How Technology Has Changed Music

Mark Katz
We must expect great innovations to transform the entire technique of the arts, thereby affecting artistic invention itself and perhaps even bringing about an amazing change in our very notion of art.

Paul Valéry

A recording is one thing, a concert is another, and never the twain shall meet.

John Pfeiffer

The machine is neither a god nor a devil.

H. H. Stuckenschmidt
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Anytown, U.S.A., 1905: a family and several neighbors stand in the parlor of a modest home, staring with equal parts curiosity and skepticism at one of the technological marvels of the day. Staring back at them is the unblinking eye of a megaphone-shaped brass horn. It protrudes about two feet from a small wooden cabinet with a crank on one side and a felt-covered metal plate on top. The marvel is a phonograph, or “talking machine,” as it was commonly called.¹

The gentleman of the house takes a heavy black disc, grooved on one side and smooth on the other, and places it over the spindle with the label facing up. He turns the crank several times, gingerly sets the needle on the outermost groove, and hurries back to his chair. Everyone stares at the phonograph in eager anticipation. The disc spins quickly, and above the whooshing and crackling the machine begins to sing. It sounds to them like actual voices and instruments, albeit in miniature. It is hard to believe that little more than a needle and a record can bring the performers to life, just as if they were right there in the parlor.

After three minutes of rapt attention, the small audience breaks into spontaneous, unselfconscious applause and calls for more. Before the man
can replay the record, a small child runs to the machine, peering under the table and jumping up to look into the horn. Everyone laughs when it becomes clear that the boy is looking for the musicians! After each record is played several times, the crowd disperses, with everyone wondering if wonders will never cease.²

This quaint vignette may seem unremarkable, but it reveals a revolution in the making. Those gathered around the phonograph were experiencing music in ways unimaginable not so many years before. They were hearing performers they could not see and music they could not normally bring into their homes. They could listen to the same pieces over and again without change. And they ultimately decided what they were to hear, and when, where, and with whom. All of this was made possible by the distinctive characteristics of sound recording technology. This is a crucial point, for as I explained in the introduction, if we understand the nature of recording, we can understand how users have adapted to, compensated for, and exploited the technology. It is in these actions that we discover the influence of recording; it is here that we find phonograph effects.

Each of the following seven sections examines a distinctive and defining trait of sound recording technology. This chapter is intentionally broad, moving quickly and often between written and oral musical cultures, East and West, popular and classical, the late nineteenth century and the early twenty-first. Such breadth is imperative, for the impact of recording is strongly shaped by the time, place, and context in which the technology is used. As we will see, phonograph effects are not simply technological phenomena.

**TANGIBILITY**

Before even setting needle to groove, the operator of the phonograph in that Anytown parlor encountered one of the most remarkable characteristics of recorded sound: its tangibility. Taking the disc out of its paper sleeve, he held the frozen sound in his hands, felt the heft of the shellac, saw the play of light on the disc’s lined, black surface. He was holding a radically new type of musical object, for whereas scores prescribe or describe music, and instruments generate music, recordings preserve actual sounds.

This tangibility has allowed extraordinary changes in the way music
can be experienced. Prior to the invention of the phonograph, Karl Marx observed what must have seemed to be an unchangeable truth about music. “The service a singer performs for me,” he noted, “satisfies my aesthetic need, but what I consume exists only in an action inseparable from the singer, and as soon as the singing is over, so too is my consumption.”

When sound is recorded and preserved in a physical medium, however, the listener’s consumption need not end when the singing is over, for the music can be separated from the performer and be replayed without the artist’s consent. Indeed, the portability and repeatability of recorded sound—two of the technology’s crucial attributes to be discussed in this chapter—derive from its tangibility. Yet tangibility is not simply a “meta-trait.” In itself the material preservation of sound—“the stockpiling of music,” in Jacques Attali’s arresting phrase—deeply influences the consumption and production of music.

To illustrate this point I want to explore briefly the impact of recording’s tangibility as revealed in, first, record collecting and, second, the physical characteristics of cassettes and compact discs.

As Evan Eisenberg has pointed out, “For the listening public at large, in every century but this one [now two], there was no such thing as collecting music.” Certainly, enthusiasts sought out instruments, manuscripts, program books, autographs, and the like. Record collecting, however, represents a new relationship with music, for these collectors seek neither the means to create sound nor mementos of it, but sound itself.

This new relationship is most vividly illuminated in its pathological extremes. Record collecting has long been described (affectionately, for the most part) as an illness or addiction. In 1924 the British magazine *Gramophone* playfully warned of “gramomania,” alerting readers to its “insidious approach, its baneful effects, its ability to destroy human delights.” Two years later, on the other side of the Atlantic, the *Phonograph Monthly Review* asked readers to recount their most dire sacrifices in the name of grooved shellac. One contestant, with the self-deprecating pseudonym “Adam Pfuhl,” spun a woeful tale of spending all the money for his family’s Christmas presents on records; another told of literally selling his shirt to support his habit. Appropriately—or perhaps not—the winning contestants received gift certificates for records. Nick Hornby’s 1995 novel *High Fidelity* demonstrates that the disease is far from eradicated. Rob, the
owner of a second-hand record shop and a passionate collector of pop music discs, sympathetically observes the habits of his more obsessive customers:

You can spot the vinyl addicts because after a while they get fed up with the rack they are flicking through, march over to a completely different section of the shop, pull a sleeve out from the middle somewhere, and come over to the counter; this is because they . . . suddenly sicken themselves with the amount of time they have wasted looking for something they don't really want. I know that feeling well: . . . it is a prickly, clammy, panicky sensation, and you go out of the shop reeling. You walk much more quickly afterward, trying to recapture the part of the day that has escaped.  

In the world of hip-hop, hunting for LPs is known as “digging in the crates,” a reference to the way in which discs are typically stored and displayed in second-hand stores and thrift shops. As we will see in chapter 6, digging is a way of life among hip-hop DJs, for their creativity is judged in part on their ability to find rare, unusual, and catchy tracks. The 1992 rap song “Diggin’ in the Crates,” by Showbiz and A.G., makes it clear that this activity is as addictive as any form of collecting: “Buying old records is a habit/You know I’ve got to have it.” The darker side of this addiction comes out in Pearl Jam’s 1994 rocker “Spin the Black Circle,” in which a phonograph stylus is like a hypodermic needle and the act of playing an LP parallels the ritual of shooting up heroin.  

Such addictions are directly connected to the materiality of recorded music, for it is often the physical artifacts themselves, more than the sound of the music, that collectors find meaningful. In speaking of his records, High Fidelity’s Rob explains: “This is my life, and it’s nice to be able to wade in it, immerse your arms in it, touch it.” To be sure, record collecting involves more than music. Collecting is about the thrill of the hunt, the accumulation of expertise, the display of wealth, the synesthetic allure of touching and seeing sound, the creation and cataloging of memories, and the pleasures (and dangers) of ritual. Record collecting represents a relationship with music that helps us, in some part small or large, to articulate and, indeed, shape who we are.  

The relative affordability of these musical objects is also significant, and
has affected all types of listeners, whether the sweaty-palmed disc junkie or the casual consumer. Recordings are often (though not always) cheaper than tickets for concerts of the same fare, and their affordability may affect listeners’ access to music. As the next chapter will show, the inexpensive disc was hailed as one of the keys to helping America become a more “musical” nation in the first decades of the twentieth century, for cheap records of the classics meant that access to “good music” need not be the exclusive domain of the rich. And one of the crucial issues in the debate over file-sharing—which I explore in the book’s final chapter—is that these sound files are being collected by the millions free of charge, much to the delight of many listeners and to the outrage of the recording industry. But as we will see, MP3s and the like are a special case, for they are not tangible in the way traditional media are.

To understand the full significance of the tangibility of recorded sound, we must know something about the specific physical characteristics of the various media, and the differences among them. Consider, for example, the cassette tape. Developed in 1963 by the Dutch company Philips, the small plastic cassette was markedly different from its predecessor, the long-playing record. Perhaps most important was that its physical characteristics made recording and duplication much easier and cheaper than had been possible in the LP era. As Peter Manuel asserts in his 1993 book Cassette Culture, these attributes have led to enormous changes in music and musical life. One compelling case in point, the focus of Manuel’s research, is North Indian popular music. Before 1978 cassettes were rare in India (LPs being dominant), and a single entity, the Gramophone Company of India (GCI), controlled the nation’s recorded music. GCI’s monopoly led to an extreme concentration of performers and styles. Most of its releases were of a particular type of love song, an adaptation of the classical ghazal form, updated for use in films; moreover, nearly all of the tens of thousands of songs—which even to fans tended to sound similar—were recorded by just a handful of long-lived singers. The resulting homogenization of Indian popular music is hard to comprehend. Imagine that for the past fifty years popular music in the United States has consisted of several thousand slight variations on “I Will Always Love You” (featured in the movie The Bodyguard), all sung by Whitney Houston. (Now imagine that you don’t like Whitney Houston.) When one critic quoted by Manuel complained of
“the crushing power of the monotony of musical soundscape” in India, we should not take this to be hyperbole.\textsuperscript{13}

In the 1980s, with relaxed government regulation on their importation, cassettes quickly came to account for 95 percent of all commercial recordings in India.\textsuperscript{14} The arrival of the cassette utterly changed the pop scene. The less complex, cheaper medium allowed smaller labels and even individuals to create and distribute recordings, ending GCI’s stranglehold on the market. This diversification brought new perspectives, giving rise to new stars, even new musical genres. And it was precisely the physical characteristics of the cassette, tangibly different from the LP, that helped prepare the ground for this revolution.

We may see a parallel phenomenon with the compact disc, though the early years of the CD suggested a return to the “one-way, monopolistic, homogenizing tendencies” of the LP that Manuel has pointed out.\textsuperscript{15} Yet in the 1990s it became much easier and cheaper to create CDs, and today most personal computers come with CD burners, making any home with a PC a potential pressing plant. With the advancement of CD production technology, many performers have decided to go into business for themselves. When the San Francisco Symphony could not get a contract with one of the major labels, they created their own; alternative pop musician Ani DiFranco, never interested in working with one of the majors, established Righteous Babe Records; and cellist David Finckel and pianist Wu Han created ArtistLed, “Classical Music’s first Internet recording company,” in order to “produce recordings in an environment free from constraints.”\textsuperscript{16}

We must be careful, however, not to assume that ease of production necessarily leads to diversification. Remarkably, the cassette seems to have had very nearly the opposite effect on the gamelan tradition of Java. Traditionally, each gamelan is a unique and matched collection of largely brass and bronze percussion instruments, with each ensemble having its own distinctive tuning. Although gamelan recordings date to the early twentieth century, it was not until cassettes came ashore in the late 1960s that gamelan recordings circulated widely across the island, and this was precisely because they were so simple to produce and disseminate. One striking effect of the new medium was that it seemed to facilitate a certain standardization within the world of gamelan performance practice. In his fieldwork in Java, ethnomusicologist Anderson Sutton observed
gamelan teachers changing the patterns and structures of certain pieces to match what they had heard on cassettes by prominent ensembles. It has also been reported that when new gamelans are made nowadays they are often tuned to match a frequently recorded gamelan.

Thus, whereas the advent of the cassette led to musical diversification in North India, it has encouraged musical homogenization in Java. One reason for this difference is fairly clear: where the Indian music industry was monopolized by a single, giant corporate entity, no such market concentration existed in Java. The contrast between these “cassette cultures” illustrates a point I have already made, but one that bears repeating: phonograph effects are not dictated solely by the traits of the technology, but arise out of broader contexts, whether economic, cultural, or aesthetic. Yet despite their differences, both cassette cultures illustrate how a very basic difference between recordings and live performance can have a profound impact on music and the way we interact with it.

**PORTABILITY**

When music becomes a thing it gains an unprecedented freedom to travel. Of course, live and recorded music are both portable, but in different ways. The portability of live music depends on the size of instruments and the number of musicians needed to perform a work. Minstrels and marching bands move easily; orchestras and anvil choruses less so. With recording, however, all music is more or less equally portable, from harmonica solos to the massive works of Mahler.

Furthermore, when music is recorded and replayed, it is removed from its original setting, losing its unique spatial and temporal identity. This loss was the subject of Walter Benjamin’s famous 1936 essay “The Work of Art in the Age of Mechanical Reproduction.” While the visual arts concerned Benjamin most, his ideas are relevant here. “Even the most perfect reproduction of a work of art,” he maintained, “is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be.” Reproductions, therefore, lack what Benjamin called the “aura” of the artwork. From Benjamin’s standpoint this absence is to be lamented. He speaks of the *withering* of the aura, the *depreciation* of the artwork, the *loss* of authenticity, and the *shattering* of tradition. Benjamin,
however, missed half of the equation. True, mass-reproduced art does lack temporal and physical uniqueness, yet reproductions, no longer bound to the circumstances of their creation, may encourage new experiences and generate new traditions, wherever they happen to be.

Consider the *picó* of modern-day Cartagena, Colombia. A *picó* is a large, elaborately designed sound system used to supply music for dance parties. Owners take great pride in their fancifully adorned *picós*, which they often tote through their communities in the back of pick-up trucks, competing with one another for the loudest, most extravagant system. While the *picó* is native to Cartagena, the music they play is not. The records, having arrived with traveling sailors, are mostly of African and Afro-Caribbean genres whose sound and language are foreign to coastal Colombia. Listeners do not typically understand the lyrics, and any dances originally connected with those genres are severed from the music. Yet the music is deeply meaningful to Cartagenos, and is central to the pleasures and experiences of *picó* culture. As the *picó* demonstrates, while recorded music is often decoupled from its origins in space and time, this “loss” begets a contextual promiscuity that allows music to accrue new, rich, and unexpected meanings.

Globetrotting recordings have also been deeply meaningful to composers, and have changed, even started, many careers. For the bandleader and composer Alton Adams (1889–1987), hearing 78s of John Philip Sousa was a formative experience. As a young man living in the Virgin Islands, he had no other access to this music. “How well do I recall,” he wrote late in his life, “the many hours spent in rhapsodic ecstasy, listening outside the residence of a devotee of the art to the recordings of beautiful music—orchestral and band selections, operatic arias, and so forth, but particularly . . . the marches of Sousa. . . . After each of these musical experiences, stretched on my bed, I would then imaginatively conduct a Sousa’s band in one of my own compositions.” Adams, a black composer living in a black society, was influenced by the recordings of a white musician. Darius Milhaud, a white European, found great value in the discs of black jazz musicians. “Thanks to the phonograph,” he wrote in 1924, “I will be able to play the discs of black music—recorded and published by blacks—that I brought back from the United States. It is truly very precious to be able to study the folklore of all the world thanks to this machine.” Records,
and with them musical influence, traveled not only from north to south and west to east, but from east to west as well. Hearing discs of Balinese gamelan music in 1929 proved decisive to the career of Canadian Colin McPhee, leading to his move to Bali in 1931 and immersion in its music and culture. Steve Reich’s exposure to recordings of African music in the 1950s made a similar impression, and indirectly led to his visit to Ghana and to his 1971 work *Drumming.*

Even when recordings aren’t winging their way across continents, they can move easily within our daily lives, detaching music from its traditional times, venues, and rituals. While hardly noteworthy today, such possibilities were once considered radical. In 1923 British writer Orlo Williams made what would today seem an oddly superfluous argument: that it should be perfectly acceptable to listen to recorded music at any time of the day. He offered a scenario involving a wealthy bachelor, and intercut his description with the imagined responses of a hidebound reader.

He comes down to breakfast at half-past nine: he skims the headlines of his paper over the kidneys and reads the feuilleton over his marmalade. Then, if I am right, he lights a large but mild cigar, sinks into an armchair, and rings for the butler to set the gramophone going. “My dear fellow . . .” you say in expostulation, “how absurd . . . how could anybody . . . I mean . . . can’t you see?” I apologise. Imagination, yours at any rate, boggles at the thought: yet what I see in alluring clearness, is a gentleman tastefully attired, smoking in an easy but not too soft a chair, while at ten o’clock on a sunny morning, he listens to the voice of Caruso issuing from a little cupboard in a mahogany cabinet.

It seems hard to believe that anyone would be shocked by such a scene. Yet because it had never been customary, morning music—especially opera—must have disrupted the fabric of daily life. “Here,” Williams explained, “we touch one of the ingrained superstitions of the Englishman, that music, except for the purpose of scales and exercises, is not decent at such an early part of the day.” But its “indecency,” he argued, was merely a function of its previous impracticality. There should be no reason, he concluded, to avoid listening to music in certain ways simply because they only recently became possible. Today, of course, the morning listener raises no eyebrows; in fact, listening to the radio or recordings during break-
fast is for some as ingrained a habit as breakfasting in silence must have been for people of earlier eras.

The portability of recordings has also allowed listeners to determine not only when and where they hear music, but with whom they listen. Solitary listening, widespread today, has been an important manifestation of this possibility. The practice, however, has not always been common. In the 1923 article just cited, Orlo Williams wondered how one might react upon walking in on a friend who is listening to recorded music . . . alone. His answer illustrates the puzzlement that may once have met solitary listening.

