hear the violins on the left, the cellos and basses on the right, and the brass further back in the space, just as they would in a live performance. Zagorski-Thomas (2014) calls this process "staging," which he explains as "the perceived spatial relationship between the performers and us" (73). The staging listeners hear is made possible by the technology available to recording and mixing engineers. As Zagorski-Thomas puts it:

> The gadgetry of the professional recording studio—dynamic compressors, noise gates, limiters, overdrive, distortion, tape saturation, low bit-rate sampling, flanging, phasing, equalization, pitch alteration— provides a huge range of techniques that can be used to

> "dress up" performances in ways that alter the atmosphere and character of the finished recording. (2014, 74)

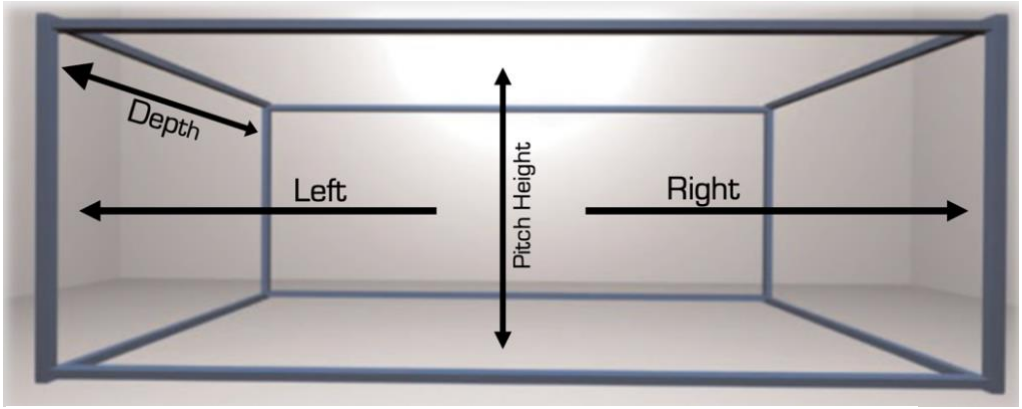
The example of an orchestral recording above is what Zagorski-Thomas would call "mimetic staging," in that the mixing engineers have decided to mimic the atmosphere of a concert hall. This is typical of classical ensemble recordings but less typical of popular music recordings, where spaces often do not mimic any kind of physical reality (Dockwray and Moore 2008). An important distinction to make at this juncture is that virtual spaces—though manipulated by musicians and engineers using recording technology—fundamentally exist *within the mind of the listener.* Zachary Zinser (2020) clarifies that in virtual space, "instead of hearing the sound of the (actual) space, we hear the (imagined) space of the sound" (69, emphasis original). This imagined space, while highly influenced by decisions made by the mixing engineers, is not fully realized until it is heard by a listener. Furthermore, different listeners may have different experiences of the same recorded virtual space, and even the same listener may interpret a space differently over time. Zinser explains that "multidimensional spaces create listening situations for which *attentional variability* can shape individual experience of 'the same' sonic content" (3, emphasis original).

This suggests that the listening experience of virtual spaces in recorded music is much more variable than listening to live musicians would be. Recording and mixing engineers are therefore under no obligation to create realistic or mimetic virtual spaces, as our imaginations are flexible enough to handle even frequent changes in spatial impressions. The "gadgetry" of recording studios can be made to create virtual spaces that are, according to Ragnhild Brøvig-Hansen and Danielsen (2013) "utterly surreal, displaying sonic features that could never occur in actual physical environments" (71). "Surreal" virtual spaces can be used to emphasize certain

aspects of a song, such as the syncopations in a groove, in a way that would not be possible in a live music setting.

Indeed, the choices made by engineers and producers afford many different possible virtual spaces that can emphasize a multitude of aspects within a song. One of the most fundamental choices producers make is what spatial format to mix in. There are many different formats available, but the most common are mono (one channel), and stereo (2 channels). In the context of this thesis, I will be discussing virtual spaces as facilitated by *stereo* recording and playback, as this is by far the most common format used since the early 1970s. This is not to say that spatialization is not also an important part of mono recordings, as Peter Doyle (2005) reveals the profound effects different types of reverb and echo can have on our perception of space, especially as it pertains to depth, in mono recordings. Stereo space, however, allows for much more spatial creativity as it incorporates a lateral dimension to the sense of depth already present in mono. This additional dimension makes it possible for sounds to seem to come from anywhere within a given space. As Lelio Camilleri explains, "The stereo space acts as a sort of window through which the listener can 'view' the location of sounds, not only in an overlapping construction but in a complex and dispersed structure" (2010, 201).

Ruth Dockwray and Allan Moore (2010) develop the "sound-box" as a visual representation of this window through which one can view the imagined virtual space. The sound-box is a graphical representation of recorded space in which instruments are placed left or right of center depending on their stereo panning. Instruments that are heard further back in the space are represented as being deeper within the box. The vertical axis organizes instruments according to their relative frequency/pitch height (see Ex. 1.2).

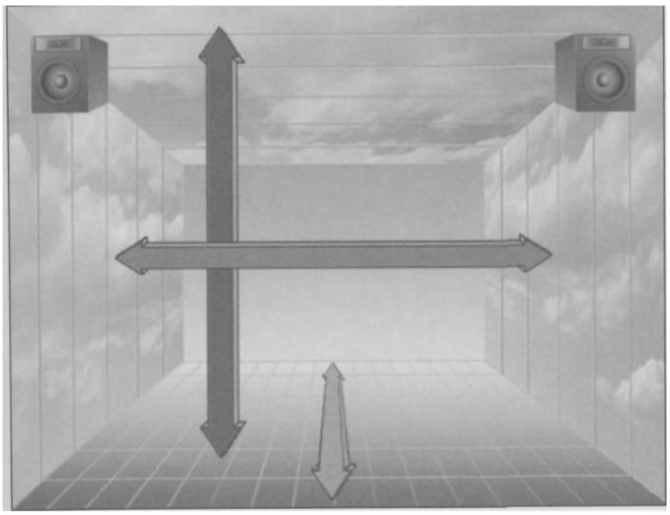


Example 1.2: The sound-box as seen in Dockwray and Moore's Figure 1 (2010, 184), modified by myself with overlayed arrows and writing.

The sound-box enables us to visualize approximately what the listener is hearing in a given virtual space. As Brøvig-Hansen and Danielsen (2013) clarify, "What is also made clear is that the sound-box is not a description of the virtual sonic space per se. Rather, it is a music-analytical tool that can be used as a matrix to map the placement of the different elements of a mix and to reveal differences in, for example, 'width' between mixes from the position of the listener" (72). Mark Saccomano (2020) criticizes what he calls this "space as container" approach (72), as it does not account for all the possible variabilities within a listening environment. For example, depending on where within a room a listener is in relation to a pair of speakers could change their experience of stereo space.[7] However, if a researcher were to attempt to account for every possible variation in listening situations, no overarching theories of spatialization could be made. In most situations, the sound-box *does* provide a useful approximation of the listening experience, assuming the listener is able to hear both stereo channels equally. Another justification for the use of the sound-box is that it is in part based in the methodologies of mixing engineers (Gibson 1997).[8] Thus, the listening experience described

[7] I will discuss my own listening situation in more detail in the Methodology section below.
[8] The earlier video version of David Gibson's *The Art of Mixing* is also a useful source for understanding mixing, not just because of the information it contains but also because of its intriguing and psychedelic animated visuals. See: TVHomeStudio, "The Art of Mixing (A Arte de Mixagem) – David Gibson" YouTube video, posted May 26, 2012. https://www.youtube.com/watch?v=TEjOdqZFvhY

by the sound-box mirrors the perspective of the mixing engineer in some ways, in that engineers conceptualize their mixes in the same way the sound-box suggests. David Gibson (1997) adopts a similar visual approach to Dockwray and Moore (see Ex. 1.3), while also explaining exactly what technology a mixing engineer can use to manipulate virtual spaces before they reach the ears of listeners.



Example 1.3: Reproduction of Gibson (1997) Visual 19 (13), note the similarity to Dockwray and Moore's sound-box model.

Gibson explains that lateral motion within the sound-box is affected by the engineers' use of panoramic potentiometers, or "pan pots," which allow them to determine how much of a given track is coming out of each speaker, thereby creating the illusion that a sound is emanating from one side of the space or the other. Perceived depth, on the other hand, is created primarily through the manipulation of relative volume levels of different tracks within the mix. If all the tracks are equally loud or soft, no sense of depth will be heard. Therefore, it is the mixing engineer's job to create a careful balance of volumes if they wish to achieve a sense of depth. Finally, the vertical axis can be manipulated through the use of frequency equalization. Equalization allows the mixing engineer to raise or lower certain frequency bands within a

sound, affecting its timbre. While lower instruments such as a bass or kick drum will always seem to reside at the bottom of the sound-box, Gibson emphasizes that many instruments can be perceptually shifted up or down using timbral manipulation through equalization. Camilleri (2010) uses the term "spectral space" to refer to the vertical axes as affected by this sort of timbral manipulation, holding that it is just as important as "localized space," the perception of sounds in certain spatial locations (202). Discussions of instrumental timbres and how they relate to their spatial placement will pervade this thesis, especially as they pertain to percussive instruments in a groove.

In sum, a mixing engineer is able to manipulate many factors that can impact the ways listeners perceive a virtual space. Yet, there is no one-to-one correlation between mixing techniques and listener experience. Although this thesis will offer spatial analyses of recorded music, it will emphasize listeners'—especially my own—subjective and unique experiences of virtual space. Having discussed groove and virtual space, I turn now to the third essential conceptual framework for my methodology: embodied cognition and embodied listening.

Embodied Listening

Notions of virtual spaces in music listening inherently imply an embodied component of music cognition. Saccomanno (2020) points out that "the sense of space is wholly dependent upon a motivated body with the ability to reach and grasp the things around it" (21). Beyond merely helping us understand the dimensions of a space, embodied cognition is also deeply important in understanding how listeners react to all musical gestures. Over the past two decades, a wide variety of scholars have interrogated the role of embodied cognition as a component of music listening, subverting the traditional mind-over-body paradigm of nineteenth century

German Idealism.[9] One such scholar is Rolf Inge Godøy (2009), who argues that musical sound is rich with gestural affordances, including affordances that serve as movement-inducing cues (104). These movement-inducing cues are a result of what Godøy calls the "perception-action cycle."[10] Drawing on earlier work by Marc Leman (2008), Godøy observes that

> the constant shift between perceiving and acting, or between listening and making (or only imagining) gestures, means that music perception is embodied in the sense that it is closely linked with bodily experience, and that music perception is multimodal in the sense that we perceive music with the help of both visual/kinematic images and effort/dynamics sensations, in addition to the 'pure' sound. (2009, 106)

Godøy emphasizes that music listening is inherently a multimodal experience. That is to say, the mere act of listening to music activates parts of our brain associated with movement and can even make us move. Though this element of music is especially pertinent when the sound-producing musician is visually present in front of the listener, the audio-motor couplings described by Godøy are also present in audio-only situations, as in the examples of recorded music within this thesis. Indeed, he writes that

> our perception of the world, and our mental activity in general such as reasoning, imagining, planning, etc., is a process of incessant mental simulation of various body movements, both those made by other people and those made by ourselves, as well as both those we can see and those we can only assume. (2009, 108)

Additionally, Godøy introduces three broad categories of musical gestures that generate different embodied responses: iterative, impulsive, and sustained gestures. Iterative gestures are

[9] In the field of music theory specifically, the shift towards an embodied understanding of music has been led by such authors as Suzanne Cusick (1994), Andrew Mead (1999), and later work by Arnie Cox (2011, 2016, see discussion below).
[10] Based on work by Ulric Neisser (1976).

those that involve the rapid repetition of small movements that fuse together to form one gesture, such as quickly executed scale or a series of *ricochet* notes on a string instrument. Impulsive gestures are those that are related to a quick impulsive movement, such as the hitting of a drum or a piano key. Finally, sustained gestures are defined by their longer sustain, such as those produced by bowed instruments. One key to convincing orchestration, Godøy argues, is to balance all three categories of musical gestures (112). I argue that the mixing process of recorded music can be seen the same way, in that mixing engineers go through a similar process and the most convincing mixes are those that blend and balance all three categories convincingly in order to create a satisfying embodied listening experience.

Leman (2009) builds on these ideas of bodily connections to musical gestures and argues that "the human body [serves] as a mediator between the musical mind and the physical environment, and gestures can be conceived as the way in which this mediator deploys itself in space and time" (127). While Leman's use of the word "space" does not refer specifically to virtual space as described above, in that he is referring to all kinds of space both real and imagined, listening to recorded music *is* an example of embodied listening in that it represents a listener engaging with what Leman calls "sonic moving forms" in much the same way we perceive another moving body (143). Arnie Cox (2011) builds on the arguments of Godøy and Leman through his "mimetic hypothesis," which suggests that listeners build a spatial understanding of music through sensory-motor mimetic engagement and participation. Cox argues that the concept of musical space, including the "high-low" metaphor of pitch space, is born out of embodied reasoning and mimetic motor imagery, in that we do not *hear* a descent, but we *feel* it bodily (16). This, of course, lends credence to the sound-box model introduced

earlier, in that embodied cognition corroborates the idea that higher frequencies are *felt* as being literally higher in space.

In sum, listening to music is a bodily experience, not just something that happens in our imagination. However, since virtual spaces are often totally removed from reality, mimetic engagement can be more complex in listening to recorded music than in a live performance. As Virgil Moorefield (2005) writes: "recording's metaphor has shifted from the 'illusion of reality' (mimetic space) to the 'reality of illusion' (a virtual world in which everything is possible)" (xiii). A central question of this thesis is how surreal virtual spaces affect our embodied experience of music, and of grooves in particular. Since discussions of embodied experiences naturally depend on subjective descriptions, I will turn now to my methodology for analyzing my own listening to groove-based music in embodied and spatial terms.

Methodology

The analysis of recorded popular music is entirely distinct from traditional score-based analysis of classical works, and therefore requires its own methodology. William Moylan is among the first authors to design a clear and structured methodology for analyzing recorded popular music. His system is focused on what he considers the five primary elements of recorded song: space, timbre, pitch/frequency, loudness, and rhythm/time (Burns, Alleyne and Moylan 2022, 2). Moylan emphasizes the relationships between the five elements and how they can combine to "establish larger concepts such as the sound stage" (39), a spatial environment modeled after the experience of a live performance. It is also important to acknowledge, however, how Moylan's first element—space—is inseparable from his other four elements,

because in a listener's perception a sound can never be separated from its perceived source.[11] In this thesis, I will seek to relate all of Moylan's elements of a recording to its virtual space to reveal details of the songs that can enrich a listener's embodied listening experience.

Another pertinent issue in the analysis of recorded music is the method of playback. There are an infinite number of ways recorded music can be heard, and each listening situation affords different experiences. The goal of an analyst should be to achieve the most transparent listening method possible. That is to say, the playback method should be able to reproduce as much of the sound data present in the recording as possible. In the digital era, this means searching for the highest quality files available, and avoiding compressed file formats such as MP3s. In this thesis, I will either analyze the original LP the recordings are found on, or digital files that closely resemble the original album releases. I will avoid using remastered recordings unless I am able to confirm that the use of space in the remastered version is the same as in the original.[12] An analyst using other sources should be mindful of how remixing and remastering can significantly impact the sound of a track, and therefore the listener's experience of its virtual space.

Once a file or format is chosen, the most crucial decision of recording analysis must be made: whether to listen through speakers or headphones. Many analysts, including Moylan, argue that the correct way to conduct recording analysis is through well-calibrated stereo speakers, as that is how mixing engineers create their records. The vast majority of people, however, do not have access to studio-quality speakers, myself included. The second-best option for an immersive and high-quality listening experience, then, is to listen to recordings through

[11] While this idea could be contested, my thesis relies on the theory of perception as described by Bregman (1990), Smalley (1997) and Fales (2004), in which a listener's auditory system is inherently source oriented.
[12] For a complete list of the specific songs and albums referenced in this thesis, see "Discography."

high-quality headphones. Throughout this thesis, I have conducted my analysis by listening to LPs and digital files through over-ear headphones.[13]

Beyond being an issue of practicality, headphone-based listening is also a much more accessible means of analysis. While few people (besides recording-industry professionals) possess studio-quality speakers, most people have access to headphones. Of course, many details will be reproduced differently in different types of headphones and earbuds, but broadly speaking the average person has access to the same listening method as I do. Furthermore, I have conducted checks using multiple types of headphones to make sure any detail I discuss is audible to the majority of listeners. In this way, headphone-based recording analysis is both accessible and equitable, and the implications of such research are more far-ranging than those dependent on expensive studio equipment.

