# Chapter 1

# Introduction: Rhythm in the
# Age of Digital Reproduction

Anne Danielsen

This book arose from a research project at the University of Oslo called Rhythm in the Age of Digital Reproduction (RADR) that evolved from one particular question: what happened to the sound and rhythm of African-American-derived, groove-directed popular music styles when these grooves began to be produced and played by machines? The question is a challenge to the view shared by many researchers up to the present that a groove depends on human performativity to be aesthetically satisfying: 'feel' is something that musicians add to an otherwise stiff rhythmic structure through their performance of it. It has further been assumed that the groove qualities of rhythmic music arise specifically from microtemporal deviations from a presumed norm.[1] It therefore also follows that machine-generated music must be necessarily devoid of groove qualities, because it typically lacks the microtemporal variation added by people in performance.

Two trends in contemporary computer-based rhythmic music oppose these assumptions, however. First of all, since the 1990s this music has involved ever-increasing experimentation with and manipulation of the microtiming of rhythmic events. This development is especially noticeable within African-American-dominated genres such as rap, neo-soul, and contemporary r&b, where the use of digital equipment for music production was quickly accepted and cleverly applied. It is linked technologically to the fact that digital editing software allows for the adjustment of individual tracks and events on a time axis with millisecond precision. As a consequence, artists and producers can create entirely new rhythmic feels – for example, by creating overlapping layers of rhythms with multiple locations of their basic pulses at a microrhythmic level. Grooves characterized by such confusion regarding pulse location became something of a fad among contemporary r&b and hip-hop producers in the late 1990s; they characterize the work of artists and bands such as D'Angelo, Common and the Roots, all of whom were prominent at that time. They can also be heard somewhat later on Brandy's innovative album *Full Moon* (Atlantic 2002), produced by Rodney Jerkins, where the 'feel' aspect of the groove is almost overdone, leading to what I call the 'exaggerated rhythmic expressivity of the machine'. Ironically, this level of

---

[1]    See, for example, Keil 1994a, 1994b, 1995; Prögler 1995; Monson 1996; Waadeland 2001; Iyer 2002; Butterfield 2006; Hove et al. 2007.

microrhythmic excess evokes earlier (and very analogue) groove-based traditions such as 1970s funk, and thus represents the antithesis of the rhythmic clarity and precision that was sought after in the early days of digital music processing in the 1980s. At a phenomenological level, this excess is experienced as a peculiar, almost vertiginous blurring of the pulse we typically rely on to locate ourselves in the play of rhythm in a given song.

The second trend comprises a counterargument to the entire assumption that a groove requires microtemporal deviations from a metric grid in order to succeed. In the electronica-related styles that concern us here, all of the rhythmic events are on a metric grid. Nevertheless, this is mostly music for dancing, and it has unmistakable groove qualities. In the early days of this trend, high-pitched sounds such as the hi-hat cymbal (or something else that fills the same musical function) were programmed 'unnaturally', either too quickly or too evenly or both. Because the ability to actually play in this way would indicate very highly developed technical skills among human performers, the sound of these songs evokes an overdone, even unlikely virtuosity.[2] I therefore call this second trend the 'exaggerated virtuosity of the machine', as defined by Aphex Twin's *Come to Daddy* (Warp 1997) or the album by Squarepusher (the performing pseudonym of British electronic music artist Thomas Jenkinson) *Hard Normal Daddy* (Warp 1997). (After a few years this aesthetic strategy had travelled from these avantgarde electronica artists' toolboxes to the title track of the Destiny's Child album *Survivor* (Columbia 2001), thus entering the popular music mainstream.) The fast speed and quantized evenness of many of the tracks on these albums anticipate the related process of chopping up musical or nonmusical sounds and subjecting the bits and pieces to a similar rhythmic treatment. Even though there are differences in the sonic qualities of their material, these artists share a preference for exaggerated tempi and an attraction to the completely straightened out, 'square' feel of quantization. This aesthetic also promotes a tendency to transform sounds with a clear semantic meaning or reference point – a different musical context, for example, or something else altogether – into 'pure' sound.[3] Sounds or clips are also often combined in choppy ways that underline sonic cut-outs rather than disguising them, resulting in a form of 'schizophonia'[4] – the kind of euphoric, skittering collage referred to by Fredric Jameson (1984) as 'The Breakdown of the Signifying Chain'.

---

[2]   As Simon Zagorski-Thomas points out (see Chapter 12 in this volume), there is some ambiguity here, given that high speed and evenness evoke both the precision of the machine and a certain technical virtuosity in the human performer – consider, for example, the fast speed of be-bop jazz recordings in the 1950s or the very even strokes required of drummers in recording studios in the 1980s.

[3]   For a discussion of this tendency in rap music, see Danielsen 2008.

[4]   The term was first employed by Schafer (1977) to refer to the split between an original sound and its electroacoustic reproduction.