You would think it odd, would you not? You would endeavour to dissemble your surprise: you would look twice to see whether some other person were not hidden in some corner of the room, and if you found no such one would painfully blush, as if you had discovered your friend sniffing cocaine, emptying a bottle of whisky, or plaiting straws in his hair. People, we think, should not do things “to themselves,” however much they may enjoy doing them in company: they may not even talk to themselves without incurring grave suspicion. And I fear that if I were discovered listening to the Fifth Symphony without a chaperon to guarantee my sanity, my friends would fall away with grievous shaking of the head.26

Even if a bit melodramatic, Williams’s remarks remind us that before the advent of recording, listening to music had always been a communal activity. In prephonographic times it had been for the most part neither practical nor possible to hear music alone. Listening was a culturally significant activity, for music accompanied central communal events, including birth or death rites, weddings, and religious festivals. Solitary listening, then, contradicted centuries of tradition. Nevertheless, the practice came to be accepted. In 1931, one writer touted its advantages: “Alone with the phonograph, all the unpleasant externals are removed: the interpreter has been disposed of; the audience has been disposed of; the uncomfortable concert hall has been disposed of. You are alone with the composer and his music. Surely no more ideal circumstances could be imagined.”27 Today, solitary listeners are everywhere, in living rooms, dorm rooms, bathrooms, offices, cars, and anywhere they might take a portable player. But there is still something strange about seeing people in public places, plugged into the earphones of the players they tote around as an emphysemic might
carry an oxygen tank. (For many, in fact, music is as necessary as oxygen.) Journalist Paul Fahri wonderfully captured that strangeness, evoking images from the classic horror movie *Night of the Living Dead*: “It is so familiar now that we don’t see or hear it anymore. It is the look and sound of the Walkman dead: the head cocked at a slight angle, the mouth gently lolling. From about the skull comes a tinny low buzzing sound, like metallic bees. The eyes flicker with consciousness, but they don’t see. They’re somewhere else.”

Perhaps we should not wonder that solitary listening was once considered unusual, but rather that it should have come to be so widely, unremarkably practiced. The same is true for the act of listening to music far removed from one’s home or culture or of experiencing music whenever and with whomever one wishes. In each case, the portability of recording has made the once unimaginable commonplace.

**INVISIBILITY**

Imagine that it is 1916 and you are shopping for records. Upon entering a store you are invited to take what is called “The Edison Realism Test.” You are led to a quiet spot where you find a phonograph, a chair, and a scrapbook, and are handed a sheet of paper with a set of six instructions. First, you are to choose the type of music you would like to hear. Next you are asked to sit facing away from the phonograph while looking at a scrapbook of concert reviews and photographs of musicians (all Edison recording artists, naturally). Then you are directed to remember the last time you witnessed a performance of the music you have chosen to hear. “Picture the scene,” you are told, until “it is clearly . . . in mind.” Once this mental image is firmly in place, you are to say, “I am ready,” at which point the demonstrator plays your chosen record. The final instruction is wonderfully complicated: “About forty-five seconds after the music begins, close your eyes and keep them closed for a minute or more. Then open your eyes for fifteen seconds but do not gaze at your surroundings. After this, close your eyes again and keep them closed until the end of the selection.” If you follow these directions exactly, you will supposedly get “the same emotional re-action experienced when you last heard the same kind of voice or instrument.” If for some reason you do not, it is because “you have not wholly shaken off the influence of your surroundings,” in which
case you are to repeat the test until successful. What is fascinating about the Edison Realism Test—essentially a set of instructions for how to listen to a phonograph—is the importance given to the visual dimension of the musical experience. Listeners must go to great lengths not only to conjure up the correct mental imagery, but also to avoid all possible conflicting stimuli. The assumption behind the test is clear: in order for recorded music to be comprehensible, listeners must visualize a performance. Seeing was indeed believing. In fact, this had always been true, as Richard Leppert makes clear in *The Sight of Sound*: “Precisely because musical sound is abstract, intangible, and ethereal—lost as soon as it is gained—the visual experience of its production is crucial . . . for locating and communicating the place of music and musical sound within society and culture.”

The Edison Realism Test reveals another little-appreciated fact about recorded music: that listeners and performers cannot see one another. Although unremarkable today, this was once a source of great anxiety. As an English music critic explained in 1923, some listeners “cannot bear to hear a remarkably life-like human voice issuing from a box. They desire the physical presence. For want of it, the gramophone distresses them.” This anxiety is understandable, for voices are typically accompanied by bodies—in fact, “hearing voices” without seeing their source is a sure sign of an unwell mind.

Various strategies were employed in the attempt to restore the missing visual dimension to the phonographic experience. The Stereophone and the Illustrated Song Machine, both introduced in 1905, consisted of similar mechanisms that, when attached to cylinder-playing phonographs, rotated images in time with the music. As an article in a trade journal crowed, the Illustrated Song Machine “is just what the public has wanted since the first automatic machine [i.e., phonograph] was placed on the market, and the listener drew a mind’s picture as the words and music were repeated to him.” In 1929 a British phonograph enthusiast reported on the miniature stages he had constructed to look at while listening to his favorite operas. He meticulously fashioned scaled-down sets and wooden cutouts of characters in various costumes, all of which he changed with every new scene. In the United States, music educator Albert Wier devised what he called the “projecting phonograph” in 1936, for use in music classes. Wier created slide shows, in which main themes or motives, graphic analy-
ses, translations of texts, and images of musicians or opera sets were projected in time with recordings. In the absence of these rather extravagant remedies, listeners simply stared at their phonographs—a practice that was, as one observer noted in 1923, “an unthinking inheritance from the days when we had no phonographs, and when we naturally had to look at the performer.”

When musicians record, their invisibility to listeners removes an important channel of communication, for performers express themselves not only through the sound of their voices or instruments but with their faces and bodies. In concert, these gestures color the audience’s understanding of the music. As Igor Stravinsky rightly explained, “The sight of the gestures and movements of the various parts of the body producing the music is fundamentally necessary if it is to be grasped in all its fullness.” The violinist Itzhak Perlman, for example, is effective in concert in part because his face registers and reinforces every expressive nuance in the music. Perlman himself once remarked that “people only half listen to you when you play—the other half is watching.” The visual aspect of performance is especially important for pop musicians. What would pop be without the wriggling and jiggling, the leaping and strutting, the leather and skin, the smoke and fire? It would merely be sound, and so much the poorer for it.

The power of the visual is further demonstrated when the audio and visual channels are at odds with each other. Consider the violinist Jascha Heifetz, known for his rigid posture, skyward stare, and blank expression when performing. A 1925 article remarked on his deportment: “Cold, calm, dispassionate, he stands on the platform and performs miracles of dexterity, displays his beauties of tone; but do we not feel slightly chilled, anxious perhaps for less mastery and more humanity?” Yet the author also noted that Heifetz sounded rather different on disc: “These impressions are to some extent corrected by Heifetz’s records. There is certainly a hint of passion, of tenderness.” In other words, with the visual channel off, Heifetz no longer seemed emotionless. Heifetz’s playing provides a musical analogue to what is known as the McGurk Effect. In a 1976 experiment, psychologists Harry McGurk and John MacDonald showed subjects a video of a young woman speaking certain syllables, while what they heard were sounds of different syllables dubbed onto the tape. The results
were striking: the subjects, who could readily identify the syllables being spoken when *not* looking at the video, consistently misidentified the sounds when the video presented conflicting information.\(^\text{39}\) The psychologists’ conclusion, which Heifetz had demonstrated long before, is that what we hear is deeply influenced by what we see.

For quite a different example, take the case of Milli Vanilli, a 1980s pop duo. Their popularity stemmed in large part from their good looks and provocative dancing. They fell from stardom, however, when it was revealed in 1990 that all along they had lip-synched to the recordings of two unknown performers.\(^\text{40}\) That the real singers, a pair of middle-aged men, were not deemed glamorous enough to be put before the public suggests how crucial a group’s look is to its success.

Yet as the Heifetz example reveals, the *absence* of the visual can have its own appeal. A 1912 article in the *Musical Courier* praised the recorded medium for stripping away all that the author considered unnecessary to the musical experience. “In listening to the Talking Machine,” he explained, “the hearer must of necessity concentrate upon the tonal performance and does not have his attention diverted to extraneous matters, such as scenery, costumes, [and] acting . . . that keep him from directing his faculties to the music itself.”\(^\text{41}\) Theodor Adorno agreed, and argued that opera—the most visual of musical genres—is in fact best heard on recordings, that is, without seeing the costumes and sets. In his 1969 article “Opera and the Long-Playing Record,” Adorno explained that contemporary stagings detracted from the musical experience, whereas, “shorn of phony hoopla, the LP simultaneously frees itself from the capriciousness of fake opera festivals. It allows for the optimal presentation of music, enabling it to recapture some of the force and intensity that had been worn threadbare in the opera houses.”\(^\text{42}\)

A musicology graduate student once told me that, for him, the experience of sacred music on disc was powerful precisely because he could not see the musicians; hearing such bodiless music made him feel closer to God. This effect is not new to recording; it is the same achieved by the age-old practice in Christian churches of placing the organist and sometimes the choir out of the sight of the congregation. The removal of visual cues, certainly no accident, separates body from sound, heightening the sense that the music comes not from humans but from heaven. In prephonographic
times such unseen music was the exception, used for specific purposes. Today, however, given the ubiquity of recorded music, such sightless hearing is closer to the rule. However listeners have responded—whether by compensating for it or exploiting it—the invisibility of performance is a fundamental part of the modern musical experience.

Ironically, this invisibility can have observable consequences. Conductor Nikolaus Harnoncourt suggested that recording artists must somehow compensate for the missing visual dimension. “If you don’t see the musician—and this is the case with all recordings—you have to add something which makes the process of music making somehow visible in the imagination of the listener.” As I will argue in chapter 4, it is precisely this missing dimension that encouraged classical violinists to “add something” to their playing—in their case, an intense vibrato that helped communicate a sense of physical and expressive immediacy. Sometimes, however, musicians have responded by taking something away. Because recordings provide no visual continuity during extended pauses or tempo changes, musicians may deemphasize temporal discontinuities when performing in the studio. This may be accomplished, as several performers have attested, by “tightening” the spaces between phrases and larger sections. Cellist Janos Starker has explained that “while in a concert hall, the performer is able to create tension with rests . . . he cannot do this with recording.” On disc, then, “the presentation of a composition” must “become much tighter.”

Eugene Drucker of the Emerson String Quartet has offered a specific example of this “tightening” response. Drucker recounted how, in recording the Schubert Quintet, guest cellist Mstislav Rostropovich encouraged the group to shorten pauses that, in concert, they might normally extend for dramatic effect. For example, “after the big chord in the coda of the first movement [m. 428] . . . we took no extra time for rhetorical effect. Rostropovich pointed out that in a recording, one cannot always afford to play quite as broadly as in a performance. The impact of the performer’s presence, even visually, can flesh out the musical ideas and add interest to phrases that might sound dull on tape.” In concert, the performers would have lifted their bows off the strings after playing the chord, paused for a moment, and slowly returned them for the following phrase. Such a gesture would have heightened the drama of the moment and visually linked the two chords. On a recording, however, an extended silence
like this would simply have been “dead air,” something to be avoided. “This streamlining of approach,” Drucker explained, “is required by recording.”

Why, however, should a second here or there make any difference in the larger scheme? Over the course of the century, there has been a noticeable move in classical performance toward steadier tempos, with fewer and less marked tempo fluctuations. What seems to be a common and almost instinctive “tightening” response has, in part, contributed to this general change in the rhetoric of modern performance.

Recording artists have also reacted to the fact that they cannot see their audiences. For many, the task of performing to unseen listeners, with recording equipment as their proxy, can be both daunting and depressing. In her memoirs, French soprano Régine Crespin registered her dismay at the artificiality of performing in the studio:

> Fear of an audience is healthy; it stimulates you. The people are there in front of you. With them there can be mutual lovefests. But how can you fall in love with a microphone? First of all, a microphone is ugly. It’s a cold, steel, impersonal thing, suspended above your head or resting on a pole just in front of your nose. And it defies you, like HAL the computer in Stanley Kubrick’s film *2001: A Space Odyssey*, although at least he talked. No, the microphone waits, unpitying, insensitive and ultrasensitive at the same time, and when it speaks, it’s to repeat everything you’ve said word for word. The beast.

Not only Western classical performers are affected by the absence of the audience. Before the era of the phonograph, Hindustani classical musicians not only took inspiration from their listeners, but also improvised directly in response to their reactions. The exact sound and shape of the performance, then, was determined in part by the interaction of artist and audience. For those who recorded, one way to compensate was to manufacture an audience, planting enthusiastic listeners in the studio. On an acoustic-era recording of Maujuddin Khan, for example, one can hear a few “plants” shouting “Wah! Wah! Maujuddin Khan! Subhanallah!,” praising the divinity of the singing. In a more recent example, I myself was an unwitting plant in a recording session for the rock group Rotoglow. After observing from the control room, I was invited to sit in the studio while the band
was recording. During a break I asked if I had been a distraction (I was occupying the very small space between the lead guitarist and the drummer) and suggested that I should perhaps return to the other side of the glass. To my surprise, the group insisted that I stay. “You’re a part of this, man!” one of them declared. I hardly acted like a typical rock concertgoer—I sat still, remained silent, and took notes when not stuffing my ears with wadded toilet paper to protect my hearing. Nevertheless, my presence must have in some way met the band’s need or desire for an audience.

For some, however, the absence of an audience may be welcome, providing respite from the stress and distractions of concert performance. In a classical concert, coughing, snoring, talking, program rustling, and candy-wrapper crinkling may fluster or irritate the performer; at a pop concert audiences may in fact be louder than the performers, and can distract the musicians in any number of other ways. Removing the audience may therefore permit a sharper focus on making music to the artist’s own satisfaction. Violinist Yehudi Menuhin, for one, valued recording for allowing him a “monastic dedication which is oblivious of audience.” As with every aspect of recording, the mutual invisibility of performer and listener offers both drawbacks and benefits, though in all cases it presents challenges to which both parties must respond.

**REPEATABILITY**

Sing a single note. Now try to recreate that sound *exactly*—not simply its pitch, but its precise volume, length, intensity, timbre, attack, and decay. Now imagine trying to repeat an entire song in this way, down to the smallest detail. It simply cannot be done. The impossibility of such an exercise reveals what is perhaps the most unbridgeable difference between live and recorded music: live performances are unique, while recordings are repeatable.

This statement deserves further explanation. Live music is in fact repeatable, but in the form of works, not performances. That is, any orchestra can play Beethoven’s Fifth Symphony many times; each performance, however, will necessarily be different. Second, to say that a recorded performance is repeated without change is not to deny that a listener may
experience a recording differently from one hearing to another, whether by adjusting the playback equipment or by focusing on different aspects of the music. I mean only that the actions that created the sound one hears on a recording are fixed, and do not change when the recording is replayed.

This difference between live and recorded music may not seem especially momentous, but in fact it may have the most complex and far-reaching consequences of any of the technology’s attributes discussed in this chapter. Given this complexity, it would be helpful to approach the influence of repeatability from three different perspectives: that of listening, that of performing, and that of composing.

For listeners, repetition raises expectations. This is true in live performance; once we’ve heard Beethoven’s Fifth in concert, we assume it will start with the same famous four notes the next time we hear it. But with recordings, we can also come to expect features that are unique to a particular performance—that a certain note will be out of tune, say. With sufficient repetition, listeners may normalize interpretive features of a performance or even mistakes, regarding them as integral not only to the performance but to the music. In other words, listeners may come to think of an interpretation as the work itself. When I was young, for example, I was particularly fond of Pablo de Sarasate’s Zigeunerweisen, one of the flashier showpieces in the violin repertoire. I came to know the piece through Jascha Heifetz’s 1951 recording, which I listened to obsessively until every nuance of the performance was ingrained in my musical memory. One such nuance was actually an error: in m. 9 of the first movement (0:34 in the recording), the violinist accidentally plucks his open E string. Though I knew the plucked E to be a mistake, I came to expect it not only when listening to Heifetz’s recording but whenever hearing the work, even in concert. In fact, I would be a bit surprised and even disappointed when I did not hear that E. Though I knew better, on a certain level I regarded that wayward note to be part of the piece.

Expectations can also be raised by sounds that originate not from a performance at all, but from defects in playback equipment or individual recordings. Anthropologist Thomas Porcello tells of the intense expectancy he experienced when listening to recordings afflicted with print-through—a defect in the recording process that results in a faint pre-echo:
When I was a teenager, I owned a couple of albums with extreme print-through at the beginning. . . . I’d put the needle down and faintly, but distinctly, hear a perfect, amplitudinally miniaturized replica of *what I was about to hear*. That tiny audio shadow always seemed to generate a visceral tension. I’d hold my breath, waiting for the release that came with the “real” beginning of the song, like smelling tequila as you bring it to your mouth, before it scalds your throat on the way down to your stomach.53

However arbitrary or incidental, such sonic artifacts can and do affect the listening experience, and do so by virtue of their repetition. If these two examples of raised expectations seem somewhat arbitrary, we can be sure that they stand in for countless experiences of listeners who may not even realize the power of repetition.

The repeatability of recorded sound has affected listeners’ expectations on a much broader scope as well. When the phonograph was invented, the goal for any recording was to simulate a live performance, to approach reality as closely as possible. Over the decades, expectations have changed. For many—perhaps most—listeners, music is now primarily a technologically mediated experience. Concerts must therefore live up to recordings. Given that live music had for millennia been the only type of music, it is amazing to see how quickly it has been supplanted as model and ideal.

