Conclusion: Noise resonances | sound in the age of technical media

When, over the years, someone asked me what this thesis was about, I used to answer it was set to analyse and revaluate the role of noise in contemporary musical practices. Because the growing importance of noise in our musical culture on the one hand and the emergence of technological sound reproduction on the other, occurred more or less simultaneously, it seems no more than logical to assume that the key to understand this proliferation of noise practices lies with the machines that increasingly came to dominate musical creativity over the past hundred and forty years. It was this hypothesis that first drew me to the work of Friedrich Kittler as a thinker who, perhaps more than anyone, conceptualised the relation between the rise of technical media, the growing importance of noise and the emergence of new types of sound, new kinds of music and, above all, a new kind of musical sensibility. He called this new sensibility the ‘other music’—the music of the media age.

Although, in recent years, the body of literature on noise has grown substantially, most analyses that specifically deal with its role in music continue to classify noise as a transgressive or subversive force, something that might be sonically or musically relevant but only in contrast to the presumed clarity and purity of musical sound. Often, these interpretations take their cue from the conceptualisation of noise in information theory as developed in Claude Shannon’s mid-twentieth century “Mathematical Theory of Communication.” On the basis of information theory, it can be argued that what is classified as noise on first hearing stops being noise as soon as it is incorporated in the system of communication and henceforth turned into information. Such an essentially dialectic interpretation of the relation between noise and information, noise and signal, noise and sound or noise and music for instance characterises Jacques Attali’s seminal book
on the history of noise. After it forces its way in from the outside and disrupts or renews the (musical) status quo, Attali argues, noise is disciplined into coercion, incorporated in the system and turned into music (Attali 2003).

This is also the basis for Paul Hegarty’s more recent argument that all musical noise practices inevitably lose their subversive potential as noise because a process of normalisation strips them of all transgressive connotations (2008: 146). Entirely defined by its musical and cultural context, it follows from these arguments that noise, as Greg Hainge puts it, “in and of itself is nothing, for it arises only in the relational process through which the world and its object express themselves in an infinite number of possible relations, assemblages or expressive forms” (2013: 15). According to Hainge’s “ontology of noise,” as a fundamentally relational phenomenon that emerges in the context of all creative acts, noise is inherently elusive and “remain[s] out of reach” (2013: 273). It disappears as soon as you put your finger on it.

Kittler’s work on sound and music, on the other hand, considers noise as a, or perhaps even the fundamental aspect of contemporary music and media alike. As with the aforementioned examples, Kittler’s concept of noise is heavily informed by information theory. However, as N. Katherine Hayles notes in How We Became Posthuman, “Shannon himself frequently cautioned that [his] theory was meant to apply only to certain technical situations” (1999: 19). Some of the conceptual overload of the concept of noise might indeed be due to the proliferation into all corners of the academy of information theoretical analyses that fail to take the media technological specificity of its terms into account. Kittler’s approach, however, exactly takes “certain technical situations” as its starting point. His media specific discourse analysis always takes into account the specificity of technological hardware as the material basis for the operations of technical media. Hence, as an essential feature of both music and media, a media specific concept of noise provides a perfect basis for rethinking their relation.

120 “Noise,” writes Hegarty, “will always fail, as noise at least,” because “any success means it has failed” (2008: 146).
In support of this argument, Chapter One shows how the history of sound reproduction from phonograph to digital sound file is in many ways a history of the continuous introduction of and fight against the noises, distortions and interferences that stick to the output of recording and reproduction media. On the one hand, this history emphasises how the relation between the development of new technologies and the appearance of new noises and distortions has been one of mutual interaction. On the other hand, however, it shows how the ways in which inventors, engineers and musicians continuously attempt to prevent, reduce or eliminate these noises have been framed by a *myth of perfect fidelity*. Assuming perfect sound reproduction and a one-on-one correspondence between input and output, this myth is based on what Jonathan Sterne calls the idea of the “vanishing mediator”: a medium that ensures the complete reduction or removal of its own influence on the reproduced signal.

This myth of perfect fidelity began to take hold in the earliest days of recording technology with the conceptual separation between sounds that are internal and noises that are external to the recording. It subsequently consolidated over the course of the ensuing decades, as the concept of noise itself changed from a primarily sonic concept in acoustics and music theory in the nineteenth century into a physical concept influenced by communication engineering in the early twentieth century and ultimately into a communicational concept developed by information theory in the 1930s and 1940s. Over the course of this redefinition, I argue, the idealised notions of noise and signal that support the myth of perfect fidelity and, by extension, the idea of noise as an unwanted, external and disruptive force, took hold. The framework supporting this notion of noise as the seemingly unambiguous antithesis to pure and clear signal transmission, to be removed, eliminated or reduced at all cost, is what I call the *conceptual logic of noise reduction*.

In Chapter Two, the media specific analyses of Dolby’s analogue dual-ended noise reduction systems and the addition of dither noise to digital sound reproductions further define and problematise this conceptual logic of noise reduction. In the final analysis, I argue, both Dolby’s companding procedure and the elimination of digital quantisation errors via dithering are ways to reinforce the suggestion of an inherent
connection between input and output. Instead of signifying fundamental differences between analogue and digital recording methods, these strategies uphold the idea that the output of any reproduction process should always approximate the input as close as possible.