The musical result of both of these trends is at once thrilling and challenging for the rhythm researcher, who must wrestle with questions about how to identify the basic beats of these new-style grooves, how to understand the effect of subdivision and syncopation within them, and how to explain the groove qualities of music whose rhythmic events in fact lie rigidly on a metric grid. This last issue engages not only the hyperquantized grooves of our digital age but also earlier forms of groovy dance music that are characterized by a strictly metronomic organization of rhythmic events, such as disco. Moreover, both trends involve music where processes of technological mediation add important and otherwise unachievable qualities to both sound and groove. Real musicians would probably have trouble producing truly multiple locations of a basic pulse, gravitating instead toward the shared understanding of shape and location that in turn enables them to play together. They would also have a hard time keeping up with the digitally programmed 'drums'; even analogue drum machines cannot reproduce their sounds, even if they can match the speed. Both trends thus are examples of music where mediating technologies are exposed – they represent instances of opaque mediation, to use a term coined by R. Brøvig-Hanssen (see Chapter 11).

In short, the two trends pointed out above, which are considered in many of the essays in this collection, characterize music that exposes the use of digital music production tools and thus in one sense conforms to the label 'machine music'. At the same time, these grooves profoundly undermine the notion of machine music as rigid and simple in its microrhythmical design. In the age of digital reproduction, then, the 'machine' is not what it used to be. Its music can be deep and groovy or high-paced and frenetic; it can expose its mediating technology or conceal it; it can even evoke the human touch of the pre-digital era.

This book presents a variety of close readings of technology-driven popular music genres, such as contemporary r&b, hip-hop, trip-hop, electro-pop and electronica, as well as played folk-music styles. Each chapter can be viewed as a distinct attempt at contributing to a multi-faceted answer to the project's initial question: what happened to the sound and rhythm of groove-directed popular music styles in the age of digital reproduction? The book also represents an important step in the process of developing theories of musical rhythm that take account of the microrhythmic dimension of groove-based musics while also revising those older theories that have long relied on musical notation. Its major topics – microrhythm and rhythmic structure, technological mediation, and the role of movement and corporeality in the experience of grooves – are pursued using a variety of methodologies ranging from musical analysis and empirical investigations to discussions of cultural meaning and aesthetics. The contributions come from scholars in all of the various disciplines that have contributed to the study of musical rhythm, including musicology, ethnomusicology, music theory, music psychology, cultural studies and aesthetics. In addition to their strong

interpretations of the rhythmic and sonic subtleties of groove-directed music,[5] these scholars bring prevailing theories on rhythm and sound to bear specifically on the developments that have taken place in popular music from the 1990s onward, in the wake of the new digital music-production tools. The book reveals that the common assumptions regarding rhythm and groove referred to in the opening of this chapter do not stand firm. The grooviness and expressivity of African-American-derived musical styles did not die with the new technology. Rather, they were reproduced and transformed.

## Representing Rhythmic Structure

A fundamental premise for the analytical work in this book is that rhythm comprises an interaction between non-sounding reference structures (schemes used by the performer/listener in their respective music-related acts) and sounding rhythmic events. In rhythm, as in music in general, virtual reference structures and actual sounding events inform one another continuously (I discuss these concepts in more detail below). Such virtual reference structures may range from the overall organizing principles of music in general (such as pulse, subdivision and so on), to learned stylistic gestures, to categories established through the patterns introduced by one particular song. Before delving into the difficult question of how to identify and represent these virtual schemes, I will briefly survey some of the literature on rhythm that shares this premise and has supported the theoretical framework of many of the contributions in this book.

Timing variations from a presumed rhythmic norm may be either happenstance or deliberate. In the 1950s, Bengtsson, Gabrielsson, and their colleagues at Uppsala University began exploring what they called 'systematic variations in duration' in music. One of the basic hypotheses underlying their work was that these variations are not random occurrences but vital means of musical expression. In an article titled 'Empirisk rytmforskning' ('Empirical Rhythm Research'), they discussed how variations may be used consciously to clarify certain specific structural features of the music, or unconsciously as part of a given tradition's musical dialect. While the former, also called 'expressive variations', occur at particular (and significant) points in the music, the latter, which they called 'idiomatic variations', are repeated as part of a recurring rhythmic pattern. Both expressive and idiomatic variations are deliberate. In order to distinguish between expressive and idiomatic variations, they proposed the aforementioned systematic variations (SYVAR), which could encompass musical aspects including frequency, amplitude, envelope and spectrum (Bengtsson et al. 1969: 95–6). Their main theoretical and empirical

---

[5]   I use the term 'groove-directed music' to refer to music with a groove at its core, as both the means and the end of the artistic process. This in contrast to, for example, a rock song, which is groove-*based* but often directs our attention to other constitutive aspects, such as chords, melody or lyrics.

focus, however, was duration (SYVAR-D), and the systematic variations in the chronometric temporal relations of sonic events.