The impact of recording’s repeatability on performers is no less significant. In concert the artist is typically concerned with the first—and only—impression, but with recordings, “shelf life” must be considered. Professional musicians have long been aware of these differences, and have often felt the need to minimize errors and even otherwise acceptable mannerisms when recording, for such “deviations” may become distracting with unchanging repetition. David Soyer, cellist for the Guarneri Quartet, has made this point: “Recordings have a tendency to iron out the eccentric, idiosyncratic, personal things that happen in a concert hall.”54 But what happens when listeners are repeatedly exposed to note-perfect recordings? Do they then expect and demand similar performances? And do performers then feel the need to meet such expectations? Undoubtedly, such feedback loops are created, with performers striving to recreate their recordings. Critic and historian Joseph Horowitz observed this in a concert performance of Brahms’s Symphony no. 1, which he described as “machine-like”
and “precision-tooled,” concluding that the Chicago Symphony had perfectly imitated the sound of an orchestra “fed through giant speakers.” In other words, “they sounded like a phonograph record.” At least they were actually playing. Many pop stars, and even some classical musicians, have been known to lip-synch to their own recordings. (The Milli Vanilli case was unusual only in that they were pretending to sing to someone else’s recordings.) But such phonograph effects are certainly not a necessary consequence of recording. Witness what appears to be the increasing popularity of live recordings—the recent releases by classical violinist Anne-Sophie Mutter and rock group Pearl Jam being two very different examples—which preserve spontaneous, idiosyncratic, even messy performances. These offerings, which seem to represent a reaction against over-produced recordings, suggest that the unique qualities of the live performance are still highly valued.

Repeatability has also affected musicians in their capacity as listeners. With recordings, performers can study, emulate, or imitate performances in a way never before possible. In the early days of recording, this possibility was trumpeted as a gift to all musicians, who could learn from the world’s great masters by studying their discs. For performers of popular music, recordings have been especially valuable learning aids. The available scores do not always represent performances adequately, and they cannot easily indicate the timbres and sonic effects that musicians seek to develop. An aspiring rock guitarist once explained why he studied recordings instead of scores: “I want to hear what the thing sounds like, and there ain’t no way a sheet of paper sounds like Jimi Hendrix.” As I will explain in chapter 3, the study of recordings is also crucial to the development of jazz musicianship, and has been for generations.

On the other hand, some have worried that repeatability may lead performers to mimic great artists without emulating their spirit, or to create bland patchwork interpretations based on their favorite recordings. The violinist Miha Pogacnik told of visiting a colleague who was preparing the Brahms Violin Concerto by listening to twenty different LPs of the work. “This was reflected in his playing,” Pogacnik lamented: “two measures of poor Milstein here, four measures of second-rate Oistrakh and Szeryng there.”

Performers exploit repeatability by studying not only the recordings of
other musicians, but their own as well. In 1905 soprano Adelina Patti was finally persuaded to commit her famous voice to wax. After singing a short selection, she heard her recorded voice for the first time. “My God!” she reportedly exclaimed, “now I understand why I am Patti! What a voice! What an artist!” While most of those hearing themselves for the first time are probably less enchanted, surprise seems to be the universal reaction. Soprano Joan Morris, for example, “practically had a cow” upon hearing herself for the first time. Once over this initial shock, however, performers often find recording quite useful in allowing them to assess their work at a temporal and spatial distance—an impossibility before the invention of the repeatable recording. In listening to themselves musicians may hear mistakes—unnoticed during a performance—which can then be corrected. Sometimes, however, what performers notice is not errors, but aspects of style or interpretation. What may have felt right in the heat of performance may in retrospect sound overdone and contrived or, at the other extreme, flat and lifeless. Probably all recording artists modify their playing to a certain extent when a desired sound is not heard. Soprano Martina Arroyo has suggested how this process might work. “There are some . . . who say, ‘Oh no, I do exactly the same thing in recording as in live performance.’ But what happens is that . . . when you hear [yourself] you adjust without even knowing, because you say ‘Ah, that’s not exactly the way I want to sound.’ And you adjust, perhaps without being aware that in a performance you wouldn’t have made that adjustment.”

Consider also the testimony of French composer and pianist Camille Saint-Saëns, who made his first recording in 1900. “While the phonograph was repeating what I had played,” he reported, “I listened with much curiosity and interest. I at once saw, or rather heard, two grave mistakes that I had made. In one part the music was more quick than I had intended, and in another the rhythm was faulty. These mistakes I subsequently corrected.” But what was Saint-Saëns really hearing? Perhaps what he described was not so much an error but the type of rhythmic inflection typical of early-twentieth-century performance as documented on countless recordings of the time. Such inflections probably passed unnoticed during the performance, but heard in retrospect may well have seemed objectionable, even wrong. I would speculate that as classical performers became accustomed to making and hearing repeatable performances, they
gradually began to correct certain rhythmic “errors,” by minimizing small-

scale tempo fluctuations and curbing the once common habit of altering

the length and placement of notes. I believe that this response to repeata-

bility, in conjunction with the “tightening” of tempo I mentioned earlier, has led to a striking change in the way modern classical performers approach musical time.64

For performers, repeatability is thus a double-edged sword, equally capa-

ble of enriching and burdening their work. Its impact may also be more subtle and far-reaching, for if control and precision have become central values in classical performance due in part to this trait of the technology, then recording affects not only technique, but aesthetics.

Like performers, composers have also had an ambivalent relationship with the repeatability of recordings. Some have seen it as an advantage. Expressing an oft-repeated sentiment, George Gershwin wrote in 1933 that “the composer, in my estimation, has been helped a great deal by the mechanical reproduction of music. . . . Music is written to be heard, and any instrument that tends to help it be heard more frequently and by great numbers is advantageous to the person who writes it.”65 Yet repeatability can also have a negative side for composers. Second-rate concert performances fade away, but inferior recordings live on to distort or misrep-

resent a composer’s music every time they are replayed. In a 1937 essay, Béla Bartók described the musical work as a living, evolving entity, suggest-

ing that even composers’ own recordings may ill serve their music. Aaron Copland agreed, writing that the “unpredictable element, so essen-
tial in keeping music truly alive . . . dies with the second playing of a record.”66

Phonographic repetition has deeply affected the ways in which com-

posers’ works are circulated and received by listeners. Some have specu-
lated that repeatability may have even greater power, influencing the composi-
tional process itself. Jonathan Kramer has suggested that certain early-twentieth-century composers, particularly Arnold Schoenberg, responded to the nature of the medium by minimizing repetition in their works: “It seems as if composers realized subconsciously that their music would be recorded and thus available to listeners for repeated hearings.”67 The connection Kramer proposes is provocative, but unlikely. Schoenberg had only the barest interaction with the medium. None of his composi-
tions appeared on disc until well into his career, and he did not make his first studio recording until he was in his sixties. Moreover, Schoenberg showed little enthusiasm for the phonograph. As he wrote in 1926, he saw “no advantage” in the mechanization of music. Given his sparse recording activity and ambivalence toward the medium, it seems doubtful that he would have altered his compositional technique, even subconsciously, in response to the repeatability of recording.

Nevertheless, I agree with Kramer that repeatability may influence the work of composers. Yet the effect is quite the opposite: recording has begotten whole genres whose identity is fundamentally connected to repetition. It is often forgotten that minimalism—whose most salient trait is the repetition and gradual development of brief musical cells—was indelibly shaped by recording technology. Steve Reich’s early minimalist works came out of his experiments in the mid-1960s with tape loops. A tape loop is a length of recorded magnetic tape with its ends connected, so that when played on a reel-to-reel machine (the available technology at the time), the music repeats indefinitely. Purely by accident, Reich discovered that when trying to play two copies of the same loop simultaneously on different machines, the loops very slowly went in and out of synch, creating a type of musical process that he called phase shifting. Reich explored phase shifting in his tape works *It’s Gonna Rain* (1965) and *Come Out* (1966), which he described as “realizations of an idea that was indigenous to machines.” He later applied the idea to non-tape works such as *Piano Phase* (1967) and *Clapping Music* (1972), demonstrating the deep influence of recording technology on his writing. It is interesting to note that minimalism is often derogated as “broken-record music.” Flutist and conductor Ransom Wilson, who later came to perform the minimalist works of Philip Glass, initially had this reaction to Glass’s five-hour opera *Einstein on the Beach*: “The music seemed to have no direction, almost giving the impression of a gigantic phonograph with a stuck needle.” Despite the dismissive tone of such statements, the link to recording technology is apt. And although it may just be coincidence, it is worth noting that the repeated motives heard in many minimalist works are often about two seconds long, the same time it takes an LP to complete a single rotation.

A decade after Steve Reich was experimenting with tape loops in San Francisco, hip-hop DJs in the Bronx found that a fragment of music could
be repeated indefinitely by switching back and forth between two copies of the same LP, each on its own turntable. (See chapter 6 for a fuller account of what came to be known as turntablism.) These repeated musical fragments were also called loops, and became the basic structural unit in the instrumental accompaniment in rap. Even in the digital age, loops persist; listen to any rap song today and you are likely to hear an instrumental foundation of loops, though now the fragments are sampled and are no longer repeated manually. Although hip-hop and minimalism are rarely uttered in the same sentence—they share little by way of sound or audience—we find an unexpected kinship in their mutual reliance on mechanical repetition.

Repeatability is perhaps the most complex of recording’s traits. It will arise in nearly every chapter of this book, and figures prominently in the discussion of jazz improvisation, classical violin playing, the computer music of Paul Lansky, and the hip-hop of Public Enemy. If nothing else, the diversity of responses to repeatability should dispel any notion of strict technological determinism, for such wildly disparate phonograph effects demonstrate that there can be no simple cause-effect relationship between recording technology and the activities of its users.

**TEMPORALITY**

With the advent of sound recording, a new rigidity was introduced into the world of music, one imposed not by performers or audiences, but by a machine. Although over the decades the time limitation has become less severe, for the seventy-one years between the invention of the phonograph and the introduction of the long-playing disc (1877 to 1948) recordings could play no more than about four and one-half minutes of music continuously. Thus, for more than seven decades, listeners, performers, and composers had to live and work with a severe and arbitrary restriction, one that constantly impinged on their activities.

For listeners living in the pre-LP era, the brevity of recordings was, most superficially, a nuisance. Blues singer Son House recalled the trials of the phonograph owner in the 1920s: these included “gettin’ up, settin’ it back, turnin’ it around, crankin’ the crank, primin’ it up, and lettin’ the horn down,” all to be repeated every few minutes. Of greater consequence,
however, was the fact that longer pieces had to be broken up over multiple discs. The discontinuity of the experience (caused by the need to change sides and records) could lead some to perceive works in units dictated not by the music itself but by the length of the discs. Composer and professor Andrew Mead has recounted how such listening affected his father’s understanding of a Brahms symphony:

My father has long held that Brahms wrote weak transitions, a position I simply couldn’t fathom. One day, we were listening to the finale of the 1st symphony, just at the point of the syncopated climax preceding the continued recap [mm. 289–301] and Dad said, “Here comes one of those bad transitions.” After the recap got under way, he allowed as how it was not a weak transition, but that he remembered it as such. I asked him how he had first gotten to know the work, and he said it was through a stack of 78 RPM discs. I asked if the passage in question marked one of the side breaks, and he said, somewhat surprised, that it did.74

The elder Mead’s experience recalls Theodor Adorno’s concept of “atomized listening.” Atomized listening, which Adorno linked directly to both recording and radio, privileges the perception of works as collections of seemingly disconnected moments rather than unified compositions.75 It is impossible to know how common this phonograph effect may have been—information on it can only be collected anecdotally—but given that generations of listeners grew up with cylinders and 78s, the phenomenon must have been pervasive. Moreover, I would speculate that the persistence of the three-minute pop song (more on which later) in an age when song lengths are no longer dictated by the capacity of 78s and 45s may well be a manifestation of atomized listening. The repetition of short pop songs over the decades almost certainly created a feedback loop in which listeners have come to expect works to be of a certain length and in which performers strive (or are pressured) to meet that expectation.

For performers, the impact of the technologically imposed time limitation is clearer. Most obviously, the four-minute limit affected repertoire. In theory, any piece, no matter how long, could have been recorded by breaking it into segments, and even whole operas were released in the era of the 78-rpm disc. Practically speaking, however, the time limitation
encouraged performers to record shorter pieces. Any survey of record catalogs from the early part of the century will reveal the dominance of character pieces, arias, marches, and brief popular song and dance numbers, while a similar study of concert programs would show that longer works—sonatas, concertos, symphonies, musicals, and operas—were quite common. It was not long before the time limitation affected not only what musicians recorded but also what they performed in public. We see a striking example of this influence in violinist Maud Powell’s Carnegie Hall “Record Recital” of 1917. Part publicity stunt, part serious venture, the concert consisted of seventeen works chosen by the public from her recorded catalog. While typical violin recitals of the time would have offered a combination of shorter and longer works of various genres, Powell’s featured mostly character pieces, and all of them—by necessity—were brief. In the 1950s, violin recital programs began to change, comprising fewer but longer works (mostly sonatas); not coincidentally, I believe, the new format arose only after the introduction of the long-playing record, an innovation that made it easier to commit such larger-scale works to disc.

The various characteristics of recording technology affect musicians of all types, and the same is true for the time limitation. Returning to the example of Hindustani music, Suman Ghosh has pointed out that while on disc whole pieces are compressed into just a few minutes, in a live setting “the performance of the \textit{raaga}, the melodic structure of Hindustani music, has rarely taken less than an hour, and it often stretched well beyond two or three hours.” In Algerian \textit{raï}, the length of performances is traditionally determined by the amount of money listeners are willing to pay to keep the musicians playing a favorite song, or alternatively, the amount of money competing audience members will pay to hear a different song. “In \textit{raï},” scholar Marc Schade-Poulesen explains, “a song rarely had a ‘full length,’ [for] the music was embedded in a social relation which began and ended according to the money involved.” In the recording studio, however, the amount of tape available determines when \textit{raï} begins and ends. And as I will explain further in chapter 3, the same was true with early jazz performers, who often stretched pieces out in concert well beyond three or four minutes, but had to plan their music making quite differently upon entering the studio. These examples should not surprise us, for much of
the world’s music exists in the oral tradition, with the length of performances fixed almost solely by the dictates of performers and listeners.

Before leaving the subject of performance length, I want to address a common misconception. It is often said that in the early 1900s Western classical musicians played faster in the studio than they would have in concert in order to stay within the time allotted by the 78-rpm disc. Although it may have happened on occasion, there is little evidence to suggest such a trend. If that had been the case, we would expect, for example, that the LP recordings Jascha Heifetz and Yehudi Menuhin made of the Beethoven Violin Concerto in the 1950s would be slower than their 78-rpm recordings of the work from the 1940s; yet both of their later recordings are faster, not slower, than the earlier ones. More conclusively, José Bowen’s study of tempo and duration in hundreds of twentieth-century orchestral recordings shows no decisive change in tempo over the course of the century. In fact, some works have gotten faster over the decades.

Rather than rushing through a piece, performers were more inclined to accommodate the time limitation by cutting music. This was very common, as I have found in my own study of early-twentieth-century violin recordings. Many of the concerto and sonata recordings from the 78 era had significant cuts. Even shorter pieces were sometimes truncated. For example, Mischa Elman’s 1910 recording of the violin-piano transcription of Chopin’s Nocturne in E-flat omits fully one-quarter of the piece. While the nocturne can be played in its entirety on a ten-inch 78, Elman’s redaction allowed him to take a quite leisurely pace. In fact, in comparing works recorded over the course of the century, I found the slowest tempos most frequently on the earlier recordings. For Elman, and the countless others who recorded abbreviated works, it would seem that playing at a desired tempo was more important than playing all the notes. Apparently, there are certain changes performers are not willing to make, regardless of the limitations of the technology.

Perhaps surprisingly, however, composers were often willing to cut their own music. Edward Elgar, for example, was merciless in editing his works for the studio. For a 1916 recording of his Violin Concerto he reduced the score so that the performance would take only four record sides. Modern recordings of the work usually fill fifty minutes or more; Elgar’s lasts about twenty. Fritz Kreisler’s Caprice viennois shows another approach. The
sketches for this violin showpiece reveal that the work originally ended with a varied repetition of an earlier section (the presto in 3/8). Kreisler cut that section before recording it in 1910; had it remained, the work would have been too long for even a twelve-inch disc. (His several recordings of the piece average about 3:25.) Kreisler often recorded his works shortly after writing them, so he may have composed with the limitations of the medium in mind. Indeed, fellow violinist Carl Flesch noted that Kreisler’s short pieces were “put together with a watch in the hand. They were intended first and foremost for the gramophone.”

A number of composers wrote works specifically for the length of the 78. In 1934, Roy Harris composed a four-minute-twenty-second-long work for flute and string quartet that he called, appropriately enough, *Four Minutes-20 Seconds*. The title and its duration are significant to the work’s origins, for Harris composed it to accompany the set of discs on which his Symphony no. 1 was recorded. The symphony took up seven record sides, leaving the last side of the fourth disc blank. Harris was asked to provide a piece to fill out the set. Harris was hardly alone in tailoring a work to fit on one side of a 78-rpm record: eminent composers such as Edward Elgar, Gabriel Fauré, Paul Hindemith, Vincent d’Indy, Fritz Kreisler, Ruggero Leoncavallo, Gabriel Pierné, Kurt Weill, and, as we know from the introduction, Igor Stravinsky, did the same, whether to accompany a composition that filled an odd number of sides, or on commission by a phonograph company.

