TIMING OF AFFECT

EPISTEMOLOGIES, AESTHETICS, POLITICS

EDITED BY

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DIAPHANES

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INTRODUCTION

Since the 1990s, a discussion of affectivity has been conducted across many disciplines, driven by cultural and feminist studies. This conspicuous turn towards affect and emotion, which can be observed in cultural, media, film and gender studies, in the social sciences, in cognitive psychology and neurology, in political science, in ethnography, but also in philosophy, has taken place in the context of a critique of the primacy of language and representation.[1]

In this focus on affect, various traditional concepts and discourses have been revived,[2] often updated with new semantic charges. This has resulted in a diversity of connotations that is often not taken into consideration, thus obscuring the theoretical and political strategies that govern the way the concept of affect is deployed. Affect is used differently, for example, in neurobiology and cognitive psychology, and differently again in psychoanalysis, or in political theory, or in philosophy influenced by post-structuralism. Moreover, many aesthetic theories refer to a concept of affect developed by Gilles Deleuze to address questions of the constitution of sensory perception/aesthesis and the specificity of artistic forms of expression. In discourses focusing on media technology (neo-cybernetics, post-humanism) the concept of affect mixes philosophical notions with techno-empirical procedures.

These terminological differences are due to culture- and discipline-specific shifts in translation, as well as specific trends in reception (such as re-readings of Spinoza, Nietzsche, Tarde, and Bergson), but they can also result from interests related to research funding. Consequently, the focus on questions of affect has contributed to a broadening and differentiation of the epistemological field and fostered a rapprochement between natural and human sciences, in some cases to the point of transdisciplinary research projects.[3]

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1 See for example: Stuart Hall, *Representation: Cultural Representations and Signifying Practices* (London/Thousand Oaks: Sage, 1997); Nigel Thrift, *Non-Representational Theory* (London/New York: Routledge, 2007); Melissa Gregg and Gregory J. Seigworth, eds., *The Affect Theory Reader* (Durham/London: Duke University Press, 2010); Patricia T. Clough and Jean Halley, eds., *The Affective Turn: Theorizing the Social* (Durham/London: Duke University Press, London 2007).

2 Among others the phenomenological tradition, including the works of Luce Irigaray, which are currently undergoing a revival. See for example: Rosi Braidotti, *Metamorphosis: Towards a Materialist Theory of Becoming* (Oxford: Blackwell Publishers, 2001).

3 See: *Languages of Emotion*, Freie Universität Berlin (http://www.loe.fu-berlin.de, retrieved March 3, 2014), *SenseLab*, University of Concordia, Montréal, CA (http://senselab.ca/wp2/, retrieved March 3, 2014).

Affective computing thus is based on a temporality of complex, discontinuous and subsequently shifting relations between science and technology. The case of affective computing illustrates how the human sciences, relying on technology and experiment, directly serve the development of media. Neither affective computing nor psychology take their own historicity and media-technological condition into account.

Translated by Maya Vinokour

ROLF GROSSMANN

SENSORY ENGINEERING
AFFECTS AND THE MECHANICS OF MUSICAL TIME

"Eleven men in four-four time" was the headline of an article I recently read in a respected German newspaper.[1] It reported on a scholarly experiment on synchronizing soccer players to achieve better performance and better results. The players of one team all heard "the same piece of music with wireless headphones, an electronic piece with a beat speed of 140 beats per minute, synchronized to the thousandth of a second. In contrast, their opponents listened to different pieces with a tempo of 119–168 beats per minute." The results were summarized by the subtitle: "they are better at dribbling, passing and shooting, and perhaps they even score more goals."[2] It is hardly surprising and easy to imagine that the team, confused by physiologically inappropriate tempos and artificially produced beats, should lose against a less troubled team. But what is noteworthy is not so much this particular experiment but the continuity of attempts to squeeze the non-verbal knowledge of music into rules and to make it usable in everyday life. And it shows the level of public discussion which corresponds to the vagueness of empirical research results that are far from having precise insights in the relationship between musical structure and bodily and emotional effects, or affective processes in a holistic view. On the other hand, we have a deep knowledge of composing or designing musical structure as a cultural practice, which, in some historical situations, is connected with more or less distinct theories of producing musical forms, patterns and figures. These poles outline the tensions we will have to deal with in this paper.

If we are working with electronic media designing aesthetic artefacts with respect to the field of synchronization, resonance and preconscious *affective* perception, we are in an open and rarely reflected laboratory of the senses and cultural behavior. There is an "indiscernible zone"[3] not only in the individual process of sensual experience between the primary affection and the conscious cognition of structure and effect but also in the cultural process of adaption and the establishing of codes for these procedures of design.