Finally, the issue of subjectivity always plays a role in the discussion of recorded music. While I make use of objective means of analysis, including spectrograms and computer-based analysis of the perceived width of a recording, the majority of my analytical insights are based on my own subjective listening experience. Rather than claim false objectivity, I openly acknowledge that my subjectivity plays a large role in my analytical conclusions. This thesis should not be read as a scientific document merely summarizing facts about given recordings. Instead, I hope to invite listeners into my own listening experience, which is informed by my training as a musician and theorist. Through analytical discoveries, my goal is to explain the embodied musical journeys I experience in such a way that readers are able to recreate and

[13] Specifically, I use Sennheiser HD598 headphones. For digital playback I use an ifi iDSD Black Label DAC. The majority of my digital listening was done through high-quality streams on the music streaming software Tidal, though others were downloaded from websites such as Qobuz. For many of the songs I discuss, I am also in possession of the original LPs on which they appear, against which I compared the modern digital versions for confirmation of their integrity and accurate reproduction of the original spatial mix.

experience the same journey. This thesis is therefore inherently auto-ethnographic and experience-based rather than abstract or entirely objective.

Conclusion and Chapter Outline

In this introductory chapter I have summarized relevant previous research on the three major concepts at work in this thesis: groove, virtual space, and embodied cognition. The topic of this thesis lies at the intersection of these three concepts. Groove-based genres of music invite listener participation through their use of syncopation and counter-rhythms against the metrical beat. This embodied experience can be heightened through spatial manipulation, in that different instrumental lines can be placed in different spatial locations, heightening the listener's awareness of the various syncopations and counter-rhythms of the groove. Through my analyses of specific songs, I will discuss how various spatial paradigms influenced by decisions made by mixing engineers affect a listener's and my own embodied experience of grooves.

In Chapter 2, "Groove in Virtual Space," I discuss how the listener's experience of groove in funk, disco, and R&B can be strengthened and enhanced through a careful use of space on the part of the mixing engineer, focusing especially on the spatially complex music of Earth, Wind & Fire. I will introduce an element of groove-based recordings I call the "spatially marked opposition," a spatialized representation of what Samuel Floyd (1991) calls the "African-American musical trope of tropes," the "Call-Response" (276). In Chapter 3, "Spatial Reinterpretation in Sample-Based Hip Hop," I analyze how hip-hop producers of the late twentieth and twenty-first centuries sampled and reinterpreted many of the same or similar groove-based songs as discussed in Chapter 2. Specifically, when sampling spatially rich groove-based music, hip-hop producers are forced to decide how to incorporate the *space* of the sampled

record into their new song, a decision that can lead to many different interpretations that have intertextual implications as well as different embodied experiences.

The goal of this thesis is to contribute to the growing discourse on the analysis of recorded music and space, and to foster a greater understanding of the aesthetic effects and musical functions of recording techniques, while rightfully acknowledging the artistic contributions of recording engineers and producers of popular music. Through analyses of recorded songs and of my own embodied experiences, I hope to shed light on these artistic contributions and the effects they can have on listeners.

Chapter 2: Groove in Virtual Space: Introduction to the Spatially Marked Opposition

In Chapter 1, I reviewed the overlapping theories of groove, virtual space, and embodied cognition and how engagement with them can enrich the listening experience of groove-based music. In this chapter, I will synthesize elements of those three theories into analyses of funk and funk-influenced music. Funk is a genre of music developed in the 1970s and most strongly associated with such artists as James Brown, George Clinton (leader of the band Parliament-Funkadelic), and Sly and the Family Stone. Characterized by many improvisational and syncopated lines occurring at once, funk's rhythmic complexity necessitates a careful use of space in the mixing process. Without spatial mixing, much of the rhythmic interplay in funk would be lost, as listeners would not be able to hear individual lines working with or against the rest of the ensemble.

In this chapter, I will explore how spatial stereo mixing can make funk grooves stronger and more impactful to listeners through analyses of the virtual spaces of several funk songs as I perceive them. Paradoxically, the clarity provided by separating instrumental lines across various points in space creates a more cohesive sound experience. I will begin by exploring Afrocentric approaches to this repertoire as exemplified in Samuel A. Floyd's (1991) "Call-Response" trope, before introducing a spatial construct I have called the "spatially marked opposition," which represents Floyd's Call-Response in a spatial dimension and persists across many funk recordings. Thereafter, I will introduce various ways the spatially marked opposition is realized in funk and funk-influenced recordings, before discussing the effect of this technique and of spatial mixing of funk records more generally on a listener's embodied experience of the music. I will conclude by discussing how spatially and rhythmically complex funk music can create a feeling of distributed subjectivity in listeners.

Samuel A. Floyd's "Call-Response"

Gates (1988) offers an Afrocentric approach to the criticism of literary works by African-American authors.[14] Rather than impose European methods of literary analysis on his chosen works, Gates draws from African-American vernacular traditions to present the idea of "Signifyin(g)," a critical lens through which, according to Gates, African-American literature can be better understood. Gates's concept is based on the oral tradition of "The Signifying Monkey," an oft-retold tale of a trickster monkey's victory over a lion that gives the orator opportunities for wordplay and subversion. Gates generalizes the act of Signifyin(g) originally found in this tradition, writing that to "Signify" is to "engage in certain rhetorical games" (54) involving the free play of associative and semantic relations, and furthermore that Signifyin(g) is "the Black trope of tropes" (42). Put more simply, to Signify is to repeat something with a difference.

Drawing on Gates's theory of Signifyin(g), Floyd (1991) situates "Afro-American" music within the early Afro-American musical dancing circle known as the "ring-shout," as described in Stuckey (1987). The ring-shout was a social dancing circle in which at least one participant would sing a Spiritual that others in the circle would react to by interjecting and Signifyin(g), using techniques that would come to define Afro-American music. Some of the techniques or aspects of later music that were already present in the ring-shout include

> elements of the calls, cries, and hollers; call-and-response devices; additive rhythms and polyrhythms; heterophony, pendular thirds, blue notes, bent notes, and elisions; hums, moans, grunts, vocables, and other rhythmic-oral declamations, interjections, and punctuations; off-beat melodic phrasings and parallel intervals and chords; constant

[14] As addressed in Chapter 1, note 3, in this discussion of Gates's and Floyd's work I will use their terms, "African-American" and "Afro-American," respectively, for clarity and to avoid misrepresenting their claims.

> repetition of rhythm and melodic figures and phrases (from which riffs and vamps would be derived); timbral distortions of various kinds; musical individuality within collectivity; game-rivalry; hand-clapping, foot-patting, and approximations thereof; and the metronomic foundational pulse that underlies all Afro-American music. (Floyd 1991, 267)

Of course, many of the rhythmic elements identified by Floyd in the ring-shout are foundational to what would later become known as a groove. Stuckey's ring-shout serves for Floyd the same purpose as the "Signifying Monkey" tale does for Gates, in that Floyd understands all later developments in Afro-American music in relation to their origins in the ring-shout. Furthermore, Floyd sees the aforementioned musical elements of the ring-shout as Signifyin(g) elements; for example, "swing" constitutes Signifyin(g) against the rhythmic timeline.[15] Furthermore, according to Floyd, genres can Signify on other genres, a concept that will play an important role in my discussion of hip hop sampling in Chapter 3.

Floyd emphasizes that useful criticism of Afro-American music should involve "the identification of the elements that captivate our attention and mediate our perceptions and reactions," rather than just applying critical methods developed for the primary elements of Western art music (275). To this end, he introduces the concept of the "Call-Response," which he calls the "musical trope of tropes" in Afro-American music under which all other tropes are subsumed (276). Importantly, the musical device known as "call-and-response" is just one of the tropes subsumed by the "Call-Response." The latter is not a specific technique but a broad "musical principle, a dialogical musical rhetoric" (276n4), that includes many of the elements Floyd identifies in the ring-shout above. Floyd argues that in most Afro-American music, there

[15] "Timeline" here refers to the repeating sequence of rhythmic events.

are "calls," to which there are "responses" that act as a Signifyin(g) revision of the call. In funk music, Call-Response figures abound, and often instruments and vocalists seem to be both calling and responding to multiple other members of the ensemble at once. The call can be made by any member of the ensemble, just as the response could come from anywhere else, creating a complex network that exemplifies Floyd's Call-Response trope. Without careful spatialization this intricate balance of calls and responses can be lost, and with it the very essence—according to Floyd—of Afro-American music can be weakened.[16]

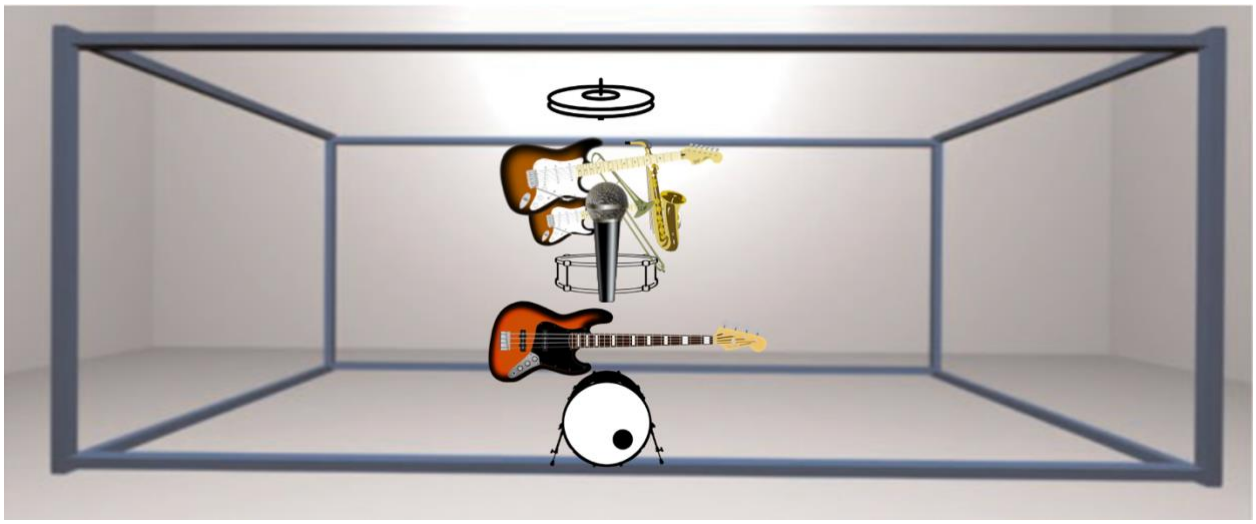
Grooves in Space: Sly and the Family Stone's "Thank You"

As an introductory example, I invite the reader to compare two versions of Sly and the Family Stone's "Thank You (Falettinme Be Mice Elf Agin)." This song was originally released in 1969 as a mono single but was remixed in stereo for the group's 1970 *Greatest Hits* compilation.[17] When listening to the original mono release, most of the song's musical elements are clearly audible. Listeners can hear the repeated, two-bar bass riff that defines the groove, the guitar's chucked responses on the fourth beat of every second bar, and the occasional horn interjections, all occurring over a steady backbeat. Yet due to the limitations of mono, this entire instrumental groove is heard *behind* the vocals, as the only tool at the mixing engineer's disposal for creating spatial separation in mono is the illusion of depth achieved through the manipulation of relative volumes (see Ex. 2.1 for a sound-box representation of the mono version). Everything that defines the song can be heard in this version, and if it weren't for the existence of the stereo

[16] Of course, this assumes the listener is in an audio-only situation, as I do in this thesis. If the listener were to visually see the interactions between different performers, audio spatialization would not play as much of a role in clarifying the Call-Response.

[17] Given that it may be difficult to find the two versions, please refer to the Discography or follow these Spotify links:
Mono version: https://open.spotify.com/track/2pS6dzWh9ksTRjU6MxZzDk?si=b04da4ea8b854ba8
Stereo version: https://open.spotify.com/track/4lAnpiPDvKqpJGK38ax35t?si=f4f411dae0fb4502

version, it would be hard to imagine a version of this song with an even stronger feeling of groove.



Example 2.1: A sound-box representation of the mono version of "Thank You (Falettinme be Mice Elf Agin)" (1969) by Sly and the Family Stone.

When listening to the subsequent stereo version, however, it becomes immediately clear that some elements *are* missing in the mono version. Instead of just momentarily hearing the guitar interjections on the fourth beat of every second bar, listeners can now hear that there are, in fact, at least two guitars playing at any given time. This is because the guitars have been panned hard left and right, that is, they are heard at the far left and right sides of the sound-box (see Ex. 2.2). While not the only spatial difference in the stereo version, this shift alone opens up much more space in the song, allowing listeners to hear the rhythmic intricacies of not just the guitars against the rest of the ensemble, but also between the two guitars themselves. By *separating* some of the sounds, the mixing engineers create more clarity and *cohesiveness* in the stereo version of this song because listeners can now hear the relationships between instrumental lines more clearly. Furthermore, this spatiality adds a kinetic quality that was missing in the mono version.

Example 1.2: A sound-box representation of the stereo version of "Thank You (Falettinme be Mice Elf Agin)" (1970) by Sly and the Family Stone.

When a complex texture is realized spatially, as heard in "Thank You," a listener may not be able to process everything that is going on at the same time. Rather, our attention might shift from one instrumental relationship to another at any given moment. Two of the primary theoretical constructs discussed in Chapter 1, groove and virtual space, have an attentional dimension, in that a listener can focus their attention on a specific part of the recorded space or groove texture while listening. The idea of variable listener attention has been previously studied by several scholars: Robert Gjerdingen (1989) discusses attentional variability in regard to meter, Peter Keller (2001) in regard to a performer's attention when playing in an ensemble. John Covach (2018) similarly introduces the idea of "positional listening," which captures listening habits of individual musicians within a band, each from their own particular vantage point during live performance. Mark Butler (2006) touches on attentional variability in EDM listening, yet the realm of attentional variability in listening to recorded music is still a subject that has not yet been fully explored.

This thesis focuses on exactly this perspective of a *listener* hearing and understanding the virtual space of a recording, in which a focus on the center of the virtual space—where the lead

singer and drums are typically heard—is typical. At any given moment, there may be multiple "attentional options" available to the listener of a recorded musical work that may pull their attention away from the center. These attentional options can be a specific instrument or group of instruments playing the same material, or they can be instruments grouped together by their rhythmic opposition to one another. These latter types of attentional options are the ones commonly discussed in studies of groove, as groove is defined by such rhythmic oppositions between a metrical beat and other syncopated elements. In my research and listening, I have found that the structural tension between the main beat and counter-rhythms, the key to groove, can be experienced not only rhythmically, but also spatially. A type of attentional option that has not yet been given theoretical attention are oppositions created primarily by instruments' marked locations in virtual space: spatially marked oppositions. Examples 2.1–2.2 already illustrated this concept in the guitars of "Thank You." For a more thorough introduction to this concept, I turn to the music of Earth, Wind & Fire (hereafter EWF).

The Spatially Marked Opposition: EWF's "September"

A prominent example of a spatially marked opposition can be found in EWF's 1978 song "September," whose sound-box is represented by Example 2.3. A texturally rich song such as this affords listeners many attentional options; a standard analysis of the groove in "September" might focus on the opposition between the metrical beat layer created by the bass and snare drum at the center of the space and the syncopated lines of the piano and rhythm-guitar that lie slightly further out from the center (this element of the groove can be heard from 00:18 onward). Indeed,

the syncopation between these outer instruments and the central drum beat forms the backbone of this song's groove and consistently keeps the song moving forward.

Example 2.2: A sound-box representation of EWF's "September" (1978).

