Phrase, gesture and temporality: a cognitive perspective on jazz improvisation[1]

Ole Kühl

The study of musical meaning has traditionally been based on the following scenario: a production of a complex - typically 19th century - symphonic piece is performed in a concert hall, and the perspective is from the listener's point of view. It could be argued, however, that the investigation of a semiotic system does not necessarily yield the best results, when based on a highly specialised version of it. Would we, for instance, endeavour to learn the language of Martians by going to a Martian theatre and sit quietly through a 4-hour play? Hardly so. Instead we would probably single out a friendly Martian and engage in conversation with him on simple, contextual stuff, in order to establish a basis for dealing with the more abstract matters.

This text proposes an approach along similar lines. In order to study how we "make sense" of music, I suggest that we focus on the simpler, more natural forms of musical communication, before we try our hands on the many-layered transmission of old musical texts. And, as a further advantage of such a scenario, I suggest involving the expressive side of music in the analysis and not only the receptive side. The group effort of jazz improvisation offers suitable material for such a study.

1 Cognizing the musical act

1.1 The musical act

I shall be arguing that the meaning, which is being negotiated in musical communication, can be considered as an embodied meaning, and that the natural form of musical communication is connected to the idea of *embodiment*, which has been introduced in cognitive science recently from various sides[2]. Let me initiate the argumentation by claiming that **musical phrases iconize the temporal structure of physical acts** (motor acts, gestures etc.).

We will compare a simple musical act - a musical phrase - with a simple physical act like placing a pencil on a table, or kicking a ball. Phenomenologically there is a simple figure/ground relation[3] between the pencil being placed and the surface of the table; between the movement of the foot and the ball. The placing of the pencil is figure and the surface of the table is ground; the kicking is figure and the ball is ground. Acts like these are, however, always contextualised in real life, and the exact articulation of the act will be influenced by the situation it is performed in: if I am angry, I may slam down the pencil; if somebody wants it, I may reach over to the other side of the table and put it there etc. And in a game of football the kick will be influenced by the particular structure of the game in the given moment, the position in the field, the positions of the other players etc.

For a jazz player the musical act, the playing of the next phrase, can be described in a similar way. The phrase itself will be figure, and the metric and harmonic properties of the chorus, the *changes*, will be ground. Contextually the precise articulation of the phrase will be influenced by the social setting, not only the interaction with the other players, but also the situation the music is produced in (concert, rehearsal, studio etc.).

1.2 The mental space network

Before pursuing the question of the relationship between motor and music acts further, we will take time out to analyse the improvisational act itself in more detail. The figure, the ground and the context can be situated in a network of mental spaces. In order for something to be understood as a mental space[4], it should have the ability to be represented in the mind with a stable structure and a well-defined boundary. These demands seem to be met by the elements of the analyses above. Figure 1 shows us the macrostructure of the jazz phrase embedded in a particular version of a mental space network known as the Aarhus-model[5] (which I have chosen to apply because of its emphasis on contextualisation).

In order to fully appreciate the implications of the model, it will be necessary to understand certain aspects of the theory on mental spaces. For one thing, it is not a generically derived model of how the brain works, but a descriptive model of how the mind works. The basic idea is that we think in mental spaces, which form networks.

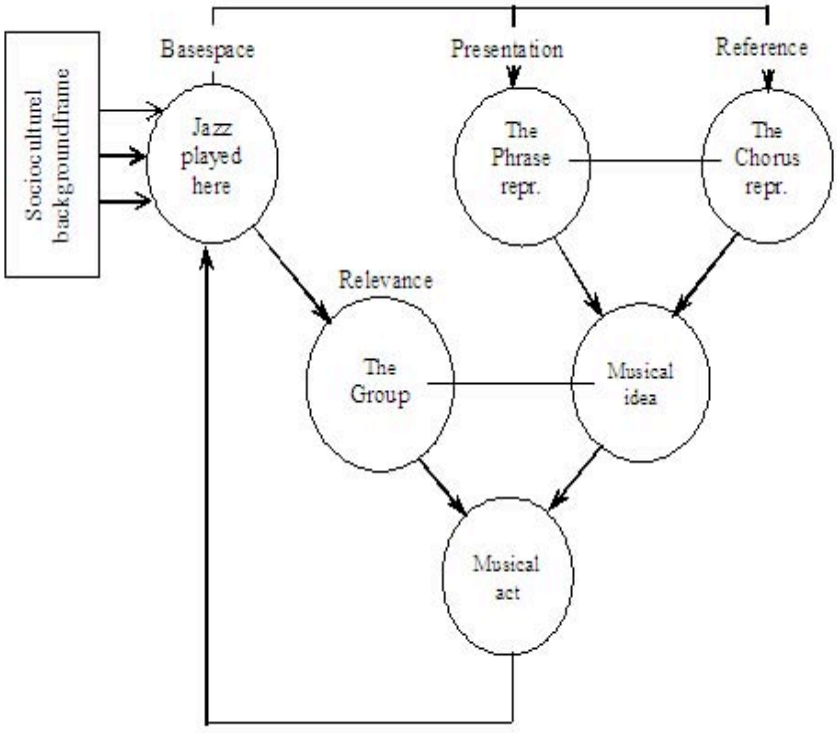


Figure 1: The macrostructure of the jazz phrase *(see text for details)*

Generally one thought leads to the next, and we get a linear development of the cognitive process in time. The spaces connect through *mappings* between structure (compare the notion of "association"). But often two spaces will interact with each other in a more dynamic way leading to a new space, which contains integrated structure derived from both the original spaces. The space containing the integrated structure will then be called a *blended space* (or merely a *blend*), and the original spaces will be called *inputspaces*.