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1 "Elf Männer im Viervierteltakt," *Süddeutsche Zeitung*, 29 January, 2013 (trans. Rolf Großmann).

2 Ibid.

3 Gilles Deleuze, "Bartleby; or, The Formula," in: idem, *Essays Clinical and Critical* (Minneapolis: University of Minnesota Press, 1997), p. 81.

In music, this zone includes topics ranging from the intonation of tones (e.g. *Autotune*-FX) on the overtones of sound to microrhythm and artificial space. Electronic and especially digital media have made this area of preconscious musical time accessible – by looping, rasterizing, masking and automated analysis – for a differentiated design, but without being accompanied by a corresponding and widely established practice of conscious and reflective listening. While pitch relationship (such as counterpoint) and macrorhythm (e.g., stylized dances) were part of the musical notation of Western cultures, and while their literacy led to composition teaching and aesthetic writings in a broad cultural and philosophical discourse (e.g., doctrine of affects [Affektenlehre]), this electronic media type of "sensory engineering" (with Kodwo Eshun) is an open, experimental and dynamic practical knowledge of direct affection (Affizierung). In hiphop's "breakbeat science" or as "groove quantize" in sequencers, for instance, rhythmic structures beyond our conscious cognition are the subject of practical and aesthetic research and generate a new epistemic situation: the knowledge of designing the rhythmic "feel" of a song or track; its "swing," "off-beat" and "groove" diffuses into the mechanical grid of technical equipment and its control.

TRADITIONS

Especially in music, we are in a long tradition of presenting and evoking affects following concrete rules of composition. In this context, we already have an elaborated theory of musical affects. So if we look for traditions of an engineering of sensory stimuli that deal with rules or mechanics of affects, we can focus on a historical period of objectivation and rationalizing affects and emotions starting in the 16th century: first, as an illustration of the emotional meaning of lyrics in Renaissance and – what is very interesting for us – later, as producing affects by special means of proper composition in the *Affektenlehre* (a "theory" or "doctrine" of affects) of Baroque music. It seems that due to the dominance of the visual (film, multimedia) in the discourse that emerged as the "affective turn"[4] in the 1990s, this culturally formed historical theory of affects was not taken into consideration. Especially in the context of a new awareness of the embodiment of affects in aesthetic processes, it is remarkable that *Affektenlehre* is not only a theory but also a practical poetics

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4 Patricia T. Clough and Jean Halley, eds., *The Affective Turn: Theorizing the Social* (Durham: Duke University Press, 2007); Melissa Gregg and Gregory J. Seigworth, eds., *The Affect Theory Reader* (Durham: Duke University Press, 2010).

which has been used for around two centuries of composing music. In musicology, it is a well-known and – from the view of composition details – well-investigated topic. I would not mention it here if it were not also an important step in the epistemology of the mechanics of affects which I would like to focus on in my contribution. In this historical period, affects were not thought of as individual subjective emotions but generalized types of an emotional state of mind. These affects were derived from Aristotle and the Greek philosophy and are listed and described, for example, by Franz Lang in his *Theatrum Affectuum Humanorum*[5] or Athanasius Kircher's *Musurgia Universalis*.[6] But, as it is well-known today, Rene Descartes' classification of six basic "passions" – *l'admiration, l'amour, la haine, le désir, la joie, la tristesse* – was most influential.[7] The closely connected affects, which are caused by the passions, were understood as chemical elements in the steering mechanism of the brain and at least, the body.

The theory of affects in Baroque music is coined by the basic concepts which came from the emerging natural sciences that were outlined by Descartes: a rationalized and at least mechanical concept of the human brain and the body which came from a mechanical view of the world as whole. The resulting principles for composing affects in music accordingly followed a rational objective and general type-orientated set of rules. The models of emotional perception and activation by musical structures are derived as analogical forms from the physics of acoustics – for example the principle of resonance, which is still in use today.[8] The transmission of affects between musical structures and recipients as well as the transmission between two persons was viewed as analog to the resonance between well-tuned strings that can activate one another. Here, one of the sources of Daniel Stern's "affect attunement"[9] can be found where the metaphor of *tuning* is used for characterizing synchronization processes between mother and child. And if we want, we can find more analogies: the Baroque theory sets the movement of harmonies (*motus harmonicus*) and the movement of the brain (*motus animae*) in close relation.[10]

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5 Franz Lang, *Theatrum Affectuum Humanorum* (Munich, 1717).