The time limitation affected popular music even more deeply. Martin Williams suggested that some early blues singers crafted the narrative structure of their songs specifically to fit the playing time of the 78, while Gunther Schuller has pointed out that Duke Ellington’s mastery of the small form was born out of the same technologically imposed necessity. The three-minute pop song itself may be considered a phonograph effect. In the late 1940s, RCA Victor introduced the 45-rpm record as an alternative to the 33 1/3-rpm long-playing format that Columbia had developed. Because of its limited playing time—about the same as a 78—the 45 could not compete with the LP for recording classical music. Instead, it became the standard format for pop, and remained so for decades. Although popular music was sometimes released on LPs beginning in the 1950s, few musicians took advantage of the possibility to record longer works.
son was strictly commercial. Much of the revenue of pop music came from the sale of “singles” released on 45s, which filled the jukeboxes and received the most radio play. A longer song would have practically no chance to sell well. Billy Joel’s 1974 song “The Entertainer” attests to the pressure to keep songs short:

You’ve heard my latest record, it’s been on the radio
It took me years to write it, they were the best years of my life
It was a beautiful song, but it ran too long
If you’re gonna get a hit you gotta make it fit
So they cut it down to 3:05.90

Joel is making a bitter and thinly veiled reference to his 1973 song “Piano Man,” which stands at 5:37 on the album but was cut nearly in half for radio play, much to his obvious displeasure.

Perhaps Joel is an exception, but there is reason to think otherwise. Rock musicians often extend their performances considerably in concert, where there is less concern about the salability or “radio friendliness” of the performances. To offer just a few examples, consider Eric Clapton’s “Blues Power” and “Cocaine”—the studio recordings are 3:06 and 3:35, while the recorded concert performances are more than twice as long at 7:21 and 7:24.91 Or compare Jimi Hendrix’s live performances of “Killing Floor” and “Hey Joe” in 1967, which come in at 8:05 and 6:44, to the earlier studio versions, much briefer at 2:27 and 3:23.92 Clearly, not all pop musicians are satisfied with the customary 180 seconds allotted them.

What determines the length of a live performance? Any of a thousand factors, whether the length of a written composition, the inspiration of a performer, the time it takes for a bride to march down the aisle, or the desire of dancers to keep shimmying. Yet of these countless possibilities, few of them fix with any great specificity or regularity the length of performances. Recording, however, parcels performances into fixed segments, regardless of the inclinations of artists or audiences. While this might seem solely a disservice to music, listeners, performers, and composers have, as we’ve seen, adapted in varied and remarkable ways to this fact of modern musical life.
RECEPTIVITY

The room was usually small, windowless, overheated, and empty, save for a large megaphone-shaped horn and a small red light or perhaps a buzzer attached to one wall. No vast stage, no ornate hall, no warm applause greeted the performer’s entrance into this, a typical early-twentieth-century recording studio. A session began not with a performance, but with a series of tests. These tests established the type of recording horn and stylus to be used, the optimal distance between performer and horn, and the dynamic range allowed by the equipment. When all the tests were complete, the performance could start, but not at the artist’s discretion. The red light would flash, the buzzer would sound, or an engineer would gesture, and the performer would begin. During the performance, musicians had to be careful not to make extraneous, recordable noises, not to gesture unduly (lest they knock the equipment over), and not to sing or play too loudly or too softly. After the performance was finished, total silence was necessary—any exclamation of relief, joy, or disappointment would ruin the recording. Thus ended the first take. (See Figure 1.)

Fast-forward nearly a century. A great deal has changed, and the performer entering a modern studio encounters not an oversized horn, but a multitude of microphones that can pick up any sound in the range of human hearing. Yet despite all the changes in recording technology, one constant remains: no recording equipment, from the simplest acoustic horn to the most sophisticated microphone, is sensitive to sound in the same way as the human ear. The earliest technology was far inferior to its biological model; the latest is in some ways more sensitive. Yet for more than a hundred years recording artists have had to adjust to the special nature of these devices, whether insensitive or hypersensitive.

Before the introduction of microphones in the mid-1920s, all recordings were made using the acoustic, or mechanical, process. Musicians sang or played into a recording horn, which funneled the sound to a narrow opening covered with a flexible membrane (often of mica or glass); the diaphragm, as it was called, transferred the vibrations to a stylus, which in turn engraved a cylinder or disc. No electricity was involved.

The demands this system placed on performers were tremendous. Soft
and loud notes, for instance, demanded drastically different techniques. A vocalist might literally stick her head inside the horn to ensure that her pianissimo would be heard, but then, with the timing of a lion tamer, quickly withdraw for her fortissimo, so as to avoid “blasting” the engraving needle out of its groove. Alternatively, studio assistants would push the artists toward the horn or pull them away according to the changing dynamics of the music. German soprano Lotte Lehmann once quipped that in her early recording sessions she not only sang but danced as well, her partner being the “pusher,” as this studio flunky was typically called. Experienced recording musicians, however, could dispense with their dancing partners. In 1916 Yvonne De Terville, an American soprano, reported one musician’s creative solution. At her first orchestral session she could hardly contain her laughter upon seeing the first violinist. He was, as she reported, “seated astride a little, low, rolling box, for all the world like the

FIGURE 1 An early recording session using the acoustic process: Rosario Bourdon conducting the Victor Salon Orchestra. George H. Clark Radioana Collection, Archives Center, National Museum of American History, Behring Center, Smithsonian Institution. Used by permission.
push cart of the beggar who has had his legs cut off and propels himself around Fifth Avenue, selling matches and shoelaces."

Many performers learned to internalize the necessary adjustments by controlling their singing or playing to suit the limitations of the technology. In 1913 a British sound engineer stressed the importance of understanding the nature of recording equipment, particularly the diaphragm: “Much depends on the manner in which the musician sings or plays in intelligent rapport with the diaphragm before him, and by a little practice it is comparatively easy . . . to manipulate it for the production of first-class effects.” Sometimes adjustments in performance were simply not enough, and certain instruments were replaced or modified for studio use. Brass instruments often took the place of strings, for they could play louder and their sound was more easily directed toward the recording horn. In the case of the Stroh violin, string and brass merged. This contraption consisted of a violin fingerboard, bridge, and chin rest, but substituting for the traditional hollow wooden body was a conical aluminum horn with a flared bell. One Stroh could replace an entire section of fiddlers, and the sound was deemed sufficiently similar to the original. (Notice the man playing the Stroh violin in the right foreground of Figure 1.)

It was not only the classical tradition that was affected in this regard. Consider the case of klezmer music. Before the twentieth century, one of the core instruments of any klezmer ensemble was the tsimbl, a gentle-sounding hammered dulcimer. Yet the tsimbl is rarely heard on early-twentieth-century recordings; it did not register strongly on acoustic machines, and its sound would have been lost in recordings of larger ensembles. The tsimbl largely disappeared from the music, particularly in America where most klezmer discs were made. Its unsuitability in the studio was almost certainly a contributing factor. While the tsimbl recorded poorly, the piercing tone of the clarinet transferred well, and its growing prominence might also be linked to the phonograph. Jazz, too, saw similar changes in performance practice (as we will see more thoroughly in chapter 3). In early recordings, the double bass was often replaced by the tuba, and drummers were apt to eschew the skins for the more focused sound of woodblocks and cowbells. Some of the most distinctive aspects of klezmer and jazz sound, therefore, arose not within isolated musical worlds, but from their interaction with a recording technology.
An “intelligent rapport” was required not only with horns and diaphragms. Microphones, used since the mid-1920s, are much more sensitive than their predecessors, but have their own demands. Because the microphone was generally placed only inches from the performer, the dynamic range appropriate in a hall or club was generally too great for the recording studio. Performing for the microphone, therefore, required moderating one’s technique in a variety of ways. Martina Arroyo has described the restraint she exercised for the microphone: “There are certain sounds that you do on stage when, for example, in *Ritorna vincitor! Aida* says, ‘affranto!’ *(Rolls the r violently)* like that. You can do that on stage, but it can be picked up by the microphone in a rather ugly fashion. So you try to give the same intensity but with an amount of sound that will allow the machinery to record without distortion.”98 Like Arroyo, John Lennon was keenly aware of the need for special techniques, often singing into the side or back of the microphone to get a desired effect or waving his hand in front of his mouth to soften the sibilants that microphones tend to exaggerate and distort.99

Instrumentalists, too, must be aware of the sensitivity of microphones. In concert, the guitarist’s left hand sliding up and down the strings or the clicking of the saxophonist’s keys are rarely heard. Yet such incidental sounds are picked up in the studio, and although performers may not always want to eliminate the noises, they must be conscious of their presence. In 1932 the Czech pianist Josef Jiránek noted that when recording he was instructed not to use the sustain pedal—a crucial expressive device in much of the repertoire—presumably because the noise of the mechanism itself would be picked up by the microphone.100

The sensitivity of the microphone also provided the means for new sounds and performance practices. Consider “crooning,” the soft, restrained vocal style popular from the 1920s to the 1950s, heard in the singing of Rudy Vallee, Bing Crosby, Perry Como, and Frank Sinatra. Crooning was only possible with the microphone, for without amplification such singing would be expressively flat and nearly inaudible. Yet the technique achieved a remarkable effect. Crooning is akin to whispering, which under normal circumstances can be heard only when one is physically very close to the speaker; crooning thus provides a sense of intimacy between artist and audience, collapsing the technologically imposed distance that would
seem to preclude such a relationship. No wonder the only moderately pre-
possessing Vallee was hailed as “God’s gift to us girls.” As I hope is clear,
although all recording machines require an “intelligent rapport,” the ways
in which the technology is accommodated may both limit and expand the
possibilities of musical performance.

Listen to most early-twentieth-century recordings and you will hear a per-
formance in the traditional sense. That is, you are hearing a single and
complete take, in which the beginning, middle, and end of the piece were
recorded in that order on the same day, in the same place, and by the same
performer or group. This was hardly out of a desire for authenticity; it was
a product of necessity. However, since the introduction of magnetic tape
(in the late 1940s) and digital recording (in the late 1970s), it has been pos-
sible to offer the illusion of a traditional performance as well as to create
“performances” that could never have existed. With the ability to manip-
ulate sound through such technology, musicians have been able to tran-
scend time, space, and human limitations, and in the process have created
wholly new sounds, works, genres, and performance traditions.

One of the most basic manipulations is splicing, in which passages re-
corded at different times are joined together. The Beatles’ “Strawberry Fields
Forever” (1967) provides a famous example. The Beatles did over two dozen
takes of the song, none of which completely satisfied John Lennon. But he
did like the first half of Take 7 and the second half of Take 26. So he asked
George Martin, their producer, to put the two together. Unfortunately, they
were in different keys and tempos. The two takes, however, were related in
such a way that when one was speeded up and the other slowed down so that
the tempos matched, the pitches also matched. Thus the two takes could
be joined, the splice occurring at about 0:59 on the word going in “Let me
take you down ‘cause I’m going to Strawberry Fields.” Although the splice
is nearly undetectable, the slightly altered speed of Lennon’s voice helps
give the song its distinctively dreamlike quality.

Pianist Glenn Gould, a passionate champion of splicing, recounted a
similar experience, but with a very different repertoire. In recording the
A minor fugue from the first book of Bach’s Well-Tempered Clavier, he and
his producer decided that the best of several takes were numbers 6 and 8. Neither, however, was acceptable on its own: “It was agreed that neither the Teutonic severity of Take 6 nor the unwarranted jubilation of Take 8 could be permitted to represent our best thoughts on the fugue.” So they decided to combine them, opening and closing with Take 6 and splicing the middle of Take 8 in between. The result, Gould felt, was “far superior” to any single, real-time performance, and he declared that the technology had allowed him to “transcend the limitations that performance imposes upon the imagination.”

While the Beatles and Glenn Gould created “performances” that were theoretically possible but never actually took place, other performers have taken advantage of the technology to make recordings that could never have existed as performances. In 1946 Jascha Heifetz released a disc on which he is heard simultaneously playing both solo parts of Bach’s Concerto in D Minor for two violins. In 1991 Natalie Cole recorded the duet “Unforgettable” with her late father, Nat King Cole, whose contribution to the song had been made decades earlier and preserved on tape. These documents could only have been created by overdubbing, in which recordings made at different times are combined, not sequentially, as in splicing, but synchronically.

Another crucial type of manipulation comes from the use of the stereo field—the sonic “stage” in which sounds occupy and move through space in a recording. Consider “Strawberry Fields Forever” once again. When listening through headphones, the song begins as if an organ or perhaps flute trio is playing softly into your left ear. (Actually, the sound comes from a Mellotron, an early synthesizer that played prerecorded tape loops.) A chord in the electric bass then sounds in your right ear, followed by John Lennon singing “Let me take you down,” seemingly in the middle of your head. Ringo Starr joins the fray, playing the drums as if he were sitting on your left shoulder. A guitar slide, traveling through your head from left to right, rounds out the opening fifteen seconds. Clearly, the Beatles (in collaboration with their producer and engineer) created a musical space unique to the work, one with no possible physical counterpart.

Often the stereo field is used simply to enliven a song’s texture or to provide added bounce or swing, but the way musical space is deployed can also enhance the meaning of a song. In “Strawberry Fields Forever,”
it is the fantastic disposition of sound that persuades us that “nothing is real.” The guitar and drums moving slowly from left to right in the opening of Jimi Hendrix’s “Crosstown Traffic” (1968) musicalize the song’s title by imitating the sound of passing cars. Late in Led Zeppelin’s “Whole Lotta Love” (1969), Robert Plant’s voice travels from right to left to right with ever greater reverberation (c. 4:19–4:27), as if he is plunging into a cavernous space. Perhaps it is meant to illustrate the perceived emptiness of the woman he has just addressed with the single-entendre, “Way down inside, woman, you need it.” Radiohead’s “Creep” (1993) features the violent tearing sound of a distorted guitar each time Thom Yorke admits, “But I’m a creep” (c. 0:58, 2:01, and 3:28). The first two times it appears, the guitar erupts in the right channel, then moves front and center, filling the stage; the sound seems to depict the anger of the song’s persona at the possibility that he is unworthy of the woman with the “face like an angel.” The last appearance of the distorted guitar, however, is much different; it is distant and barely audible, having been pushed to the left rear corner of the stage. The sound is dulled and softened, suggesting the bitter resignation of someone who now believes the worst about himself. As careful listening and a good pair of headphones will reveal, the use of the stereo field can add depth to a recording, both physically and expressively.

A more recent development in sound manipulation goes under the general heading of digital signal processing, or DSP. DSP far transcends the limitations and possibilities of magnetic tape. With rhythm quantization, for example, a performance with an unsteady tempo becomes metro-nomically precise as all notes are forced to fall on the closest beat. Pitch correction follows a similar principle, pushing pitches up or down to the nearest specified level. Moreover, both can be applied in real time. Thus I could go into a studio, belt out “Copacabana” in my wobbly pitch and uncertain rhythm, and have it come back at me through the monitor—*as I am singing*—sounding closer to Barry Manilow than nature or good sense should allow.

Digital processing, though widespread, is a controversial practice. As singer and producer Richard Marx puts it, “You have a guy or girl who literally can’t sing one phrase in tune to save their lives, and I can make them sound like they can. It’s misleading—but it’s not overly uncommon.” In an episode from February 2001, the animated television show
The Simpsons skewered the prevalence of pop processing. Bart Simpson and three of his friends are brought together by a successful producer to form the next big “boy band.” They have the right looks, the right moves, the right attitudes—everything except for musical ability. At first they can only croak out the lines to their song. The producer shudders, heads over to an oversized console labeled “Studio Magic,” and turns the “voice enhancer” dial. The boys sing again, only this time we hear buttery voices, perfect intonation, and exquisite timing coming from the studio monitors.108 This send-up only slightly exaggerates reality. The website for Auto-Tune pitch correction software and hardware made this triumphant claim: “Auto-Tune corrects ‘intonation’ problems of vocals and other solo recordings—in real time! In goes out-of-tune screeching, out comes bewdiful [sic] singing.”109

But there is another side to the debate, and many feel that the benefits of processing are far from insidious. Producer Matt Serletic has pointed out that the technology allows performers to minimize the stress and strain of recording sessions. “You no longer have to beat an artist into submission by asking them to pound out a vocal 15 times to get that one magic performance—which can result in a recording that’s technically accurate but passionately not convincing. With vocal processing, you can get the passion and then fix something.”110 Moreover, the technology allows singers to produce otherwise impossible sounds. Part of the appeal of Cher’s 1999 hit “Believe” was certainly the slightly stuttered, mechanical sound of the title word, an effect created through digital processing.111 Like splicing and overdubbing, DSP is a tool that can be, and has been, used in a variety of ways, both laudable and censurable.

It is important to realize that sound is manipulated in the studio not (or not typically) by performers, but by a variety of sound engineers and producers, sometimes referred to collectively as recordists. Recordists fall outside (or perhaps in between) the traditional triad of composer, performer, and listener. They might be thought of as sound shapers, artists in their own right who collaborate with performers and composers. Because their work is done mostly behind the scenes, their influence is not as widely or deeply appreciated as it should be, though a growing body of literature is starting to remedy the situation.112

Recording technology can be used to manipulate sound not only in the
In chapter 6 we will see how, beginning in the 1970s, hip-hop musicians transformed the phonograph into a performing instrument capable of generating complex compositions. Although turntablism, as their art came to be called, was new in its particulars, a long tradition of harnessing the technology for similar ends preceded it. As early as the 1920s, avant-garde classical composers treated the phonograph as a means to develop new sounds, and an influential school of thought developed around the possibility of what was sometimes called *Grammophonmusik* (the subject of chapter 5). Beginning in 1939, American experimental composer John Cage began using the phonograph in his music. The earliest example was *Imaginary Landscape No. 1*, scored for muted piano, cymbal, and two variable-speed turntables. It requires two musicians to “play” the machines by altering the speed of the discs and by rhythmically raising and lowering the styli. Although Cage was attracted to the possibilities of the phonograph, he had little interest in its intended use. “The only lively thing that will happen with a record,” he once said, “is if somehow you would use it to make something which it isn’t. If you could for instance make another piece of music with a record . . . that I would find interesting.”