Another prominent, groove-defining aspect of the song can be seen in the lead guitar and bongos, situated respectively at the extreme left and right ends of the sound-box, which can be heard clearly from the very beginning of the song. These instruments are spatially marked, in that they lie so far out on either side that they are inherently heard as separate from, and in opposition to, what is heard at the center of the space. In listening to virtual spaces, listeners not only group together instruments in the same spatial locations, but also instruments that are at a similar distance to the central axis on either side of the space. Usually, this grouping is exploited by producers to create balance across the stereo image by giving instruments on either side of the center similar material. Allan Moore (2012a) writes: "It is a norm … for sound-sources to be balanced in the stereo field, either side of a central axis that is normally occupied by the lead voice" (110). Yet this connection heard across the central axis can also be used to create a purposefully unbalanced rhythmic *opposition,* where instead of playing in unison, instruments respond to one another with syncopation and other rhythmic interplay.

When the instruments in this kind of unbalanced rhythmic relationship are also spatially marked, they form what I call a spatially marked opposition (SMO). These oppositions often feature increased syncopation and rhythmic density, as well as timbres contrasting to the primarily metrical instruments in the center of the space. Typically, this occurs between two instruments at the extreme left and right ends of the space, as with the lead guitar and bongos in "September."[18] In this example, the instruments' rhythmic opposition is defined by syncopation, as the lead guitar's line is consistently syncopated against the bongo's metrical beats.

As mentioned above, the usual focus of a listener's attention is the center of the space, where metric regularity is typically established by the drums. In "September," listeners entrain to the metric regularity provided by the kick and snare drum of the backbeat in the center of the space, against which the syncopated elements, including the SMO, are heard. The instruments of the SMO are further from the central drums than any other instruments, heightening their experienced separation from the rest of the ensemble. This separation allows listeners to hear them not only in relation to the central backbeat, but also their own opposition with each other. This double opposition, between the SMO instruments themselves and between the SMO instruments and the central drums, is what makes SMOs so impactful as a driver of groove.

The SMO in "September" presents itself as a prominent attentional option to the listener and adds a further layer of complexity to the groove of the song. The lead guitar's syncopations seem to bounce off the bongo's metrical beats, across the entire width of the stereo image. The spatial distance between the two instruments encourages listeners to *feel* the syncopations, heightens the rhythmic tension, and "propel[s] the groove forward" (Witek 2017, 143). Ultimately, the two instruments' spatially marked locations allow them to be more easily heard

[18] Partially due to technical limitations of the 1970s/early 1980s, all the examples in this chapter feature static spatial mixing. That is to say, the instruments stay in the same spatial location throughout the entire song.

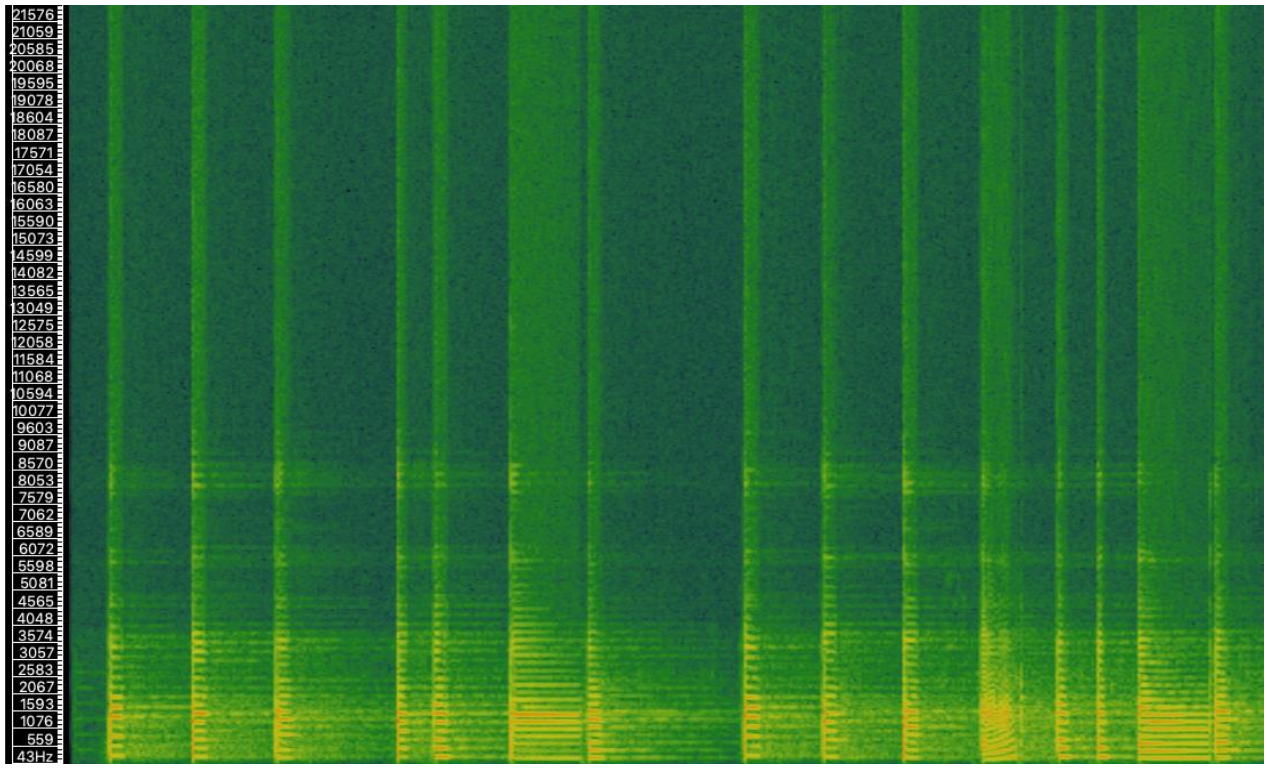
at any moment in the mix, making them a pronounced attentional option and increasing the listener's perception of groove.

Timbre in Spatially Marked Oppositions: Stevie Wonder's "Superstition"

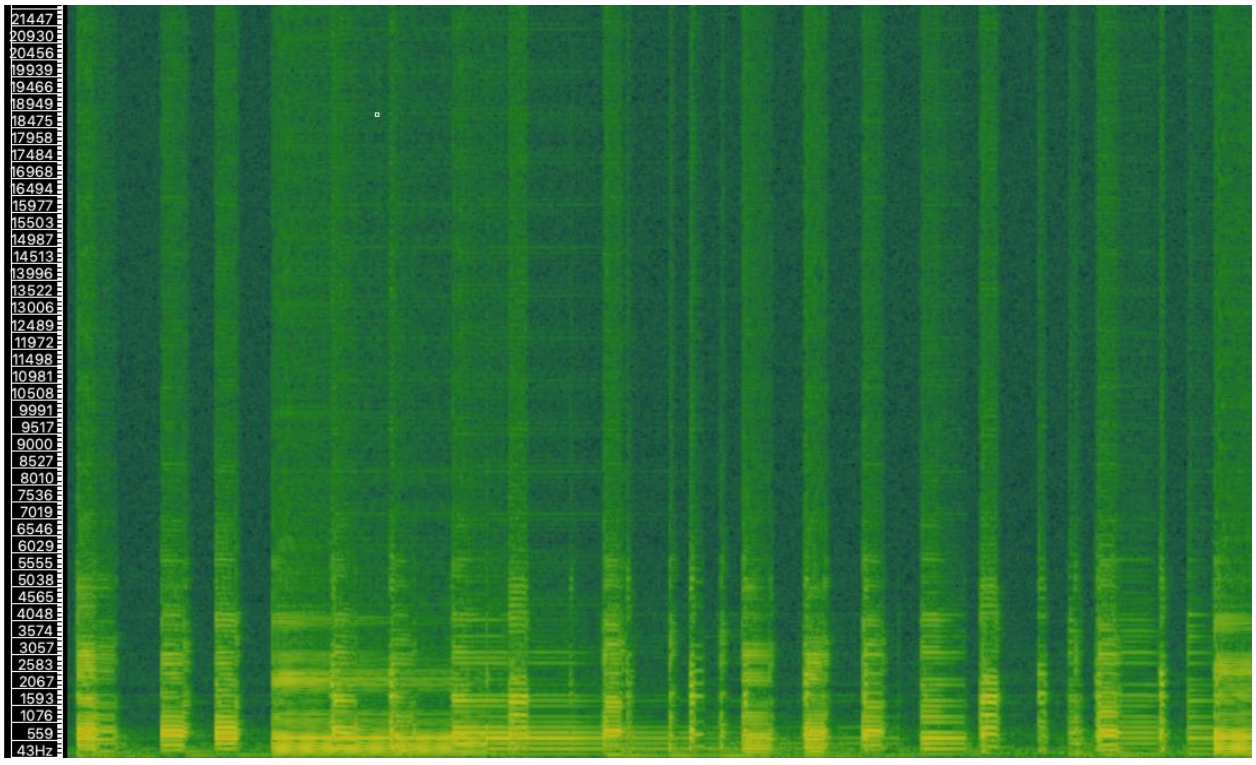
Stevie Wonder's "Superstition" (1972) also features an SMO, in this case between two clavinets. The clavinet is an electric harpsichord-like instrument that became a sonic marker for funk music primarily due to its use by Wonder on his albums *Talking Book* (1972), *Innervisions* (1973), and *Fullfillingness' First Finale* (1974). "Superstition" opens with a relatively simple backbeat played by the centrally located drums, until the first clavinet, panned hard right, enters at 00:08, followed closely by the second clavinet, panned hard left. Part of what contributes to the satisfying rhythmic complexity of these clavinets is that they are an amalgamation of multiple takes, so each apparent clavinet part is actually created by multiple recorded tracks playing simultaneously. While both perceived clavinet parts come together on the first beat of every bar, they are consistently syncopated against each other after that beat, fostering a similar physical listening experience as in the SMO from "September," as noted by Hughes:

> In ["Superstition"], two clavinet parts with similar timbres but different rhythms were placed in different locations in the stereo mix. Because of the clavinet's sharp attack, it attracts attention from the middle of a full texture and is easy to follow with the ear. By combining two parts, the result is a noticeable interlocking effect that seems to have a single sound source but which greatly increases the kineticism of the part by bouncing rapidly throughout the stereo mix. (2003, 145)

Hughes here observes the physical sensation created by the bouncing effect of SMOs, as well as emphasizing the importance of the shared timbral characteristics of instruments in a SMO.



Example 2.4: A spectrogram of the electric guitar sound from EWF's "September" (1978), 00:00–00:07.



Example 2.5: A spectrogram of the clavinet sound from Stevie Wonder's "Superstition" (1972), 00:10–00:16.

Indeed, a defining aspect of SMOs is the timbre of the instruments that are typically

found in this kind of relationship. In “September,” the opposition is between bongos and an electric guitar. While the guitar is not a percussion instrument, it is played in a percussive manner, with a short, sharp attack. This kind of guitar playing is typical of the funk genre and is often found in SMOs, as will be shown below (see Exx. 2.7, 2.8 and 2.9). Yet the specific timbral characteristics of the guitar sound in “September” can also be found in other instruments within SMOs. A spectral comparison between the electric guitar in “September” and the clavinets of “Superstition” helps establish some of the timbral characteristics that tend to be found in SMOs (see Exx. 2.4—2.5). Megan Lavengood (2020) establishes a series of binary oppositions to describe timbre (see Ex. 2.6 below). In the case of the electric guitar from “September” and the clavinet from “Superstition,” the spectrograms reveal that their sustain is *bright, rich,* and somewhat *noisy*. These characteristics align with what one would expect of an instrument treated with distortion (Berger and Fales 2005), as both instruments in these examples have been distorted to a limited degree.

Spectral components - sustain
bright / dark
pure / noisy
full / hollow
rich / sparse
beatless / beating
harmonic / inharmonic
Spectral components – attack
percussive / legato
bright / dark
Pitch components
low / high
steady / wavering

Example 2.6: Table of binary timbral oppositions based on Lavengood (2020).

While the distorted charactersitics of the instruments’ sustain are common in SMOs, it is the spectral characteristics and amplitude envelopes of their *attacks* that especially define these

sounds as being well-suited for SMOs. Both instruments feature *percussive* attacks—as indicated by the vertical lines at the start of their notes in the spectrograms—as well as falling on the *bright* side of the *bright/dark* binary opposition. Furthermore, the instruments not only feature quick attacks but also quick decays, another timbral attribute of percussive instruments.[19] Placing instruments with quick, bright attacks and fast decays at the edges of the stereo space also serves a practical purpose for the mixing engineer, namely, to add clarity to the mix. The amplitude envelopes of these sounds allow them to "pop" out of the mix, without "muddying" the center of the space, where we must still be able to hear the vocals and the other instruments.[20] Spatially and timbrally, then, the instruments found in SMOs create *cohesiveness* in the groove through their clarity and *separation* from the other instruments.

The "Two Guitars" SMO: Parliament's "Flash Light"

By far the most common type of SMO found across the funk genre is one between two electric guitars. Practically, this is probably because distorted electric guitars tend to use a broad band of the middle frequency range, overlapping with the midrange frequencies of vocals. Placing these guitars further out from the center, as mixing engineers often do, gives the vocals physical and spectral space to cut through the mix. Example 2.2 above shows this phenomenon, and even "Superstition" could be said to fit into this tradition, given the timbral similarities between the clavinet as performed in "Superstition" and an electric guitar. George Clinton's band Parliament also frequently made use of the "two guitars" SMO, as the song "Flash Light" (1977) exemplifies (see sound-box representation in Ex. 2.7). "Flash Light" is a particularly good

[19] As Wilson (1992) notes, playing instruments in a percussive manner is a typical attribute of African-American music making.
[20] Terms such as "muddy" and "pop" are often used in discussions of mixing, such as in Gibson (1997) and Bartlett et al. (2009).

example because the SMO is the first thing heard in the song (00:00). Right away, the mixing engineers draw listeners' attention far out to either side, broadening their awareness and setting the stage for what will occur in the center of the space. While the guitars initially play in unison, as soon as the other instruments and vocals come in (00:09), both guitars start playing highly syncopated funky lines. Specifically, the guitar on the left (guitar L) is fulfilling the typical role of a funk rhythm guitar, "chucking" chords in a rhythmically unpredictable fashion, while the guitar on the right (guitar R) adds mostly single note interjections. While they are not highly rhythmically coordinated, the single notes of guitar R do seem to "fill in" (Witek 2017) the rhythmic gaps left by guitar L, creating the bouncing kinetic experience of the SMO.

Example 2.7: A sound-box representation of Parliament's "Flash Light" (1977).

An additional element of this SMO is the use of effects on the two guitars. Guitar L, fulfilling the rhythm guitar role, is mostly clean, while guitar R is heavily treated with "wah-wah" and other effects changing its amplitude envelope, giving it a more psychedelic sound. The different sonic treatments of the two guitars adds another layer to this SMO and is also a common trait within the funk genre. One can find the same subtly oppositional sonic treatment of the two guitars in "Thank You" as well as Lakeside's "Fantastic Voyage" (1979). The slight timbral differentiation created by the use of different effects on the two guitars adds to Wilson's

theory of the "Heteregeneous Sound Ideal in African-American Music,"[21] as he writes that "there tends to be an intensification of the stratification of the musical lines by means of emphasizing the independence of timbre (color) for each voice" (1974, 15). The timbral differentiation created by effects is enough to intensify the stratification, but not enough to disturb the timbral similarity required for an effective SMO.