6 Athanasius Kircher, *Musurgia Universalis* (Rome, 1650).

7 René Descartes, *Les Passions de l'Ame* (Paris, 1649).

8 The history of the principle of resonance and its importance for the development of rationality and modernity is deeply investigated in: Veit Erlmann, *Reason and Resonance: A History of Modern Aurality* (New York: Zone Books, 2010).

9 Daniel N. Stern, *The Interpersonal World of the Infant. A View from Psychoanalysis and Developmental Psychology* (New York: Basic Books, 1985).

10 A detailed critique of the resonance model in the context of musical meaning can be found in Eric F. Clark, "Perception, Ecology and Music," in: idem, *Ways of Listening. An Ecological Approach to the Perception of*

In terms of musical structure, the rules of the affect theory deal with the progression of melodic and harmonic intervals or cadenza, the tempo and measure, with dynamics, ornamentation and instrumental arrangement. Aria no. 58 "Es ist vollbracht" from the *Johannespassion* (St. John's Passion), composed by Johann Sebastian Bach in 1724, is a well-known and easily followed example. [Fig. 1.1 and 1.2[11]]

The example illustrates the change of affects from suffering to hope and victory in a condensed form. In the first part, there are only a few instruments with a dark character – solo violoncello instead of violins – and the vocal part is an alto, while the key of B-minor is the key of darkness and death, the tempo is slow, and the melodic contour of the phrase "Es ist vollbracht" goes downward. Everything changes when the lyrics change to the topics *victory* and *hero* ("Der Held aus Juda siegt mit Macht"); the key is now the heroic D-major, the tempo faster, and the melodic motion goes upward.

Here, music is intended as a projection of the emotional gestures of strongly stylized and codified affects. If it were composed perfectly – following the *Affektenlehre* – the senses and the body should resonate with the same affect. This normative-static model was soon expanded and dissolved during the course of the 18th century because it could no longer adapt to the dynamics of musical development.

PROGRAM-CONTROLLED PERFORMANCE

So much for Baroque affects. Now let me switch to the mechanics of affection and affect in the mediascape of the twenty-first century. Since Descartes, there have been many other concepts of music influenced by natural science, its perception and the senses. If we read Hermann von Helmholtz' groundbreaking *On the Sensations of Tone*,[12] it is immediately understandable how far-reaching the unmarked landscapes of acoustic and psychophysical knowledge were and what great efforts were necessary to enter new regions of a theory of the perception of sound. But now these laborious days seem to be gone: we can use media technology to zoom into the structures of produced, stored and performed music as well as into the neural topography of perception, cognition, emotion

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Musical Meaning (Oxford: Oxford University Press, 2005), p. 17–47.

11 "It is accomplished; what comfort for suffering human souls! I can see the end of the night of sorrow. The hero from Judah ends his victorious fight. It is accomplished!" (trans. Rolf Großmann).

12 Hermann von Helmholtz, *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* (Braunschweig: Vieweg, 1863).

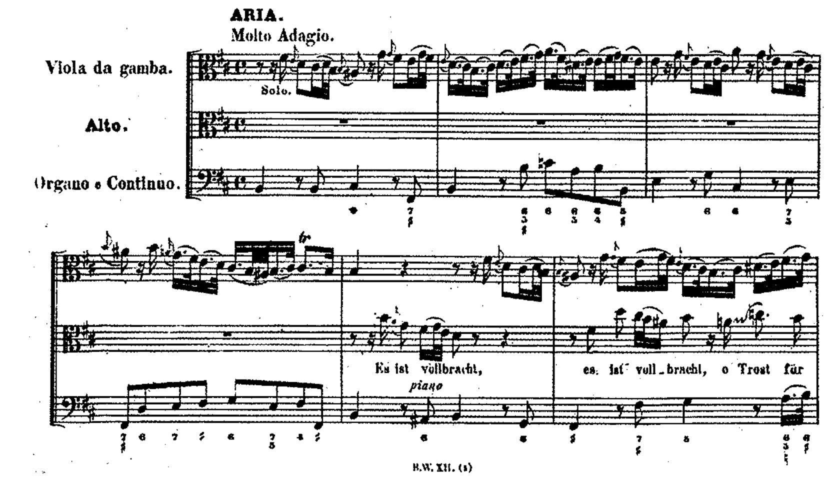

Fig. 1.1

Fig. 1.2: *Johannespassion* BWV 245 Arie Nr. 58 (alto) "Es ist vollbracht" (excerpts)

and meaning. The first method can be executed by accurately controllable synthesizers, phonography and digital sampling, through auditory and visual interfaces that allow us to analyze the "real" sound (the acoustic waves) not only the abstract notation of sheet music. The results can be used to synthesize and shape the sounding musical structure in every detail of its overtone and time structure.

