THE STUDY OF RHYTHM IN POPULAR MUSIC. APPROACHES AND EMPIRICAL RESULTS

Martin Pfleiderer
Institute for Musicology, Hamburg University, Germany

ABSTRACT

Background: Today, many people are involved in listening or playing various kinds of popular music. To appreciate the music preferences and experiences of those people can give research in music psychology more ecological validity.

Aims: I want to present some theories and empirical investigations concerning the perception, cognition and production of rhythm in popular music in order to show directions of future research and possible contributions to an understanding of the variety of music experience.

Main Contributions: After some considerations concerning the dimensions and theories of rhythm in general the phenomena of groove and perceptual multiplicity in popular music will be discussed. Other interesting features including microtiming, interactive processes as well as motional and emotional responses are mentioned. Finally a prospect on possible methods and areas of future research on rhythm in popular music is given.

Implications/results: Rhythm in popular music often is a complex phenomenon with many interdependencies between various musical layers and sound parameters, between various possible perceptual interpretations and between perceptual processes (bottom up) and learned schemas (top down). Therefore the aim of future research should be to face and understand the richness and variety to experience rhythm rather than to find some everlasting principles.

1. INTRODUCTION

Experienced listeners of various kinds of popular music are familiar with some stylistic features, e.g. aspects of sound and rhythm, that differ from other kinds of Western tonal music. To ignore these phenomena is to ignore the musical preferences and experiences of a majority of listeners today. To study rhythm or sound in popular music is to give research in music psychology (that often is confined to simple, reductionistic stimuli or Western art music between 1600 and 1900) more external or ecological validity. While *sound* is an omnipresent term in writings on popular music including various meanings – the timbre of single sound events, technical devices of musicians or vocalists, textures of group interplay as well as overall styles of music (see Pfleiderer in press) – rhythm seems to be an aspect more graspable. Moreover, rhythm is essential in the cognitive, emotional and motional responses of musicians, listeners, and dancers alike.

In this paper I like to put together several considerations and approaches concerning rhythm in popular music and to outline possible directions of future research. In doing so, I will focus on some rhythmic devices involving perceptual-cognitive rivalry or multiplicity, that are widespread in popular music today because of the omnipresent impact of African American music. To other important phenomena, e.g. microtiming, emotional experiences and motional responses only a glance will be given. But first, I like to make some general remarks on approaches to rhythm and rhythm experience.

2. RHYTHM AND RHYTHM EXPERIENCE

Probably, the well known and blameable intricacies to define rhythm are caused by differences among rhythmic (or merely periodic) phenomena in biological and physiological processes, body movements, speech or music and the theories and methodologies prevailing in various sciences e.g. biology, neurology, psychology, literature and musicology (Spitznagel 2000). But even if you choose a single field of rhythm research – rhythm in music – the situation seems to be rather complicated due to various contradictory definitions and approaches. My own approach to rhythm is a music psychologists approach grounded in the seminal research done by Alf Gabrielsson in the early 1970es (1973 a,b,c, see also Gabrielsson 1994). According to Gabrielsson (1986) rhythm in music includes aspects on three levels: As part of musical communication, rhythm can be approached from the point of view of the performer (including the composer and the notational representations), the medium (air waves / sound), and the human responses to certain properties of the sound sequences. The rhythm responses could be subdivided into behavioural aspects (e.g. body movements), psychophysiological reactions (e.g. pulse and breath frequency), and finally the experience of rhythm with its various dimensions. In a sequence of investigations using similarity judgements and adjective ratings Gabrielsson examined the experiential dimensions of rhythm, which happened to include: cognitive-perceptual aspects or structural properties (meter, accentuation of the first beat, kind of basis pattern, uniformity/simplicity versus variation/complexity), several perceptual-emotional aspects or movement properties, and emotional aspects represented by pairs of adjectives. Gabrielsson's explorative studies are outstanding not only because of the results, but as well because in some experiments he uses excerpts of popular music recordings (from Viennese waltzes to rock'n'roll) and polyphonic patterns of an electronic "rhythm machine". Moreover his combination of various methodological approaches is well thought-out: While similarity judgements (analysed via multidimensional scaling) involve the rather cognitive task of judging structural properties of the stimuli, the meanings of the proposed adjectives in the rating task may reveal more emotional responses; furthermore, open comments of the listeners may give additional insights in experiential dimensions. It may be instructive to repeat