It should also be noted, that the Aarhus-model differs from the Fauconnerian model[6] not only through the attempt to incorporate the context into the description as a third inputspace, but also because the three inputspaces are seen as assigning certain

necessary functions to specific parts of the network. Accordingly, the two original inputs are marked in the model as the *presentation space* and the *reference space* respectively, and the third additional input space is known as the *relevance space*.

1.3 The integrated network of jazz improvisation

The network unfolds from a *basespace* (see figure 1), which determines the basic scenario, and from which all relevant information is delegated to the inputs. In this case the basespace will contain a scenario in which a jazz musician improvises along with other musicians in front of an audience. In **figure 1** a frame has been added to the basespace in order to emphasize the simple fact, that a synchronically described scenario always will contain a diachronic dimension. The basespace points to a specific scenario, say Afro-American bebop, New York, late 1940s. This scenario is grounded in a specific set of socio-cultural structures: Afro-American culture, the social and political conditions of Afro-Americans in New York at this time, the structure of the jazz scene etc. Grounded in individual experience much of this information will have the ability to emerge in the network, for instance as blues phrasing in the presentation space; as specific forms of social interaction in the relevance space; or as preferred reharmonizations and substitutions in the reference space.

Although the network unfolds in a flash, it is still possible to distinguish certain stages of the process. The presentation space contains a representation of the phrase, or a "ghost" of the phrase, we could call it a pre-phrase. Separate from this the reference space contains a mental representation of the metric/harmonic properties of the chorus, which can be thought of as the mental representation of a route through a physical room, with distances, specific points on the road etc. Certain properties of the current position in this set of references will map onto the pre-phrase, which leads to the formation of an integrated space[7] containing a more elaborate musical idea. But, as dealing with the context is necessary for the perfect performance of an act, the reference space offers a representation of the social interaction in the jazz group and

its conditions. Particular elements of the integrated space will map onto particular elements of the relevance space (substitutions, dynamics, points of rhythmical salience etc.) before the final integration which leads to the execution of the musical act. This instantly becomes history and is delegated back to the basespace, which subsequently is ready for the next phrase. Thus, the network unfolds again and again, and the resulting information is seamlessly integrated in the representation of the basic scenario.

It has been necessary to explain the workings of the mental space diagram in some detail, in order to show how extremely complex even a simple act as the playing of a jazz phrase is, when studied in a cognitive perspective. Moreover, the model illustrates in a heuristic way the relations between musicological disciplines as theory and history. It should be noted at this point, that the description of the physical acts introduced above - placing the pencil and kicking the ball - would equally well fit into the network. But let us leave the mental space theory for a moment and try to explore the relationship between musical and gestural act from a different perspective.

2 Phrase structure and the focal point

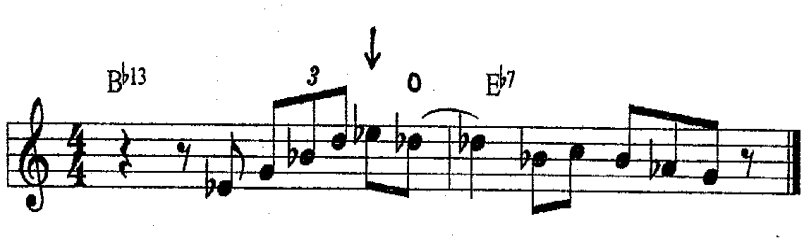
2.1 The phrase as a temporal object

A musical event can be interpreted as (and may indeed be perceived as) a temporal object, meaning that it has a temporal structure and a clear boundary in time[8]. Musical events will as a general rule fit this description, whether they are large objects, like symphonies and operas, smaller objects like songs and pop tunes, or very small objects like phrases. The morphology of the larger objects are dealt with - although from a different perspective - in formal analysis. As we are concerning ourselves at this point with simple musical communication on a basic level, the object of study is the musical phrase.[9] Viewed as a temporal object, the phrase will have a specific internal structure, which shall be examined closer.

2.2 The focal point of the musical phrase

We will look at a specific bebop phrase (see figure 2)[10]. There is a clear emphasis on the syncopated Db leading into the Eb7 chord (marked 'o'). As the note which distinguishes an Eb7 from a Bb13, it becomes what jazz musicians refer to as the *target note* of the phrase. The relative length of the note as compared to the eighths and triplets surrounding it, together with the emphasis provided by the syncopated downbeat, additionally serve to mark the note as the pivot point of the phrase. It focuses our attention on the specific harmonic quality of the current chord change, and could accordingly be called the *harmonic focal point* of the phrase.