Forty years after Cage’s initial experiments, artist and composer Christian Marclay continued what might be called avant-garde turntablism. On one occasion, he created an art installation consisting of dozens of records arranged on a gallery floor, and instructed visitors to walk across them. Later, Marclay gave a concert in which he took the scuffed and scratched discs and, using several turntables, performed a musical collage of pops, clicks, and some heavily obscured tunes. “Instead of rejecting these residual sounds,” Marclay explained in a 1998 interview, “I’ve tried to use them, bringing them to the foreground to make people aware that they’re listening to a recording and not live music. We usually make abstractions of the [recorded] medium. For me it was important . . . to give it a voice.”

If recording could foster the work of composer-performers, it could also separate composers from performers. *Musique concrète* was an early manifestation of this radical change. The genre was the inspiration of Pierre Schaeffer, who in 1948 began composing musical works by mixing and arranging nonmusical sounds collected via microphone. In the classical tradition, music is typically first conceived by the composer and then interpreted by performers. But musique concrète dispenses with performers by
starting with sound rather than score; as the name suggests, it begins with the concrete rather than the abstract. Schaeffer’s first such “concrete” piece was *Etude aux chemins de fer* (1948), a “railway etude” that, in the long history of train-inspired musical works, was the first to be derived solely from actual train sounds, which Schaeffer collected from a Paris station. In the United States beginning in the 1950s, a similar compositional approach arose known as tape music, which likewise treated recorded sound as raw material. Pioneer tape music composer Vladimir Ussachevsky, for example, kept dozens of individually boxed and labeled loops in his studio as a painter might keep jars of paint, ready for use in any future work. John Cage used a library of six hundred different sounds to assemble (through chance means) thousands of minuscule bits of magnetic tape into *Williams Mix* (1952). Like Schaeffer, both worked directly with sound, leaving performers out of the loop, so to speak. Extending the possibilities of tape music is the more recent practice of digital sampling, a method in which sound is converted into highly manipulable data. The range of material from which composers draw is vast, including speech and environmental sounds, as well as live and recorded music; as we will discover in chapter 7, the practice raises difficult questions about every aspect of composition, from aesthetics to ethics. In fact, the very possibility of manipulating sound after its creation—from splicing to digital pitch correction—forces us to reformulate our ideas about composition, performance, and the relationship between the two.

Music and musical life have been transformed in the age of recording. However vast and complex, this transformation can be traced to ways in which users of the technology respond to the seven interdependent traits that define recording. Yet recording does more than influence the activities of composers, performers, and listeners. It affects the relationship among these actors and in fact challenges the stability, even the validity, of the triad. It is no longer necessary for listeners and performers, or for performers and composers, to work together in order to create music. Yet at the same time, listeners and composers have discovered a more intimate relationship, one that can bypass the mediation of performers, while performers can work in solitude, without the need to stand before listeners.
Performances and works are no longer clearly distinct, for recordings can take on the function and meaning of both. Just as recordings can be heard as spontaneous interpretive acts, their repetition can transform them into compositions, works that can be analyzed, historicized, canonized, politicized, and problematized. Nor are production and reproduction so easily separated when preexisting sounds can be manipulated in real time. With recording, listeners need not simply receive music, for they have an unprecedented control over the sounds they hear. While there have always been composer-performers—artists who interpret their own works—with recording we can conceive of listener-performers and listener-composers. Recording thus not only affects the practice of music, it shapes the very way in which we think about music: what it is, can, and should be.
A fragment of a drum solo: the thump of the bass, the crack of the snare, the sting of the hi-hat, all combined in a distinctively syncopated pattern. Common sense suggests that this solo was fixed long ago, on the day drummer Clyde Stubblefield recorded it as part of James Brown’s 1970 R&B song “Funky Drummer, Part 1 and 2.” Yet this two-second sequence enjoys a promiscuous, chameleonic existence. Accelerated, equalized to sound muffled and distant, and repeated continuously in Eric B. and Rakim’s “Lyrics of Fury” (1988), it takes on a menacing tone, matching the intensity of the rap. Similarly looped, but slowed slightly and placed underneath a haunting folklike melody, it occupies a completely different sound world on Sinéad O’Connor’s “I Am Stretched on Your Grave” (1990)—that of the Irish lament. It masquerades as a reggae beat in Sublime’s “Scarlet Begonias” (1992) and turns wistful in George Michael’s pop ballad “Waiting for That Day” (1994). In each example, and in scores of others that appropriate Stubblefield, something of the original sound is maintained, yet its meaning changes in every new setting.

The multiple incarnations of Clyde Stubblefield’s “Funky Drummer” arise from the practice of digital sampling, a form of musical borrowing...
in which a portion of one recording is incorporated into another. Since the 1980s, musicians of every stripe have embraced the technology. Their work raises a host of questions, from the aesthetic and the technical to the ethical and the legal. How have composers changed their work in response to the possibilities of this technology? Has digital sampling introduced a fundamentally new compositional aesthetic, or is it best understood as an extension of older practices? What is it about the technology and its applications that have exposed the practice to charges of being inartistic, immoral, and illegal? Three case studies will address these questions. The first examines *Notjustmoreidlechatter*, a work by composer Paul Lansky that transforms speech into music. The second explores the complex relationship between two pop songs, one of which, Camille Yarbrough’s “Take Yo’ Praise,” is sampled by the other, Fatboy Slim’s “Praise You.” The final case study focuses on Public Enemy’s “Fight the Power,” whose extravagant sampling serves to enact the group’s political and cultural agendas. But before addressing the complex questions just raised, we must first answer a more straightforward one.

**WHAT IS DIGITAL SAMPLING?**

Digital sampling is a type of computer synthesis in which sound is rendered into data, data that in turn comprise instructions for reconstructing that sound. Sampling is typically regarded as a type of musical quotation, usually of one pop song by another, but it encompasses the digital incorporation of any prerecorded sound into a new recorded work. The equipment used to create samples varies widely, from traditional-looking keyboards to purpose-built machines dominated by buttons, knobs, and sliders that look nothing like musical instruments, to software used on personal computers. Regardless of the gear, on the simplest level sampling works like a jigsaw puzzle: a sound is cut up into pieces and then put back together to form a digitized “picture” of that sound. When a sound wave is digitized, using what is called an analog-to-digital converter (ADC), it is not reproduced in its entirety; rather, select “samples” of the wave are assigned binary numbers. Each of these numbers represents the amplitude, or height, of a wave at a given point. When a sound is reconstructed, a digital-to-analog converter (DAC) emits voltages corresponding to each
of these binary numbers. When all of these various voltages are emitted in a particular order, the result very closely approximates the original. This may seem to be an odd way of reproducing sound—breaking it down and then putting it back together—but in fact it works very well. At present, the standard sampling rate is 44,100 Hz, meaning that every second of sound that is sampled is cut into 44,100 slices; typically, each of these slices is given a sixteen-digit binary number, which allows for extremely fine gradations \(2^{16}\), or 65,536) in measuring the amplitude of a wave. Sampling can therefore be fast and fine enough so that the human ear perceives a continuous and faithfully rendered reproduction.

The advantage of digitization is that sound, once rendered into data, can be manipulated in a variety of ways down to the smallest details. Tempo and pitch can be increased or decreased in any increment, and the two can be manipulated independently. (In the predigital age, when the speed of a recording was increased, the pitch rose, and when the record slowed, the pitch fell. Think of the sound of a phonograph switching from 33 1/3 to 45 rpm or vice versa.) Sounds can be reversed, cut, looped, and layered; reverberation can be added; certain frequencies within a sound can be boosted or deemphasized. Noise can be removed to make an old recording sound pristine, or even added to make a pristine recording sound old, as can often be heard in recent popular music. All of these manipulations can be visited upon any sound, musical or otherwise, and on any length of sound that can be recorded. A sample can be a fraction of a waveform, a single note from an instrument or voice, a rhythm, a melody, a harmony, or an entire work or album. Although sampling, particularly when done well, is far from a simple matter, the possibilities it offers are nearly limitless.

As a form of musical borrowing, the roots of digital sampling reach back more than a millennium. Consider just the Western musical tradition: medieval chants freely incorporated and adapted melodic patterns from earlier chants; dozens of Renaissance masses were based on the melody of the secular song “L’homme armé”; a similar craze raged centuries later when composers such as Berlioz, Liszt, Rachmaninoff, Saint-Saëns, and Ysaÿe “sampled” the chant Dies irae (“The Day of Wrath”) in their instrumental works; Bach reworked Vivaldi’s music; more than a century later Gounod returned the favor, adding a new melody to Bach’s Prelude in C Major and calling it Ave Maria; Mahler cannibalized his own earlier vocal
works in several of his symphonies; Ives quoted George M. Cohan’s “Over There” in his song “Tom Sails Away”; Bartók parodied Shostakovich’s Leningrad Symphony in his Concerto for Orchestra; and so on and on.

Yet isn’t there something fundamentally different between such traditional acts of borrowing and digital sampling? It is sometimes said that while a quotation is simply a representation of another piece, a sampled passage of music is that music. But that depends on what the meaning of “is” is. Consider a conventional example of musical quotation: in the third movement of Luciano Berio’s Sinfonia, an enormous five-movement work for orchestra and vocalists from 1968, the composer quotes music by Brahms, Debussy, Hindemith, Mahler, Ravel, Schoenberg, and Strauss, among many others. These quotations are notational—that is, Berio reproduces not the sounds themselves, but the instructions for recreating them. The quotations are only complete when performed. Digital sampling also involves symbols—1s and 0s instead of the various lines, dots, and squiggles of traditional notation. As a standard textbook on computer music explains, “What computers manipulate is not sound itself but representations of sounds.” Therefore, if sampling represents sound, we cannot say that a sampled passage of music is that music.

But if sampling does not differ from traditional musical borrowing in kind, it certainly differs in degree. Consider a hypothetical quotation, in which the score of an otherwise original work notates the two-second “Funky Drummer” solo. At most, only a dozen or so instructions (in the form of various symbols) would be used: several to indicate the parts of the drum kit (bass, snare, tom-tom, hi-hat, etc.), a handful for the duration of each note, and a few for dynamics, accentuation, and meter. But the equivalent digital sample would require nearly a hundred thousand distinct instructions, a level of specificity impossible to notate. With all of these instructions, so much more can be indicated: the sound of a particular drum being hit with a certain amount of force using a specific stick, or the exact number of milliseconds a note enters before or after the beat. Moreover, the sonic aura surrounding the sound can also be captured. By “aura” I mean two things: the reverberation that imparts a sense of space, and the slight but constant ambient noise—a patina, perhaps—that is a by-product of imperfect recording fidelity. Digital sampling offers the possibility of what I would call performative quotation: quotation that recre-
ates all the details of timbre and timing that evoke and identify a unique sound event, whether two seconds of Clyde Stubblefield’s drumming or the slow, unsteady tapping rhythms produced as I type this sentence. In other words, traditional musical quotations typically cite works; samples cite performances. As we will see, it is the possibility of performative quotation, including the ability to manipulate those sounds, that sets sampling apart from traditional quotation and has led to some astonishingly creative works of modern music.

THE UNCOMMON PARLANCE OF PAUL LANSKY

I was sitting on a plane just before takeoff when an announcement came over the loudspeaker. It was no doubt the usual welcome, but for some reason I could not quite understand what the attendant was saying. At first I thought the loudspeaker was faulty, and then I put the difficulty to the noise of the engines. I leaned forward, closed my eyes, and concentrated, yet I still could not make sense of the words. My frustration mounted, but then suddenly I could understand her perfectly. I quickly realized why, much to my chagrin: I was on a KLM flight to Amsterdam, and it dawned on me that the attendant had given the announcement twice—first in Dutch, and then in English. Dutch, at least to my ears, sounded quite a bit like English. But it did not occur to me that she was speaking a different language. Rather, it seemed as if she were using all the basic and familiar sounds of English, but in a completely unfamiliar (and rather maddening) way.

I am reminded of this incident when I listen to Notjustmoreidlechatter, a 1988 work by composer Paul Lansky. Lansky, a professor of music at Princeton University, creates his music almost exclusively with computers, and the eight-minute Notjustmoreidlechatter is one in a series of works in which he digitally manipulates speech—English speech—to create fantastic musical textures in which semantic meaning is tantalizingly out of reach. Lansky has long been interested in using the computer to transform the everyday into music, or perhaps to extract the music from the everyday. He finds inspiration in unexpected places—conversations, highway traffic, a bustling shopping mall, his own kitchen. Rather than sampling preexisting works (as the other composers discussed in this chapter do), he mines raw sonic material; moreover, these works bear little con-
nection to the world of traditional performance. Lansky is thus presented with a distinct compositional challenge: How does a composer write music that lives only on recordings? That is, how does one write a work that not only must stand up to exact and frequent repetition, but must also create its own self-sufficient world outside the familiar traditional concert venues? Lansky answers these challenges in the form of Notjustmoreidlechatter.

Notjustmoreidlechatter (Track 10 on the accompanying CD) opens with what one might take for the Babel of legend. Countless unintelligible voices—high, low, fast, slow—bombard the listener from every direction. Heard on headphones (perhaps the “natural” venue for such a piece), the voices seem to be inside one’s head, bouncing and darting chaotically. In fact, we are hearing only one voice, that of Lansky’s wife, Hannah MacKay. MacKay is reading from chapter 25 of Charlotte Brontë’s Jane Eyre, in which Jane tells Rochester of her unusual dreams. The subject seems appropriate to the piece, for the disembodied voices have an unreal, otherworldly sound. While MacKay’s voice is digitally multiplied, fractured, and transformed so that no single word is long or distinct enough to be understood, it is still possible to pick out recognizable syllables or phonemes. Here Lansky strikes a balance between familiarity and strangeness, in which listeners instinctively “squint” their ears, as Lansky puts it, in an attempt to understand what is being said. (Much as I did when I tried to make sense of Dutch on the KLM flight.) This is a canny compositional strategy, for it not only encourages attentive listening but also addresses the problem of repeatability. Even the most careful scrutiny will not reveal the text, but with every successive hearing the listener cannot help trying to extrapolate meaning from these verbal scraps. Here Lansky exploits the human tendency to fill in missing or unclear information to form whole structures. This is the same tendency that leads listeners to misinterpret indistinct song lyrics, even if the result makes little sense, for nonsense seems always to be more tolerable than uncertainty. (Examples of misheard lyrics are legion: “Excuse me while I kiss this guy,” instead of “Excuse me while I kiss the sky”; “The ants are my friends, they’re blowin’ in the wind,” instead of “The answer, my friends . . .”; and so on.) Play Notjustmoreidlechatter to a group of listeners and you will find that they all think (and even insist) that they hear particular words, though few if any will agree on what is being said.
Lansky responded to the repeatability issue in another way as well. Using what he describes as stochastic mixing techniques, he essentially instructed a computer to determine certain aspects of the chattering at random. As Lansky has explained, the purpose of this unpredictability is to compensate for the fixity of the recorded medium, and in doing so simulate the spontaneity, the “danger,” of live performance:

My view is that in order to recreate that sense of danger you have to make the listener into the performer. The listener has to take an active part in the experience in fundamentally different ways than in live performance, and in order to do this I think that it’s necessary to compose elements into the music that are non-linear, sometimes random, sometimes noisy and not discursive in the ways that a lot of traditional music is. I want the music to challenge the listener anew on each hearing, so that identical sounds will end up sounding different depending on the performance the listener creates in his own mind and ear.6

In *Notjustmoreidlechatter* there is no performer in the traditional sense. So the performer’s task—to create a fresh interpretation of a work with each performance—is split between composer and listener. The composer imbues the work with the unpredictability of a live performance, while the listener assumes the executant’s interpretive duties. In fact, for Lansky it is the listener who truly defines the music: “The essence of the music,” he argues, “doesn’t lie as much in its details as in the act of trying to understand them.”7 If we compare Lansky’s response to repeatability with that of the recording performer, we see a fascinating inversion. I suggested in chapter 1 (see p. 25) that recording artists transform performances into works by creating unchanging texts that transcend the temporal vicissitudes of the concert. Lansky has done exactly the opposite: he has composed a work with the qualities of a performance.

As its title suggests, there is more to the work than chaotic chatter, which alone might well drive listeners to distraction. Just as Lansky seeks a balance between familiarity and strangeness, he also leavens complexity with simplicity. Anchoring the swiftly moving surface voices are what Lansky refers to as background singers. Where the former move randomly in complicated rhythms guided by no perceivable system of tonality, the latter
do the opposite. These voices sing slowly in simple harmonies on vowel sounds, meandering in stepwise motion within a diatonic scale. Although they do not follow the traditional rules of tonal voice-leading, their deliberate and predictable movement provides structure to the piece. A broader organizing principle also helps unify the work. The chatter voices chart a gradual path from lesser to greater intelligibility and back again, providing a kind of arch form to the work. At the midpoint of the piece, the background voices fade while the chattering becomes more prominent and distinct. Lansky seems to be rewarding careful listeners; for example, I hear “dream” and “a long way” (4:23–4:24), both of which are in the source text. (Then again, I would swear that I hear certain words and phrases that are not in the source text, so at any point in the piece it is impossible to know whether I hear what I think I hear.) After this section of relative clarity, the distinctness of the text diminishes as the chattering recedes into the background. After nearly eight minutes, the piece slowly fades from one’s consciousness, the voices dying away inarticulate, to paraphrase Jane Eyre’s description of her own voice disappearing in a dream.