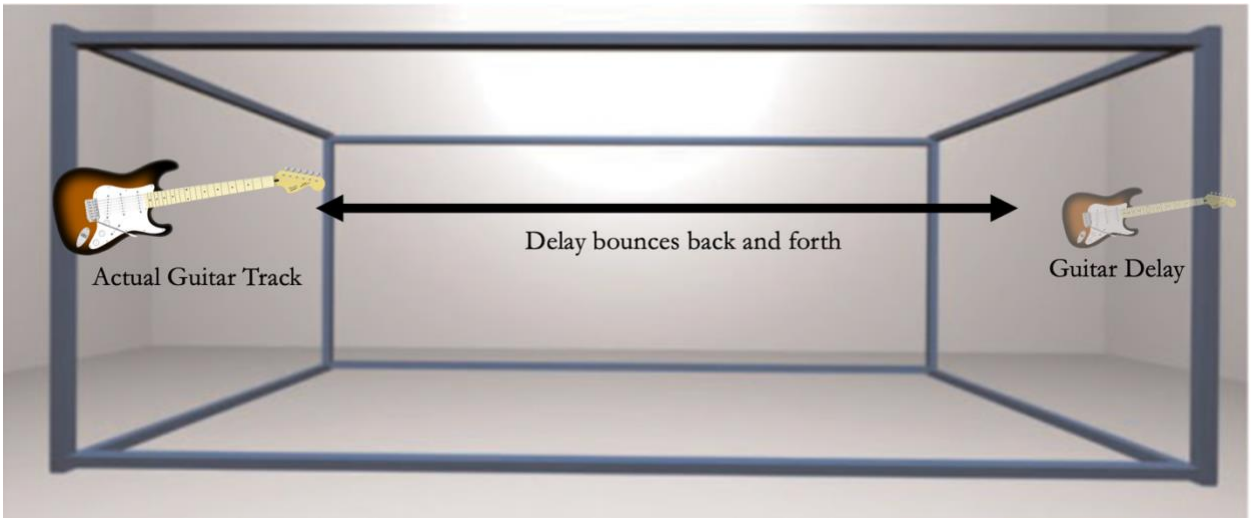
The effect of the "two guitars" SMO is to metaphorically and sonically "frame" the center of a funk song's virtual space with funky lines on either side. Everything that is going on closer to the center of the virtual space is heard in reference to these funky framing elements. Even though listeners will most likely entrain to the metrical regularity at the center of the space, they will be sonically surrounded by constant syncopation and counterrhythms. Thus, spatially marked oppositions function particularly well in funk records, enveloping listeners in a funky atmosphere.

Use of Effects to Create SMOs: David Bowie's "Let's Dance"

Post-production effects can also allow mixing engineers to create an SMO while using only one recorded instrument. As pointed out in Gibson (1997), "[e]ffects like delay, flange, chorus, phase, harmonizer, and reverb can be panned separately from the instrument sound they came from" (106). This means that, by panning (moving the perceived lateral location of a sound left or right) the reverb or delay of an instrument to the opposite side of the space as the instrument itself, mixing engineers can create a kind of "Call-Response" using only one instrumental signal. A classic example of this phenomenon is David Bowie's "Let's Dance" (1983), produced, written, and featuring the guitar playing of the famed disco songwriter Nile

[21] Refer to Chapter 1 for more information on Wilson's theory.

Rodgers. According to Rodgers, he happened to walk in while mixing engineer Bob Clearmountain was playing around with a multi-tap delay effect and was so impressed that Rodgers asked Clearmountain to "put my guitar in that thing."[22] The delay effect bounced Rodgers's guitar sound in such a way that it sounded, according to Bowie, "like what Nile does without Nile having to do it,"[23] referring to Rodgers's typical chucked, improvisatory rhythm guitar playing (see sound-box representation of the effect in Ex. 2.8).



Example 2.8: A sound-box representation of how the guitar SMO is created using a delay effect in David Bowie's "Let's Dance" (1983).

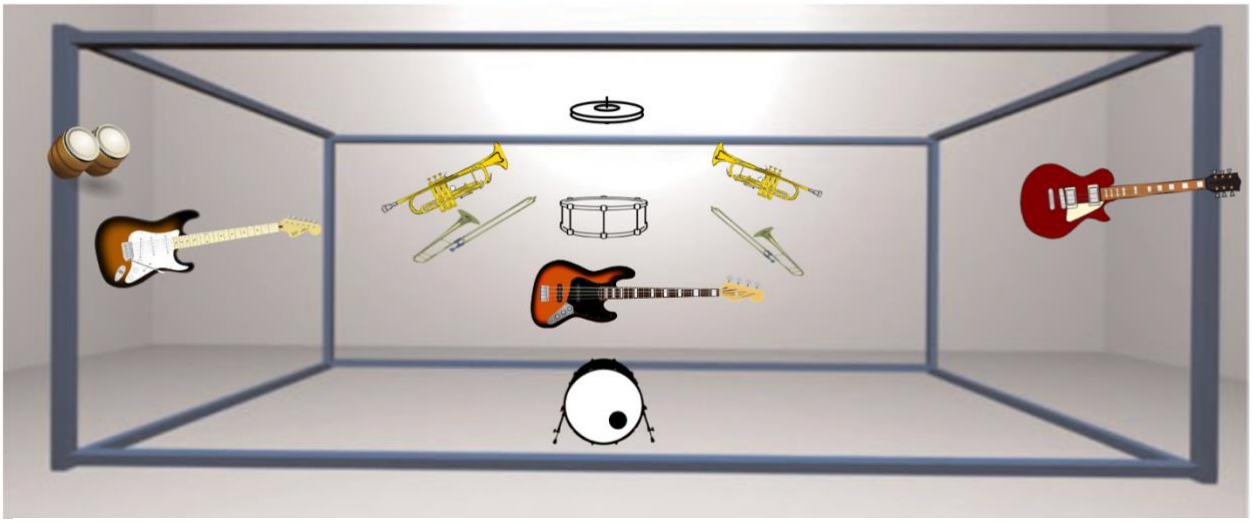
Indeed, when listening to "Let's Dance," starting at 00:08 one might think there are two guitar tracks panned hard left and hard right, respectively. The delay effect creates a "surreal" and physically impossible (Brøvig-Hanssen and Danielsen, 2013) version of the SMO and of Floyd's (1991) "Call-Response," because we are in actuality hearing only three upstrokes on each chord, which are then bounced around the virtual space to sound like many more attacks.

[22]As quoted in: Sam Kemp, "Nile Rogers remembers crafting 'Let's Dance' with David Bowie," *Far Out*, March 14, 2023, https://faroutmagazine.co.uk/nile-rogers-lets-dance-david-bowie/.
[23] According to Rodgers, at least. See: Fender, "Nile Rodgers | Song by Song | Fender" YouTube video, 10:40, posted April 5, 2022, https://www.youtube.com/watch?v=-MR2E56ipOU

"Let's Dance" is also an example of how SMOs can be found in genres outside of funk, especially in disco, a dance-oriented yet funk-influenced genre.[24]

SMOs as a Determinant of Form: EWF's "Let Your Feelings Show"

So far, all the examples discussed have been from songs in which the SMO serves as a part of and helps define *one* groove. The spatial distance between the instruments heightens the tension of the rhythmic opposition of the groove and adds a new dimension to Floyd's "Call-Response" principle. The SMO can also be used to juxtapose two different grooves, in songs in which multiple grooves are found in different formal sections. An example of this phenomenon occurs in Earth, Wind & Fire's "Let Your Feeling Show" from their 1979 album *I Am* (see sound-box representation in Ex. 2.9).

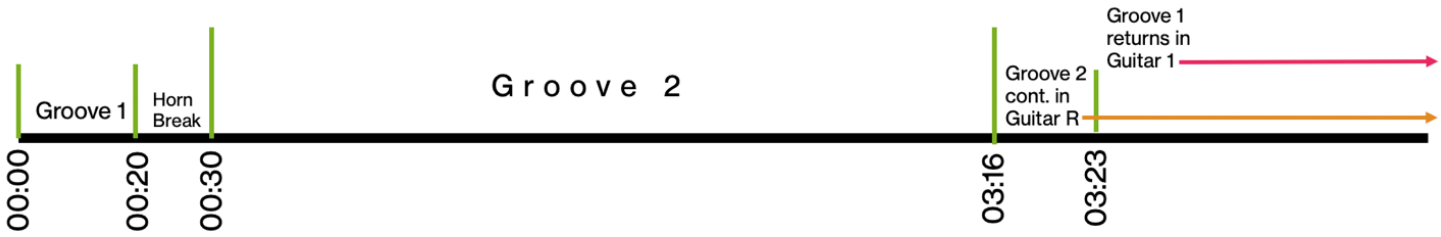


Example 2.9: A sound-box representation of EWF's "Let Your Feelings Show" (1979).

"Let Your Feelings Show" begins with an introduction defined by a riff (00:05) played by the guitar on the left side of the space, which I will refer to as Guitar L (see formal timeline in Ex. 2.10). Along with Guitar L, there is a rhythm guitar on the right (Guitar R) filling with

[24] A similar effect can be heard in Minnie Riperton's R&B/soul song "Reasons" (1974), though in this example the guitar playing is more complex, and the delay is doing less of the work in creating the SMO.

consistently short note values, bongos on the far left, and bass in the center. This represents the traditional setup of a SMO, similar to Exx. 2.3 and 2.7, with the addition that we can hear an SMO both between the two guitars *and* between Guitar R and the bongos on the left. The timeline in Ex. 2.10 designates this section as "Groove 1." At 00:21 there is a horn break that ends the introduction and marks the beginning of the central portion of the song. This central portion, beginning at 00:32, is defined by a markedly different riff in the Guitar L part (labeled



Example 2.10: A formal timeline of EWF's "Let Your Feelings Show" (1979).

Groove 2 in Ex. 2.10). Guitar R continues filling with consistently short note values, though a careful listening at 00:32 reveals that its accents are now aligned with those of the "Groove 2" rhythm in Guitar L. Thus, the central portion of this song is in part defined by less rhythmic opposition between the spatially marked instruments.

Over the course of the next three minutes, the song goes through two verse-chorus cycles, returning to Groove 2 at the start of each verse section (01:48, 02:45). During this time, the rhythmic activity of Guitars L and R takes hold as the defining feature of this groove. At 03:16, there is another brief horn break, and almost the entire ensemble drops out. What remains is Guitar R, continuing to play a line resembling the rhythmic profile of Groove 2. Yet at 03:23, Guitar L comes back, now recapitulating the material of Groove 1 *against* Guitar R's Groove 2. The juxtaposition of the two grooves is made very clear by the spatially marked positioning of the two guitars opposite each other. A close listening to this critical moment reveals that the guitar parts of both Grooves 1 and 2 accent the same metrical beats. However, since they come

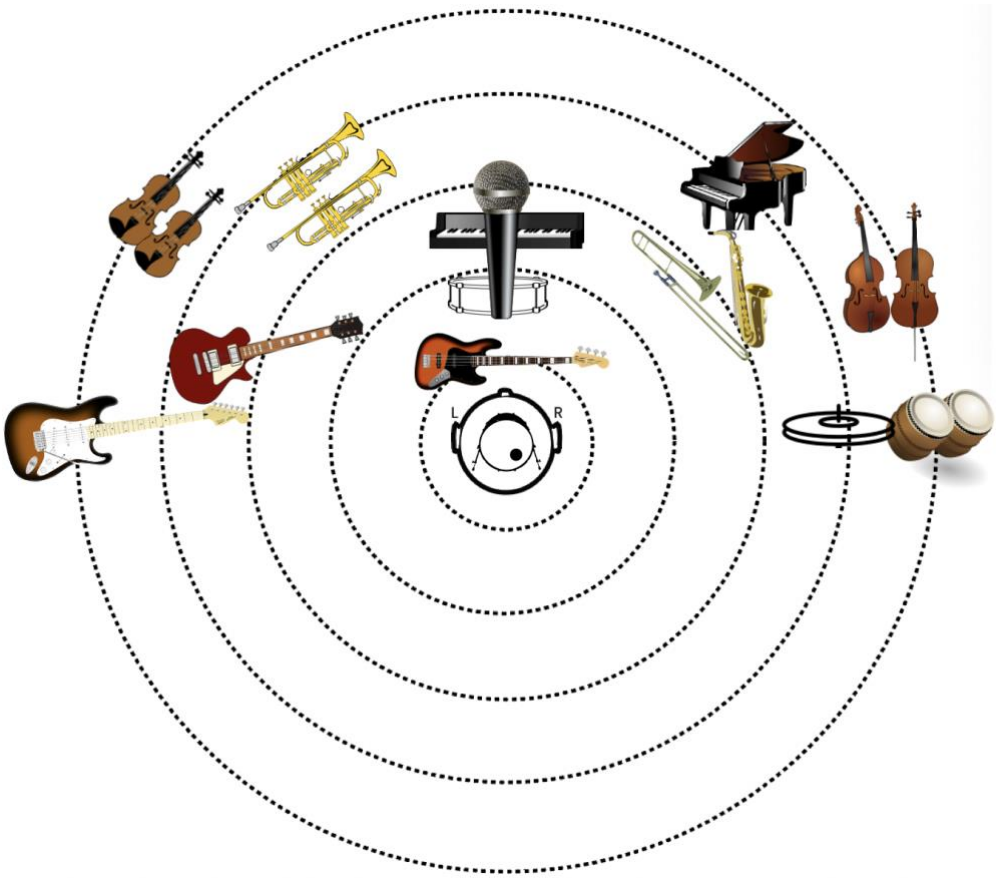
from distinctly different sections of the song, and because of their spatialization, I argue that they still sound individuated and separate in this SMO, despite their rhythmic similarity. In my subjective listening experience, the two guitars are acting as representatives of the grooves they define, therefore I am not hearing merely two guitar lines, but two grooves at once. This suggests that it could be possible for *a groove itself* to become an individuated element within a spatially marked opposition. What ends up being heard is a kind of meta-groove, in which oppositions are expressed between the spatially marked instruments, between those instruments and the central instruments, and even between the grooves themselves.

The remainder of the outro continuously increases the complexity with the addition of various instruments and vocals. At some point, it becomes impossible for me to perceive the entire ensemble at once, and I find my attention going back and forth between different instrumental sections.

Embodied and Posthuman Interpretations of SMOs

Given the complexity of "Let Your Feelings Show," and the shifting locales of my attention when listening, I now turn to an analysis of my own embodied experience when listening to SMOs. This discussion is inherently subjective and may not represent all listeners' experiences. As discussed in Chapter 1, I have conducted the analyses in this thesis by listening through headphones, a listening situation that brings with it a different embodied experience than listening through speakers. For this reason, I will here use Kate Mancey's (2022) model of virtual space for headphone listeners, which is able to capture specific aspects of my own listening experience (see Ex. 2.11)[25].

[25] The template for Example 2.11 is borrowed from Mancey (2022).



Example 2.11: A spatial representation of the headphone listening experience of "September" (1978, based on a template from Mancey (2022)). Note the listener's head in the center of the circle, as well as the bass drum which appears to sit within the listener's head.

Example 2.11, EWF's "September," exemplifies the effect of Cox's (2011) "mimetic hypothesis" in the realm of SMOs, as well as Godøy's (2009) discussion of audio-motor couplings in the listening experience. When listening to the introduction, the sharp sounding, plucked attacks of the guitar and the bongos coming from far out on either side of my head trigger muscle responses in my own body that lead me to experience short and quick movements, especially in comparison to the smoother attack of the kick drum in the center of my head (see Ex. 2.11). Given that listeners entrain to the metric regularity of the drums at the center of the space, SMOs *physically* counter the entrained meter as established in the center. The spatially marked placement of the guitar and the bongos causes me to be more spatially aware while

listening, and the jerkiness created by their syncopation jolts me to sit up in my chair. In the confined listening experience of sitting down wearing wired headphones, there is only so much movement my body can do, yet it is easy to extrapolate how the spatial and timbral features of the SMO could lead listeners to be inclined to dance. Furthermore, as Witek (2017) notes, listeners to groove-based music will want to "fill in" syncopations with their own body motions. The wide spatialization of this and other EWF songs gives me a sense that there is *physical space* within the recording for my own body, seemingly inviting me and my body into the very fabric of the song.

The above analysis of "September" offers an example of the simplest version of an SMO: a listener entrains to a central beat, and the SMO jolts them off-balance through its rhythmic and physical countering of the central instruments. A more complex spatial example such as "Let Your Feelings Show," in which the groove is more layered and more instruments are heard in impossible and surreal clarity, would necessitate an analysis that takes into account attentional variability, as listeners cannot possibly focus on everything at once. This leads to the concept of "distributed subjectivity," Katherine Hayles's posthuman idea that technology allows us to "participate in systems whose total cognitive capacity exceeds our individual knowledge" (1999, 289). Rather than seeing human interactions with virtual spaces as an experience where we must leave our bodies behind, Hayles reconfigures embodiment in the context of technology. She writes that "it is not a question of leaving the body behind, but rather of extending awareness in highly specific, local, and material ways that would be impossible without electronic prostheses" (291).