But in many current fields, the goal of research is very comparable to Descartes' orientation. The enticement to find the key for a basic mechanical relationship between musical structure, affection and expressing emotions is still unbroken. That it has continued to the present is shown by research contexts like the automatic performance software Director Musices developed by the Stockholm KTH.[13] The research at the KTH is an attempt to describe and evaluate emotional aspects of music performance. Part of the experimental evaluation process is a software that produces synthesizer-generated performances, in which tonal and rhythmic microstructure is completely controlled by an appropriate set of rules. These rules correspond directly to types of emotion, which reminds us of categories we know already from the *Affektenlehre*:

> Combinations of performance rules and of their parameters can be used for synthesizing interpretations that differ in emotional quality. Performances were synthesized so as to elicit listeners' associations to six different emotions (fear, anger, happiness, sadness, tenderness, and solemnity). In a forced-choice listening test 20 listeners were asked to classify the performances with respect to emotions. The results showed that the listeners, with very few exceptions, recognized the intended emotions correctly.[14] [Fig. 2[15]]

The large share of media configurations in the "knowledge ability" of musical structure and its affective impact is remarkable. Basically, conventional notation is still the paradigm of literacy in the Director Musices software, but now the original function of operating instructions for the performance is also delegated to a (programmed) medium. The rules of the automatic performance couple musical notation with another media-writing, which yet seems to contain (to "embody") the complex performative knowledge which was generated from the body knowledge of practicing instrumentalists. The embodiment of human body experience and practice in configurations of human computer interfaces (HCI) and software in music has been investigated in several research contexts.[16]

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13 I would like to thank Kai Köpp, Bern University of the Arts (Switzerland), for giving me the reference to KTH Royal Institute of Technology (Kungliga Tekniska Högskolan, Stockholm).

14 KTH-Department of Speech, Music and Hearing: http://www.speech.kth.se/music/performance/performance-emotion.html (retrieved February 25, 2014).

15 http://www.speech.kth.se/roberto/emotion/ (retrieved February 25, 2014).

16 Jin Hyun Kim and Uwe Seifert, "Embodiment: The Body in Algorithmic Sound Generation," *Contemporary Music Review* 25.1/2 (2006): p. 139–149; Jin Hyun Kim, *Embodiment in interaktiven Musik- und Medienperformances unter besonderer Berücksichtigung medientheoretischer und kognitionswissenschaftlicher Perspektiven* (Osnabrück: epOs-Music, 2012).

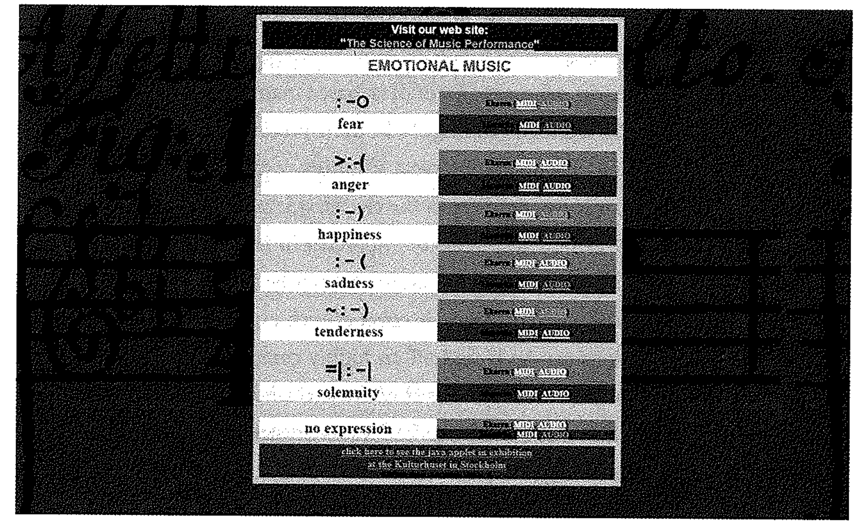

Fig. 2: To get an impression of how the program works and what differences can be heard, rule-based "emotional music" performances can be played via the KTH website.

