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Late to the party

Concerning contemporary music's current (and long overdue) broadening of practice

1. Introduction

At British University Music Departments during the 1990s it was commonplace for students to take a compulsory year-long course entitled „compositional techniques“¹ before being allowed to write music in a style of their own choosing. Compositional techniques consisted of learning how to mimic musical forms from the era of common practice: Bach chorales, Baroque-style fugues and Mozart string quartets. There was always quite some debate concerning compositional techniques, especially with regards to the nature of its exact purpose. Was it intended for future musicologists and music theorists, so that they could get their hands dirty with the material of the 18th century? Or was it really, as the title of the course suggested, a primer for those wanting to be composers, the implication being that knowing how to write tonal harmony and counterpoint was essential to the practice of (contemporary) composition. It is difficult to know what, if anything, composition students could learn from such a course. The only thing that comes to mind is that it might have helped to develop in them an awareness of how one constantly had to check both vertically and horizontally as you were writing the music in order to make sure it all sounded ‚good‘. It was at best a transferrable skill: a skill developed in one situation that could be put to use in a differing context.

And then, moving on from this, what are the skills that a composer of instrumental and electronic music can apply to, say, making a video? Who dare apply them? Does knowing how to edit audio in Protools mean that you are qualified to edit film in Final Cut? Certainly, once we enter the realm of digital technology, differences between disciplines are ironed out a little. We can begin to see the similarities in the interfaces of audio and video software: zoomable timelines, choices of formats, bins filled with material, cross-fades and cross-dissolves. In the end it is all just composition: arranging things in time, understanding the potential of the materials, and checking that everything seems to work both horizontally and vertically.

I am not the first person to focus on the broadening of compositional practice and how it might be considered as one of the more striking aspects defining

my generation of composers and the ones below. Jennifer Walshe and Marko Ciciliani have already written eloquently on the subject. While Walshe's „The New Discipline“² and Ciciliani's „Music in the expanded field“³ approach their subjects very differently, they are united in two assertions. Firstly, that composers working in practices that go beyond the traditional limits of contemporary instrumental and/or electronic concert music, are doing the ‚extra-musical‘ things themselves and not in collaboration, and secondly that in order to do this, they have had to dig deep into their own artistic resources in order to find a set of transferable skills.

I would like to try to situate myself as an artist within this discourse on broadening, and in order to do so, I will be a little more specific in my approach than either Walshe or Ciciliani, and concentrate on my own interests: the implications of the idea of intermediality, and how this might relate to approaches to audio-visual work practiced by those with a background in musical composition. The title of my paper suggests that we in contemporary music are a little behind the other arts in freeing ourselves from the boundaries of monomedia, and although this may well be true, I have no interest for the moment in trying to prove such an assertion. Instead, I would like to amend my proposition and talk about some possible approaches to audio-visual work, that are so to say, slightly late to a party that was half-started fifty years ago on the other side of the Atlantic. I have a personal affinity with American Experimental music and film from the 60s and 70s, and during this paper I will try to make some connections, via intermedial theory between some of the concerns of artists and thinkers from that era and those of my own and some of my contemporaries. I have opted not to talk about my work, but have chosen pieces by Johannes Kreidler and Alexander Schubert that display, albeit in very different manners, similar interests to my own.

2. Intermedia

„Much of the best work being produced today seems to fall between media. This is no accident. The concept of the separation between media arose in the Renaissance. The idea that a painting is made of paint on canvas or that a sculpture should not be painted seems characteristic of the kind of social thought — categorizing and dividing society into nobility with its various subdivisions, untitled gentry, artisans, serfs and landless workers — which we call the feudal conception of the Great Chain of Being ... However, the social problems that characterize our time, as opposed to the political ones, no longer allow a compartmentalized approach. We are approaching the dawn of a classless society, to which separation into rigid categories is absolutely irrelevant.“⁴

Jens Schröter has arranged the various types of intermediality and the discourses surrounding them into four categories. His first category, what he calls

„synthetic intermediality“⁵ is perhaps synonymous with the idea of the Gesamtkunstwerk and owes a great deal to the ideas put forward by Fluxus artist Dick Higgins (see above) and media theorist Marshall McLuhan. Synthetic intermediality finds its force in new combinations of media the meeting of which create as McLuhan says, „a moment of freedom and release from the ordinary trance and numbness imposed by them on our senses“.⁶ In order to maintain this effect, intermedial forms must be continually renewed before we become too used to them, and in fact the idea of breaking the habits of perception through art is a central concern of the work I will talk about.