This emphasis on norm and variation (or, more suggestively, 'deviation') has dominated much of the subsequent research on the relationship between rhythmic structure and timing. Kvifte's research from the 1980s, for example, is clearly inspired by the fundamental assumptions of the Uppsala school, particularly his distinction (in turn influenced by Gregory Bateson) between 'digital' and 'analogue' aspects of the experience of music: 'If we encounter a pitch somewhere between C♯ and D, we divide the experience of pitch in two aspects, one digital (the note "D") and one analog ("out of tune")' (Kvifte 1989: 94).

Clarke's work on categorical perception in music is also influenced by the pathbreaking theories of the Uppsala school. In his studies of the relationship between rhythmic structure and timing, Clarke investigates how conscious variations – what he calls 'expressive timing' – can clarify structural features of music (Clarke 1985, 1987, 1989). Another important issue in Clarke's research, however, involves the inherent qualities that such variations contribute to the music – using Kvifte's example, the fact that the D is out of tune is as important to the experience of it as the fact that it can be said to belong to the pitch category 'D'. Clarke observes, 'There is considerable evidence that this information [the perceptual information inherent in the variations] is not discarded [in the perceptual process], but is used to make a different sort of perceptual judgment than that associated with the categorical component' (Clarke 1987: 22). This shift in focus toward the noncategorical or nonstructural aspects of rhythm is clarified in Clarke's 2000 paper titled 'Categorical Rhythm Perception and Event Perception', where he concludes that all acoustical rhythmic information in fact engages two different perceptual domains – expression and rhythm, the latter understood as rhythmic structure (Clarke 2000: 5). In other words, sounding rhythm contains both its relevant structuring pattern *and* the particular quality of a significant or expressive variation of this pattern.[6]

The theoretical framework of Desain and Honing's studies in rhythm and musical time likewise relies upon a division of musical experience along these lines. Drawing upon Clarke's work on categorical perception, they state: 'To make sense of most musical styles, it is necessary to separate the discrete and the continuous components of musical time' (Desain and Honing 1989: 56). Other studies of microrhythm apply the same theoretical premise. Keil's writings on participatory discrepancies in jazz represent an early example (Keil 1994a, 1994b, 1995). Butterfield, however, in a recent article, accuses Keil of understating the importance of structural aspects or, in Keil's words, 'syntactical patterns' (Butterfield 2006). Moreover, studies of Norwegian folk music by Kvifte, Blom,

---

[6]   Clarke uses the term *rhythm* to denote only its virtual aspects – that is, its structure – when describing how, in classical music, rhythm is a medium for expression (see Clarke 1985: 211). In contrast, I use *rhythm* to denote the interplay between the sound *and* its non-sounding virtual aspects.

and Johansson have focused on the relationship between rhythmic structure and sounding events with a particular focus on listeners' and dancers' schematization of asymmetric beat patterns (Blom and Kvifte 1986; Kvifte 1999; Kvifte 2004; Johansson 2010). More recently, Iyer, drawing upon theories of 'embodied cognition', has examined the ways in which different types of expressive timing are crucial to the inner structuring of the groove in jazz (Iyer 2002).

All of these contributions to the study of rhythm share the fundamental premise that rhythm comprises an interaction between rhythmic structure and the sounding realization(s) of that structure. In my work on the funk grooves of James Brown and Parliament, I used the terms 'actual sounding events' and 'virtual reference structures' (the nonsounding schemes that structure sounding events) to describe this interaction, exploring the microrhythmic features of funk in order to begin to define it as a musical style (see Danielsen 2006, chapters 3–7). In addition to metre, pulse and patterns of subdivision, I introduce a reference structure at the level of the figure, and a related notion of the gesture as the figure's sounding counterpart. My distinction between figure and gesture parallels the Bakhtinian distinction between sentence and utterance, where the sentence is part of an abstract or virtual system and the utterance is its spoken actualization (see Bakhtin 1986). In a similar vein, the figure is the virtual reference structure behind the gesture, while the gesture is a sounding actualization, a demarcated musical utterance occurring within the fabric of rhythm. Even though a gesture may be best described via its most characteristic aspect (for example, as a rhythmic or melodic figure), it in fact transcends any traditional division into analytical parameters such as rhythm, melody or harmony (see Danielsen 2006: 47–8). The role and ontological status of structural, or structuring, aspects of rhythm becomes clearer still in the context of Deleuze's notion of 'virtuality'. In *Difference and Repetition* (1994), Deleuze discusses the relationships among the actual, the virtual and the real, stating that the virtual is not the opposite of the real but of a different manifestation of the real that he calls the actual. In fact, the virtual is *fully* real and must be defined as a part of the real object, as if an object always has a part of itself in a virtual domain (Deleuze 1994: 208).