Figure 2: The focal point



If we listen closely to the recording of the phrase, however, we will hear that Parker emphasized the highest note of the phrase, the Eb before the Db (marked with an arrow). This stressing of individual notes, which was an essential part of Parker's improvisational strategies[11], served several purposes. For one thing it established a rhythmical net, which worked above and against the regular metrics. And, additionally, it served to bring the musical phrase closer to the speech act (see below).

So it seems that Parker - along with myriads of other jazz musicians who carve out their phrases in a similar way - operated with two types of focal points: a harmonic focal point and a dynamic or *expressive focal point*. Analyses show, however, that when the two focal points are separate from each other, they tend to be on two consecutive notes, with the expressive focal point on the high note of the phrase (see figure 2 as an example)[12]. This distinction, then, may be interpreted as one of style

only, and does not take away from my basic argument in this section: that the focal point serves to structure the phrase.

2.3 The focal point of the speech act

When we speak, we usually stress one particular syllable in the sentence. This is known as one of the paralinguistic features of language, which are the strategies that are available in the speech act, but that do not easily, if at all, transmit in written language. Although the stress is not referential in itself, the way individual words and clauses can be, it does have a semantic value, as it serves to transmit meaning in a certain way. Consider the difference in meaning between the following sentences: "My house is red"; "My house is red"; "My house is red".

The focal point structures the sentence as object-in-time semantically as well as pragmatically. As a temporal object, the sentence will be structured in the following way: pre-focal part - focal point - post-focal part, which is a well-known schema that can be expressed in different ways.

This structure not only ties the speech act to the musical act, but also to the physical act of speaking. A simple act like kicking a football is also structured temporally according to the same schema. It will have a focal point (the split-second of making contact with the ball), which controls the execution of the whole act including preparation (pre-focal part) and finishing (post-focal part). As any musician, football player, dancer etc., who works professionally with their body, will tell you, a perfect, natural and relaxed execution of a physical act demands that this structure is followed meticulously, and that all three phases are given equal care. Only then is it possible to execute an act again and again without unnecessary tension.

The act of speaking, then, will be no different from other physical acts in this respect. The musculature involved in speaking (diaphragm, larynx etc.) needs a focal point for the proper execution of the act. In other words we can say that from a

physiological viewpoint, the musical act, the physical act and the speech act are based on the same basic motor schema.

3 Segmentation and the three second window

3.1 The 3-second window

These are simple facts and we can easily convince ourselves of their validity through proprioception. But we do not often stop to think about, how such conditions shape our interaction with the world. Here is another finding from neuro-physiological research, which ties into the argumentation at hand.

Although the brain has developed a number of extremely complex and sophisticated strategies in order to deal with short-term and long-term cognitive processes, including memory, very little research has been done on the temporal performance of the brain. One reason is, of course, the staggering complexity of the brain itself, which still leaves us grasping for the fundamental clues. Another reason is the inherent difficulties involved in collecting data[13]. Still some basic facts concerning the temporal aspects of auditive perception have been established[14]. One of these is the 3-second window.

It has been shown through experiments[15], that the capacity of the brain for on-line registration of events is limited to a time window of 3 - 4,5 seconds. Inside this window we perform a more or less complete registration of all details as they are perceived, and, furthermore, we are able to "play the tape again", so to speak. When the object we are trying to perceive exceeds this length, we are in trouble. If, for instance, we are to learn a 6 seconds long musical phrase, most of us will have forgotten the first half of it after having heard it once, and if we are not able to make any kind of sense of the phrase, we will often forget it completely, the mind becomes blank. (Part of the training in jazz schools is about developing strategies for dealing with this problem). In order to make room, the short term memory cache has to be "erased",

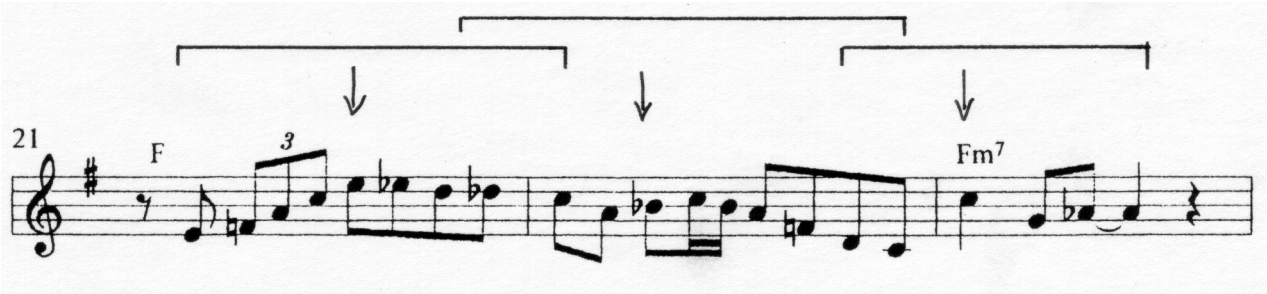
and the contents transferred to a long term memory cache (short term and long term memory are located in different areas of the brain). In this process some kind of sense has to be made of the data, and if it is completely unintelligible, it is often dumped.