The reason for the uneasiness one feels about this transfer of 17th-century mechanistic thinking into the computer-controlled presence is right here. The hubris of defining affective processes in a set of parameters to directly compare the automatic performance to a trained pianist reduces the cultural practice of composition, performance and reception to an almost absurd degree and thus even falls behind the simple mechanical concept of the *Affektenlehre* as a set of rules in poesis. Nevertheless, for the purposes of scientific experiments, it could be quite interesting to compare the performance results of the program with a culturally educated and musically trained human instrumentalist if we are – as the KTH Team surely is – aware of these reductions.

NEUROPERSPECTIVES

As one new establishing discipline in music psychology the neuroscience of music raises expectations in discovering significant insights into operations of the brain. These perspectives should grant new views on the processes that start when we are affected by music. If we were to have a deep knowledge of the brain processes, it seems that we could explore new principles of relationship between media design, affections and emotional effects. For questions of timing, studies on neurophysiological correlates of the syntactic processing of music are very instructive because they deal with a precise timeline of perception.[17]

Neurological experiments generate a lot of data, based mainly on levels of activation, its physical location in the brain and timing. To be more precise, in the common experimental design, "activation" means to observe a stimulus-related increase in blood circulation (the "hemodynamic reaction") or in the electrical level of brain regions (Event-Related brain Potential = ERP). These data are important in searching for answers that are related to the medical functions of the brain and can be found by comparing and analyzing stimuli-response patterns. As a side effect of such experiments and the resulting data, some speculations can be kicked off on highly complex cultural phenomena like the processing of musical structure, its similarity to language or even more complex, musical meaning. But there seems to be a Heisenbergian uncertainty principle in neuroscience: the closer we get to phenomena of consciousness, sense, meaning and cultural practice, the more the observed and the observing brain discover new layers of constructive processes that question the sharp and definite knowledge that we have just won in the observation of physical processes of the brain.

In our context, I am not interested in these speculations but in the temporal process of reception that is documented in the data of brain activation (the ERPs). So let me quote a short passage that describes the first activation responses:

> The earliest ERP responses elicited by an auditory stimulus are the auditory brainstem responses, which occur within the first few milliseconds (ms) after the onset of the stimulus. These responses appeared to be automatic, that is, unaffected by attentional factors. The brainstem responses are followed by the so-called middle latency-responses which are presumably generated in the primary auditory cortex. Their latency is from about 9 to 50 ms after stimulus onset.[18]

The first components that are "modulated by attentional factors" occur at around 100 ms. And now we are not speaking about conscious reception, which decodes semantic information on a level of mental awareness. [Fig. 3[19]]

If we take the ERP timescale as a background to focus on the time structures in music production with sequencers or digital audio workstations (DAWs) we are work-

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17 Stefan Koelsch, *Brain and Music* (Chichester: John Wiley & Sons, 2012), p. 212.

18 Ibid., p. 52.

19 Ibid., p. 120.

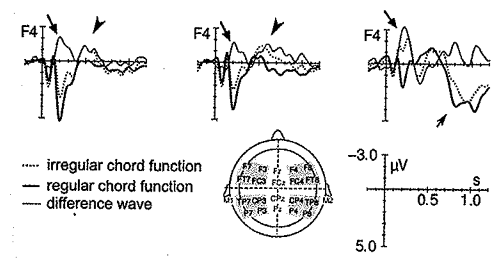

Fig. 3: ERPs elicited by regular and irregular chord progressions.

ing in time grids that are far below the threshold of conscious perception. But they are visualized in graphic interfaces and, of course, time manipulations can be identified by trained listeners due to the resulting effects. Common sound effects and enhancement processors deal with time differences below a few microseconds. The half-second which is widely discussed in affect discourse is half an eternity in music, especially in the spatial perception and rhythmic structures of groove-based contemporary music like jazz and pop.

To give a few examples, spatial perception is caused by runtime differences of the acoustic waves in relation to both our ears. If we double a signal, spread it to two channels and delay one channel around 3 ms, no delay will be heard, but a new impression of space will emerge (an effect that is well known as the Haas-Effect). If we do not split the signals into two channels but mix them directly into one channel and gradually increase the time delay of the signals, we first get combfilter and "phasing" effects, then a sort of fattening or doubling impression, then echo, then repetition and – if delayed in beat-related time – rhythmic effects. The signal itself can be identified as a delayed signal – and this experience matches the ERP timescale – in the doubling and echo phase above 100 ms delay.