ISBN 3-931852-67-9
ISSN 1617-6847

Gabrielssons dimension analysis with other kinds of popular music – either broadening the music examples or restricting the scope to only one stylistic area, exploring richness and variety of experiential dimensions inherent in one particular style.

In a later paper Gabrielsson names four aspects of musical rhythm: experienced grouping, experienced accenting, perceived regularity and the perceptual limits of the psychological present (Gabrielsson 1994). Grouping and regularity, emerging from the perception of timing patterns and various types of accents, are central to the conception of two parallel rhythm hierarchies proposed by Lerdahl and Jackendoff (1983): grouping hierarchies, concerning the hierarchical organisation of elements into groups (e.g. motives and phrases), and meter hierarchies, determining the strength for each beat on each hierarchical level. In the design of a cognitive theory of music according to Lerdahl and Jackendoff, there is no automatism of cognitive interpretations, but only a set of preference rules, specifying inclinations of the experienced listener to understand the given musical structure.

It is important to keep in mind that rhythm in music mostly is a multi-layered phenomenon, emerging from the combination of several instruments or voices. For the listeners it is possible to pay selective attention to one rhythm stream or to a emergent rhythm consisting of several layers, as well as to pay divisive attention to several rhythmic layers at once. Furthermore, rhythm experiences emerge from the interplay, interdependencies and combinations of various parameters (e.g. timing, loudness, timbre, pitch, contour, harmonic tension) determining group boundaries and accents as well as pulse and beat induction. It should be clear that in changing one parameter sometimes the experience of the whole pattern will be restructured (Handel 1989).

3. GROOVE AND PERCEPTUAL MULTIPLICITIES IN „BLACK ATLANTIC RHYTHM"

The various rhythm devices grown out of music brought to the Americas by African slaves some centuries ago have an crucial impact on almost all kinds of popular music – starting with the impact of ragtime syncopation on American Popular Song in the Tin Pan Alley-era, the influence of rhythm'n'blues on rock'n'roll and rock, the omnipresence of jazz as well as south American music like son, rumba, salsa, reggae, samba or bossa nova (to name just a view), and last not least modern disco music, house and techno: all these styles show some characteristic rhythmic features rooting in the African American traditions. Recently, Jeff Pressing has called these rhythm devices "Black Atlantic Rhythm" (Pressing 2002). The concept of *groove* or *feel* is central to African American derived rhythm – but not easy to grasp. Although it is not clear to me, if the term groove is appropriate for rhythmic devices in various kinds of popular music beyond the African American traditions, it seem to encompass some crucial experiences with popular music rhythm, including the experiential dimensions named by Gabrielsson.

In colloquial English the use of the term groove is twofold (see Moore 2001: 34): On the one hand, groove serves as an aesthetic category for listeners and musicians talking about their emotional and motional involvement ("being one with the music") as well as some social implications of the listening context. To put it with a stereotype: If the music grooves, you feel good – and vice versa. On the other hand groove functions as a more technical term referring to characteristic properties in the play of the rhythm section. In his attempt of a definition, Pressing emphasises the structural aspects as well as the resulting body response:

„A *groove* or *feel* is taken here to be a cognitive temporal phenomen emerging from one or more carefully aligned concurrent rhythmic patterns, charaterized by:

1. perception of recurring pulses, and subdivision of structure in such pulses,
2. perception of a cycle of time, of length 2 or more pulses, enabling identification of cycle locations, and
3. effectiveness of engaging synchronizing body responses (e.g. dance, foot-tapping)" (Pressing 2002, 288).