The 3-second window is a biological restraint on our auditive perception, one that we have developed a number of strategies to overcome. It seems to be so fundamental, that it tends to influence our strategies for dealing with the world, especially when dealing with other members of the species in a cultural setting. Thus, gesture tends to unfold within the time window; gestural elements of rituals (handshakes, circumflexions etc.) tend to adhere to it; and in natural language - especially if you want to emphasize what you are saying - the sentence generally fills out 3 - 4 seconds. Even in the sonnets of Shakespeare, when read at an ordinary pace, each line lasts about 3 seconds.

3.2 Segmentation

Given the focal point as the structuring centre of the 'phrase-as-temporal-object', and the 3-second window as a guideline for determining the boundaries of this object, it will be a simple procedure to perform a segmentation of a longer phrase, what I would call a compound phrase. The following example (figure 3) is from bar 21 through 23 of the Ornithology solo.

Figure 3: Segmentation of a compound phrase



This phrase breaks up into three segments. The arrows indicate the three expressive focal points, that can be clearly heard in Parker's execution of the phrase. The passage from one phrase to the next is an example of a phenomenon, that in cognitive

linguistics is known as “fuzzy boundaries”: the last couple of notes in bar 21 would serve equally well belonging to the post-focal part of the first phrase, and belonging to the pre-focal part of the second phrase.

In other words, the three phrases join each other seamlessly. This further strengthens the tie to motor acts, which most of the time occur as compounds, where part of the unwinding of one movement becomes part of the preparation of the next. Iterative acts like running are the clearest examples of this. Although the focal point of the single act clearly is the contact with the ground, the preparation of the next movement and the ending of the last merge into each other in a cyclic process. More complex acts, like opening a car door or putting on the kettle, are structured in similar ways. (We have developed schemas for the execution of acts like these, and most of the time don’t give them much attention.)

3.3 Metrical strategies

It is worth noting the absence of harmonic focal points in the compound phrase of figure 3. The 2 bars of F major do not provide a target note, and the change to F minor may not be harmonically interesting enough for such a thing to occur (although one could make a case for the Ab in measure 23). We noted earlier that Parker’s stressing of individual notes at seemingly odd places in the phrase served several purposes. Not only does the expressive focal point contribute to the sculpturing of the phrase, but it also provides an affinity to the speech act (and, as we have seen, to the gesture). And, it sets up a net on a different level from and interacting with the level of the basic pulse, the 4/4 structure below the improvisation. As this last phenomenon is an important part of Parker’s improvisational strategy, we will look at it a little closer.

The expressive focal point is articulated in a dynamic relationship with the regular pulsation of the beat. Playing even eighths one can either put the emphasis on the beat or between the beats (offbeat) (with faster notes many more possibilities

arise). Again, playing on the beats, one can emphasize the heavy beats (1 and 3) or the afterbeats (2 and 4). Given these choices there are numerous possibilities of creating lines, that either move along with the pulse, or sets up various irregular patterns over the basic metrical grid.[16]