*Notjustmoreidlechatter* wonderfully demonstrates the musical and aesthetic potential of digital technologies. Like an alchemist, Lansky transforms the ordinary into the precious, where a spoken word becomes a superhuman chorus. But this is no black magic—it is virtuosic handicraft developed from an understanding of both computer software and human perception. If Lansky exploits the possibilities of the technology to the fullest, he also confronts its limitations. The 1s and 0s of *Notjustmoreidlechatter* will not change no matter how many times we hear the piece. But he uses those same fixed digits to create the illusion of spontaneity, and makes us squint our ears in an attempt to hear more. The piece also raises questions about the definition of music. How does mere sound become music? Can we pinpoint the transformation? Or is the transformation in the listener, achieved when something is heard as music? Lansky does not answer these questions, but he does suggest (as John Cage had done before, but with very different sonic results) that the line between noise and music is far from clear, if such a line exists at all.

Paul Lansky hopes that listeners will not dwell on the technology with which he creates his music. “Music succeeds when its machinery is less interesting than its tunes.” His stance is understandable, for he certainly
would not want the medium to overshadow the message. While I do not agree with Marshall McLuhan that the medium is the message, a rich understanding can come of investigating both. Although the world of *Notjustmoreidlechatter* springs from the imagination of the composer, it is the technology that renders it audible.

**FROM ‘TAKE YO’ PRAISE’ TO ‘PRAISE YOU’**

The recording opens with a piano playing an eight-bar introduction in a gospel style. We can imagine the pianist sitting at a battered upright, vamping an introduction for a nervous amateur singer. Oblivious to the proceedings, some members of the audience continue their neighborly chitchat. The singer then enters tentatively:

We’ve come a long, long way together,  
Through the hard times and the good.  
I have to celebrate you baby,  
I have to praise you like I should.

At the end of the phrase something very strange happens, disrupting our mental image of the proceedings. The singer starts to stutter unnaturally on the word *should*, as a complement of percussion instruments and then an electric bass thicken the texture. The woman holds the note for ten, twenty, thirty seconds. A synthesized drum joins in, pounding out quarter, then eighth, then sixteenth, then thirty-second notes before the texture erupts into an up-tempo dance.

The minute and twenty seconds of music I just described opens “Praise You” (Track 11 on the accompanying CD), the 1998 electronic dance music hit by Norman Cook, better known in his native Britain and throughout the world as Fatboy Slim. At the core of “Praise You,” however, is another song, representing a different era and genre. The voice we hear belongs to Camille Yarbrough and was recorded in 1975 as the opening of her soul/funk song “Take Yo’ Praise” (Track 12). Through the technology of digital sampling, Cook has at once decontextualized and recontextualized Yarbrough’s voice, giving it new sounds, functions, and meanings. What
makes this case study fascinating, however, is that the relationship between these two songs simultaneously confirms and confounds our expectations of digital sampling, and in the process raises some of the complex aesthetic and ethical issues arising from this new form of musical borrowing.

Cook samples only the first twenty seconds of “Take Yo’ Praise,” which consist of Yarbrough’s unaccompanied singing—nothing more. This comes as a surprise to most listeners, who assume that the opening of “Praise You” is an unretouched aural snapshot of an actual performance. It was Cook, then, who added the piano and the background voices; he even manipulated the crackling sound of the LP from which he sampled the piano, making it more prominent. (He also altered Yarbrough’s singing, increasing the tempo and flattening the melodic contour.) Cook demonstrates his mastery of the sampler here, providing a sense of wholeness to this olio. He does this not only through the harmonization of the vocal line, but with noise. The background chatter offers a sense of occasion, of liveness, and of place; the foreground crackling offers a sense of time, evoking the unspecified past of the vinyl age. The latter can now be produced digitally and is aptly known as the phonograph effect. A phonograph effect indeed, for it is a palpable manifestation of recording’s influence. This noise, real or digitally simulated, is now firmly part of our modern sonic vocabulary, and can be powerfully evocative to listeners. It was long deemed an unwanted addition to the phonographic experience by both the industry and listeners, but ironically became a valued and meaningful sound when digital technology finally eliminated it. In the age of noiseless digital recordings, this sonic patina prompts nostalgia, transporting listeners to days gone by (whether of their own or some generalized past), an effect Cook exploits in “Praise You.”

In the original, Yarbrough’s line “I have to praise you like I should” leads to the entrance of a sublimely funky electric bass line, with guitar and percussion filling in the accompaniment. As the song continues through several more verses, text and tone become increasingly passionate and erotic before subsiding into a postcoital coda. Cook, however, takes another path. The music following the opening sixteen measures, when Yarbrough’s voice starts to skip, seems rather unimaginative, even inept. The vocal stutter suggests a failed attempt to create a superhuman fermata; the synthesized sound of the throbbing drum is clearly foreign to the rest of the musical
texture; and the successive doubling of the pulse is a dance music cliché. Yet whatever else he is, Cook is not inept. He is actually playing a sly joke on us, for his intentionally ham-fisted sampling convinces us all the more of the “authenticity” and “naturalness” of the opening, which, as we now know, is neither. Cook himself admits that the vocal stutter was “a gag, a way of saying, ‘Look, I sampled this.’” With this heavy-handedness he thus makes his presence known; the man behind the curtain has revealed himself. Of course, he was there from the start. Attentive listening reveals that the first four seconds of “Praise You” are looped, so that the two measures in the piano, the fragment of conversation, even the pattern of pops and clicks are repeated in exactly the same form. His portrait of an artist as a young woman is clearly a construct.

The introduction now over, Cook proceeds to use the twenty seconds of Yarbrough’s singing, and various parts of it, through the rest of the five-minute song. The entire sample is heard only three times. All other appearances of Yarbrough’s voice come from the last line, “I have to praise you like I should.” Cook does not further alter the sample; rather, variation in the music comes from the accompaniment, which changes throughout the piece. Although this is dance music, which requires repetition and a steady beat, it has a subtlety that rewards close listening. Cook himself might argue to the contrary, however. According to him, with dance music, and his music by extension, “There’s nothing to sit and listen to. It’s the soundtrack of your nights out rather than anything that’s supposed to be heard or discussed at home at great length.” Yet notice the male voice singing along to the bass in nonsense syllables at 0:57, the faint vocal echoes accompanying “I have to praise you” starting at 1:57, the human beat-box rhythm at 2:11, and the variety of glissandos, cymbal hits, and robotic chirps that pepper the texture. Most of these can only be heard with careful attention and headphones—that is, at home, rather than at the club.

If Cook adds a good deal musically, he also strips much away from the original. Camille Yarbrough’s “Take Yo’ Praise” offers a complex message, one absent in “Praise You.” Yarbrough’s is a multifaceted love song, one woman’s moving and sensual tribute to the man in her life. As the composer reveals, the lyrics are autobiographical: “I wanted the brother with whom I was attached to know that . . . he had contributed a lot to my growth.” The song has broader implications as well. Yarbrough wrote
“Take Yo’ Praise” during the civil rights movement, in which she, an African American woman, was deeply involved. “I had decided to give it a double meaning,” she explains. “It was also directed at all people of African ancestry . . . who had at that time been in the front lines of the battle to turn racism around.” The opening line—“We’ve come a long, long way together”—refers, then, to her people, not just her man. In Cook’s hands, however, both the personal and political meanings of the original evaporate. In fact, after so much sheer repetition, it’s unclear whether these words mean much beyond what the timbre and rhythms of Yarbrough’s voice communicate musically. In a survey of informal reviews of “Praise You” posted on the Internet I found very few that even mentioned the lyrics. Of those that did, most were dismissive. “I can’t really say the lyrics are deep, because they’re not,” one reviewer noted. He summed up the song in this way: “I think one of my friends described ‘Praise You’ best when she said it felt like one of those songs you cruise around town with all your friends listening to and doing fun, crazy stuff. And if you know that feeling, you know what ‘Praise You’ feels like. It’s just a fun song.”

While it might be tempting to dismiss this assessment as superficial, it is important to remember that Cook omits the vast majority of the text, repeating just a few words over and again. No wonder fans of the song have had little to say about its lyrics.

One could also argue that through his sampling Cook digitally neuters Yarbrough. On first hearing, many people think that the singer is a man or are unsure of the gender. Cook changes Yarbrough’s voice in such a way that it is less nuanced than the original, and the lack of timbral clues makes it possible to hear it as a tenor or alto. (Interestingly, Cook points out that the quality of Yarbrough’s sampled voice was an unintended consequence of time-stretching, at the time a relatively new and rather unrefined technique used to change the tempo of a recording without affecting its pitch. He nevertheless appreciated the resulting gender ambiguity.) Nor does the sample offer any textual clues as to gender, whereas in the original the second verse leaves no doubt as Yarbrough sings, “You make me glad I’m a woman, because you’re a feeling, thinking man.” The lack of any eroticism in “Praise You,” so clear in “Take Yo’ Praise,” also renders the voice asexual. The effect of this digital denaturing is ambiguous. It is possible to hear Yarbrough’s bodiless voice as a free-floating signifier, one that transforms
the personal into the universal and allows the song to be heard from a male or female, heterosexual or homosexual, frame of reference. Another possibility, perhaps not mutually exclusive, is that Cook is disempowering Yarbrough, erasing her history, identity, and vitality. As Kay Dickinson has pointed out, “In the case of sampling, it would not seem untoward to derive extremely disempowering readings from male producers chopping chunks out of women’s performance.” It would certainly be fair to say that Cook has “chopped chunks” out of Yarbrough’s performance.

What should we make of “Praise You”? Is this just another example of a white musician—Cook—appropriating and denuding black culture for profit and fame? Certainly there was an unequal power relationship. Cook was a popular and wealthy musician (becoming much more so after the release of “Praise You”), while Yarbrough’s musical career brought her rather less money and notoriety, and was all but forgotten by 1998. (Even by Yarbrough herself; she had long since moved on in her varied career as a dancer, actress, radio host, writer, and teacher.) Notice, too, the “whitening” of the title as the black vernacular “Take Yo’ Praise” becomes “Praise You.”

Yet the story is not so black and white. It turns out that Yarbrough was actually “pleasantly surprised” when she first heard the song. She was pleased that Cook had sampled the hook from “Take Yo’ Praise,” which she considers the emotional core of her song, with an important message to offer. “We need to praise one another,” she explains, “we need to stop all the negativity. Once you begin to fill your mouth and your mind and your heart with praising something or someone the put-down lessens.” Yarbrough also feels that the gospel quality Cook lent the sample was appropriate, and brought out the spirituality of her song, at least in the opening of “Praise You.” (While Cook acknowledges the influence of gospel, he denies that there is anything spiritual about his song. Ironically, it is the gospel sound of the Rolling Stones’ “Sympathy for the Devil” that he cites as inspiration. As Cook points out, “I’m a big fan of gospel music, more than I am of God.”) And although Yarbrough seems ambivalent about what she calls the “dance hall” sound of the remainder of the song, she does not feel that it in any way devalues her work. After all, she points out, “I can still do that song as I do it. And so what he did, that’s on him; what I do, that’s me.”
For his part, Cook understands that what he did is on him. “I’m always aware that white artists who are fans of black music tend to have big hits when they cover black records. All I can say is, I don’t do it for profit, I do it because that’s the music I love, that’s the music I want to make in my way. I always try to make sure that the original artist gets the credit and the money.”

To be sure, Yarbrough received both. Cook gave her co-composer credit and a 60 percent share of the royalties, a generous arrangement indeed. Cook, however, may have learned from experience. On his previous album, *Better Living through Chemistry*, he sampled guitar chords from The Who’s “I Can’t Explain” without permission. Not until a year after its release did Cook approach Pete Townshend, the composer and copyright holder of the song. The ensuing negotiations between their respective lawyers ended badly for Cook: Townshend was given sole composer credit for the song and 100 percent of the royalties. Cook obviously wanted to avoid such a debacle with “Praise You.” Nevertheless, Yarbrough received (and still receives) a considerable amount of money from the song not only from album sales, but from licensing fees paid by the many film and television producers who have used the song. She does not downplay the significance of this windfall, which she has described as “a gift.” She later joked, “I have a platinum card, so now I praise Fatboy Slim!” Moreover, “Praise You” has brought a good deal of positive attention to Yarbrough and her music, leading to the re-release of her 1975 album *The Iron Pot Cooker*, two remixes of the song, and a reevaluation of her place in poplar music by the press. Cook may have “chopped chunks” out of Yarbrough’s song, but the result hardly seems to have been disempowering.

In 2002 I presented this case study to an undergraduate class on popular music and invited Yarbrough to speak to the students. The students were enchanted by Yarbrough and fell in love with her music. Yet as impressed as they were with Yarbrough’s talent and integrity—or perhaps because of it—a number of students were disappointed that she so readily accepted Cook’s “Praise You.” In a later discussion, these students said that Cook’s treatment of “Take Yo’ Praise” was demeaning, and found it disturbing that Yarbrough, who spoke so forcefully to us about racism and injustice, did not see that she herself had been exploited. Regardless of how Yarbrough felt about the matter or how well she was paid, these students still felt there was something wrong about the whole affair.
Although I sympathize with their viewpoint, I disagree with it, and will persist in resisting an unambiguous view of these two songs and their relationship, and of digital sampling in general. Sampling has often been criticized as fundamentally uncreative, even unethical. True, one can hear unimaginative borrowings that capitalize on a sample’s familiarity, neither revealing new ways of hearing the sample nor enriching its musical surroundings. And many musicians have had their work sampled without credit or payment, with others profiting from their creativity. Fatboy Slim’s “Praise You,” however, does not allow us the luxury of a blanket condemnation (or celebration, for that matter); it can be understood as derivative and novel, exploitative and respectful, awkward and subtle. The song, moreover, raises questions of creativity and originality, and forces us to confront issues of gender, class, and race. In that sense, the relationship between “Praise You” and “Take Yo’ Praise” brings into focus some of the crucial questions, issues, and ambiguities that face the study of digital sampling, as it presents to us the practice in microcosm.

DIGITAL AESTHETICS AND POLITICS IN “FIGHT THE POWER”

Consider the opening of Public Enemy’s 1990 rap song “Fight the Power” (Track 13 on the accompanying CD). In less than a minute, more than a dozen samples fly by, chopped, looped, layered, and transformed in any number of other ways. The tone is set in the opening seconds by a resonant, agitated voice: “Yet our best trained, best educated, best equipped, best prepared troops refuse to fight. Matter of fact, it’s safe to say that they would rather switch than fight.” The second section (0:17–0:24), a mere three measures long, is anchored by the dotted rhythm of a vocal sample repeated six times. The words are indistinct, and with good reason—they’re backwards. The words are “pump me up,” from Trouble Funk’s 1982 song of the same name. Against this pattern a melodic line, sunk deep into the mix, snakes upward in triplets over the three measures. The sound, obviously electronically processed, may be the saxophone playing of Branford Marsalis, the only instrumentalist (in addition to Terminator X, who provided the turntable scratches) who performed specifically for this song. Eight hits of a snare drum in the second measure and some vocal exclama-
mations in the third fill out the texture. (One of these exclamations, a nonsemantic “chuck chuck” from the 1972 soul song “Whatcha See Is Whatcha Get” by the Dramatics, may well be a sly nod to Public Enemy’s rapper, Chuck D.) The next section (0:24–0:44), which leads up to the entrance of the rappers, is even more complex. Clyde Stubblefield’s “Funky Drummer” solo makes an appearance, though it is submerged within a dense web of other samples. Only the first two eighth-notes in the bass drum (or kick) and the snare hit are clearly heard. Competing for the listener’s attention is a host of other sounds: four fragmented vocal samples (three have text and the other is one of James Brown’s famous grunts) as well as guitar, synthesizer, bass (from James Brown’s 1971 “Hot Pants”), and various percussion samples. The effect created by Public Enemy’s production team is dizzying, exhilarating, and tantalizing—one clearly cannot take it all in at once.

When Public Enemy rapper and spokesman Chuck D. explains, “Our music is all about samples,” he reveals the centrality of recording technology to the group’s work. Simply put, “Fight the Power,” and likely Public Enemy itself, could not exist without it. “Fight the Power” is a complex and subtle testament to the influence and possibilities of sound recording; but at the same time, it reveals how the aesthetic, cultural, and political priorities of musicians shape how the technology is understood and used. A look at Public Enemy’s use of looping and performative quotation in “Fight the Power” will illuminate the mutual influences between musician and machine.

The looping in “Fight the Power,” and in rap generally, directly arose from the hip-hop DJs of the 1970s. As we know from chapter 6, a recorded passage—typically an instrumental solo, or “break”—would be repeated by switching back and forth between two turntables playing the same record. Although looping in most rap (“Fight the Power” included) is no longer created on turntables, its connection to DJing remains crucial. Many hip-hop producers were once (or are simultaneously) DJs, and the skills in selecting and assembling beats are required of both. Moreover, the DJ is a central, founding figure in hip-hop music and a constant point of reference in its discourse; producers who stray too far from the practices and aesthetics of DJing risk compromising their hip-hop credentials.