This definition of the structural aspect of groove or feel is arguable, although it is questionable, if grooving music always have to include cyclical patterns – somtimes a pulse or steady beat may be sufficient (e.g. in modern jazz); moreover, in order to make a music groove probably other structural features (and micro-structural features, see 4.) are important too.

Referring to phenomena of perceptual rivalry or multiplicity in vision (e.g. the Necker cube or vase/face silhouette pictures), Pressings argues that perceptual rivalry or multiplicity is essential to groove or feel. Pressing names several rhythm devices of African American music (also widespread in other popular styles) that are grounded in perceptual rivalry:

- syncopation: a tension between accents of the syncopated line and the strong beats of the underlying metric structure;
- off-beat-phrasing (that is another kind of syncopation): starting and ending of phrases at off-beat-points.
- overlay (actually an extension of syncopation): temporary consolidation of an alternative metric structure before eventually returning to the fundamental meter. (Pressing distinguishes between in-time and out-of-time overlays, the latter referring to a kind of rubato phenomenon, playing the overlaying line completely independent of the underlying metric structure.)
- displacement: playing the same rhythmic pattern – or some stylistically typical rhythmic formulas – at different points of the metric structure. Rhythmic displacement is often used in modern jazz in order to obscure the metric structure and temporarily disorientate listeners (e.g. by establishing alternative down beats).

More elaborated devices are the introduction of two (or more) conflicting isochronous pulse streams. Moreover, in ensemble

ISBN 3-931852-67-9
ISSN 1617-6847

playing there are interlocking and hocketing-techniques, creating a dense rhythmic give-and-take (similar to call and response but on a lower temporal level) and heterophonic variations (often out-of-time) resulting in a comparable effect.

Note that most of these devices depend on the previous induction of a fundamental beat. Thus they could be understood as temporary manipulations of a metric deep structure. Hence preference rules like the following could be proposed: "Syncopation Shift Rule. In inferring the deep structure of a melody from the surface structure, any event may be shifted forward by one beat at a low metrical level" (Temperley 1999, 26). Other preference rules, each one referring to a limited stylistic scope of popular music, should be hypothesised in order to enable an experimental examination.

According to Pressing, "(...) perceptual rivalry is an arousing process, because it is based on a kind of cognitive dissonance, a contradiction between interpretations" (Pressing 2002, 299). So it will be no harm to a possible cognitive theory of popular music to assume preference rules contradicting each other. Contradiction and cognitive dissonance is arousing attention and emotions. Moreover, if listeners are familiar with the perceptual rivalries, they are able to enjoy them aesthetically. It is of crucial importance to understand how dissonant mechanisms of bottom up-perception interact with top down-schemas learned by repeatedly listening to specific styles. I think, top down-mechanisms, stylistic conventions and rhythmic formulas are of crucial importance in listening to various styles of popular music. While offering a common ground for cognitive interpretations such formulas help to appreciate and enjoy the perceptual rivalries without loosing all the orientation and familiarity. (This may be different in some more complex and more ambiguous rhythmic textures in music from Africa or South America.)

Let's look at a striking example for the importance of rhythm formulas and stylistic conventions. Richard Parncutt (1994, 421f) is wondering about a strange result in the data of his meter induction experiments using sequences of simple drum machine strokes. While his rules predict a stronger metric accent on longer notes (or inter-onset intervals), in the sound example called "march" (long short short long short short etc.) most of his subjects perceived the down beat on the first short note. I want to propose a simple interpretation: Turning on the radio, you may seldom listen to marches today, but very often to rock and pop rhythms using a bass drum - snare drum pattern: *bumbum tschak, bumbum tschak*. Note that Parncutts listeners were mainly Swedish music students far from being innocent concerning popular music.