Traditionally, rhythmic structure has been represented by, and to some extent also conceptualized as equal to, the aspects that have been possible to capture via the notational system – that is, as a set of configurations of the basic units of an isochronous metric grid (crotchet [quarter note], quaver [eighth note], and so on). As we know, the metric system of music is based on a metronomic division of time characterized by each pulse's arrival after pauses of *equal length*. As Kvifte (2007a) cautions in his critique of London's use of clock models in a theory of rhythm (2004), however, there is often no good reason for dividing every rhythmic unit into two or three *equal* parts: the matrix could just as easily be long–short, short–long, short–long–short, and so on. When it comes to much of the music dealt with in this book, then, including played groove-oriented styles such as Norwegian folk tunes in flexible metre or the complex grooves of Afro-Cuban jazz music, the shortcomings of the traditional theoretical framework of

rhythmic structure are particularly apparent. In addition, how could we possibly notate the rhythmic structure of the two main trends of groove-oriented, computer-based music from the late 1990s discussed above – the exaggerated expressivity of the blurry, wobbling grooves of contemporary r&b or the quantized patchwork of sounds of electronica? In the case of the former, the gestural shape and inner dynamics of compound or extended beats would simply get lost. In the case of the latter, the combination of sampling and digital cut-and-paste in fact results in sequences that, while technically amenable to notation, are so much *more* than a simple series of semiquavers (sixteenth notes) (for example).

The close analysis of such peculiar or subtle microrhythmic designs eludes our traditional representations of virtual structure. In fact, it is difficult to come to terms with the categories to which these sorts of actual musical events might relate. Yet we must postulate some kind of reference structure, and at times the standard notational system and/or a metric grid do prove to be useful. I would not discard either as potential representational systems for rhythmic structure. The important thing to note is that what constitutes a relevant representation of rhythmic structure *varies*. And it varies not only with the sound in question but also with the position and priorities of the observer. As mentioned previously, for a confident listener, the particular timing pattern typical of the funk idiom, for example, is a constitutive aspect of this groove, whereas it would probably be considered an expressive aspect (and thus not part of the rhythmic structure) in a notation-based musicological analysis. In other words, what is considered structure is a hermeneutic issue, whether we try to represent it via notation or some other means. No matter how spacious our notion of structure might be, no matter how many aspects of it are formalized, there is no guarantee that it will be the same as the virtual reference structures of the groove as it happened.

Summing up, the structuring features of rhythm may vary considerably from style to style and also change over time. Moreover, as many of the contributions to this book make apparent, the categories used in these structuring processes, whether a basic pulse, a set of stylistic figures, or certain patterns of subdivision, may likewise require a certain flexibility in their application. A figure that is experienced as a specific timing pattern – such as the 'One' in funk – does not need to be realized as an exact temporal position but instead might work as a framework within which a cluster of acceptable realizations may occur. Thus the categories used in the production and reception of groove also involve a level of 'rhythmic tolerance'.[7] Rather than asking what the rhythmic structure is, one should perhaps ask how best to represent the reference structures at work in one's particular listening process. The chapters in this book hopefully do exactly that.

---

[7]   This is a concept put forward by Johansson in his discussion of Norwegian folk dances to account for the flexibility of the categories used to structure these grooves (see Chapter 5, this volume).

## Beyond Time: Timbral and Dynamic Aspects of Microrhythm

It has been argued that the recording practices that accompanied the phonographic age invited a new focus on the performative aspects of music: with the advent of the recording, one could freeze the moment of performance and repeat it again and again (see also Gracyk 1996; Zak 2001; Clarke 2007; and Wikshåland 2009). In postwar popular music, this iterative character, which Walter Benjamin claimed resulted in the loss of 'aura' of the artwork (Benjamin 1999), seems to have manifested itself through an artistic obsession with sonic design, or 'sound', as well as the innovative use of mediating technologies. Together with rhythm and groove (derived from the close relationship of many popular music styles to African-American musical traditions), sound is perhaps the foremost constitutive aspect of postwar popular music. Against such a backdrop, popular musicologists' relative disinterest in *analysing* both sound and rhythm/groove is surprising. Although many scholars pay lip service to these issues, only a few major works on groove and sound precede this book.[8] The fact that the artifice and sophistication of the rhythmic and sonic design of groove-based musics have until recently been largely overlooked can be linked to several factors. First of all, rhythm has typically been aligned with 'nature' rather than 'culture' (see Danielsen 2006). The neglect of rhythm and groove within musicology and its subdisciplines of music psychology and music theory probably also arises from the limitations of the notation-based analytical tradition.[9] This is possibly also responsible for the fact that the performative aspects of music were previously categorized under 'expression' or 'interpretation' and seldom became the subject of analysis or systematic investigations.[10]

The central role of sound and groove in rhythmic music encourages us to approach it at the microlevel, where much of the most creative work actually takes place. Through the deliberate manipulation of sounds down to the most seemingly insignificant nuance, the producer of this music shapes rhythmic events exactly so, until he or she succeeds in creating an irresistible groove. In order to account fully for the results of these processes, researchers must explore how the temporal