Figure 4: Metrical Strategies

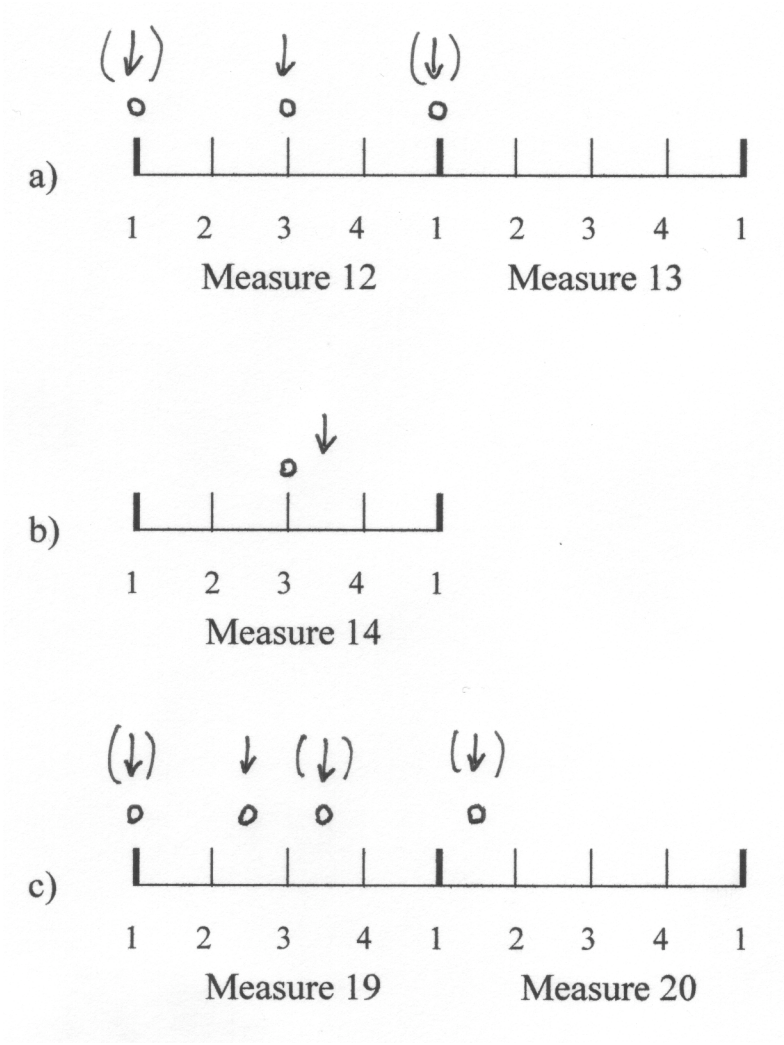


Figure 4 shows three different phrases, all taken from the Ornithology solo (compare with the complete transcription of the solo in figure 6). In 4a) The emphasis is on the heavy beats, 1, 3 and 1: Parker is playing <u>with</u> the basic pulse. In 4b) we encounter a displacement of the expressive focal point, which occurs on the note after the harmonic focal point; the harmonic focal point occurs on 3, the expressive focal point on the second eighth of three: the basic pulse is <u>confronted</u>. And in 4c) we meet

a whole series of displaced accents, moving the harmonic focal point along with the expressive focal point. Both occur between beats: Parker is playing against the rhythmical pulse.

This set of three possible strategies, that can be varied endlessly, set up a continuum between what Vuust[17] has called the rhythmical "in" and the rhythmical "out". When playing inside, Parker plays along with the pulse; when playing outside, he plays against the pulse; and in between he can strike up a position, which can go both ways. His choice demands a respond from the other musicians, and such a play with the basic rhythmical balance of the musical piece is one of the important parameters that are being negotiated in the social interaction between musicians in a jazz group[18].

Returning to our main topic, which is the construction of temporal objects, their conceptualization and embodied meaning, let us sum up in the following way: Viewed as temporal objects similarities exist between motor, speech and musical acts not only on the structural level, but also through the mind's strategies for dealing with the perception of such objects. The contiguity between gestural, musical and speech related structures in the cognitive system could serve as the basis for cross-modal mappings, which again would lead to the arising of embodied meaning from music: A compound phrase iconizes a compound motor act, and some sort of embodied meaning arises from perceived sound. For instance, in figure 3, the 3, the 2 and the 1 are emphasized in three consecutive measures. Parker is playing 'out' in a particular way, which depicts a set of movements - a mental dance - on top of the pulse.

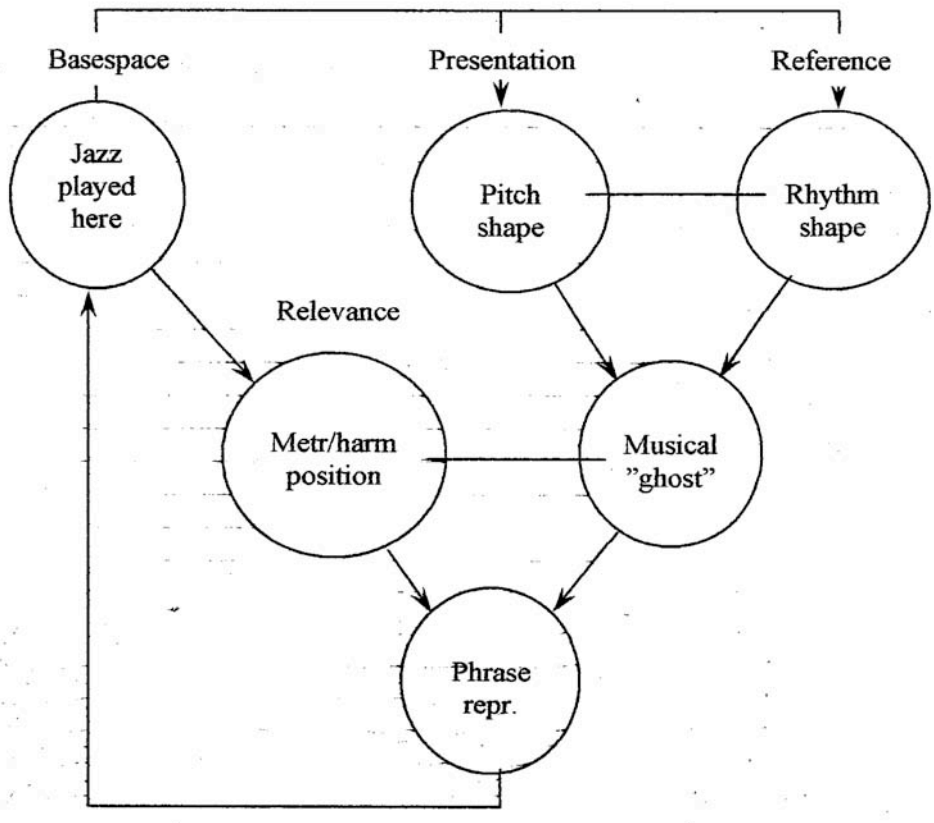
4 Conceptualizing the Phrase

4.1 Pitch and time

We shall now study the process of perceptual integration, that results in a musical phrase, in more detail. Auditive perception involves a number of brain centres, organized in what is called a *brain map*. Although some headway has been made