As one might imagine, the phenomenon of synesthesia has been appropriated with great enthusiasm by those writing about intermedia. It might be a kind of synesthesia that characterizes the ‚natural‘ state of art, the primordial goo, out of which monomedias have arisen over the course of history. Schröter states that the formation of monomedias is „the result of purposeful and institutionally caused blockades, incisions, and mechanisms of exclusion“;⁷ whereas Allen S. Weiss describes „an implicit nexus of synesthesia and heterogeneity in all arts, such that every art form has correspondences with, explicitly or implicitly, all other art forms“,⁸ one in which „formal transpositions are possible between all art forms“.⁹ I find Weiss’s idea of an unending potential for formal transposition particularly appealing and I believe that it ties in directly with the notion that composers have transferable skills, and that it is these skills that allow them to engage with the intermedial.

There is a darker side to all of this, however. Processes of transposition between forms, the creation of intermedial works and the blissful return to the primordial, utterly interconnected state of art has been greatly facilitated by the rise of the digital, and the ease of working in this realm that is afforded by its platforms. Whereas back in 1965 Higgins talks about intermedia and its breaking down of hierarchies and categories in Marxist terms, the reality today is something much more politically ambiguous. Charlie Gere’s 2002 book *Digital Culture* approaches the subject from a highly critical standpoint, warning us against the „technological enchantment“¹⁰ practiced by proponents of the digital. He also reminds us of the similarities between the digital and the modus operandi of capitalism, a system described as

*predicated on abstraction, standardization and mechanization, to ensure that it can operate as a universal machine, capable of treating disparate phenomena as equal and interchangeable.*¹¹

Friedrich Kittler, describes the ultimate digital endgame where „sound and image, voice and text are reduced to surface effects“.¹² Like the nightmare reverse side of the intermedial nexus, Kittler predicts a situation in which

... any medium can be translated into any other. With numbers, everything goes. Modulation, transformation, synchronization; delay, storage, transposition;

*scrambling, scanning, mapping a total media link on a digital base will erase the very concept of medium. Instead of wiring people and technologies, absolute knowledge will run as an endless loop.*¹³

3. Composers and Film

We will bear in mind the role of the digital later on in this paper, as it relates to the work of Schubert and Kreidler, but for the moment I would like to go back in time. In 1967 Steve Reich created a conceptual work entitled *Slow Motion Sound*. It consisted of the following instruction: „Very gradually slow down a recorded sound to many times its original length without changing its pitch or timbre at all.“ Writing about the work seven years later, Reich explains that although some non pitch-shifting time-stretching techniques were available at the time, they were not able to lengthen the sound to the extent and in the way that Reich desired. Reich saw his non-pitch-shifted ‚imagining‘ of slow-motion sound as the natural analogue of slow motion in film and was greatly influenced by the work on slowness that was characteristic of much experimental film and video of his time.¹⁴ Being influenced by currents in the visual arts, however, is not the same as being an intermedial artist. To give a more recent example, the output of the composer Bernhard Lang owes a great deal to the micro-looping techniques of the film-maker Martin Arnold, but Lang engages with the visual and theatrical only in the context of more traditional collaborative set-ups with other artists.

So, if composers are going to do it all for themselves and become truly intermedial artists, what could they have to offer the field and how might they approach the audio-visual? In fact, between commercial films and television, pop music videos and *YouTube* clips, one could say that the world is already filled to the brim with audio-visual intermedia, but it is another matter as to whether we find the audio-visual relations found in them particularly stimulating. The truth is that certain conventions regarding the way that sound and image are put together dominate these types of media. I do not wish to list them here, this list is long and not of central concern, only to say that it might be the job of a contemporary composer to, as McLuhan says, release a spectator from the numbness that has been imposed on them by these forms. I have isolated two distinct approaches for composers dealing with the audio-visual: the first I would describe as visual music or musicalized visuals, and the second as being concerned with issues of sampling.