---

[8]   For groove, see Mark Butler's analysis of electronic dance music (2006), as well as my study of 1970s funk grooves  (Danielsen 2006); the latter anticipates the theoretical work presented in the following chapters. In French there is one book on groove co-edited by Roy and Lacasse (2006). For sound, Lacasse (2000), Michelsen (1997), and Moylan (1992) have made significant contributions. Also Moore (2001), Zagorski-Thomas (2006), and I (Danielsen 1998) have dealt with the issue of sound. A study of music production in a related genre, hip-hop, is Schloss (2004). A few other books have sections that touch upon issues of music production and technological mediation in various ways, including Gracyk 1996; Théberge 1997; Zak 2001; Katz 2004; and Greene and Porcello 2005.

[9]   See also Middleton's discussion of 'notational centricity' (1990: 104–106).

[10]   For an overview of studies in music performance within music psychology, see Gabrielsson 1999.

aspects of rhythm interact with aspects of sound, such as timbre, texture, dynamics and pitch, and how the relationship between musical rhythm and the embodied character of its perception is influenced by recording practices and other forms of technological mediation. This pursuit differs from notation-based approaches to rhythm on at least three counts. First, as discussed above, it comprises structural aspects at what Prögler (1995) called the subsyntax level – that is, at a level that notation-based approaches to rhythmic structure label the domain of expression. Second, it comprises timbral and dynamic aspects of rhythm, or, in other words, aspects of *sound* (and pitch, when relevant). This in fact distinguishes between microrhythm and 'microtiming', which examines only the *temporal* aspects of the larger field of microrhythm.[11] Third, it takes into account the fact that different microrhythmic designs appeal to (and signify differently for) different audiences. This approach acknowledges that rhythmic music depends as much on the circumstances of its reception as it does on those of its production.

While the importance of microtiming is now almost a given in the field of rhythm research – though it is not always considered part of the rhythmic structure – most scholars privilege only attack-point rhythm and ignore the potential impact of sound or any other non-timing aspects. The temporal location of the rhythmic event is identified with its point of attack alone, and relevant durations (or the distances between events) have been conceptualized as the intervals between such attack points, the so-called inter-onset-intervals (IOI). As Waadeland has pointed out, many of the essential aspects of rhythm are lost when the continuous, multidimensional phenomenon of rhythmic performance is projected onto a discrete, one-dimensional registration of points in time (Waadeland 2001: 24).[12] Iyer also favours a more holistic description of rhythmic feel:

> In groove contexts, musicians display a heightened, seemingly microscopic sensitivity to musical timing (on the order of a few milliseconds). They are able to evoke a variety of rhythmic qualities, accents, or emotional moods by playing notes slightly late or early relative to a theoretical metric time point … In groove-based contexts, even as the tempo remains constant, fine-scale rhythmic delivery becomes just as important a parameter as, say, tone, pitch, or loudness. All these musical quantities combine dynamically and holistically to form what some would call a musician's 'feel'. (Iyer 2002: 398)

---

[11] Many previous studies of microrhythm have focused solely on timing relationships with a focus on mapping either 'expressive timing' in Western art music (see Clarke 1999; Gabrielsson 2003) or repeated timing patterns in groove-related music (see, for example, Prögler 1995; Iyer 2002; Butterfield 2006).

[12] Recent empirical research provides support for the existence of a reciprocal relationship between timing and sound at the microlevel, both as regards physical properties and/or in the perception of rhythmic events: see Dahl 2000, 2004; Waadeland 2003, 2006; Dahl and Altenmüller 2008; and Danielsen, Waadeland et al. (forthcoming).

For me, the notion of gesture, a key term in the analytical framework of my previous work on funk (Danielsen 2006), first suggested this expansion of the investigation of microrhythm into its nontemporal aspects. As I have pointed out elsewhere, the notion of gesture implies a holistic approach to rhythm that comprises all of the dimensions of this sonic category and names a demarcated musical utterance within the fabric of a rhythm. A gesture might be a riff or a vocal phrase (or a part of either), or a group of beats or just one beat, perceived as forming an entity, and it includes in principal every aspect of this entity. The notion of gesture even incorporates the cultural dimension of the music, because it names a sounding entity that is being communicated to others. Whereas a stylistic figure is no more than a preliminary condition for musical performance, the gesture is the music as performed for someone (Danielsen 2006: 47–8).