Beside sound effects and, perhaps even more importantly, in the center of a performed musical structure, there are relative time positions of sound elements in a rhythmic pattern. Even if we consider that we group patterns of events in an active process of rhythm cognition, the difference that a timeshift of a few percussive events for some milliseconds in relation to the rest of the rhythmic texture induces is crucial for the "feel" and flow of a piece of music. Phenomena such as groove, flow, and swing can be seen as results of micro-timing, which for current music production software means a specific deviation of note-events compared to the mathematically calculated correct time grid. In the early days of sequencing, the simulation of human performance was achieved by a random deviation of notes (the "humanize" function), while an orientation towards specific mask-designed grooves was not possible. The KTH software that simulates "emotional music" performance, as mentioned above, has already implemented functions for manipulations of the relation between long and short notes ("duration contrast") and the delay between soloist and drums ("ensemble swing").[20] Current tools available in common audio workstations for rhythmic design allow not only a continuous scaling of a swing factor and individual groove quantize, but also the analysis of preexisting sound material as drum-breaks or bass-loops. The extracted and stored microrhythmic map ("groove map") can be applied to a newly constructed sound pattern or breakbeats which were cut ("chopped") into elements and reassembled. [Fig. 4][21]

Both examples, the research on musical performance of KTH as well as the grid-based microrhythm in sequencer programs, show the extent to which the calculative literacy of digital media redefines the relationship between musical practice and body knowledge. Despite these sophisticated and powerful tools, no clearly defined abstract rules for constructing specific grooves or "expressive timing" in professional production have emerged so far. It seems plausible that beside the deviation to the mathematical grid, a complex mesh of psychophysical and cultural preconditions plays an important role, as Rainer Polak summarizes his "chronometric project" on Jembe Music from Mali: "From a culture-sensitive perspective, the common understandings of expressive timing emerge as limited. It is more universally valid, I suggest, to conceive of expressive timing as rhythmic variation of metric expectation."[22] If we follow this consideration, studio production merges extremely divergent poles of aesthetic design: Highly developed digital tools for calculative analysis and programmable automation are used with experience-based trial and error methods of an experimental laboratory of musical timing.

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20 For more details, see: http://www.speech.kth.se/music/performance/performance_rules.html (retrieved February 27, 2014).

21 Cubase 6.0 Advanced Audio Production System, Fa. Steinberg, Hamburg.

22 Rainer Polak, "Rhythmic Feel as Meter: Non-Isochronous Beat Subdivision in Jembe Music from Mali," *Music Theory Online* 16/4 (December 2010), http://www.mtosmt.org/issues/mto.10.16.4/mto.10.16.4.polak.html (retrieved February 27, 2014): "The objective of the chronometric project was to test the existence of rhythmic feel patterns, specify their structure and proportions, and analyze their stability and correlations with tempo, ensemble size, ensemble parts, rhythmic grouping structure, and personal styles. The approach was to calculate the intervals between strokes (IOIs), which are given in milliseconds (ms), as percentages of the normalized beat duration, or '(pulse) timing ratio.'"

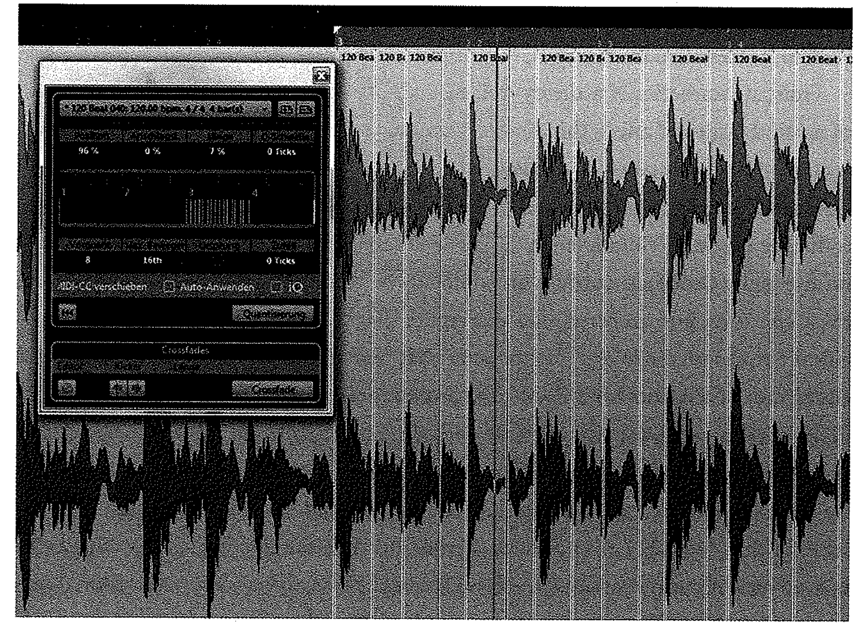

Fig. 4: *Quantize* Sequencertools

This type of "affective computing"[23] is present, hidden as hyper-realistic simulation or visible as aesthetic design, in the mainstream of everyday media culture. Spatial simulation, groove quantize and enhancement algorithms can be found in every current music production. The affective quality of music in the electronic media is decisively shaped to a considerable extent by specially designed time structures that lie in a range beyond the above mentioned "attentional factors" and which come to conscious perception only through complex cognitive and cultural processes.