4. Visual Music / Musicalized Visuals

I would like to look at the idea of transforming sound into image (and vice-versa) through the use of analogue and digital processes, and by imagining one through

the lens of the other. Such transformations provide possible meeting places between the audio and visual rooted in concrete correspondences rather than artificial conventions, and as always, it is the hope that these approaches to art might reinvigorate creative practices and forge new kinds of links between disciplines. Relationships between the audio and visual extend far beyond the things we will discuss. Some of these relationships are related to cultural practices — the score for instance, is a visual medium that nearly always accompanies Western art music, as is the sight of the performers playing that music in a concert situation. In the schizophrenic context of electronically reproduced sound there is always something to look at, arguably even when we have our eyes closed — it simply may not have any causal or composed relationship to the object of our listening. Certainly, beyond synesthesia, we are all capable of giving music a visual dimension in our minds. In his book *Music and memory*,¹⁵ Bob Snyder talks about „image schemas“, cognitive structures that form the basis of the metaphorical mappings we apply to sound as well as other perceptual phenomena. He defines them as follows:

*Image-schemas are thought to be derived from commonalities in different experiences that seem related; as such, they are believed to form a basis for our conceptual systems, indeed to connect our perceptual experience and concepts. Image schemas represent the most stable constancies and structures we all share as human beings, derived from dynamic patterns of interaction with our environment.*¹⁶

Snyder specifies musical metaphors such as the up and down of pitch, tension, and centrality as having originated in a more generalized conception of the way the world is — though some image schemas may well be culturally specific.¹⁷ Furthermore, despite being called ‚image schemas‘, these cognitive structures are not entirely visual in nature, they exist „somewhere between concrete, specific visual images and abstract concepts“ often incorporating „a kinesthetic component“.¹⁸ Perhaps it would be better to speak of a kind of mental space which we might imagine sound or music to occupy — different entirely from the way that sound inhabits an actual space, as a bunch of invisible vibrating air molecules bouncing off objects and walls in complex ways.

In contrast to the inner musical world, lying partway between image and concept, the sonic also meets the visible more concretely in what Douglas Kahn refers to as the „jagged phonographic line“,¹⁹ a line representing the pressure fluctuations over time of a sound source. The invention of audio recording technologies in the nineteenth century made this line accessible, and with this accessibility a new world of ideas about sound and music was opened up. The early days of audio-recording and the excitement generated by the possibilities of sound media have been well-documented by writers such as Kahn and Kittler. For instance, the artist Moholy-Nagy proposed doing away with acoustic

input and starting from the bottom up by designing a „groove-script alphabet“ that would form the basis of compositions that could be engraved directly into a gramophone record.²⁰ However, these speculations fail to come to terms with the full complexity of the relationship between what the acoustic line looks like and how it actually sounds. I have the feeling that Moholy-Nagy’s groove-script alphabet, had it ever been realised, would have had an intriguing appearance, but resulted in a selection of dull crackles and thuds.²¹ The audio waveform simply does not represent sound in the way that we need it to be represented in order for us to grasp those things, such a pitch and tone colour, that we hold so dearly.

Alvin Lucier’s *The Queen of the South* from 1972 involves cymatics, the study of making sound visible by passing its vibrations through solid or liquid matter, and in the case of a Chladni plate, via a centrally mounted metal surface sprinkled with sand. The patterns that occur are nodal lines created by the modes of vibration passing through the material, and the devices used in cymatics are generally designed to vibrate symmetrically. The effect of the sound on a Chladni plate, especially the quality of movement in the patterns as that sound changes, is objectively very beautiful. The symmetry helps too — rather like a kaleidoscope, the complexity of the designs is given order by being reflected two-fold, four-fold or more. Lucier’s piece, inspired by the work of Chladni and its revival in the twentieth century by the Swiss doctor Hans Jenny, is text-based and sets out instructions and suggestions for using cymatics to create an audio-visual performance. It begins with the following words:

*Sing, speak or play electronic or acoustic musical instruments in such a way as to activate metal plates, drumheads, sheets of glass or any wood, copper, steel, glass, cardboard, earthenware or other responsive surfaces upon which is strewn quartz sand, silver salt, iron filings, lycopodium, granulated sugar, pearled barley or grains of other kinds or other similar materials suitable for making visible the effects of sound.*²²

Admittedly, I have never seen a live performance of the work, only videos on the internet, and though there is of course an utterly direct analogue connection between sound and image, I do wonder if this is what I would like „making sound visible“ to actually be. Chladni patterns are not so far away from the „jagged phonographic line“, they are simply more interesting to look at after having been given an extra dimension, and enhanced by symmetry. In the end though, I cannot tell what pitches are being played, or anything about the timbre of a sound by looking at the patterns, and ultimately I consider the discernibility of these parameters essential to the creation of ‚visible music‘.