In terms of this thesis, the "electronic prostheses" in question is my listening system: the stereo sound files, the means of playback, and the headphones. When listening to complex

spatial music, I am, as Joseph Auner argues, “removed from the central position of subjectivity to become only one part of the total system” of whatever music I am engaging with (2003, 117). While Auner’s article is in reference to a “total system” that includes extramusical references and cultural constructions, a spatially realized groove can also be an example of such a system. Auner adds that “by distributing subjectivity between various subroutines, listeners can be seamlessly grafted into the system at many points” (119), just as listeners can be “seamlessly grafted” to a groove by embodying syncopations that are being metrically countered or vice versa.

Thus the “electronic prostheses” that listeners use to listen to recorded music allows them extend their awareness in highly specific ways, creating an embodied listening experience that is impossible in a live acoustic situation. When listening to “Let Your Feelings Show,” listeners can choose to graft themselves onto a number of different attentional options, including the SMOs. Some listeners may find themselves pulled to the SMO between the rhythm guitar (right) and the bongos, while others may be entirely focused on the central vocals and drums. Yet even when a listener is giving what they believe to be their full attention to the center of the virtual space, the electronic prostheses of headphones allow the listener to subconsciously experience the syncopations of the spatially marked instruments surrounding them. SMOs are often subtle and may not be a listener’s primary point of attention. My own listening experience tends to focus attention on small details, but not all listeners will choose to listen in this way. The spatial clarity and relative isolation created by listening through headphones, however, means listeners embody the groove, literally hearing different parts of the music in different parts of their body, without even necessarily choosing to do so.

Conclusion

In this chapter, I have discussed the effect of spatialization on the embodied listening experience of grooves by introducing a phenomenon I call the spatially marked opposition. A SMO typically features two instruments at the far left and right ends of the stereo space, that oppose both each other and the central instruments rhythmically. The SMO allows listeners to physically feel a groove, as the spatial distance between the two instruments heightens the rhythmic tension between them. Furthermore, the spatially marked placement of the instruments, as well as their distinct timbral characteristics, create a kind of clarity and separation that paradoxically increases the experienced cohesiveness of the groove. Listeners may often hear SMOs in recorded music without even thinking about them. Yet even when this is the case, using headphones will guarantee that whatever a listener is focused on will be sonically framed by the SMO.

Referring back to Floyd's (1991) "trope of tropes" in African American music, it becomes clear that the SMO is a spatialized realization of the Call-Response. Not only are the instruments calling and responding to one another, but also to the more centralized instruments. A complex network of dialogues among timbrally diverse instruments can be heard in a groove, and spatial mixing can make these dialogues even more audible and captivating. While this chapter focused primarily on funk and funk-adjacent songs, other groove-based genres of the same time period featured similar spatialization, including disco, R&B, and soul. As the hip hop genre began to develop in the 1980s, many producers chose to sample these very same groove-based records that feature wide spatialization. In sampling these records, the producers must choose what aspects of the spatialization to preserve in their new hip-hop song. The spatial

recontextualization that thereby occurs in hip hop sampling practice is the focus of the following chapter.

Chapter 3: Spatial Reinterpretation in Hip Hop Sampling Practice

In Chapter 2, I analyzed how mixing engineers realize grooves spatially in funk and funk-influenced genres. I argued that the spatially marked opposition represents a spatialized version of Floyd's (1991) "Call-Response" trope, and that the SMO can increase a listener's embodied feeling of groove. Another important argument found in Floyd's article is the idea that "genres can Signify on other genres" (271). Floyd writes that

> ragtime Signifies on European and early Euro-American dance music, including the march; blues on the ballad; the spiritual on the hymn; jazz on blues and ragtime; gospel on the hymn, the spiritual, and the blues; rhythm and blues on blues and jazz; rock 'n' roll on rhythm & blues; soul on rhythm and blues and rock; funk on soul; rap [hip hop] on funk; bebop on swing, ragtime rhythms, and blues (271).

Floyd's summary of the relations among "Afro-American" genres emphasizes how interdependent they are and implies the possibility of genre crossover. Yet out of all the genres Floyd lists, hip hop perhaps most obviously Signifies on previous genres through the use of sampling.

Sampling is the process by which hip-hop producers repurpose sonic objects from previously recorded songs. By placing these sonic objects in new and sometimes radically different contexts, producers Signify on the origins of their samples, giving them new rhetorical and musical meanings. LeRoi Jones ([1967] 1998, later known as Amiri Baraka) calls this process of genre-interdependence in Black American music "the changing same," a concept that has special relevance in relation to sampling in that what is literally the *same* sonic and musical content can be radically changed by its new surroundings.

Whereas previous scholarship on sampling has focused on structural musical features, in this chapter I will theorize the essential role of spatialization as a frame of reference to explore the changes that samples undergo when they are reinterpreted in a new song. The source material for samples often comes from similar groove-based 1970s disco and funk records as I discussed in Chapter 2, featuring detailed spatialization. As a result, hip-hop producers must decide how much of the wide stereo mix to retain from the original records, and how to recontextualize the space of the sample within their new song. While producers were initially constrained by the technological limitations of analog recording equipment and hardware samplers, as hip hop evolved into the twenty-first century the prevalence of Digital Audio Workstations (DAWs) has allowed for more complex uses of space in sampling. In this chapter, I will first survey previous academic approaches to sampling, specifically focusing on Amanda Sewell's (2013) typology of hip-hop samples. Thereafter I will discuss the role of evolving technology in sampling, before delving into case studies that epitomize the "classic" approach to sample spatialization of the 1990s, which demonstrates hip hop's propensity to foreground the relationship between the vocals and the drums. I will also discuss several alternative means of reinterpretation, including the spatial preservation approach that began in the 2000s, as well as more creative and diverse scenarios that can be found in subgenre of trap from the 2010s onward. Each of these case studies will illustrate how the use of space in sample spatialization can reveal the aesthetic goals of hip-hop producers and of the genre more broadly.

Theorizing Samples: Sewell's Typology

In the late 1980s and early 1990s, as hip hop began to enter the American mainstream, critical writings on the genre began to emerge. During this time, many scholars were

condescending towards the practice of sampling, calling it a form of musical and intellectual theft. For example, contemporary musicologist Andrew Goodwin characterizes the wave of sample-based popular music in the 1980s as the "Age of Plunder" (1988, 43). This attitude was also reflected in copyright court proceedings of the time, including the infamous 1991 lawsuit, Grand Upright Music Ltd. v. Warner Brothers Records, in which the court ruled that rapper Biz Markie had stolen the intellectual property of Gilbert O'Sullivan by sampling the latter's song without permission (Claire McLeish 2020, 3). In addition to epitomizing the public, legal, and scholarly opinions on sampling at the time, this ruling also changed the way producers used sampling in their records. Sewell (2014) writes that before the court ruling, producers would use samples from many different sources in the same song, while afterwards they were much more careful about only using samples for which they had a license. Since 1991, however, public and scholarly opinion has shifted towards viewing sampling as a complex, intertextual artistic practice rather than theft, leading to many different and creative uses of samples.

Sampling in hip hop is not a singular or straight-forward process; rather, producers[26] reuse and "flip" sampled material in remarkably multifaceted ways. Therefore, a typology that categorizes and differentiates between the common sampling strategies used by producers can be a helpful analytical tool. Sewell (2014) categorizes samples into three broad categories and various subcategories (see Ex. 3.1). The first, structural samples, constitutes samples that "create the rhythmic foundation and groove of the track" (26). While this definition emphasizes the rhythmic element of structural samples, the subcategories (percussion-only, intact, non-percussion, and aggregate) reveal that multiple harmonic or melodic instruments can also be present in such samples. Another important element of structural samples is that they are looped

[26] In hip-hop culture, the "producer" occupies the former role of the DJ as the one who creates the instrumental track, over which the MC raps their verses.

throughout long sections or the entirety of the song, rather than only appearing momentarily; in this way they become "structural." Given the topic of this thesis, and that structural samples create a hip-hop song's groove, the majority of this chapter's examples will discuss structural samples. More specifically, I will mostly discuss "intact" and "non-percussion" samples, where multiple instruments from a spatially complex funk, soul, or disco song are reinterpreted in the new hip-hop song. As Sewell emphasizes, while drums and rhythm are foundational to hip hop, "[a]ny definition of a hip-hop groove must account for instrumentation in addition to drums, source materials, rhythmic character and how various layers interact" (32). All of these aspects can be addressed through the lens of spatialization.

- Structural: looped (repeated end-to-end in sustainable patterns throughout a track)
    - Percussion-only: borrowing only non-pitched rhythmic instruments from the source
    - Intact: borrowing drums and various combinations of bass, keyboard, guitar, or other instruments, all of which sounded simultaneously in the source
    - Non-percussion: using original bass, keyboards, or other instruments, but lacking any sampled drums
    - Aggregate: using drums and various combinations of instruments, but each sampled from a distinct source
- Surface: decorate or emphasize the structural samples
    - Constituent: only a beat long and appearing at regular intervals atop the groove
    - Emphatic: appearing at the beginning or end of a track
    - Momentary: appearing only once in a track but in an unpredictable place
- Lyric: spoken, sung, or rapped text
    - Singular: heard once during a track
    - Recurring: heard repeatedly during a track, usually in the choruses

Example 3.1: A typology of sampling in hip hop, recreation of Sewell (2014): Figure 4

The second of Sewell's categories, surface samples, can also have spatial implications, particularly its first subcategory: constituent surface samples, which reappear at regular intervals. Especially in trap, which tends to "fill up" all available space in the sound box and emphasize an

uncanny sense of space, constituent surface samples can be found that shift spatial position and appear to come from multiple places throughout a song, adding to the surreal feeling of listening to this subgenre. Vocal ad-libs, both when sampled and when recorded specifically for a song, fulfill this category and are a defining feature of trap songs (see analysis of Ex. 3.5 below). Sewell's final category, lyric samples, will not be discussed in this chapter, as they involve the vocabulary and lyrical content of the songs, an element that cannot be realized spatially.[27]

Sewell's typology of samples reveals that there are many different approaches to the practice of sampling. These approaches, while primarily creative decisions, are also inherently affected by the type of technology used to sample previous records. As such, a discussion of the evolving technology of sampling will enrich the analytical case studies, which come from distinctly different eras of hip hop.

The Role of Technology in Sampling

It is important to note that hip-hop musicians were not the first to sample music from other sources. The practice of musical borrowing dates back at least to the Renaissance, if not earlier. Even in recorded music, the splicing and looping of tapes by *musique concrète* composers of the 1940s could arguably be seen as the first use of "sampling" as we use the term today. The practice of hip-hop sampling, however, originated completely separately from the development of *musique concrète* in the performances of DJs during the 1980s. Initially, DJs would use a turntable to loop a certain section of a vinyl record, over which an MC would rap. Yet sampling did not gain more mainstream popularity until the introduction of affordable hardware samplers, machines that would allow producers to record snippets of audio and play

[27] While I will discuss the spatialization of vocals, the abstract lyrics themselves cannot be treated spatially.

them back at will. A particularly important type of hardware sampler was the Akai MPC series, first released in 1988, which allowed the production of sample-based songs to flourish into the early 1990s.

Later in the 1990s and into the 2000s, Digital Audio Workstations (DAWs) became the most common method of producing hip hop (and popular music in general). DAWs allow for much more flexible and creative methods of sampling, as digital technology affords more precise audio manipulation than analog recording methods. Along with DAWs came the increased prominence of the internet, through which producers had access to a seemingly unlimited repository of sources to sample from. No longer were they limited to sampling directly from physical records or tapes, as millions of audio files could be downloaded at any time. Along with the audio files for complete mastered recordings, the stem tracks of recording sessions could also be found, having been digitalized and shared by someone with access to the original tapes.[28] This means that, with a bit of searching, producers can find the *original* tape recordings of just *one* instrumental track from a given classic funk or soul song, allowing for much more creativity in the way they integrate the samples into their new song, both musically and spatially. While talented producers of the past were able to separate individual instruments from a texture using hardware samplers, the ability to sample individual stem tracks made this kind of sampling much more accessible.

Of course, not everything that might sound like a sample *is* a sample. Producers will sometimes hire studio musicians to re-record the music of a previous recording instead of sampling the record itself, often as a way to skirt copyright laws. This means that what may be

[28] A stem track is the recorded track of one instrument or vocal line isolated from the rest of a complete song. Many of the stem tracks that can be found online are uploaded there illegally, so producers must be careful with how they use them in their samples. This can either be done by doing their best to conceal their source, or by clearing the sample with the holder of its copyright ahead of release.

heard as a sample could actually be an *interpolation* of previous musical material. As McLeish (2020) points out, this is the hip hop equivalent of the difference between an *allosonic* quotation and an *autosonic* quotation. Allosonic quotations are found across many different styles of music, in which musicians quote other music by re-performing it. An autosonic quotation instead "uses the recording itself, quoting not just a passage of the work, but a particular recording of a performance of that work" (McLeish 2020, 187). As my focus in this chapter is on the sampling and reinterpretation of previously recorded material, the majority of my examples will feature autosonic quotation, unless stated otherwise. Producers can also blend allosonic and autosonic techniques in a single song, creating yet more opportunities for spatial manipulation, as will be discussed below.

Sampling can be either a subliminal or an obvious practice; that is, producers can choose to hide their samples in the mix or make them prominent. An example of subliminal sampling is the kind of sample Sewell (2013) calls a structural aggregate sample, in which the complete texture of a song is made up of many small samples from multiple sources. While the smaller snippets found in aggregate samples can be heard as referencing the song they come from, it is usually impossible to distinguish their origin by ear. Therefore, my examples in this chapter will all feature samples that are recognizable and clearly reference their origin, allowing me to speak of a process of recontextualization that is heard by both the producer and the listener.

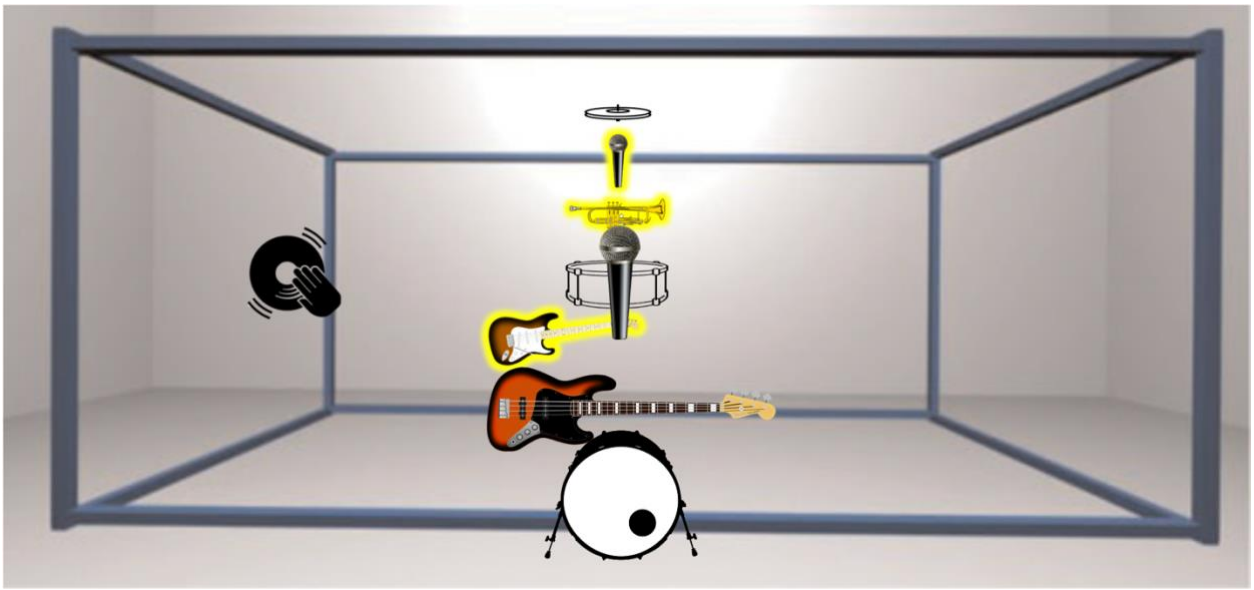
"Classic" Centralized Sampling

As discussed above, hip-hop producers in the 1990s were relatively constrained by the technology of the time, as they were using hardware samplers and mostly analog recording equipment. Out of these constraints, however, producers created a classic approach to hip-hop

sampling that persists in some songs to this day. One example of this classic approach is "Mo Money Mo Problems," from The Notorious B.I.G.'s (henceforth B.I.G.) 1997 album *Life After Death,* which samples Diana Ross's 1980 disco hit "I'm Coming Out" (notably written and produced by Nile Rodgers and Bernard Edwards of Chic, who also play guitar and bass, respectively, on the track). The Diana Ross track features a wide stereo spatialization, in which all the instruments that make up the large ensemble have a specific fixed place in the virtual space (see Ex. 3.2 for a sound-box representation of "I'm Coming Out"). As a result of this specific spatialization, the relationships between instruments in different spatial locations can increase the effectiveness of the groove, as was observed in multiple examples from Chapter 2. For example, in the introduction of "I'm Coming Out" (00:00–00:52), the syncopated relationships between the lead guitar on the right, the kick and snare drums in the center, the toms on the left, and the horns on the edges of the sound-box are clarified and exaggerated by their spatial placement.