VIBRATIONS

The focus on advanced musical structures in tonality and rhythm lacks a whole area of auditory practice, which is latent in Western European art music but has been hidden

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23 See also: Anna Tuschling's text in this volume.

from the established aesthetics of music: the direct physical affection by the vibration itself or, as Steve Goodman puts it, "vibrational force."[24]

From an aesthetics of a theory-guided, codified, mechanically planned connection of musical form and affect, this view is concerned with a brute force attack on our perception system: the power of acoustic waves. Sound as a weapon that induces fear and discomfort in its most simple and probably most effective form is based on the direct influence of sound vibrations on the ear and, especially in low-frequency vibrations, on the body. Goodman outlines an "ontology of vibrational force" that goes beyond these effects on human perception and argues that we need a multi-disciplinary "specifically tuned methodology" for the sonic that "delves below philosophy of sound and the physics of acoustics toward the basic processes of entities affecting other entities."[25] "This ontology is concerned primarily with the texturhythms of matter, the patterned physicality of a musical beat or pulse, sometimes imperceptible, sometimes, as cymatics shows, in some sensitive media, such as water or sand, visible."[26] A visual icon often used for the physicality of sonic forces beyond music is the change in the arrangement of sand on a vibrating surface known as *Chladnische Klangfiguren*. They are material pictures of sound, enabling its effect to be traced directly. [Fig. 5]

It is not accidental that these visualizations should come from a historical phase of the formation of natural sciences closely following Descartes, and, as Goodman points out, it would be just as problematic as in the *Affektenlehre* to produce a mechanical relationship between the power of the vibrations and the effects of affection. However, and this is why the images of such forms are quite instructive, they demonstrate very clearly the massive physical effects of "vibrational forces."

A path to a contemporary aesthetic of such premusically effective sound structures crosses the bass frequencies of the dub, its offshoots in dance and disco music and its successors in hiphop, techno and, referring to Goodman's producer alter-ego as *Kode9*, dubstep: club music, in which sonic force creates a rhythmically organized, community-building atmosphere of vibrations. This "affective mobilization"[27] by "bass materialist practices"[28] brings into the game a psychophysical dimension beyond the elaborate and culturally determined structures of melody and harmony, a direct physical affection

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24 Steve Goodman, "13.7 Billion B.C.: The Ontology of Vibrational Force," in: idem, *Sonic Warfare. Sound, Affect, and the Ecology of Fear* (Cambridge, Mass.: MIT Press, 2010), p. 81–84.

25 Ibid., p. 81.

26 Ibid., p. 83.

27 Ibid., p. xx.

28 Ibid., p. 28.

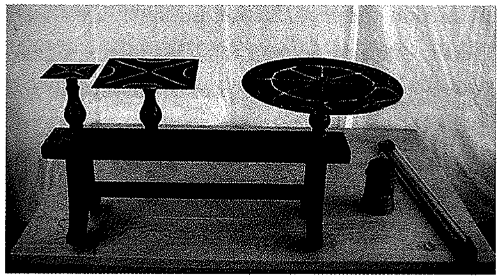

Fig. 5: Chladni figures, experimental setup, method published by Ernst F. F. Chladni 1787.

of the senses and the body, alternating between violence and sonic synchronization of community building perception.

With the aim of "an investigation of the material processes that accompany the sonic fictions,"[29] Goodman refers to Kodwo Eshun's collection of afrofuturistic essays that appeared in 1998 and is subtitled "Adventures in Sonic Fiction."[30] There, Eshun develops a discursive frame for two highly relevant terms: "break-beat science" and "sonic engineering," terms of a hybrid media-techno-human musical practice of auditive production and reception.

SENSORY ENGINEERING

As soon as cutting emerges, Rhythm migrates from the drums to the Technics, from the group to the dj, from the studio to the bedroom. Limb by limb, the drummer is transferred to the machines. Breakflow scales across the globe. Phase 1: the decks. Phase 2: the rhythm synthesizer. Phase 3 will be the sampler.[31]

The doors for a laboratory of auditory affects open with a new kind of writing, with phonography ("the decks") and with a new code, the programming of digital media. Media technologies as discussed here offer a new approach to the mystery of sound and rhythm, especially by making time structures available for precise manipulations from the shape of waves through delay and reverb to the construction of rhythmic patterns.