Although “Fight the Power” samples dozens of different works, the total
length of those fragments is fairly short, as most are less than a second long. From such an economy of material, the four-and-a-half-minute track can only exist through an extravagance of looping. Indeed, as Chuck D. once told an interviewer, “We put loops on top of loops on top of loops.” For example, in just one four-second segment (0:24–0:28), at least ten distinct samples are being looped; the whole texture is then repeated four more times as a meta-loop until the rappers enter. The section is wildly polyrhythmic; with no two samples overlapping completely, each one competes for the listener’s attention. This raises an interesting musical question: What is the effect of weaving together so many distinct and opposing rhythms into an ostinato? An uneasy balance is struck. The repetition provides a consistent pulse, yet the angular syncopation of the various fragments hardly provides a model of stability. The result is something of a paradox—a groove that somehow resists inevitability however many times it is repeated. This practice is also characteristic of various African American musics that do not make use of digital sampling. One need only listen to, say, James Brown’s “Papa’s Got a Brand New Bag” or “Funky President,” both densely packed with competing ostinatos, to understand that looping represents an extension of earlier practices, not a break from them. The loops in “Fight the Power” are not only polymetric, they are polytimbral, representing what composer Olly Wilson calls the “heterogeneous sound ideal.” Such an ideal values a diversity of tone colors sounding simultaneously and is demonstrated in a wide variety of African and African American repertoires. Listen again to the section following the opening spoken sample: the combination of percussive grunts, singsong speech, throbbing bass, cracking drums, and high-pitched ringing defines “heterogeneous.” This meta-loop is therefore not simply a technological manifestation, but a cultural one.

Public Enemy’s sampling in “Fight the Power” serves political as well as musical ends. There is no mistaking the song’s rhetoric. The lyrics express black pride, voice opposition to the white establishment, and address racism, freedom of speech, and the representation of blacks in American life and culture. Toward the end of the song (3:18–3:24) Chuck D. raps, “Most of my heroes don’t appear on no stamps/Sample a look back you look and find/Nothing but rednecks for 400 years if you check.” The use of the word sample is significant. Public Enemy’s remedy is to provide
its own samples, literally in the form of digitized snippets—performative quotations—of the work of its underrepresented heroes. Among others, these samples pay homage to Afrika Bambaataa, Bobby Byrd, James Brown, George Clinton and Funkadelic, the Jacksons, Sly and the Family Stone, and Trouble Funk, all seminal figures in the development of late-twentieth-century African American popular music (and popular music, period). Although many of the samples in “Fight the Power” are disguised beyond recognizability, there is no mistaking Brown’s grunts and Bambaataa’s electronically processed exclamations. Even when not readily identifiable, the samples clearly draw from African American culture. Various exhortations common in black music and church services—“Let me hear you say,” “Come on and get down,” “Brothers and sisters”—dot the soundscape. Reinforcing the musical samples are textual references to the music of black Americans (many of them also quoted digitally), including “sound of the funky drummer” (James Brown and Clyde Stubblefield), “I know you got soul” (the title of a Bobby Byrd and, later, an Eric B. and Rakim song), “freedom or death” (a Stetsasonic song), “people, people” (from James Brown’s “Funky President”), and “I’m black and I’m proud” (James Brown’s famous anthem). The track’s title itself invokes the Isley Brothers song of the same name. Finally, a more general reference to African American music is implicit throughout the entire song—in its virtuosic sampling and looping, “Fight the Power” draws upon and honors the work of the hip-hop DJ.

In Black Noise, Tricia Rose argues that “although rap music is shaped by and articulated through advanced reproduction equipment, its stylistic priorities are not merely by-products of such equipment.” “Fight the Power” perfectly illustrates that claim. On the one hand, it would be extraordinarily difficult, perhaps impossible, to reproduce the dense polyphony and distinctive timbres of the rhythm track without digital sampling. Even if the sampled musicians were to perform their chopped and looped parts in concert (an unlikely prospect!), they themselves could not exactly reproduce the original. It is not simply their voices or their playing that is important, but specific and well-known performances as mediated through recording technologies and heard on discs of a certain vintage. And even if it were somehow possible to recreate the samples, to do so would be to miss the point of hip-hop sampling completely. As Joseph Schloss has
demonstrated in his study of the practice, it is the sample—not the live performance—that is the real thing. As one producer explained to him, a live recreation “just doesn’t sound authentic. There’s something about the way old records sound when they’re put together right. You can’t really recapture ’em when you play [live].” In other words, it is performative quotation—made available by digital sampling—that allows Public Enemy to call forth a pantheon of black figures with such vividness. And it is the manipulability offered by recording technology that makes it possible to interweave these sounds into a rich collage.

Yet the structure and texture of the music were not directly determined by the tools used to create them. Rather, Public Enemy employed these tools in ways that served their own musical and rhetorical ends. They would no doubt agree with Stetsasonic’s Daddy O. (cited as a “lyrical inspiration” in the liner notes of Fear of a Black Planet) that “A sample’s just a tactic/A portion of my method, a tool/In fact it’s only of importance when I make it a priority.” Sampling serves to continue the predigital, prephonographic practice of signifying that arose in the African American community. Signifying, which can be used to boast, insult, praise, or moralize, generally plays on the many possible meanings and interpretations of a given statement; it is, in the words of Henry Louis Gates Jr., a “black double-voicedness.”

We can see how in “Fight the Power” sampling is a digital form of signifying. (Recall how in chapter 6 turntablism was invoked as an analog form of signifying.) The double-voicedness of the samples is clear, as two examples will illustrate. In its original context, the opening sample (“Yet our best trained . . . troops refuse to fight”) most likely referred to the Vietnam War. In quoting this passage, Public Enemy preserves its bitterness and fury, but broadens the message, suggesting that real injustice comes not from without (in the form of the country’s wartime rivals) but from within, in the form of racism, poverty, and crime, attributed here to the white establishment—“the power.” The statement of “people, people” (1:45) is literally double-voiced: Flavor-Flav and a sampled James Brown (from “Funky President”) speak simultaneously. But the double-voicedness is also rhetorical. Flavor-Flav proclaims “People, people we are the same,” while Chuck D. retorts, “No we’re not the same.” On its own, the lyric expresses the conflict between assimilation and separatism within the
black community. The addition of James Brown’s voice taps into his cultural authority, while linking Public Enemy to the less complacent past of the civil rights era.

Yet the power of these sampled statements comes not just from their words, but from their voices, their digitally sampled voices. It is the “grain” of these voices—captured in sequences of 1s and 0s—that truly gives their words such power. And round and round we go: the message cannot be understood without examining the medium, while the nature of the medium is not fully apparent independent of the message. One way of understanding “Fight the Power,” then, is as a four-and-a-half-minute treatise on the phonograph effect, one that reveals, as much as anything discussed in this book, the complex relationship between artist and technology.

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Too often discussions of sampling treat the practice simply as technological quotation. However, as I have suggested throughout this chapter, sampling is most fundamentally an art of transformation. A sample changes the moment it is relocated. Any sound, placed into a new musical context, will take on some of the character of its new sonic environment. Every “Funky Drummer” sample, however recognizable, leads a distinct life in its new home. Thus, the sound and sense of a two-second drum break may change radically from song to song, even if the patterns of 1s and 0s do not.

Yet samples rarely leave home unchanged, and it is in the chopping, looping, tweaking, and shuffling that the art is truly found. The sampled sounds are really only raw materials, waiting to be mined and refined. This is made most clear in the work of Paul Lansky, whose sources are not songs but everyday sound, and it is up to him to give them musical meaning and syntax. But even finished compositions are ore in the sampler’s hands. “Take Yo’ Praise” is still recognizable in “Praise You,” but in changing its sound, Norman Cook has transformed its function and meaning as well. By contrast, very little of the ore Public Enemy mines in “Fight the Power” is even recognizable, having been transformed so dramatically.

Sampling is also transformative in a less tangible way, in that it blurs the traditional distinction between ideas and expressions. As they are typically understood in the discourse of intellectual property, an idea is a con-
cept, principle, process, or system that is independent of any form, while an expression is a particular embodiment of that idea. For example, the concept that sound recording influences modern musical life is an idea, one that I and many other people share. On the other hand, Capturing Sound is a particular expression of that idea. In practice, the dichotomy is not always so clear-cut, but digital sampling muddies the distinction almost beyond recognition. Trouble Funk’s 1982 song “Pump Me Up” is obviously not an abstract idea, but a concrete expression. But does the passage sampled in Public Enemy’s “Fight the Power” remain Trouble Funk’s expression when it no longer bears any resemblance to its unaltered state? Isn’t Public Enemy’s use of that sound an expression distinct from Trouble Funk’s? And if so, does that make the Trouble Funk song the raw material of an idea (or even a wholly different idea) for Public Enemy?

The collapse of the idea-expression dichotomy could have considerable ramifications for copyright law, for while expressions are legally protected, ideas are not. If sampling can be more like taking inspiration from another’s ideas than appropriating another’s expressions, then sampling—in many cases—should be treated as a form of protected speech immune to prosecution for copyright infringement. My point, however, is not to argue the legal issues of sampling—an area I have intentionally avoided, as I believe it overshadows so many more interesting aspects of the practice. Rather, I raise the idea-expression dichotomy to demonstrate the radically transformative potential of digital sampling.

Finally, sampling has transformed the very art of composition. When composers sample existing works, they begin with expressions, transform them into ideas, and then again into new expressions. Sampling obviates the need for notation or performers, since the final product is not a score requiring interpretive realization, but a document of binary numbers requiring electronic conversion. Composers who work with samples work directly with sound, thus becoming more like their counterparts in the visual and plastic arts. As Public Enemy’s Chuck D. explained, “We approach every record like it was a painting.” Sampling is a rich and complex practice, one that challenges our notions of originality, of borrowing, of craft, and even of composition itself.

8. I have chosen to name this concept after the phonograph (as opposed to a newer technology) because it is the original mechanism for sound recording and reproduction and, having survived for more than a dozen decades, will be remembered long after others have faded into obscurity.


11. Smith and Marx, eds., Does Technology Drive History?, xi.

12. Here I am in general sympathy with historians who espouse the view known as the social construction of technology (SCOT), which examines technology from the standpoint of users and explores their role in technological change. For a fascinating case study on the automobile, which also surveys and refines SCOT, see Ronald Kline and Trevor Pinch, “Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States,” Technology and Culture 37 (1996): 763–95.

13. The connection between the car and the American suburb has long been observed in histories of the automobile and in writings on technology in general. See, for example, Ruth Schwartz Cowan, A Social History of American Technology (New York: Oxford University Press, 1997), 237–38.

CHAPTER ONE

1. A note on terminology: phonograph originally denoted cylinder-playing machines only, while gramophone referred to machines that played discs. At the turn of the century these terms were not interchangeable. It was not until the 1920s, when cylinder recording all but disappeared, that both terms referred to disc players. Today, phonograph is used in the United States and gramophone in Great Britain to describe the record player. In this book, phonograph will be used generically. Other terms will be used when dictated by context. For more on the early history of the phonograph, see Day, Century of Recorded Music; Roland Gelatt, The Fabulous Phonograph, 2d rev. ed. (New York: Macmillan, 1977); Oliver Read and Walter L. Welch, From Tin Foil to Stereo: Evolution of the Phonograph, 2d ed. (Indianapolis: Sams, 1976); and Walter L. Welch and Leah Brodbeck

2. While this particular scene is of my own invention, it is based on a wide examination of primary documents, including photographs, catalogs, advertisements, and accounts of phonographic listening in the early twentieth century.


15. Ibid., 2.

16. In addition to lower production and manufacturing costs, the Internet has been crucial for the success of these labels by facilitating marketing and sales. See their websites at www.shopsfsymphony.org/home.jsp; www.righteousbabe.com; and www.artistled.com.


18. My thanks to gamelan performer and scholar Susan Walton for sharing this observation.

19. Walter Benjamin, “The Work of Art in the Age of Mechanical Repro-


22. “Grâce au gramophone, je vais pouvoir vous faire entendre des disques de musique nègre que j’ai rapportés des États-Unis, enregistrés et publiés par des nègres. Il est vraiment bien précieux de pouvoir étudier le folklore de tout l’univers grâce à cet instrument” (Darius Milhaud, “Les Ressources nouvelles de la musique,” *L’Esprit nouveau*, no. 25 [1924]: unpaginated; seventh page of the article).


26. Ibid.


31. Here I am speaking of audio-only recordings (i.e., not music videos) in which traditional performers participate. In certain types of electronic or computer music, there are no performers to see.


46. For a detailed account of this trend, see Philip, *Early Recordings and Musical Style*, 6–36.
51. What exactly constitutes a musical work is far from a simple matter, one with which philosophers and aestheticians have long struggled. See, for

52. Pablo de Sarasate, *Zigeunerweisen*, Jascha Heifetz, RCA compact disc 7709-2-RG.


59. “Ah, mon Dieu!, maintenant je comprends pourquoi je suis Patti! Mon cher, quelle voix! Quelle artiste!” This story was told by the English conductor Landon Ronald but was disputed by Patti biographer Herman Klein. The anecdote and Klein’s response are in Herman Klein, *Herman Klein and The Gramophone*, ed. William R. Moran (Portland, OR: Amadeus, 1990), 589.


61. Most recording artists who have spoken about their listening habits say that they tend to listen to their performances during or soon after recording sessions, but rarely after their recordings have been released.
Many say they find the experience unpleasant. This is frequently reported in the interviews in Harvith and Harvith, eds., *Edison, Musicians, and the Phonograph*; and Badal, *Recording the Classics.*


63. Quoted in “The Phonograph as an Aid to Composers,” *Phonogram*, no. 3 (July 1900): 67.

64. I make this argument, with particular attention to violin playing, in “The Phonograph Effect: The Influence of Recording on Listener, Performer, Composer, 1900–1940” (Ph.D. diss., University of Michigan, 1999), 138–62.


69. Recording’s influence was certainly just as slight on the work of Schoenberg’s two most famous pupils. Alban Berg never recorded; the first discs of his music came only in 1936, the year after his death. Anton Webern recorded only his arrangement of some Schubert dances, and few of his original compositions were recorded by others during his lifetime. It would be difficult to see why either man would have been moved to accommodate to a technology with which he had such sparse contact.


72. Four and one-half minutes was the limit for twelve-inch discs, which were introduced in 1903. Previously, the seven- and ten-inch sizes, which had considerably shorter playing times, were standard. For cylinders, two minutes was the general limit until Edison introduced the
four-minute Amberol in 1908. There were a few exceptions to the four- and-a-half-minute limit before the LP was introduced in 1948, however. Cylinders occasionally exceeded it, and a number of companies produced experimental (and ultimately unsuccessful) longer-playing discs. For more information on playing time, see Guy A. Marco, ed., *Encyclopedia of Recorded Sound in the United States* (New York: Garland, 1993), s.v. cylinder, disc, and long playing record.


74. Andrew Mead, e-mail message to author, 16 January 1997.


82. Chopin, Nocturne in E-flat, op. 9, no. 2 (arr. Sarasate), Mischa Elman, Biddulph compact disc, LAB 035.


84. Fritz Kreisler Collection, box 1, folder 10, Music Division, Library of Congress.


89. Jazz was one area in which musicians often exploited the extended playing time of LPs.

90. “The Entertainer,” written by Billy Joel © 1974, JoelSongs (ASCAP). All rights reserved. Used by permission. “The Entertainer” has been released on Streetlife Serenade, Columbia compact disc 69382.

91. “Blues Power” was released on Eric Clapton, Polydor compact disc 825 093 (studio version) and Just One Night, Polydor compact disc 800 093-2 (concert version). “Cocaine” was released on Slowhand, Polydor compact disc 823 276 (studio) and Just One Night (concert).

92. The studio and concert versions of “Killing Floor” were released on, respectively, Radio One, Rykodisc compact disc RCD 20078; and Live at Winterland, Rykodisc compact disc RCD 20038. The studio and concert versions of “Hey Joe” were released on Are You Experienced?, Reprise compact disc 6261–2; and Live at Winterland.


97. We may take Martin Schwartz’s compilation *Early Klezmer Music, 1908–1927* (Arhoolie compact disc 7034) as a representative sample. The selections with tsimbl are exclusively duo ensembles, with the tsimbl acting as accompaniment. None of the larger groups use the tsimbl. For more on the tsimbl, see Mark Slobin, “Fiddler Off the Roof: Klezmer Music as an Ethnic Musical Style,” in *The Jews of North America*, ed. Moses Rischin (Detroit: Wayne State University Press, 1987), 98.


100. Josef Jiránek, *O Smetanovy klavínich skladbách a jeho klavírní hře* (Prague: Nákladem Společnosti Bedricha Smetany, 1932), 33. I am grateful to Judith Fiehler for bringing this passage to my attention, and to Fiehler and Milada Hornová for making their translation of the Jiránek available to me.


103. Gould, “Prospects of Recording,” 338, 339. The recording has been reissued on Sony compact disc 52600.


40. John Cage, Imaginary Landscape No. 1 (New York: Peters, 1960). Cage used turntables in later works as well, including Credo in Us (1942), Imaginary Landscape no. 5 (1952), and 33⅓ (1969).


CHAPTER SIX

1. Babu explains how he came up with the term in the 2001 documentary film Scratch (Palm digital videodisc 3046-2). Scratch, as well as the 1997 documentary Battle Sounds (videotape, no label number, available through www.battlesounds.com), is required viewing for anyone interested in the world of the hip-hop DJ.