through high technological scanning of performing brains[19], it is still very unclear how the brain perceives sound, let alone conceptualizes it. One thing that seems to be clear is that pitch and time are processed in separate systems in the brain (pitch perception takes place in the right side of the brain, and temporal perception is primarily situated in the left side of the brain[20]). This empirical observation accords with the fact, that professional musicians (and many amateurs as well) are able to mentally represent the rhythmical and the tonal information of a given musical phrase separately. (One purpose of the discipline of ear training is to facilitate this function, and, indeed, it is not possible to write or read music properly without this ability, as musical notation basically is a projection of pitches onto a timeline.)

Figure 5: The Integrated Network of the Micro Level



4.2 The Integrated Network of the Micro Level

Taken for granted, that the improvising jazz musician not only works with a mental representation of the pitch shape and the rhythmical contour of the phrase he is about to play, but also takes into consideration - constructs a mental representation of - the segment of the chorus that he is going to place his phrase in, and its dynamic properties, it is possible to conceive of the process as a mental space network (see figure 5).

Once again, the base space is a jazz musician improvising in a given context, but this time the focus is on the micro level, inside the 3-second window, where the musical phrase is conceptualized and executed: the musical NOW. The first two inputs are representations of the pitch shape and the rhythmic contour, which are joined in a musical "ghost", the notion of the musical action about to be performed. The mappings are simple, each note should fit a specific slot in the rhythm grid.

The ghost is held up against a representation of the position in the metric/harmonic framework, that is defined by the changes, the number of bars and other formal properties delegated from the chorus structure. The successful integration of these two spaces are dependent upon a mapping between characteristic features of both spaces. For instance the target note of the phrase should map onto the specific quality of the chord change, the rhythmic contour should fit the downbeat in a certain way etc. The final blend will be a clear representation of the phrase-about-to-be-played, which is ready for execution.

Possibly this system runs parallel to the network we saw in figure 1, in which case the final blend will become the input of the presentation space in the network of the macrostructure. This would imply, that jazz musicians must develop a double-scoped concentration: on the micro level s/he should pay attention to the minute details of phrasing, timing, intonation etc. in the split-second of actualized time. And on the macro level s/he should be aware of the form, of the story being told, of the social interaction in the group etc.

5 The Way We Think About Music

On the neural level the conceptualization of the musical phrase is of course an exceedingly complex phenomenon. Cognitive theory does, however, offer a possibility of describing the process in a generalized, heuristic manner, which can be useful when we try to assess the "meaning of the meaning". Music means something to us - that should be clear from the outset. Otherwise, why spend so much time and energy on it.

To conceptualize something is to bring order to a perceived phenomenon, to categorize it, relate it to existing experiential structures, in short to understand it. But the meaning that we are subjected to in music goes beyond this kind of lexical referentiality, which belongs to the surface level of language that can be simulated by a machine, not the deep human level of enunciation.

So, in order to fully understand how meaning occurs from music in human beings, we need to understand not only the cognitive structures of experiential domains embedded in the human psyche that music refers to, but also what part emotion plays in the picture, and how it interacts with the whole semiotic process. Embodiment may be a key to this.

The body has a knowledge of its own, which is embedded in neural mechanisms, a knowledge which is not easily accessible for the conscious mind, nor easily converted to the semiotics of words. We all know of the situation, when an action, we normally perform smoothly, becomes awkward, because we start to think about it. It seems that the intervention of rational consciousness into the interaction between perception and knowledge structures on the subliminal level introduces an element of delay and uncertainty, that tend to jeopardize smooth performance.

When I claim that musical structures iconize gestures, I believe that the *semiosis* - the production of meaning - is grounded on this level.

5.1 An Ontogenetic Perspective

Gesture and emotion are closely interrelated. It has been suggested that human cognition develops from image schemas formed in our earliest childhood, schemas that condense the experiences of our earliest interaction with the world on an abstract, preverbal level. These schemas are not only related to the physical experiences of moving and acting[21], but also to our emotional experiences[22]. Let us conclude this survey of musical cognition with an ontogenetic perspective on the problem.

For a complete understanding of the ways of the natural foundation of musical communication we must complement our historical understanding of the development of music on the discursive level with a study of how we as individual humans learn and develop musicality in the first place. And such a study must go beyond the "do-re-mi" of the music schools.

There is evidence that already shortly after birth the infant is communicating intentionally in a musical way[23], and that musicality is an intrinsic part of the neurobiology of humans. The interaction is always two ways, involving a care-person intimately connected emotionally and physically with the baby, and this *protoconversation* may well be the most important activity for the baby in the first year or two. Emotion, gesture and sensual perception are interwoven in a dialogic communication with "the other", an activity which becomes the foundation for social communication later in life, and which is musical in its very nature.