In my opinion, in order to understand the perception and cognition of rhythm in real music, first of all you have to look on the music as a complex, multi-layered phenomenon with lots of stylistic conventions and formulas. It is important for music psychologist to learn from the expert knowledge of musicians (lied down in magazines and workshops), experienced listeners or musicologists familiar with popular music. Only then you can build valid models and experimental designs, how perception and cognition really works. I'm convinced that musical cognition does not just build up from elementary rules. First you have to model the cognitive experience as a whole and then you may look how it works in detail.

4. MICROTIMING, MOVEMENT CHARACTER AND EMOTION

There are many aspects of groove and feel, or of rhythm in general, beyond cognitive aspects like pulse, meter and multiplicities in rhythm worth to be taken into consideration. Today, the phenomomena of microtiming or microrhythm especially in jazz has been investigated by several studies (e.g. Rose 1989, Prögler 1995, Iyer 2002, Busse 2002, see also Pfleiderer 2002). But there's a lack of microtiming research concerning other styles of popular music. According to Vijay Iyer (2002) microrhythmic deviations from a steady pulse "(…) create an attentional give-and-take to emphasize different moments interactively. Such techniques are manipulated with great skill by experienced musicians playing together, as kind of communication at the "feel" level" (Iyer 2000, 398). The various perceptual effects of microrhythmic deviations (see Iyer 2002, 400ff) aside, the effects on emotional expression and movement character are evident. Beside the tempo of the fundamental beat and the temporary event density ("rhythmic contour"), the impression of forward movement ("drive", "push" or "swing") as well as several movement characters are probably determined by the multi-layered timing and accent texture as well as by mikorhythmic deviations. How these motion experiences are constituted will be an issue of future research. One possible explanation is the approach of image schemas, interpreting timing and accent metaphorically but on a perceptual level with fundamental experiences of the motions of physical objects and the human body in time and space (see Snyder 2000, 107-119). It could be instructive to examine how people move and dance to various kinds of music as well as how they describe their impressions of musical movement.

It is convincing that the perceptual rivalries mentioned before as well as microtiming play are so widespread in popular music because of arousing effects and the potential to increase attention, emotional involvement as well as bodily and socially engagement (Pressing 2002) – and aesthetic pleasure too. In analysing these effects we have to take into account interdependencies and interactions between a variety of variables not only concerning the various structural aspects of music, but also variables concerning the listeners, their moods and preferences, and the whole listening context. That's why experimental research on emotional experiences seems difficult to carry out. It is not at all clear, why participants of laboratory experiments should have comparable emotions like they have in a concert or club. But hopefully they can report of the emotions they had. Thus narrative interviews concerning emotional experiences with music, or interviews focused on some stimuli, or field observations paired with interviews are preferable.

5. OUTLOOK ON FUTURE RESEARCH

The various rhythm devices and the rhythm experiences of listeners familiar with various styles of popular music are an open and fascinating area for future research – contributing to the psychology of music as well as to a thorough understanding of popular music valuable for listeners, musicians and musicologists alike. Taking up the various considerations and approaches presented in my paper, I want to suggest two directions of future research:

ISBN 3-931852-67-9
ISSN 1617-6847

At first, dimensions of the experience of rhythm in popular music need be further explored – experiences according to various styles as well as to various groups of listeners and musicians. The result may be a more detailed and more realistic picture of possible ways to listen to and to play several kinds of rhythm structures. Similarity judgements and adjective ratings may be helpful, but even more valuable may be qualitative interviews with various experts (musicians, experienced listeners). An important completion are the careful analysis of rhythmic structures of recorded music including measurement of microrhythmic play.