Example 3.2: A sound-box representation of Diana Ross's "I'm Coming Out" (1980).

"Mo Money Mo Problems" samples the intro from "I'm Coming Out" in the form of a non-percussion structural sample. The key difference is that in the new song all the sampled instruments have been moved to the center of the space (this shift can be heard between 00:00–00:30 of the B.I.G. record, see Ex. 3.3). The carefully constructed spatial relationships among the different instruments in "I'm Coming Out" is gone, in favor of a spatialization in which all the sampled instruments of "Mo Money" are heard directly *behind* the rapped vocals, in the center of the space.



Example 3.3: A sound-box representation of the verse sections of The Notorious B.I.G.'s "Mo Money Mo Problems" (1997). Sampled instruments from "I'm Coming Out" (1980) are highlighted in yellow.

This reflects the differing aesthetics of the hip hop and disco genres. While hip hop still features a strong emphasis on groove, it is a markedly different kind of groove than in disco, funk, or soul. According to mixing engineer Matthew Weiss, hip hop is "quintessentially…about the relationship between the vocals and the drums" (Shelvock 2017, 180), and how the rhythms of these two lines interact with each other. Therefore, the spatialization of the Diana Ross track, in which our attention is drawn to the interaction between various instruments, would be less

desirable in hip hop where the producers encourage an intense focus on the vocals and the drums. By putting all the sampled instruments in the center of the space, *behind* the rapped vocals, the producers of the B.I.G. song allow the vocals and drums to cut through prominently, and bring a listener's focus to the lyrical flow and rhythmic delivery of the MC.

The chorus of "Mo Money" presents a slightly different spatial relationship between the sampled instruments and the vocals (see Ex. 3.4 for the sound-box of the chorus at 00:53). Now, instead of being heard in front of the sampled instruments, the sung female vocals of the chorus are heard on either side of center, surrounding the sampled instruments. This spatialization reflects Michele Duguay's (2021) writing on the "gendering of vocals" in popular music, as she writes that "women artists are generally assigned vocal placements that are wider, more layered, and more reverberated than those of men," and furthermore that "this vocal placement configuration…creates a sonic contrast that presents women's voices as ornamental and diffuse, and men's voices as direct and relatable" (v). This potentially sexist dichotomy can also be seen in the lyrical content of the B.I.G. song, in that the male rappers' verses tell the narrative of their

Example 3.4: A sound-box representation of the chorus sections of The Notorious B.I.G.'s "Mo Money Mo Problems" (1997). Sampled instruments from "I'm Coming Out" (1980) are highlighted in yellow.

rise from poverty to fame and success, while the female voices in the chorus merely comment on these stories rather than taking control of the song and telling their own narrative.

Putting aside for now the complicated and important issues of gender raised by Duguay's work, the decentered female chorus vocals also allow us to hear more clearly the relationship between the sampled instruments and the sung vocals, as they are not occurring on top of each other (as with the rapped vocals and sampled instruments in the verses). Perhaps the producers sought to bring out the groove of the sample's original disco context more prominently in the chorus by making the rhythmic interactions between different instrumental lines and the melodic vocal line more obvious. As Ismail Muhammad (2017) writes, "'Mo Money Mo Problems' was an exuberant nod to hip hop's roots in black dance music, and it harnesses disco in order to transmit that genre's insistence on rapture, the possibility that utopia can be found on the dance floor" (n.p.). Nowhere in the song can this be seen more prominently than in the chorus, where the vocals move out of the center to make room for the original groove.

Furthermore, the spatialization of the vocals in the chorus also presents an opportunity to hear the interaction between the autosonic and allosonic layers of this song. The chorus melody is based on that of "I'm Coming Out," with slight melodic differences and new lyrics. This represents an interpolation, or allosonic sample, from "I'm Coming Out," occurring at the same time as the autosonic sample is heard at the center of the space. The spatialization of the chorus vocals, which creates some distance between the allosonic and autosonic layers, allows listeners to hear the new chorus as an intertextual commentary on the original sample. The chorus vocal's lyrics about the difficulties brought by fame and wealth add to the narrative of the Diana Ross song, which discusses breaking free from societal bonds. In other words, the B.I.G. song

Signifies on the Ross song. By allowing both of these narratives to speak for themselves through spatialization, the mixing engineers make this dialogue physically audible.

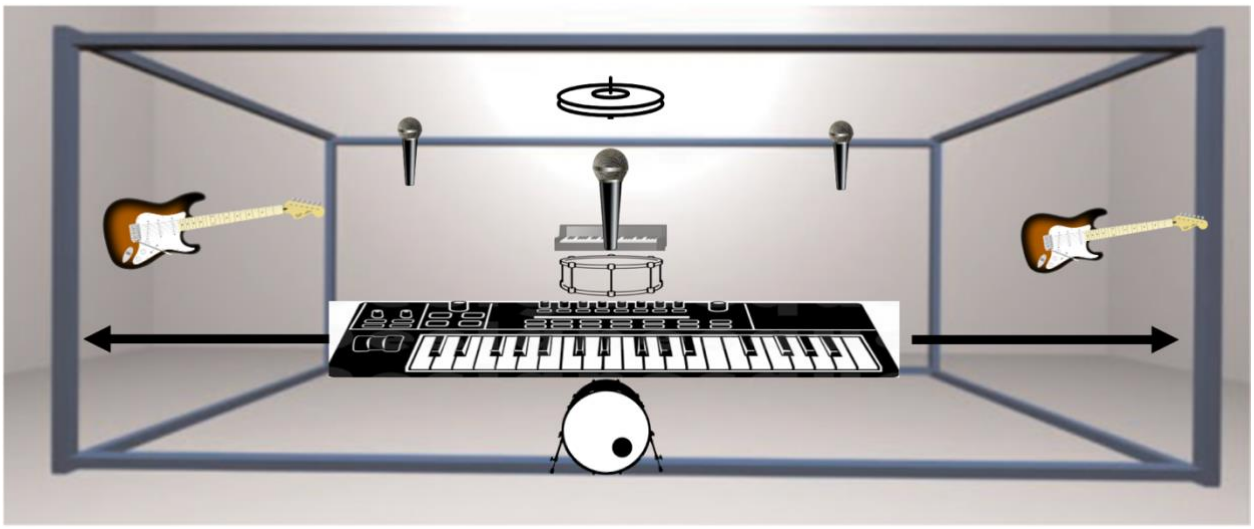
Overall, "Mo Money" presents a classic approach to sampling that can be found throughout hip-hop songs from the 1990s to the present. Due to the technological constraints at the time, producers may have had no other choice than to keep a sample intact and play it through one channel.[29] Since the center of the virtual space is where the core structural layers (such as what Moore (2012b) calls the explicit beat and bass layers)[30] are typically found in popular music it makes sense that this is where producers would choose to place their structural sample. While the spatial placement of samples may have been constrained by technology, producers were still able to be creative with how they spatialized the newly added elements, as is seen in the chorus of the B.I.G. song.

Even though this spatial paradigm may have originated out of necessity, it nevertheless caught on as a stylistic practice characteristic of hip hop. As an example, Foxy Brown's "Big Bad Mama" (1997) features an *interpolation* of Carl Carlton's "She's a Bad Mama Jama" (1981), but still uses the same approach. The original Carlton song featured an extremely wide and diffuse synth bass sound. That is, the bass seems to be coming at the listener from all sides, rather than merely from the center. In the Foxy Brown song, however, the bass is purely constrained to the center of the virtual space (see Exx. 3.4–3.5). The outer edges of the soundbox are instead reserved for hi-hats, shakers, and vocal ad-libs, a feature common to many hip-hop songs of this and later eras. Therefore, despite the ability to spatialize the "sample" in any way

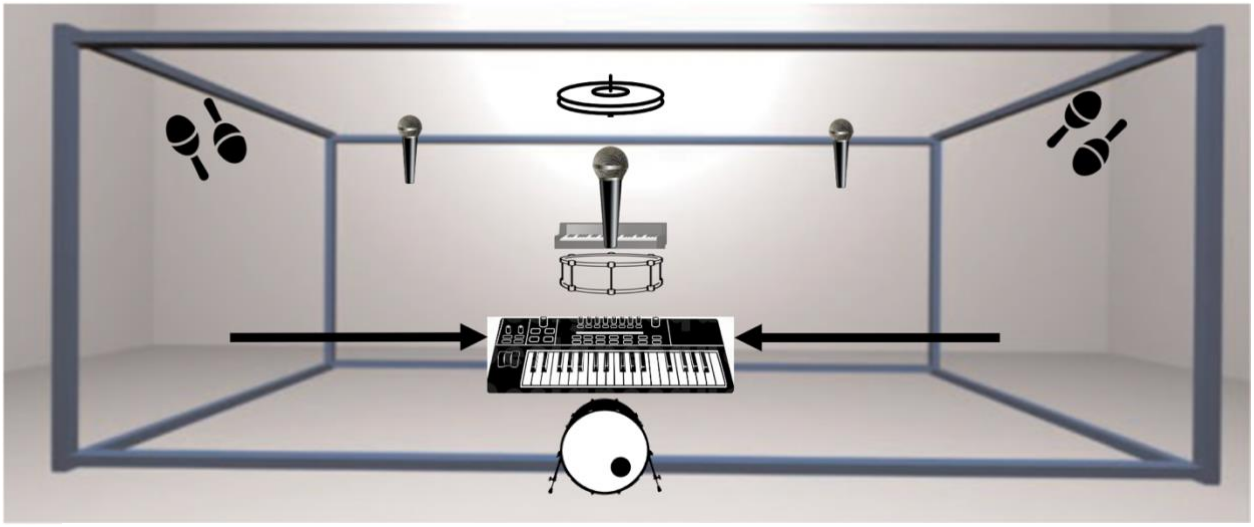
[29] The spatial compression caused by this mixing decision creates an interesting parallel with the mono versus stereo versions of "Thank You (Falettinme Be Mice Elf Agin) discussed in Chapter 2. Again, we see how a groove mixed in mono presents less opportunities for listeners to embody all the rhythmic intricacies of the groove.

[30] Moore's (2012b) theory of textural layers in popular music includes an "explicit beat" layer, a "functional bass" layer, a "melodic" layer, and a "harmonic filler" layer, to which Lavengood (2020) adds a "novelty" layer.

due to it being a re-recorded interpolation, the Foxy Brown song still follows the same spatial paradigm as the B.I.G. song, demonstrating that this style of mixing became a stylistic choice.



Example 3.4: A sound-box representation of Carl Carlton's "She's a Bad Mama Jama" (1981). Note the wide and diffused sound of the synth bass, which dominates the soundbox.



Example 3.5: A sound-box representation of Foxy Brown's "Big Bad Mama" (1997). Note how the synth bass, interpolated from Carl Carlton's song, has been constrained to the center.

The "classic" style of sampling has persisted even into the 2020s. For example, Pusha T's "Dreamin of the Past" (2022), features an intact structural sample from Donny Hathaway's soul

version of "Jealous Guy" (1972). Despite Kanye West's[31]—the producer—ability to preserve the spatialization of the Hathaway song or to manipulate it in any way using digital audio tools, he chooses to reference this classic hip hop paradigm by constraining the structural sample to the center of the space. In the case of "Dreamin of the Past," the title and lyric content of the song suggest this mixing choice is very much intentional. Therefore, the "classic" approach to spatializing structural samples can be seen as a stylistic choice that enculturated listeners can recognize as a reference to the "golden age" of 1990s hip hop.[32] One might even say that modern hip-hop songs that use the "classic" approach are Signifyin(g) on both the source of their samples, and on hip-hop songs of this bygone era.

Spatial Preservation in Structural Sampling

While the "classic" approach has persisted to the present day, as digital sampling and recording technology improved into the early 2000s producers gained much more creative freedom in terms of spatialization. Today, producers can choose to *retain,* or preserve, the entire wide lateral spatialization from the sampled track, rather than having to constrain it to one channel in the center. Preserving a sample's lateral spatialization represents one possible alternative to the "classic" approach. For instance, Kanye West's "Touch the Sky" (2005) features an intact structural sample from Curtis Mayfield's "Move on Up" (1970). West's song retains the original wide spatialization of the Mayfield song in the introduction and chorus sections, with only slight spatial modifications. This comparison is evident in the contrast

[31] This artist has since changed their name to "Ye." I continue to use "Kanye West" in this thesis as that is the name under which the songs mentioned in this thesis were released, and because I wish to maintain distance from the extremely distasteful views he has espoused since changing his name. For a thoughtful account on why analysts might continue to analyze West's work despite his recent views, see: Jeremy Tatar (2023).

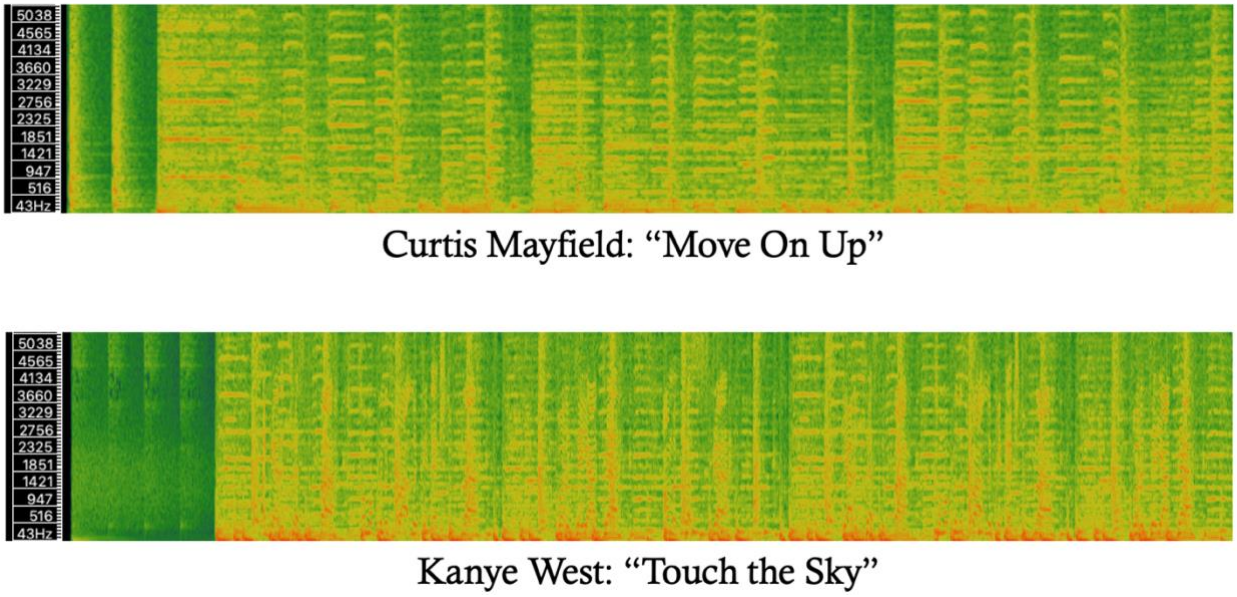
[32] Further examples of the "classic" approach to structural sample spatialization include Tyler the Creator's "WUSYANAME" (2021), Kanye West's "Through the Wire" (2004), The Notorious B.I.G.'s "Big Poppa" (1994), and many others.

between the openings of both songs, as well as between West's chorus (00:55) and Mayfield's instrumental break (01:50). The effect of retaining the spatialization is that West's song features a groove that is closer to Mayfield's than it would have been if the sample was centralized. The producer, Just Blaze, allows listeners to hear the interactions among all the instrumental layers of Mayfield's song as well as between the sampled instruments and the newly added instruments and vocals.