In this view musicality is grounded in neural systems that generate transformations of the body. There is reason to assume that a central mechanism - Trevarthen calls it the Intrinsic Motive Formation (IMF) - controls these wide-ranging neural activities. The IMF integrates functions such as attention, learning and goal-oriented action, and regulates expressive as well as receptive conditions. Accordingly the IMF must have expressive structure as well as receptive structure, and, according to Trevarthen, the expressive side of IMF is primary in the development of intelligence. In

other words, the ability to express oneself follows from the possibility of doing so, and is a necessary requirement for the ability to understand.

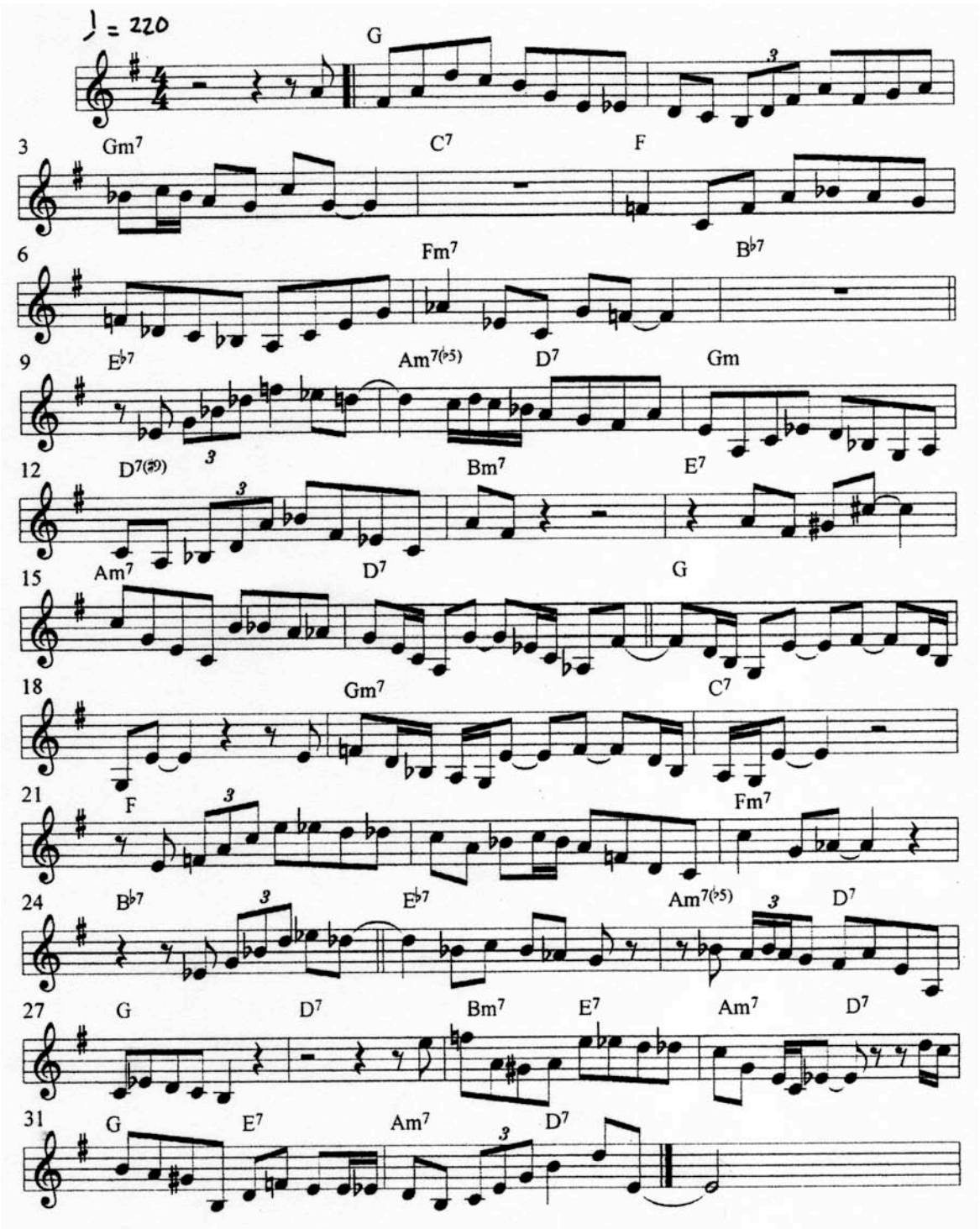
Musicality can be understood as the audible part of the activity of the IMF: "Music is audible gesture" (Trevarthen p. 172). Neurally the IMF seems closely related to the limbic system. This is placed in the deepest and evolutionarily oldest part of the brain, and is connected to the neuro-chemical emotional systems. Emotion, gesture and musicality are then linked together in the formation of the motive, in the intentionality of the expressive act.