3. This story has been recounted in a number of sources. Livingston himself retells it in Battle Sounds and Scratch. See also Bill Brewster and Frank Broughton, Last Night a DJ Saved My Life (New York: Grove Press, 2000), 224–25; and Jim Fricke and Charlie Ahearn, Yes Yes Y’All: The Experience Music Project Oral History of Hip-Hop’s First Decade (Cambridge, MA: Da Capo, 2002), 63.

4. Although the birth of turntablism is usually traced to the Bronx of the 1970s, DJs in Jamaica, where Kool Herc and others had roots, had earlier practiced similar forms of sound manipulation. See Dick Hebdige, Cut ‘n’ Mix: Culture, Identity, and Caribbean Music (London: Comedia, 1987), 136–48. An even earlier, though unrelated, type of phonographic manipulation was, as discussed in chapter 5, practiced by Paul Hindemith, Ernst Toch, John Cage, and others starting in the 1920s.

5. Fricke and Ahearn, Yes Yes Y’All, 63.

6. There is an analogous practice using reel-to-reel tape recorders known as scrubbing. The tape is manually moved back and forth against the playback head in order to locate a specific point on the tape for editing purposes. The sound it produces is similar to that of scratching. Although scrubbing predates scratching, no similar musical practice arose from it, and it seems to have no connection to turntablism. I am
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attention.

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the bedroom, and many would fall into multiple categories simultane-
ously. A 2002 poll at the Scratch DJ website asked readers to identify
themselves with one of these four DJ types. As of 24 October 2003 the
results were as follows: production (6.48 percent); club (9.03 percent);
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percent). It is unclear how closely this sample of respondents matches
the total DJ population. (To see up-to-date statistics, go to www.
scratchdj.com/cgi-bin/poll/prev_poll.cgi?start and click on Question 4
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8. Many DJs perform with rappers; Mixmaster Mike’s work with the
Beastie Boys is just one of innumerable examples. DJs are also members
of rock groups such as Incubus, Limp Bizkit, and Sugar Ray, and play
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Washington, 2000), 93–119. This dissertation, in revised form, was
published under the same title in 2004 by Wesleyan University Press.

11. For an appreciation of Ultimate Breaks and Beats and a complete
listing
of its contents, see Andrew Mason, “Building Blocks,” Wax Poetics, no.

12. For a review of Final Scratch, see Jason Blum, “Stanton Final Scratch:

13. DJ A-Trak, e-mail message to author, 26 August 2002. See also Michael
12/03/arts/03SCRA.html.


17. DJ A-Trak, e-mail message to author, 26 August 2002.


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26. Hebdige, Cut ‘n’ Mix, 142.


28. Swift, interview with author. The lack of improvisation distinguishes DJ battles from MC (rap) battles, in which contestants are expected to improvise to a certain extent. Part of the difference between battles stems from the fact that in DJ battles, the records determine the material of the routine, while MCs have more flexibility. MC battles have become more popular of late, due in part to the success of the 2002 film 8 Mile, starring rapper Eminem. The raucous battle scenes in the film nicely capture the atmosphere of both MC and DJ battles, though battles of both types tend to be more racially and ethnically diverse than depicted in the film.

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30. I.Emerge, telephone conversation with author, 23 June 2003. My analysis of this routine is greatly indebted to this discussion.

31. The intent of this message is clearly to intimidate, though in its original context—the animated children’s movie *Shrek*—the effect is somewhat less menacing.


33. DJ Babu, on *Turntable Wizardry Stage 1* videocassette. Anecdotally, it is said that turntablism, and hip-hop in general, emerged in New York at a time when funding for school music programs was being drastically cut. It may be that rapping and DJing emerged as alternatives.

34. See Clyde Haberman, “New Vandals Scratching Up the Subways,” *New York Times*, 26 January 1999, B1. The link between the two forms of scratching is made explicit on the cover of the X-Ecutioners 1997 album *X-pressions* (Asphodel compact disc 0977), which features a photograph of the group’s name scratched into a subway car window.


36. Several examples of cutting contests are described in Crow, ed., *Jazz Anecdotes*, 89–100.


40. Ibid., 27.


112. Some recent works on the role of recordists include Day, Century of Recorded Music; Susan Schmidt Horning, “Chasing Sound: The Culture and Technology of Recording Studios in America” (Ph.D. diss., Case Western Reserve University, 2002); James P. Kraft, Stage to Studio: Musicians and the Sound Revolution, 1890–1950 (Baltimore: Johns Hopkins University Press, 1996); Massey, Behind the Glass; and Zak, Poetics of Rock.


116. These loops now reside in the Vladimir Ussachevsky Collection in the Recorded Sound section of the Library of Congress.

CHAPTER TWO

1. Robert Haven Schauffler and Sigmund Spaeth, Music as a Social Force in America (New York: Caxton Institute, 1927), 1–38. Schauffler’s Main
41. *Turntable Wizardry Stage 1* videocassette.
42. Z-Pabon, e-mail message to author.
45. According to John Carluccio, director of the *Battle Sounds* documentary, battles are sometimes described as “almanacs,” for battle videos circulate widely within the DJ community and are closely studied by turntablists (telephone conversation with author, 16 October 2001).

**CHAPTER SEVEN**

1. “Funky Drummer” was originally released as an LP on King 6290 in 1970. It has been reissued on *Star Time*, Polydor compact disc 849 108.
5. Paul Lansky, *Notjustmoreidlechatter*, on *More Than Idle Chatter* (Bridge compact disc BCD 9050). Lansky’s other “chatter works” are *Idle Chatter* (1985), *just_more_idle_chatter* (1987), and *Idle Chatter Junior* (1999). The first two are included on *More Than Idle Chatter*; the most recent was released in 2000 on Paul Lansky, *Ride* (Bridge compact disc BCD 9103). Lansky also manipulates speech, though in different ways, in several works on *Conversation Pieces* (Bridge compact disc BCD 9083).
7. Paul Lansky, e-mail message to author, 7 April 2003.
9. “Praise You” was released on *You’ve Come a Long Way, Baby* (Skint compact disc BRASSIC11CD 66247–2); “Take Yo’ Praise” has been re-released on *The Iron Pot Cooker* (Vanguard compact disc 79356-2).
12. Camille Yarbrough, telephone interview with author, 15 July 2001. Unless otherwise noted, all following quotations of Yarbrough come from this source as well.
13. Review posted 17 April 2000 at www.epinions.com/musc-review-7CEE-132C3929-38FBF273-prod5. I did find one review that actually interpreted the lyrics. The reviewer, who wanted to have the song played at his wedding, explained: “To me these words pretty much sum up every couple in the world. Two people that love and care for one another through thick and thin” (www.epinions.com/musc-review-646-3A14354C-3A1AEE0D-prod6, posted 21 November 2000).
14. I base this assessment on the reactions I have gotten to the song when presenting it to students and acquaintances.
15. Cook, telephone interview with author.
17. Cook, telephone interview with author.
18. Ibid.
23. In hip-hop, there is typically a division of labor between the rappers, who write and perform the vocal part of a song, and the producer(s), who compose the accompaniment—referred to as the rhythm track or the beats—but do not perform. The opening section of “Fight the Power” and the rhythm track for the whole song were created by the Bomb Squad, Public Enemy’s production team. Published interviews of the rappers and the production team make it clear, however, that there was a close collaboration in the creation of the tracks and the lyrics in *Fear of a Black Planet*, the album on which “Fight the Power” appears.

24. Ibid., 92.
25. For more on the relationship between DJing and producing, see Schloss, “Making Beats,” 65–74.
28. Chuck D. proves prescient here, for Elvis Presley, who is derided earlier in the song as “straight up racist,” was put on a United States postage stamp to great fanfare in 1992, not long after the release of the song.
29. Bobby McFerrin’s “Don’t Worry, Be Happy” is also cited, though this sunny song is held up for derision.
32. Stetsasonic, “Talkin’ All that Jazz” (1988), on *In Full Gear* (Tommy Boy compact disc 1459).
34. For a discussion of the way that music problematizes this distinction, see Vaidhyanathan, *Copyrights and Copywrongs*, 117–18.

CHAPTER EIGHT

3. There are other file-compression formats, such as Windows Media Audio (WMA), Real Audio, Ogg Vorbis, and AAC. However, I will be focusing on MP3, as it is the current de facto standard for file-sharing.
5. My thanks to Christopher Burns for clarifying the concept of perceptual coding to me. For a very lucid explanation of perceptual coding and, more generally, the process of creating MP3 files, see Paul Sellars, “Behind the Mask—Perceptual Coding: How MP3 Compression Works,” *Sound on Sound* (May 2000), www.sospubs.co.uk/sos/may00/articles/mp3.htm.

It should also be noted that not all MP3s have the same sound quality. The sound quality depends on the bit rate—the average number of

43. Ibid., 112.


CHAPTER FIVE


2. For more on these festivals, see Josef Häusler, *Spiegel der neuen Musik: Donaueschingen* (Kassel: Bärenreiter, 1996).

3. The program for the Neue Musik Berlin 1930 festival is reprinted in ibid., 430.

4. Martin Elste has tested this possibility by overdubbing two recordings of the work eight beats apart. I have heard Elste’s canonic recording and find it effective, though it is only speculation that Hindemith played the recordings in this way.


7. “Ich wählte dazu das gesprochene Wort und ließ einen vierstimmigen gemischten Kammerchor genau festgelegte Rhythmen, Vokale, Konsonanten, Silben, und Worte so sprechen, daß unter Einschaltung der
mechanischen Möglichkeiten bei der Aufnahme (Vervielfachung des Tempos und die damit verbundene Ton-Erhöhung), eine Art Instrumentalmusik entstand, die es wohl fast fast vergessen machen mag, daß ihrer Hervorbringung nur ein Sprechen zugrunde liegt. (Nur in einem Punkte täuschte mich die Maschine leider: sie veränderte die Vokale in einer nicht von mir beabsichtigten Weise mit). In zwei bewegten Sätzen und einer 'Fuge aus der Geographie' versuchte ich, das Problem von mehreren Seiten anzupacken" (ibid.).


17. Ibid.


21. “Welche Möglichkeiten hat ein Komponist, den Solopart zu nucieren, was Klang sowohl wie auch Farben anbelangt! Wie eigenartig und wechselvoll kann man die Unterhaltung der beiden Klanggruppen gestalten, als Gegeneinanderbewegung und auch als Folge von Solo und Tutti! (Man denke sich zum Beispiel zu einer matten Farbe des Begleitungensembles, sagen wir Flöte, sordinierte Violine, Klavier in höherer Lage, den sonoren Klang eines vom Blech gestützten Streichorchesters in Phonographen.) Also: die Mittel diese Art zu musizieren, sind fast unbegrenzt, von Einfachsten bis zum Raffiniertesten” (ibid., 407).


described) in Stuckenschmidt, “Mechanisierung der Musik,” 7–8. Mil-
hau’d’s experiments are mentioned in Lowell Cross, “Electronic Music, 1948–1953,” Perspectives of New Music 7 (fall–winter 1968): 35.
28. “Von größtem Interesse wäre es aber, spezifische Musik für die phono-
graphische Wiedergabe zu schaffen, eine Musik, die erst ihr wahres
Bild, den Originalklang, durch die mechanische Wiedergabe erhielte.
Dies wäre wohl das Endziel des eigens für die Schallplatte schaffenden
Komponisten der Zukunft” (Igor Stravinsky, “Meine Stellung zur
Schallplatte,” Kultur und Schallplatte 1 [March 1930]: 65).
31. “Ein interessanter akustischer Versuch . . . ein musikalischer Scherz
wohl auch” (Toch, “Über meine Kantate ‘Das Wasser,’” 222).
August 1930, sec. 8, p. 5; Hans Gutman, “The Festivals as Music Barom-
33. Krenek, Music Here and Now, 238–39.
34. See Richard S. James, “Avant-garde Sound-on-Film Techniques and
Their Relationship to Electro-Acoustic Music,” Musical Quarterly 72
(1986): 74–89; and idem, “Expansion of Sound Resources in France,”
203ff.
35. See Rex Lawson, “Stravinsky and the Pianola,” in Confronting Stravin-
sky, ed. Jann Pasler (Berkeley and Los Angeles: University of California
36. The program is reprinted in Häusler, Spiegel der neuen Musik, 427.
37. For more on the Theremin, see Albert Glinsky, Theremin: Ether Music
38. “Nichts unterläuft, was nicht durch Tonhöhe, Metrum, Rhythmus,
Tempo, Dynamik in den Noten fixiert ist; jede Spur einer Spontaneität,
 eines Sentimentes, eines Impulses ist hinausgedrängt” (Ernst Toch,
“Musik für mechanische Instrumente,” Neue Musikzeitung 47 [July
1926]: 433).
39. “Möglichkeit der absoluten Festlegung des Willens des Komponisten
... Erweiterung der technischen und klanglichen Möglichkeiten” (Paul Hindemith, “Zur mechanischen Musik,” Musikanten Gilde 5 [15 November 1927]: 156).

40. John Cage, Imaginary Landscape No. 1 (New York: Peters, 1960). Cage used turntables in later works as well, including Credo in Us (1942), Imaginary Landscape no. 5 (1952), and 33⅓ (1969).


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30. I.Emerge, telephone conversation with author, 23 June 2003. My analysis of this routine is greatly indebted to this discussion.

31. The intent of this message is clearly to intimidate, though in its original context—the animated children’s movie *Shrek*—the effect is somewhat less menacing.


33. DJ Babu, on *Turntable Wizardry Stage 1* videocassette. Anecdotally, it is said that turntablism, and hip-hop in general, emerged in New York at a time when funding for school music programs was being drastically cut. It may be that rapping and DJing emerged as alternatives.

34. See Clyde Haberman, “New Vandals Scratching Up the Subways,” *New York Times*, 26 January 1999, B1. The link between the two forms of scratching is made explicit on the cover of the X-Ecutioners 1997 album *X-pressions* (Asphodel compact disc 0977), which features a photograph of the group’s name scratched into a subway car window.


36. Several examples of cutting contests are described in Crow, ed., *Jazz Anecdotes*, 89–100.


40. Ibid., 27.
41. *Turntable Wizardry Stage 1* videocassette.

42. Z-Pabon, e-mail message to author.


45. According to John Carluccio, director of the *Battle Sounds* documentary, battles are sometimes described as “almanacs,” for battle videos circulate widely within the DJ community and are closely studied by turntablists (telephone conversation with author, 16 October 2001).

CHAPTER SEVEN

1. “Funky Drummer” was originally released as an LP on King 6290 in 1970. It has been reissued on *Star Time*, Polydor compact disc 849 108.


5. Paul Lansky, *Notjustmoreidlechatter*, on *More Than Idle Chatter* (Bridge compact disc BCD 9050). Lansky’s other “chatter works” are *Idle Chatter* (1985), *just_more_idle_chatter* (1987), and *Idle Chatter Junior* (1999). The first two are included on *More Than Idle Chatter*; the most recent was released in 2000 on Paul Lansky, *Ride* (Bridge compact disc BCD 9103). Lansky also manipulates speech, though in different ways, in several works on *Conversation Pieces* (Bridge compact disc BCD 9083).


7. Paul Lansky, e-mail message to author, 7 April 2003.


9. “Praise You” was released on *You’ve Come a Long Way, Baby* (Skint compact disc BRASSIC11CD 66247–2); “Take Yo’ Praise” has been re-released on *The Iron Pot Cooker* (Vanguard compact disc 79356-2).
12. Camille Yarbrough, telephone interview with author, 15 July 2001. Unless otherwise noted, all following quotations of Yarbrough come from this source as well.
13. Review posted 17 April 2000 at www.epinions.com/musc-review-7CEE-132C3929-38FBF273-prod5. I did find one review that actually interpreted the lyrics. The reviewer, who wanted to have the song played at his wedding, explained: “To me these words pretty much sum up every couple in the world. Two people that love and care for one another through thick and thin” (www.epinions.com/musc-review-646-3A14354C-3A1AEE0D-prod6, posted 21 November 2000).
14. I base this assessment on the reactions I have gotten to the song when presenting it to students and acquaintances.
15. Cook, telephone interview with author.
17. Cook, telephone interview with author.
18. Ibid.
23. In hip-hop, there is typically a division of labor between the rappers, who write and perform the vocal part of a song, and the producer(s), who compose the accompaniment—referred to as the rhythm track or the beats—but do not perform. The opening section of “Fight the Power” and the rhythm track for the whole song were created by the Bomb Squad, Public Enemy’s production team. Published interviews of the rappers and the production team make it clear, however, that there was a close collaboration in the creation of the tracks and the lyrics in *Fear of a Black Planet*, the album on which “Fight the Power” appears.

24. Ibid., 92.

25. For more on the relationship between DJing and producing, see Schloss, “Making Beats,” 65–74.


28. Chuck D. proves prescient here, for Elvis Presley, who is derided earlier in the song as “straight up racist,” was put on a United States postage stamp to great fanfare in 1992, not long after the release of the song.

29. Bobby McFerrin’s “Don’t Worry, Be Happy” is also cited, though this sunny song is held up for derision.


32. Stetsasonic, “Talkin’ All that Jazz” (1988), on *In Full Gear* (Tommy Boy compact disc 1459).


34. For a discussion of the way that music problematizes this distinction, see Vaidhyanathan, *Copyrights and Copywrongs*, 117–18.