The notion of gesture acknowledges that, in the actual experience of rhythm, it is impossible to distinguish among its different dimensions. In musical analysis, however, some kind of analytical separation nevertheless has to take place, so we must take as our point of departure the character of the gesture *as experienced* when determining our analytical focus. In practice, this means to be suspicious of the inherited methodology for rhythm analysis, and to adjust our focus to the music at hand. As the contributions in this book reveal, different musical aspects can be decisive to the shaping of a rhythmic gesture, from the temporal aspects of the rhythmic structure to the vocal melody or even the inner dynamics of the sound of one drum beat. Many of the RADR project's themes have acted to expand the range of musical aspects through which microrhythmic relationships might be approached. Of particular interest has been their *interaction*. How does sound influence our experience of timing? How do the inner dynamics of a sound influence our experience of a beat's onset? How do timbre, dynamics and texture shape our experience of the temporal distance between events, or the friction that can arise between asynchronous rhythmic layers? Here, of course, the impact of mediation and music-production processes becomes profound, because recording as well as post-production processes such as equalizing and mixing deeply affect how we hear rhythmic phenomena. The potential clash of rhythmic accents in a given mix may, for example, be attenuated by making the clashing sounds less prominent, or by softening their attacks.

Rhythm and sound have commonly been regarded as two separate domains in the analysis of music, but several contributions in this volume demonstrate that such a distinction is very difficult to maintain. This is important to remember when approaching music at the level of microrhythm. Moreover, recent developments in music technology seem to have encouraged a means of producing rhythmic music that relies upon an even more mutually dependent relationship between timing information and timbral and dynamic features.

## But it Is Dance Music, Isn't it?

The third aspect of microrhythm mentioned above, also often excluded from the traditional analysis of rhythmic music, concerns its bodily appeal: the groove qualities of rhythmic music are often related to the music's perceived ability to make one's body move.[13] Even though the term 'groove' seems to carry with it some sort of embedded appeal to corporeal movement, groove-directed music can display ambiguity toward this goal.[14] Whether music is regarded good or bad, groovy or not, often depends on the circumstances of its reception. Different microrhythmic designs may have different effects, or, to borrow a term from ecological perception theory – a perspective that is central to two essays here explicitly addressing the issue of corporeality in music listening (see Chapters 7 and 8) – they may have different affordances for different audiences. When it comes to most groove-directed music, however, it is particularly important to allow for the fact that the perceiver has a body, and, moreover, that it is often moving.

How grooviness and body movement are connected certainly remains an open question, but recent perspectives from the field of embodied music cognition pave the way for relevant reference structures or categories that do not arise solely from the metrical system.[15] One possibility, exemplified in Chapter 8 here, is to explore the correspondence between perceived vertical movements in the music and the actual bodily movements commonly accompanying it (see also Blom and Kvifte 1986; Kvifte 1999). Moreover, in Waadeland's article on swing movements in jazz, swing is understood as a mingling of the basic pulse and a second sine wave of triplets. Waadeland therefore represents the swing feeling via sine waveforms, which in turn evoke the corresponding movements of the drummer's arm producing the music (Waadeland 2001). These attempts at connecting music and movement do not, however, imply that the relation between music and movement is one-to-one. Additional rhythmic layers always tend to 'modulate' the basic beat of a groove in various ways, playing with our expectations regarding the regularity of the basic beat and other recurring rhythmic events.

Generally, discussions of the relationship between groove and corporeality in music listening point to the real and underacknowledged possibility that we

---

[13]  Madison, for example, defines groove almost exclusively in relation to its encouragement of body movement: 'There is a quality of music that makes people tap their feet, rock their head, and get up and dance. For some music, such as jazz and various kinds of dance music, this is perhaps the most essential feature … Here, I will refer to this experience as groove, operationally defined as "wanting to move some part of the body in relation to some aspect of the sound pattern". This definition leaves open the quality of the music that is presumed to induce it' (Madison 2006: 201).

[14]  See, for example, Clarke's discussion of trip-hop artist Tricky's music in Chapter 7 in this volume.

[15]  For examples of the use of these perspectives in music research, see Godøy 2001; Aksnes 2002; Iyer 2002; Godøy, Haga and Jensenius 2006; and Leman 2008.

structure our actual musical experiences according to patterns and models received from extra-musical sources. Feelings, images and movements can all be part of the process of making music meaningful. The emotional content of music can, for example, completely overshadow its 'musical' meaning. As Lacasse points out, however, expressive musical gestures also commonly lead the listener to set aside a non-musical realistic framework and instead accept the music itself as the frame of reference for engaging with its emotions (see Chapter 9). This phenomenon in turn recalls the use of the 'awkward' practice of sung dialogue in opera and music theatre.

Thus dance and movement affect the way we experience and understand grooves, and vice versa – inner or outer movements can be induced or proposed by music. A particular timing pattern evoking a certain bodily response, may, for example, be remembered and in turn used as a structuring scheme. In relation to the virtual reference structures at work in our production and reception of groove-based musics, this means that we might draw upon any number of bodily experiences in the process of making sense of musical sounds.[16] It can also mean that when we play a rhythm, we do not realize a specific virtual organization of durations in an isochronometric system but rather simply riff off of what we have played or heard before; we play yesterday's gestures, so to speak.