In December 2016 I saw a test version of Johannes Kreidler’s *The Wires* for cello, video and playback written for the Norwegian cellist Tanja Orning. In this work Kreidler uses what he refers to as a process of ‚sonification‘ to provide us

with a more intuitive seeming analogue between sound and image. Sonification is quite a broad term that refers to the transformation of data into non-verbal audio. Its applications are generally practical and can be found in devices such as the Geiger counter or heart-beat monitor. Kreidler uses sonification extensively in his works involving video in order to translate images, moving graphics or physical gestures into sound. He makes use of a frequency mapping that corresponds to the conceptual space of the image schema that I mentioned before as well as, to a certain extent, the musical score and the frequency domain.²³ It proves to be a useful space for Kreidler, inasmuch as it allows him to make connections between the musical and the non-musical, to insert the non-musical into the musical (and vice-versa), to give the non-musical a voice, and ultimately to develop this space and play with the audio-visual mappings and how they relate to received ideas about music and the way it functions.

The non-musical subject of *The Wires* are the various types of barbed wire found in an illustrated catalogue entitled *Barbs, prongs, points, pricklers and stickers* by Robert T. Clifton.²⁴ We cannot help but associate this subject with a kind of brutally enforced control of borders and boundaries, of not letting people either in or out, and so by extension we are reminded of the troubled times we live in. However, beyond its political connotations, there remain resemblances between the shape of the barbed wire and the idea of a musical figure, phonographic line or even the staff and bar lines of a score, and it is these connections that Kreidler exploits in order to explore different kinds of sound-image spaces while simultaneously keeping the real world in full view. When sonified, the barbed wire sounds, as we expect it to, like a wavering sustained small group of tones regularly interrupted by short bursts of wide cluster-type sounds corresponding to the vertical 'barbs'. The idea of a musical line is reinforced by the cellist who has been given similar material to that of the sonified wire: long notes periodically broken up by shorter more percussive sounds. Kreidler though, problematizes these intuitive mappings by incorporating his own version of *The Queen of the South* into the piece. He makes sound visible by displaying the acoustic wave of the live cello superimposed onto the illustrations of wire and we are confronted by the complex physical reality of a held note as opposed to the musical-image space conceptualizing of it. The piece is layered in quite a unique way. Its sonic and visual components facilitate a kind of hyperconnected thinking, that in turn produces a range of interlinked questions. To what extent can such potent images be made abstract by means of visual-audio transposition? Are some types of wire objectively more beautiful than others and how does this correspond to sonic beauty? Is there enough variety in these forms to make a piece? Can the times we live in be sonified and if so, what exactly would such a sonification tell us?

5. Sampling and Flicker

The French filmmaker Jean-Luc Godard is frequently quoted describing cinema as „truth 24 times per second“.²⁵ I would like to transpose Godard’s statement and apply it to digital audio as well, which at a standard CD sampling rate might be said to be a kind of truth (if indeed a voltage reading constitutes ‚truth‘) 44,100 times per second. Sound-media traversed Kittler’s categories over three decades ago, leaving behind the continuous formats of gramophone and magnetic tape, and entering into the realm of the digital and therefore the discrete.

Godard’s statement contains an implicit criticism of the medium in question, one which might prompt us to modify the original citation and state instead that „cinema is truth only 24 times per second“. Why can’t it be truth 240 or 2400 times per second, or even truth for the whole continuous duration of that second? What about those in-between moments, short as they are, when the rotating shutter of the movie-camera is closed, or between voltage meter readings in an analogue to digital audio converter, when whatever it is that happens during this tiny interval fails to register?

The idea of ‚sampling‘ as being common to both film and digital audio could presumably act as the starting point of work seeking to explore intermedial spaces, as it does in Alexander Schubert’s *Sensate Focus* from 2014, written for the group that I run with Matthew Shlomowitz, Ensemble Plus-Minus.