This *infant semiosis* lies at the bottom of aesthetic expression and experience. In it we see an interdependence between emotion, gesture and music, which makes it clear why we as grown up experience this mapping from musical experience to movements of the body and emotional response (and the other ways around too!). Language has, as so many times before, preserved this piece of wisdom for us in the expression "we are moved by music"!.

5.2 Conclusion

On the biological framework, provided by nature from birth, is built, through years of learning and developing, expression and reception, acquiring of skills and knowledge structures on the physical, emotional and mental level, our musical culture and abilities among many other things. This process of ontogenesis deserves a much closer study and a deeper understanding than we have today. How and when does the cultural delegation take place, for instance? And how is the culturally divergent expressions of the same deep human call related, what are the similarities and the differences? A study of jazz, which in many ways seems so closely attuned to the musical expression of infants, can only open the door. A widening of the range and a further development of the semio-cognitive study of human musicality will lead to a deeper understanding of the phenomenon of music itself, and through this to a richer understanding of humanity itself.

Figure 6: Parker's solo in Ornithology, complete transcription by the author.



Biography

The author is a saxophonist and has worked professionally for over 30 years, playing jazz, rock and fusion music. In 2003 he took a Master's degree in musicology and semiotics. He is currently teaching musical theory and ear training at the Royal Academy of Music in Aarhus.

Keywords: Conceptualization; mental spaces; jazz improvisation; embodiment.

Bibliographical references:

Brandt, Per Aage: *What Is Music?* Århus 2000

Brandt, Per Aage (n.d. 1): *The Architecture of Semantic Domains*, www.hum.au.dk /semiotics/docs/Texts.html

Brandt, Per Aage (n.d. 2): *From Gesture to Theatricality*, www.hum.au.dk/semiotics/ docs/Texts.html

Brown, Steven Ravett: *Music and Gesture*, in press

Fauconnier, Gilles: *Mappings in Thought and Language*, Cambridge 1997

Fauconnier, Gilles and Turner, Mark: *The Way We Think: Conceptual blending and the mind's hidden complexities*, New York 2002

Gates, Henry Louis Jr.: *The Signifying Monkey: a Theory of African-American Literary Criticism*. New York 1988

Gillespie, Dizzy with Al Fraser: *To be or not ... to bop! memoirs,* New York 1979

Kühl, Ole: *Improvisation og Tanke*, forthcoming

Lakoff, George and Johnson, Mark: *Philosophy in the Flesh: The embodied mind and its challenge to Western thought,* New York 1999

Monson, Ingrid: *Saying Something: Jazz Improvisation and Interaction.* Chicago 1996

Pöppel, Ernst: *Temporal mechanisms in perception*. In: International Review of Neurobiology, 37/1994.

Trevarthen, Colwyn: *Musicality and the Intrinsic Motive Pulse*, in: "Rhythm, Musical Narrative and Origins of Human Communication", special issue of "Musicæ Scientiæ" 1999 - 2000

Ungerer, F. and Schmid, H.J.: *An Introduction to Cognitive Linguistics*, London 1996

Vuust, Peter: *Polyrytmik og -metrik i moderne jazz*, Denmark 2000

Zatorre, Robert J. and Isabelle Peretz (eds.): *The Biological Foundations of Music*, New York 2001

---

[1] This study is based on parts of my master's thesis (Kühl, forthcoming)
[2] See Lakoff and Johnson (1999) and Trevarthen (1999-2000).
[3] On figure/ground relations see for instance Ungerer & Schmid (1996).
[4] On mental space theory see Fauconnier (1997), Fauconnier and Turner (2001).
[5] For more information on the Aarhus model see Brandt (n.d. 1 and 2)
[6] Fauconnier uses two inputspaces leading to one integrated space, thus leaving out the context. An additional fourth space, called the generic space, will not be taken into consideration here.
[7] It is an open question whether this space is actually a blended space in the Fauconnerian sense.
[8] Temporal cognition has unfortunately been very sparingly dealt with in cognitive research, but see below.
[9] This discussion leads to the question of segmentation which will be taken up later
[10] The phrase is taken from Charlie Parkers solo on Ornithology (rec. in Hollywood, March 28th 1946).
[11] According to Gillespie this was Parkers greatest contribution to the development of jazz, see Gillespie 1979.
[12] This "double articulation" can be understood as a musical parallel to the phenomenon of *signifyin(g)*, see Gates 1988 and Monson 1996,
[13] See Zatorre and Peretz 2001 for more information.
[14] See Trevarthen 1999-2000 for a summation of the most important findings.
[15] Pöppel 1994
[16] See Vuust 2000 for a comprehensive analysis of this phenomenon, especially the polyrhythmic aspect of it. (Unfortunately it is only available in Danish).
[17] Vuust 2000
[18] See Monson 1996 for a more detailed account of how jazz musicians play together.
[19] Zatorre and Peretz 2001.
[20] Pöppel 1994, Zatorre and Peretz 2001
[21] Lakoff and Johnson 1999.
[22] Brown, in press; Brandt 2000.
[23] Trevarthen 1999-2000