Patterns of musical gesticulation, particularly in orally transmitted genres, are often at the very heart of a tradition, and a way of playing can become so striking and systematic as to form an identifying aspect of a style. As I have discussed more thoroughly elsewhere (see Danielsen 2006), then, microrhythmic relationships are not only constitutive for the groove as performed but also for the groove as a pattern. They transcend the influence of individual performance styles, so that the features that make up a particular microrhythmic design, such as the swung subdivision of a swing groove or the early attack of the 'One' in a funk groove, are aspects of the stylistic pattern as such. The term 'groove' itself reflects this duality. As a noun, it refers to the iterable aspects of a played pattern, including its 'performance practice' – that is, the microrhythmic design embedded in that pattern. As a verb, 'to groove' points to the unique qualities of a given performance and in fact involves an aesthetic judgement: when a groove grooves, it is good. (This is also sometimes the implication of the noun as well, as in the title of the James Brown tune 'Ain't That a Groove'.) The two aspects of groove are, in other words, so interconnected that groove becomes a noun that includes itself as a verb: it has to groove to be a groove.[17]

In the same way that we memorize a particular microrhythmic design as a 'gestural' figure, we can also draw upon our internalized repertoire of already acquired gestures to make sense of a new timing pattern. We might also find that

---

[16]     This recalls recent research on the role of the sensory-motoric system in perception and learning, as well as in conceptual knowledge (see, for example, Wilson and Knoblich 2005, and Gallese and Lakoff 2005).

[17]     For ethnographic work on the meaning of the term 'groove', see Monson 1996.

entirely new gestures can be proposed by a piece of music, if we simply allow for them. Contemporary computer-generated grooves might in fact evoke completely new movement patterns, as we develop ways of internally or externally responding to these grooves; it can develop a gestural repertory that goes beyond our 'natural' repertory (natural here understood as what we regard possible for human beings in the present historical situation). Put simple, mediation may cause new ways of moving.

Finally, the digital recording of sound not only has made new grooves and sounds possible. It has allowed us to better capture, manipulate and systematically analyse rhythm and sound, particularly at the level of microrhythm. Through a combination of auditory analysis and visual interpretation via graphic representations of sound in sonograms and amplitude graphs, this book will demonstrate these possibilities. Both sonograms and amplitude graphs help the scholar by 'freezing' time and especially by detailing microrhythmic subtleties (see, for example, Chapters 2, 6, 8, 9 and 10). The title of this book thus touches on two intertwined phenomena linked with the advent of digital technology. It refers to the fact that the production of rhythmic music in the age of digital reproduction involves digital music production tools, but it also emphasizes the changes now possible in the methods and focus of the study of rhythmic traditions.

## Outline

The first section of the book, 'Microrhythm and Rhythmic Structure', addresses the following questions: what are the virtual reference structures employed in our schematizing of sounding rhythmic events, and how are these virtual structures shaped? To what extent do aspects of sound (timbre, dynamics, pitch, texture) or melody influence the shaping of such references structures, and to what extent are such aspects to be considered identifying features of rhythmic events? The section starts out (Danielsen) with an analysis of D'Angelo's song 'Left and Right' from the classic neo-soul album *Voodoo* that presents three different models of pulse – the metronome, local time shift, and beat bin – and evaluates their relevance to the song's unique rhythmic feel. The models represent different conceptions of rhythmic structure and anticipate in important respects the various theoretical frameworks of the succeeding chapters. The first of these (Chor) comprises an empirical investigation of microtiming in Afro-Cuban music that focuses on the actual relationship between a metrically conceived reference structure and its performative variations. Chor demonstrates in particular how a metric grid does in fact help to pin down systematic performative variations in a particular musical style. The next chapter (Carlsen and Witek) comprises an analysis of the relationship between rhythmic figures and their gestural realizations in the Roots song 'Rock You' and Brandy's 'What About Us?'. Abandoning any single reference structure, simultaneously sounding events are taken to point to alternative structures that in turn imply alternative placements of the basic beat of

the groove. Though these sounds might coincide as sounds, they do not coincide as manifestations of structure. The authors introduce dynamic attending theory as a way to understand the perceptual mechanisms behind the experiential result of this phenomenon, which paves the way for the next chapter (Johansson), a challenge to the entire traditional notion of metric grids as a reliable reference for microrhythmic patterns. Johansson introduces the concept of 'rhythmic tolerance' to explain the organization of time in Scandinavian fiddle tunes (*pols* and *springar*) that are characterized by great variability in the lengths of their rhythmic units (measures and beats) within a constant, danceable tempo. He concludes that in this case the *melodic* rhythm constitutes the basic groove-forming element. The last chapter in this section (Bjerke) directs our attention to how relationships between sounds with different qualities affects our experience of microtemporal events. As Bjerke's comparative analysis of Common's 'The Hustle' and D'Angelo's 'Untitled' and my own analysis of D'Angelo's 'Left and Right' make clear, timbral, dynamic and pitch-related features of rhythmic events all influence our perception of their timing.