A great deal of film theory has been written on the subject of film’s inherent bittiness and the way that it attempts to conceal the manner of its own making. In 1970 Jean-Louis Baudry wrote:

*Projector and screen restore the light lost in the shooting process, and transform a succession of separate images into an unrolling which also restores, but according to another scansion, the movement seized from ‚objective reality‘.*²⁶

It is interesting that Baudry uses the word ‚scansion‘ — it reminds us that film has a kind of rhythm and that it is the revelation of this rhythm that was the focus for a generation of film makers who wished to reveal how the technology we take for granted works. They chose to underline the 24 fps of film by extremely rapid editing, using the frame itself as the basic ‚rhythmic‘ unit. The flicker movies of the 1960s and 70s, made by artists such as Peter Kubelka, Tony Conrad and Paul Sharits, stripped back film to basic materials of black, white or coloured frames. Kubelka has always claimed a certain type of musicality for this film, a musicality which I suppose is intrinsic to all flicker films inasmuch as they have a 24 frames per second tempo. It is probably not surprising that Kubelka is himself a competent classical musician, and of course Conrad was as well-known for his involvement in experimental music as he was for his visual art. By ‚un-smoothing‘ the illusion of film, the flicker film-makers not only revealed the basic discrete component of the frame, they found a different kind

of way of connecting it to sound/music, far-removed from the aesthetics of the traditional movie score.

Revealing the sample rate in digital audio, however, is not quite such a straightforward matter of course, given the speeds involved and the interdependence of pitch and sampling rate. Instead, as in the glitch music that emerged in the 1990s, a possible solution could be to work with the sound of malfunctioning digital audio. The micro-looping grains that characterize glitch might be seen as a representation, writ-large, of the sampled quality of the digital, of the discrete and discontinuous. Alexander Schubert is in many ways a child of his time, and in *Sensate Focus* he reveals both the influence of glitch music, and his experience of the immersive strobing audio-visual context of a rave party. Perhaps the most sophisticated aspect of the work is the way in which Schubert blends the sampling theme into a performance situation that uses both recorded and live elements. He has said that he finds the incorporation of video into concert performance, and the separation between screen and stage that is inevitably created by this incorporation, inherently problematic. Instead Schubert finds a solution for presenting 'sampled' visuals in a set-up involving a darkened hall and four very responsive LED lights hung over the heads of a row of four musicians. Each performer can be made to appear, disappear and flicker at various rates through the manipulation of the LED lamps, and so in effect the use of light becomes a tool for live visual editing. This possibility for live editing allows Schubert to play with the conventions of the concert image. The pattern of moving and flickering lights sometimes articulates a live audio-source (a musician making a sound), leads us to associate a moment of playback with a particular musician (even if they are not responsible for making the sound), underlines the rhythms and accelerandos of the music, and in effect becomes another (silent) layer of the work, acting on the sound to bring elements of it into or out of relief.

Precise audio-visual synchronization is made possible by the pre-programmed light display and the mixture of playback and click-tracked live instrumentalists that constitute the sound. The live sound only occasionally, as with a violin tremolo, mimics the grainy sampled-quality of the audio micro-loops of playback or the flickering lights, but together these three elements are bound by a sense of fluctuating ambiguity regarding playback and liveness, and throughout the piece our attention is in turn directed and misdirected by this interplay.

I would say that Schubert's work here displays both the use of transferable skills, as well as the trend amongst his generation of composers to do it all for themselves. He has a background in programming that he admits facilitates the handling of all kinds of data, and it is the exchangeable nature of the audio and visual information in his creative world that shapes both his way of working, and our experience of the work itself. The making of strange and slightly awkward

equivalences between what we see and hear, just as in Kreidler's piece, are key here.

In conclusion I would like to briefly talk about an aspect of this growing intermediality to which I have not yet given the necessary research time that it warrants as a subject. Please forgive my generalizations and speculations, and instead take this conclusion as an invitation to delve further into the topic.

We could imagine, that if we in music are gradually spreading ourselves outwards in terms of our field of action, as contemporary performance and the plastic arts have been doing for many decades now, we should all theoretically meet each other and reform the primordial intermedial nexus that idealizes the more continuous and dynamic model for artistic practice that I mentioned earlier. I do not have the impression of such a meeting up yet (though maybe I am wrong) and I would hazard a guess that the creation of a true intermedial nexus is not possible as long as the institutions running the arts, the places where art can be experienced, the economic structures governing each discipline, and the 'scenes' themselves remain in general, so separate from one another. Nor is there much of a consensus amongst these disciplines concerning what is interesting or current or worth working on, on the infrequent occasions I have witnessed them interacting. There is clearly work to be done here on curatorial, institutional and academic levels in order to reflect in cultural structures the dissolving of intermedial barriers that is being effected by individual artists today.