In the verses of "Touch the Sky" the sample has been altered so that the sampled instruments are less prominent and sound significantly further back in the mix (the first verse begins at 00:19). This alteration reflects the same production technique that I observed in the B.I.G. song, in which rapped verse vocals are placed *in front of* the sampled instruments. Even though the sampled instruments are still laterally spatialized in the verses of "Touch the Sky" (in that they are not simply piled in the center), they are perceived as being deeper within the sound-box than in the chorus. This commonality between the B.I.G. and West songs suggests that perhaps producers feel more freedom to create complex spatial relationships between the vocals and the sampled instruments in the chorus than in the verse, as the latter is reserved for a focus on lyrical delivery. This reflects a more general tendency in popular music mixing to make vocals more direct in verses, which tend to feature more expository lyrics, while the narrative of material of the chorus is more about emotional release and commentary, leading to less focused vocal mixing.

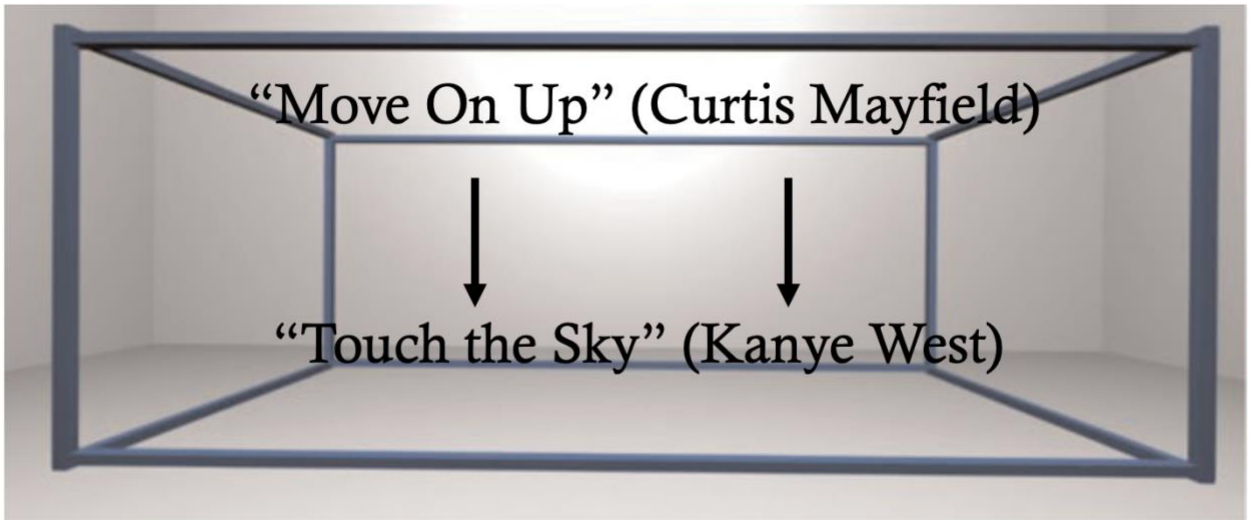
Having established that for much of the song the sampled instruments in "Touch the Sky" are spatialized in essentially the same way as they were in "Move on Up," how does the new song Signify on its source material and transform it to fit within the hip hop genre? For one thing, Just Blaze adds new drums featuring a much more prominent kick and snare drum. The

sample has also been slowed down slightly, causing it to sound about a quarter tone lower. Additionally, the high-end frequencies have been made less prominent through equalization. Overall, this means that West's song features low frequencies more prominently (see Ex. 3.6 for a comparison of the two songs' spectrograms). As the sound-box model suggests, listeners perceive lower frequencies as being physically lower in space. Therefore, the increased focus on lower frequencies in the West song leads to an overall *downward shift* in the sound-box (see Ex. 3.7).



Example 3.6: A comparison of the low-end spectrograms of 00:00–00:11 of Curtis Mayfield's "Move on Up" (1970) and 00:00–00:18 of Kanye West's "Touch the Sky" (2005). Note the darker orange coloring in the low end of West's song.

This downward shift in combination with the slower tempo can fundamentally change a listener's embodied reaction to the song. Heavy low-frequency sounds tend to be felt in what Moylan (2020) refers to as the "intimate/body space" zone (315), in that the sounds seem to be taking place within a listener's own body. This effect is especially noticeable when listening to music through a speaker system with a strong subwoofer, where it is possible to literally feel the low frequencies vibrating one's entire body. Mayfield's song, with its higher overall spectral



Example 3.7: A schematic representation of the “downward shift” in the sound-box caused by the increased use of lower frequencies in Kanye West’s “Touch the Sky” (2005).

center, does not create the same “intimate” embodied experience as “Touch the Sky.” In my own embodied perception of these songs, the lower frequencies and slower tempo of West’s song makes me want to sit back in my chair, while Mayfield’s song evokes the opposite response in making me want to sit up and be more alert. Therefore, one could hypothesize a literal one-to-one correspondence between music and body in which a downward shift in the sound-box encourages a downward shift in bodily position.

While songs that preserve their sample’s spatialization may not change the spatial location of instruments in lateral space, as the above analysis of “Touch the Sky” showed, they do often manipulate the sample’s spatialization in terms of depth and perceived height, largely as a result of equalization and effects on the sample and its interaction with additional instruments and vocals. Songs that retain all of their sample’s instruments *and* their lateral spatialization throughout a majority of their length are, however, relatively rare. In post-2010 hip hop, and especially in the trap subgenre, it is more common to hear smaller snippets of spatialized samples, that are radically transformed due to the differing goals of trap producers.

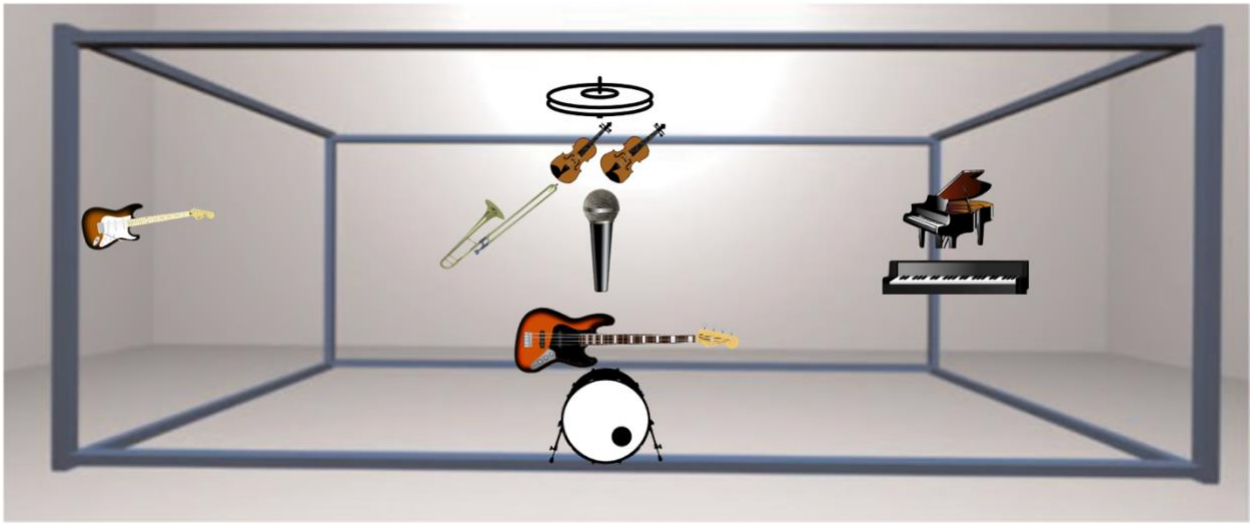
Other Creative Spatial Scenarios in Trap

The trap subgenre of hip hop represents a departure from all of the examples above, in that, as pointed out by Benjamin Duinker (2020), it "relies heavily on synthesizers and drum machines, and less (than in Golden-Age hip-hop music, for example) on samples from soul, funk, and R&B records" (45). Despite the density of musical events, the texture of trap songs also tends to sound paradoxically sparser than in classic hip hop, as a sense of open space is often created through reverb on both vocals and instruments. The result of these production decisions, in combination with the subject matter of the lyrics that often concern taking and selling drugs, is to create a psychedelic listening experience. This aesthetic of intoxication extends to the vocal delivery of MCs, which Justin Burton (2017) describes as follows: "[t]he barely enunciated lyrics of trap artists like Future, Young Thug, and Rich Homie Quan perform the woozy, stunted motor skills of a lean-induced stupor" (97).[33] How, then, do producers Signify on samples from soul, funk, and R&B records to contribute to this atmosphere in trap songs?

"P Power," (2022) by Atlanta trap artist Gunna and featuring Drake, prominently uses a sample from Donna Summer's "Could It Be Magic" (1976). Summer's version—a disco cover of a song written by Barry Manilow—was produced by notable disco pioneer Giorgio Moroder. Moroder's work with Summer is characterized by his portrayal of her as a sex symbol, both through her vocalizations and the musical landscape he surrounded her voice with. "Could It Be Magic" is an example of this highly suggestive style of disco, especially the instrumental break following the first chorus (01:11), which prominently features Summer's moaning. In Summer's

[33] "Lean," also known as "Purp(le) Drank" is "an Actavis-produced cough syrup mixture of codeine and promethazine […], a sweet drink like Sprite, and candy" (Burton 2017, 96).

original version, this section features a typically wide spatialization, with her voice prominent and centralized over a lush string orchestra, horn section, bass guitar, drums, a rhythm guitar



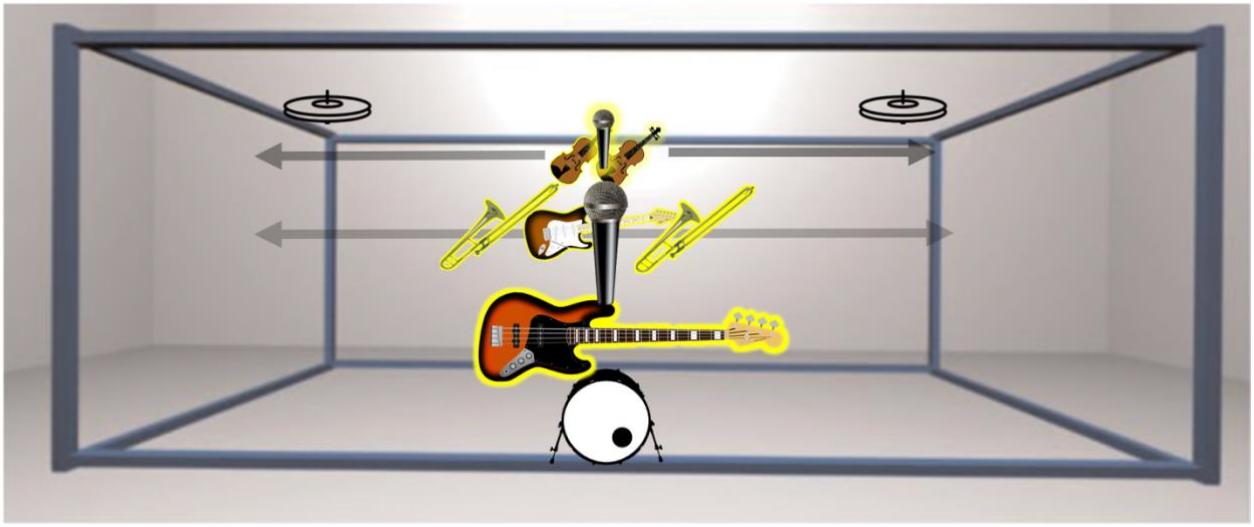
Example 3.8: A sound-box representation of Donna Summer's "Could it Be Magic" (1976).

treated with the "wah" effect on the far left, and a keyboard on the far right (see Ex. 3.8).

"P Power" uses the instrumental break from Summer's song as a structural sample throughout its entire duration. Essentially, the producer Metro Boomin centralizes the entire ensemble from the Summer song, yet the way in which he does so yields a different effect from the "classic" approaches discussed above. Some of the instruments sound distinctively more diffuse, that is, they seem to be taking up more lateral space in the sound-box than in the original mix (see Ex. 3.9). The rhythm guitar with its "wah" effect especially seems to be much wider than in the original.[34] In "P Power," the guitar sounds like it is surrounding the listener, rather than being located in a distinct location as in "Could It Be Magic." The "wah" effect adds to the feeling of breadth, as it causes the guitar's attack to be slowed, making it sound as if it is slowly fading in and out. The guitar's slipping in and out of prominence creates a

[34] This could be accomplished through a variety of effects in the mixing process, such as flanging, chorusing, and reverb, all of which can create a "fattening" effect (see Gibson 1997, 112).

listening experience similar to the feeling of slipping in and out of consciousness after having consumed copious drugs, exemplifying the aesthetic of the trap subgenre.



Example 3.9: A sound-box representation of Gunna's "P Power" (2022). Sampled instruments from "Could it Be Magic" are highlighted in yellow, arrows connote diffusion across the stereo space.

Metro Boomin's sampling process thereby creates a highly psychedelic sound, in which the listener is unsure of where exactly sounds are coming from. Yet what is also notable is that "P Power" retains Summer's moaning vocals. Whereas in Summer's song her vocals are the most prominent element of the mix, in "P Power" they are heard behind the rapper's vocals and are given more reverb, making them sound diffuse and indirect. This spatial choice represents another example of Duguay's (2021) "gendered virtual space," in that the mix relegates Summer's female voice to the background while the male rappers are heard front and center. The lyrical content of the rappers' verses further problematizes this spatialization, as they rap about their sexual prowess and their views of women as sexual objects, seen in lines such as "tell my brother she ours." This usage of Summer's voice makes for a sharp contrast with her original song, which is a proud statement of female sexual agency and empowerment. As Diana Mankowski (2010) writes, "[w]hile the breathy vocals of Summer's early music do not suggest

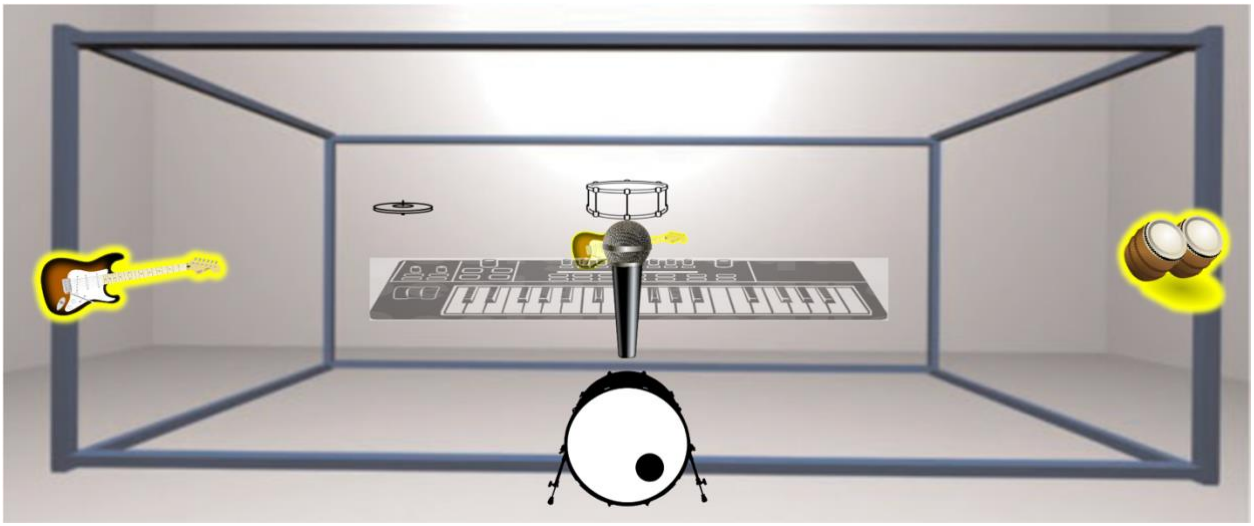
an overly aggressive female agency, the assertive nature of many lyrics would have appealed to women looking for liberation through sexual self-determination" (357). Gunna and Drake's sample disturbingly subverts this narrative, treating Summer's moaning vocals as a background object over which to assert their own dominance.