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29 Ibid., p. 4.

30 Kodwo Eshun, *More Brilliant than the Sun. Adventures in Sonic Fiction* (London: Quartet, 1998).

31 Ibid., p. 02[017].

As was to be demonstrated, media production and reproduction machines are always deeply linked to human reception. There are no neutral tools for transmitting signals from A to B and the artifacts which are designed for media reception are optimized and enhanced to achieve a maximum of attention and, not least, economic success. Media are always "outsourcing various aspects of the psyche into technological objects."[32] These "media objects"[33] are not objects of technological distance to the senses. Indeed, they are artificial, constructed, products of science, and engineered but they intensify sensory experience by connecting our senses directly to a simultaneously mirroring and generating machine.

One evident example is the practice of DJs exploring the elements of breakbeats through the recurrent repetition of the medially formed loop, to which the perceptual apparatus is docked until it becomes part of the media configuration itself. Or the practice of Jamaican dub, which can be seen as a laboratory for hybridization of transcultural musical practice, alienation of suppressed ethnicities and electronic music technology. One of the inventors of dub, Lee Perry, is attributed the role of a protagonist of a hybrid practice of techno-cultural "black electronic":

> Of course, Perry's instrumentals were also formed in the machine, and it's this imaginal network between the machinic and mental realms that opens up both the disembodied architectures of cyberspace and the more abstract dimensions of the drum. West Africa's polyrhythmic ensembles can already be seen as deploying a kind of abstract machine, their enormous intensities engineered with a notable coolness, precision, and craft. [...] This crisp and cool sensibility informs the Black Electronic's unique reconfiguring of the physically alienated or "mental" labor necessary to engineer electronic musical spaces.[34]

The question remains: What type of knowledge and science is inherent in designing this *terra incognita* between a blind practice of doing things that make an effect,

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32 As Eshun summarizes a contribution of Paul D. Miller (aka DJ Spooky that Subliminal Kid) to the Neuro-Aesthetics Conference, Goldsmiths University, London UK, May 2005: Kodwo Eshun, "The Affective Logic of the Sound File in the Age of the Global Sound Archive," *Journal of Neuro-Aesthetic Theory* 4 (2005–2007), http://www.artbrain.org/category/journal-neuro-aesthetic-theory/journal-neuro-aesthetic-theory-4/ (retrieved February 27, 2014).

33 "Computerbasierte Medienobjekte," in: Georg Trogemann and Jochen Viehoff, *Code@Art. Eine elementare Einführung in die Programmierung als künstlerische Praxis* (Vienna: Springer 2005), p. 125.

34 Erik Davis, "'Roots and Wires' Remix: Polyrhythmic Tricks and the Black Electronic," in: Paul D. Miller, ed., *Sound Unbound. Sampling Digital Music and Culture* (Cambridge, Mass.: MIT Press 2008), p. 53–73, here p. 62.

media technology and the rationalized attempts to control affects, emotions (or what is reduced to the term "mood *management*" in the current psychology of music, which is not so far from the mechanical view of affects in the era of Baroque.) Microrhythmic patterns are located in a time range that cannot be clearly and precisely identified by conscious reception. Without media tools, our access to this phenomenon is very limited. Perhaps we would not even know it as a means of design but only as a mystified resource of musical intensity (like "black" swing in the former days of jazz).

> And the thing I notice about breakbeat science, about the way science is used in music in general, is that science is always used as a science of intensified sensation. In the classical two cultures in mainstream society, science is still the science that drains the blood of life and leaves everything vivisected. But in music it's never been like that; as soon as you hear the word science, you know you're in for an intensification of sensation. In this way, science then refers to a science of sensory engineering.[35]

There is a specific media knowledge of processes that need electronic, and in some extensions, digital media as epistemic preconditions not only as analytical or algorithmic tools or instruments but also as sensory connections between humans and new types of machine mediated artifacts. And we can use media as knowledge machines for memorizing, re- and deconstructing sediments of aesthetic practice. Breakbeat science and sampledelia are part of a practical hybrid man-machine science which contains imaginary models for hitherto unheard of relations and layers of motion and time, and which enables us to design new aesthetic experiences based on this hybrid knowledge of sensory engineering.

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35 Eshun, Sonic Fiction, p. A[177].