¹ I am writing about „compositional techniques“ courses in the past tense. Firstly because I am drawing on my own experience as an undergraduate in the 1990s, and secondly, because as many of my colleagues teaching at British universities have told me, this kind of course exists nowadays only in a watered-down version, is in the process of being phased-out or has disappeared from the curriculum altogether.

² Jennifer Walshe: „Die ‚Neue Disziplin‘“, in: Jörn Peter Hiekel (Ed.): *Body sounds. Aspekte des Körperlichen in der Musik der Gegenwart* (= *Veröffentlichungen des Instituts für Neue Musik und Musikerziehung Darmstadt*, vol. 56), Mainz 2017, p. 214–217.

³ Marko Ciciliani: „Music in the Expanded Field“, in: Michael Rebhahn and Thomas Schäfer (Ed.): *Darmstädter Beiträge zur Neuen Musik*, vol. 24, Mainz 2017.

⁴ Dick Higgins: „Intermedia“, in: *Leonardo* 34 (2001), p. 49.

⁵ Jens Schröter: „Four Models of Intermediality“, in Bernd Herzogenrath (Ed.): *Travels in Intermedia[lity]: ReBlurring the Boundaries* (Lebanon: University Press of New England, 2012), Kindle edition, loc. 427.

⁶ *Ibid.*, p. 445–50.

⁷ *Ibid.*, p. 766–69.

⁸ Allen S. Weiss: *Varieties of Audio Mimesis: Musical Evocations of Landscape*, Berlin 2008, p. 11.

⁹ *Ibid.*, p. 12.

¹⁰ Charlie Gere: *Digital Culture*, London 2002, p. 19.

¹¹ *Ibid.*, p. 24.

¹² Friedrich A. Kittler: *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael

Wutz, Palo Alto, CA 1999, p. 1.

¹³ *Ibid.*, p. 2.

¹⁴ For the full text score of *Slow Motion Sound* and Reich's commentary on it, see Steve Reich: *Writings about Music*, Halifax 1974.

¹⁵ I would like to credit the composer Simon Katan, whose lecture alerted me to Snyder's book and his ideas about image schemas. Katan's own audio-visual works such as *Cube with Magic Ribbons* (2012) would have been an interesting addition to this paper.

¹⁶ Bob Snyder: *Music and Memory: an introduction*, Cambridge 2001, p. 108.

¹⁷ *Ibid.*, p. 110–111.

¹⁸ *Ibid.*, p. 108.

¹⁹ Douglas Kahn: *Noise Water Meat: A History of Sound in the Arts*, Cambridge 1999, p. 71.

²⁰ See Mark Katz: *Capturing Sound: How Technology has Changed Music* (Berkeley: University of California Press, 2010), Kindle Edition, p. 115.

²¹ The engraving a gramophone idea was developed further by the German composer and musicologist Hans Heinz Stuckenschmidt. He believed that very small wavy lines rather than graphic symbols might form a better basis for a script, and that a microscope could be a useful aid in the process. However, like Moholy-Nagy, he never realized his ideas. See Katz, *Capturing Sound*, p. 116.

²² Alvin Lucier: *Reflections: Interviews, Scores, Writings / Reflexionen: Interviews, Notationen, Texte*, ed. by Gisela Gronemeyer and Reinhard Oehlschlägel, Köln 1995, p. 109.

²³ The frequency domain (as opposed to the time or waveform domain) is used in audio signal processing. It represents sound in a two-dimensional space, with time going along the x-axis and pitch up the y-axis. Entering and exiting the frequency domain is achieved by means of the Fast Fourier Transform and its inversion, and time and frequency can be manipulated separately to a certain extent, giving the illusion that they are independent variables (they are not). I initially thought that Kreidler had used the frequency domain in his audio-visual works but he corrected me. In fact he programmed a much simpler system mapping pixels on an image to a corresponding range of pitches, scaled to his choosing.

²⁴ Robert T. Clifton: *Barbs, prongs, points, prickers and stickers: a complete and illustrated catalogue of antique barbed wire*, Norman 1970.

²⁵ The quote comes from Godard's 1963 film *Le Petit Soldat*. Laura Mulvey: *Death 24x a Second: Stillness and the Moving Image* (London: Reaktion Books, 2011), Kindle edition, p. 156–159.

²⁶ Jean-Louis Baudry: „Effects of the Basic Cinematographic Apparatus“ (trans. Alan Williams), in: *Film Quarterly* 28 (1974), p. 40.