The middle section, 'Groove and Embodiment', raises a crucial question: how do dance and movement affect our experience and understanding of groove-based music in general, and computer-based grooves in particular? Moreover, how is the bodily character of groove-based music conveyed? The first chapter (Clarke) discusses four years of the British artist and producer Tricky's music with regard to musical corporeality and autonomy, using a framework of critical theory and ecological perceptual theory and focusing on the artist's ambivalence about the 'dance-inducing' aspects of his music. Clarke demonstrates how an ecological approach derived from the work of James Gibson can shed 'significant light on the ways in which people listen to, and actively engage with, music through its focus on the reciprocal relationship between perceivers and their environments' (Clarke, this volume: 106). The next chapter (Zeiner-Henriksen) discusses correspondences between rhythm, sound and movement in relation to electronic dance music, drawing particular attention to the ways in which music production tools can introduce pitch movements to bass drum sounds that in turn affect how we move to them. Aided by sonograms of actual sounds, Zeiner-Henriksen also directs our attention to the importance of the dynamic, timbral and pitch-related processes that take place *within* a particular sound, and their importance for the experienced grooviness of the music. The next chapter (Lacasse) considers musical embodiment in the form of vocal expressivity through an analysis of 'creaky voice' in the Australian artist Sia's 'Breathe Me'. He further attempts to clarify the role of microrhythmic and other paralinguistic features in the expressivity of a vocal performance, proposing to approach popular singing as a 'supradiegetic conductor' to which all other elements of the song may be subjected.

The last section, 'Mediation and Music Production', focuses on the impact of technological mediation on microrhythm and sound, given both its possibilities and its constraints. It considers the following question: how does computer-based music production affect the overall sound and microrhythmic relationships of a

groove? The first chapter (Brøvig-Hanssen) analyses the use of the digital cut-and-paste technique in the song 'Break' by DJ Food; Brøvig-Hanssen proposes the term 'opaque mediation' to help us express the ways in which mediating technology can be exposed and in turn contribute significantly to the groove. The next chapter (Harkins) introduces another instance of opaque mediation in contemporary electronic music – the use of chopped-up samples, or microsamples, in UK garage music. Harkins discusses the ways in which artist Todd Edwards uses the sampler to 'decompose' vocal tracks, transforming concrete semantic meanings into abstract collages of sounds. The penultimate chapter (Zagorski-Thomas) looks at the interaction between mediated sounds and performance practice, focusing on the ways in which changes in technology have affected the manipulation of rock drum kit performance in the recording process since the early 1970s. Zagorski-Thomas raises the issue of the extent to which drum kit performance practice has changed as a result of, for example, quantized rhythms and machine time in popular music. As mentioned above, today's DAWs (Digital Audio Workstations) allow for considerable control over sound, timing and phrasing, and the last contribution to this book (Kvifte) describes this ability to meticulously 'script' and manipulate such performative aspects in light of the changing relationship between performing and composing in contemporary computer-based music-making.

Expanding the study of microrhythm beyond the temporal domain is a necessary step toward allowing for the ways in which timbre, pitch, dynamics and texture, including the role of technological mediation, influence rhythm. It also opens up the issue of movement, or its absence, with regard to our perception of rhythmic events. As the analyses and discussions in this book will demonstrate, the answers to these questions elude the prevailing, metrically based theories of rhythm and groove. It becomes clear that our notions of both rhythmic expressivity and machine music must be revised. Today it is not easy to tell where 'machine time' ends and 'human time' starts, and vice versa: what we thought was machine music might be no more dependent on digital music production tools than so-called live or played music has become. As Brøvig-Andersen (2007) points out, our impression of what digitally produced music sounds like probably arises from aesthetics rather than technology.

In short, the equation of machine music with standardization or inhumanness is passé, and it was probably also heavily ideologically loaded along the lines of the Frankfurter-inflected strands of theories about popular culture in the first place. In the end, the music and topics discussed in the following pages make the point that machines are probably first of all a means of producing new, or additional, forms of 'humanness'. What also becomes clear is that each 'generation' of music production tools seems to produce a corresponding and very specific repertoire of musical gestures and forms. From the relatively limited time period of popular music history involved with this collection of essays, it seems that the two microrhythmic tendencies pointed out above and dealt with by many of these authors seem to have become in turn characteristic of the music produced with them. Just like the sparkling sound of the digital Lexicon reverb tends to bring

memories of early 1980s pop, and the specific punch of the Roland TR909 drum machine points to a specific time in the history of electronic dance music, these particular microrhythmic designs qualify as strong candidates for denoting the time of the introduction of DAWs in the mid-1990s. They represent a significant chapter in the story of popular music's ongoing and intricate relationship with new technology.

**Acknowledgements**