"P Power" is an example where spatial recontextualization is used to subvert a narrative and to give a disco sample a more psychedelic sound. While "P Power" has a markedly different effect than the other samples discussed so far in this chapter, its centralized spatialization nevertheless suggests some relationship to the "classic" approach to sample spatialization. Other trap songs, however, depart from the "classic" approach entirely. One such example is Young Thug's "Amazing" (2015), which samples the spatially marked opposition from Earth, Wind & Fire's "September" (1978). As noted in Chapter 2, the introduction of "September" features two instruments placed at the very edges of the sound-box: the bongos on the far right, and the lead guitar on the far left. These two instruments form a syncopated relationship whose spatially marked placement makes their opposition more prominent and thereby increases the overall feeling of groove in the song (see Ex. 2.3).

Wheezy, the producer of "Amazing," samples these two instruments (see Ex. 3.10 below). This sample highlights another progression in sampling technology as compared to many of the above examples, in that Wheezy is able to cleanly sample one specific spatialized element, the SMO from "September."[35] When listening to the beginning of "Amazing," it becomes immediately clear that the spatially marked instruments of "September" function entirely differently in the new song. Instead of clarifying and enhancing a listener's experience of groove, the instruments now induce a sort of trance-like listening experience in the introduction and first

[35] The more centralized rhythm guitar can also be faintly heard in the sample, but the most prominently audible feature of the sample is the spatially marked opposition.

verse (00:00–01:06). This feeling is further heightened by the considerable reverb applied to most of the instruments in this track, and by the general openness of the texture, which can be seen in the emptiness of the sound-box in Ex. 3.10. As previously mentioned, ample reverb and a sense of open space are both key attributes of the trap subgenre and contribute to the trance-like listening experience evocative of taking drugs.

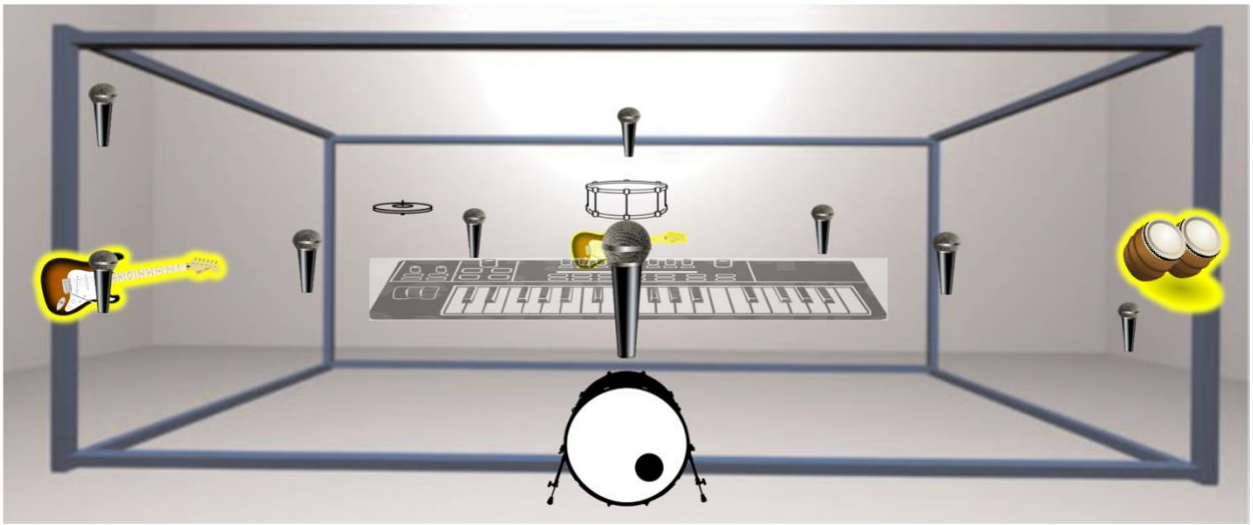


Example 3.10: A sound-box representation of Young Thug's "Amazing" (2015). Sampled instruments from "September" (1978) are highlighted in yellow.

As in some previous examples, the sample is used differently in the verse and chorus sections of this track. The spatialization of the sample at the edges of the sound-box, however, remains consistent throughout the entire song. Yet when comparing the introduction (00:00), the verse (00:13), and the chorus (01:07), a listener can hear varying levels of prominence as well as a shifting tempo of the sample. In the introduction and chorus sections, the sample is forward in the mix and in a similar tempo as it was in "September." In the verses, however, the sample is slowed and pitched down significantly, inducing the aforementioned trance-like experience. Even though the tempo and prominence of the sample in the chorus of "Amazing" is similar to how the instruments sounded in their original context, the groove they create is very different

from that of "September." Instead of pushing against the primary metrical beat of the song in a predictable syncopated manner, the instruments form a more complex polyrhythm with the centralized chorus vocals of "Amazing." Therefore, while their spatially marked placement enables the cohesion of the groove in "September" to be heard more clearly, in the chorus of "Amazing" their spatialization creates the opposite effect, emphasizing how the vocals and the sample appear to be operating in different tempos and time signatures.

"Amazing" therefore subverts the groove-creating paradigm of the SMO from "September" and instead uses the SMO as a way of creating the trance-inducing atmosphere of trap. My own embodied experience of the SMO is also markedly different, as the slower tempo in the verses heightens the off-balance feeling of the bouncing syncopations between the spatially marked instruments. Rather than alerting my senses through its kineticism, the SMO in this context makes it sound as if my senses have been dulled in an unnatural way, adding to the aesthetic of simulated intoxication. This sense of unnatural space is further heightened by vocal ad libs that come from all angles throughout the song. For example, during the first verse, Young Thug's ad-libs come from almost every conceivable spatial location (see Ex. 3.11).



Example 3.11: A sound-box representation of "Amazing" (2015), with microphones connoting all the spatial locations of vocal ad-libs as heard in the first verse (00:00–01:07).

Brøvig-Hanssen and Danielsen (2013) argue that "surreal" or "unnatural" virtual spaces are defined by such departures from what could be heard in a real-world space. However, they also emphasize that at this point in the development of recorded music, where listeners have become familiar with the typical spatialization of popular song, surreal virtual spaces are often only heard as such in comparison to other virtual spaces. That is, given the ubiquity of recorded music and that all virtual spaces are imaginary constructions, a listener will only hear something as being "unnatural" when it is not what they expect, given their expectations as built by previous listening experiences. Sample-based hip hop, with its references to other recordings, always has the potential to sound "surreal" in that listeners may compare it to the source of its sample(s). Since I as a listener am very familiar with the virtual space in "September," with its SMO and static overall spatialization, that particular spatialization has been "naturalized" for me. The transformation of the SMO in "Amazing" along with the shifting spatial position of the vocal ad-libs, by comparison, sounds uncanny and surreal. This situation highlights the variable listening experiences possible in sample-based music, as without knowing the virtual space of a sample's source a listener may not experience the recontextualization and the full range of its implications.

Furthermore, the SMO as it appears in "Amazing" defies categorization according to Sewell's typology (see Ex. 3.1 above). While it is structural in that it is looped throughout most of the track, it does not fall neatly into the category of "percussion only," as one of the instruments is pitched. It is not really "intact," given that not all the instruments from "September" are sampled. It is not a "non-percussion" sample, and it is also not an "aggregate" sample. What further complicates this sample is that it is unclear whether it is part of the beat layer (since it includes the guitar), or whether it fulfills some other functional purpose, such as

being a part of the novelty layer. The novelty layer, as defined by Lavengood (2020), is a layer that encompasses a musical element that is a unique identifier of a song but does not fit neatly into the explicit beat, harmonic, or melodic layers. In the chorus, the metrical dissonance between the sample and the central beat leads to the feeling that the sample is more novelty than beat-related, while in the verses the sample's rhythmic alignment with the beat suggests it has a more structural role.

Sewell's typology falls short here in that it does not have a clear category for the sample's ambiguous role in the chorus, nor does it allow for a sample to shift types over the course of one song. In the specific case of "Amazing," it might be more productive to focus on what remains *the same* throughout the song: the sample's spatialization. Putting aside the rhythmic complications, this sample suggests a new category for Sewell's typology: an "atmospheric structural sample," defined by its marked spatialization. These types of samples are more prevalent in post-2010 trap, which may explain why it does not fall into any of Sewell's primarily 1990s-based categories.

Conclusions and Potential Future Developments

The above analyses have summarized several approaches to spatial recontextualization in hip-hop sampling. In the "classic" and predominant approach, as exemplified by "Mo Money," all the sampled instruments are centralized and heard under the main vocals in the verse sections, while the chorus sections often feature more spatial creativity. Other paradigms include the preserved spatialization approach, as seen in "Touch the Sky," where the entire instrumental ensemble from the sample's source song is retained with its lateral spatialization intact. The differences in samples that preserve their spatialization as compared to their source include an

increased emphasis on low frequencies, which can change the embodied experience of the listener. Finally, analyses of "P Power" and "Amazing" showed that, due in part to ever-increasing technological capabilities, trap producers of the 2010s and beyond can be more creative in their use of space for rhetorical and embodied effects. Throughout all of these sampling techniques, a number of general trends can be seen that contribute to defining the sound of the hip hop genre. Most notably, the tendency to emphasize low frequencies and to foreground the relationship between the rapped vocals and the beat. Both of these tendencies can be seen in each example discussed in this chapter.

As we enter the mid-2020s, new spatial audio technologies are becoming more prevalent and are beginning to be used in hip-hop production. For example, Apple Music offers a kind of spatial audio that, according to their website, allows for a listening experience where "sound seems like it's coming from all around you."[36] This technology, however, is limited to users of Apple branded headphones and devices. Dolby, the audio software developer, also offers a spatial audio format called Dolby Atmos, which converts multi-channel surround sound mixes into a format that can be played back on regular stereo headphones.[37] Streaming platforms such as Tidal allow listeners to listen to Dolby Atmos versions of many new releases, among them Kendrick Lamar's 2022 hip-hop album *Mr. Morale and the Big Steppers*. The last song on this album, "The Heart Part 5," offers a glimpse into what the future of sample spatialization might look like. This song features a re-recorded interpolation of Marvin Gaye's "I Want You" (1976), a soul song featuring typically wide and detailed spatialization. The Lamar song adds additional percussive elements that are placed throughout the virtual space, creating various spatial

[36] See: "Listen with spatial audio for Airpods and Beats," Apple Support. July 19, 2023, https://support.apple.com/en-us/HT211775
[37] See: "Dolby Atmos," Dolby. 2023, https://www.dolby.com/technologies/dolby-atmos/

rhythmic relationships. In the Dolby Atmos version, the various percussion instruments seem to be even further apart than they are in the stereo version, heightening the rhythmic tension as in an SMO, since the Atmos technology allows for more detailed spatialization. When comparing the Atmos version of Lamar's song to Marvin Gaye's stereo original, there is a marked difference in the clarity of the spatial mixing.

For now, however, the differences between the Atmos and stereo versions of "The Heart Part 5" *itself* are relatively minor. It remains to be seen what hip-hop producers may be able to achieve with this new spatial specificity if this technology becomes the norm. If producers were to mix their records in spatial audio natively, they could create entirely new spatial paradigms from the ones discussed above and push the art of sampling into a new era. As music producers and technology companies continue to push spatial audio as the future of listening, listeners may become more aware of detailed spatialization. This, in turn, could give mixing engineers and producers more artistic agency than ever before in creating compelling listening experiences.

Chapter 4: Conclusion

In this thesis, I have analyzed multiple ways in which spatialization can affect a listener's embodied experience of groove-based popular music. In Chapter 2, I theorized a spatial structure found in funk, disco, and soul called the spatially marked opposition. In an SMO, the rhythmic tension between two spatially marked instruments is heightened by the perceived distance between them. Through analyses of music by Earth, Wind & Fire, Stevie Wonder, Parliament, and others, I discussed how the SMOs found in these songs increase my embodied experience of groove.

In Chapter 3, I discussed the spatial recontextualization that occurs when hip-hop producers sample material from spatially complex songs. I found that many hip-hop songs follow a "classic" approach to sample spatialization, in which the sampled material is centralized. While this approach first developed due to the technological constraints of the 1990s, I showed that it remains prominent in more recent hip hop, demonstrating that it has become a stylistic convention. Besides the "classic" approach, I also analyzed songs in which the original spatialization of a sample is preserved, as well as several complex spatial scenarios in more recent trap music. Each of the spatial recontextualization methods I discussed have their own effects on my embodied listening experience, although some universal traits persist across each example. These included the propensity to highlight low frequencies and to emphasize the relationship between the rapped vocals and the drums.

My spatial and embodied analyses within this thesis relied mostly on my own first-person experience of listening to this music. This approach allowed me to present my findings in greater detail than I could have had I tried to assume how other listeners would experience the same music, especially given the unknowability of every listener's listening environment and musical

background. While this approach has yielded fruitful results, it was also a necessity given the lack of empirical studies on listeners' experience of virtual space. Should such empirical studies be pursued, one could make more wide-ranging conclusions about the varying effects of different uses of recorded space. For example, a study based on Chapter 3 might seek to find out the differences in listeners' reactions to sampled material in its original form and in its new context. This type of study could be conducted in a variety of ways, but having listeners describe the spatial shifts they hear in the recontextualization might be one approach that helps illuminate the effects of hearing the same musical material in different spatial contexts. A study based on Chapter 2 could attempt to clarify the difference spatial distance makes in a listener's embodied experience of rhythmic tension. I have found that spatial distance increases tension, but different listeners might have different interpretations.

The types of studies suggested above would of course draw listeners' attention to the spatial aspects of musical sound. My own analytical conclusions have come from such repeated and attentive listening to small sonic details. Many listeners, however, may not usually be focused on these specific aspects of the virtual space. Regardless of listener attentiveness, in Chapter 2 I emphasized that when using headphones listeners are naturally surrounded by the virtual space, thereby taking part in a spatial listening experience whether they realize it or not. The rise of wireless headphone or earbud use in everyday life, as well as the ever-increasing popularity of more complex spatial audio formats, could lead to a future where listeners are more focused on virtual spaces than ever before. If or when this occurs, the type of work that I have conducted in this thesis could become a model for future studies seeking to understand spatial listening experiences.

Beyond empirical studies on listener reactions, another fruitful vein of research could be an ethnography on spatial mixing in groove-based music, in which a researcher interviews engineers and learns about the process from within the studio. This would allow a researcher to speak with more certainty about *why* certain spatial paradigms are the way they are, and how mixing engineers go about spatially realizing a groove. Throughout the thesis, I have described how certain mixing choices highlight unique cultural elements of Black American music, such as Floyd's "Call-Response" and Gates's concept of "Signifyin(g)." It would be interesting to learn to what extent mixing engineers are focused on preserving the cultural elements of groove-based music, or whether the magnification of these concepts through spatial mixing is purely coincidental.

While many of the techniques I have described in this thesis may have come about as a necessity for creating a clear mix, there are certainly many artistic choices within mixing that listeners, including myself, may not be able to hear. Delving into the mix of groove-based music with the mixing engineer themselves could teach us more about the music than we are able to hear on our own. Additionally, many songs may not have been mixed with headphone listening in mind. Groove-based music is often heard by listeners in dance clubs or on car stereos. It is possible that some of the spatial paradigms I have discussed were constructed to function particularly well in a non-headphone listening environment. Figuring out what listening environment a mixing engineer had in mind when constructing a virtual space could lead to interesting conclusions about how these decisions impact listeners in a variety of situations.

My intention in writing this thesis has been to open the reader's ears to new listening experiences. My hope is that by listening more attentively to spatialization, listeners come to a greater appreciation of both the music itself and of the artistry in music production. Every aspect

of recorded popular music is carefully shaped by the many musicians and audio engineers involved. The result is a highly polished final product in which every attribute of the music, including its virtual space, deserves close attention on the part of the listener and the analyst.

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