A step towards generalisation may start with the formulation of some hypothetical preference rules, taking in account the findings on the perception of time sequences and simple rhythms (bottom up) as well as rhythmic formulas, schemas and perceptual multiplicities familiar to the experienced listeners (top-down) shaping their cognitive, motional and emotional experience. Taking into account the several layers of real music rhythms and the many interdependencies between several rules and devices, it will be no easy task to design experimental investigations that gain external validity. And even then, a generalisation to other groups of listeners are questionable. But that's no harm, if the purpose of the study of rhythm in popular music is not to discover some everlasting laws and principles, but an exploration of the richness and possible variety to experience rhythm.

6. REFERENCES

1. Busse, W. G. (2002): Toward Objective Measurement and Evaluation of Jazz Piano Performance Via MIDI-Based Groove Quantize Templates. *Music Perception, 19, 443-461.*

2. Gabrielsson, Alf (1973a). Similarity Ratings and Dimension Analyses of Auditory Rhythm Patters. I / II. *Scandinavian Journal of Psychology, 14, 138-160, 161-174.*

3. Gabrielsson, Alf (1973b): Adjective Ratings and Dimension Analysis of Auditory Rhythm Patterns. *Scandinavian Journal of Psychology, 14, 244-260.*

4. Gabrielsson, Alf (1973c): *Studies in Rhythm*, (= Acta Universitatis Upsalienisis 7). Diss. Uppsala.

5. Gabrielsson, Alf (1986). Rhythm in Music. In Evans, J. R. and Clynes, M. (eds.), *Rhythm in Psychological, Linguistic and Musical Processes* (pp. 131-169). Springfield: Charles C. Thomas.

6. Gabrielsson, Alf (1993): The Complexities of Rhythm. In Tighe, Thomas J. and Dowling, W. Jay (eds.): *Psychology and Music. Understanding of Melody and Rhythm* (pp. 94-120). Hillsdale: Erlbaum.

7. Handel, Stephen (1989): *Listening. An Introduction to the Perception of Auditory Events*. Cambridge: MIT Press.

8. Iyer, Vijay (2002): Embodied Mind, Situated Cognition, and Expressive Microtiming in African-American Music. *Music Perception, 19, 387-414.*

9. Lerdahl, Fred and Jackendoff, Ray (1983): *A Generative Theory of Tonal Music*. Cambridge: MIT Press.

10. Moore, Allan F. (2001): *Rock. The Primary Text. Developing a Musicology of Rock*, 2nd edition. Aldershot: Ashgate.

11. Parncutt, Richard (1994): A Perceptual Model of Pulse Salience and Metrical Accent in Musical Rhythm. *Music Perception 11, 4, 409-464*.

12. Pfleiderer, Martin (2002): It don't mean a thing if it ain't got that swing. Zur mikrorhythmischen Gestaltung in populärer Musik. *Jahrbuch Musikpsychologie 16, 104-124*.

13. Pfleiderer, Martin (in press): Sound. Anmerkungen zu einem populären Begriff. In Phleps, Thomas and van Appen, Ralf (eds.): *PopSounds*. Bielefeld: transcript.

14. Pressing, Jeff (2002): Black Atlantic Rhythm. Its Computational and Transcultural Foundations. *Music Perception, 19, 285-310*.

15. Prögler, J.A. (1995): Searching for Swing. Participatory Discrepancies in the Jazz Rhythm Section. *Ethnomusicology 39, 21- 54.*

16. Rose, Richard Franklin (1989). *An Analysis of Timing in Jazz Rhythm Section Performance*. Diss. University of Texas at Austin: University Microfilms No. 9005520.

17. Bob Snyder (2000): *Music and Memory. An Introduction*. Cambridge: MIT University Press.

18. Spitznagel, Albert (2000): Zur Geschichte der psychologischen Rhythmusforschung. In Müller, K. and Aschersleben, G. (eds.): *Rhythmus. Ein interdisziplinäres Handbuch* (pp. 1-40). Bern: Huber.

19. Temperley, David (1999): Syncopation in Rock. A Perceptual Perspective. *Popular Music 18, 19-40*.

ISBN 3-931852-67-9
ISSN 1617-6847