This means that both analogue noise reduction and digital dithering confront the inherent limits of symbolic representation and technological reproduction. The actively created silence introduced by analogue noise reduction and the slight layer of random background noise created by dither are supposed to conceal what Bernhard Siegert identifies as the ‘rupture’ between the asymptotic idealisations represented by modern mathematical analysis and the physical signals they represent. This rupture between representation and represented and between reproduction and reproduced is exactly what the myth of perfect fidelity, supported by the conceptual logic of noise reduction, conceals.

Although this logic assumes a perfectly unambiguous separation between noise and signal, such a separation implies a clearly definable and thus inherently limited concept of noise that cannot account for the fact that the operations of technical media always run into fundamental limitations. Contrasting this idealised separation between noise and signal upheld by the conceptual logic of noise reduction, I therefore introduce the alternative concept of a noise resonance of sound reproduction to conceptualise how the sound of technical media does not take shape despite of the noise of sound reproduction but exactly because of the way that this noise inherently affects and changes all output signals.

In order to further problematises the conceptual logic of noise reduction and embed the concept of a noise resonance of sound reproduction in the historical development of the discourse on sound and sound reproduction, Chapter Three traces the discursive roots of the modern representation and reproduction of sound back to the early nineteenth century mathematical invention of Fourier analysis and the corresponding conceptualisation of the figure of the sine wave as the representation of a pure, single sound wave. Because the symbolic representation of physical sound as sets of endlessly repeating sine waves produced by Fourier analysis seem to empirically confirm ideals of musical harmony and regularity that go back all the way to the Pythagorean
Harmony of the Spheres, I suggest that its symbolic representation of a “world without noise” constitutes the modern, scientific origin of the ideals of infinite clarity and maximal purity that define the conceptual logic of noise reduction (Serres 2008: 126).

Sine waves and Fourier analysis belong to a domain of entirely clear and pure signals; a domain from which all randomness, ambiguity and noise have been symbolically removed by perfectly seamless filters. I call this the domain of the ideal filter. Whereas sine waves symbolically represent infinite, periodic frequencies, their symbolic opposite are Dirac impulses: infinitesimally short, completely a-periodic, transient events. Both sine waves and Dirac impulses are idealisations suggesting a level of spectral clarity and temporal exactitude that no physical filtering operation can possibly achieve. In contrast to such idealisation and following the fundamental uncertainty principle at work in communication engineering and information theory, signals in the domain of physical filters are produced on the basis of a negotiation between the static noiseless purity of sine waves and the temporal exactitude of Dirac impulses—a negotiation between frequency and time.

Although, as Kittler argues, exactly the symbolic idealisations courtesy of the domain of the ideal filter enabled the “clarity and sharpness” of mathematical analysis and technological (re)production, the operations of technical media in the domain of physical filters are always limited by this negotiation between time and frequency (2012b: 53). Whereas the purity and clarity represented by ideal filters requires a symbolic clean cut that leaves behind no traces, the physical cuts of technical filters are subject to the limitations of the uncertainty principle. As a consequence, physical filters always leave behind traces of their own operation in the form of transient noises and distortions added to the output signal. Hence, whereas the conceptual logic of noise reduction presupposes the clean cut of an ideal filter, the noise resonance of sound reproduction is based on the primacy of the physical cuts of technical filters.

Further assessing the consequences of this primacy of physical filtering operations for the role of noise in technological sound reproduction, and ultimately, in music, required a shift from the media
specific (or media archaeological) analyses conducted in Chapters One and Two to an analysis of the primary logic of filtering itself in Chapters Four and Five. Because the transient noises and distortions that are caused by the cuts of physical filtering operations shape the singular sound of music in the media age, I argue that the assessment of the logic that supports these filtering operations helps our understanding of the way the output of technical media continues to arrive in the ears and brains of human listeners as sound or, even more extraordinary, as music.

The nature of the noise resonance of sound reproduction that shapes the relation between technologically (re)produced music and its listeners, I claim in Chapter Four, is inherently temporal. Because the logic of filtering emphasises how media in the domain of physical filters always (re)produce signals that extend in space and change over time, it draws attention to all the transient events that escape the clean cuts of ideal filters. In the domain of physical filters, any signal has a beginning and an end—an attack and decay—that cause what Norbert Wiener calls “small, but very real,” random alterations to its frequency spectrum (1976: 544-545). Contrary to clean cuts that leave no trace whatsoever, a technological recording and reproduction chain must be understood, following Serres, as a series of parasites (1982b: 172). Each parasitic filter affects the characteristic noise of sound reproduction and changes the output of the chain.

These changes are not external to the signal; they are not an intrusion or disruption. They are as much part of the reproduced sound as all the frequencies that pass through the channel unaffected. They are therefore part of the system (as information, signal and sound) but they also still count as noise: random, transient, unpredictable signals. As biophysicist Henri Atlan—whose work greatly influenced Serres—writes in “Noise as a Principle of Self-Organization”: even when “the effects of noise become events in the history of the system and its process of organization,” they nonetheless “remain […] effects of noise inasmuch as their occurrence was unforeseeable” (2011: 112). Caused by the physical filtering operations of technological sound reproduction, the spectral and temporal changes to the noise of sound reproduction are physical traces of
a journey over space and time, hardwired in the frequency composition of the output signal.

These transient traces, these effects of the “noise of documentation and transduction” emphasise the multi-layered temporality of technological sound. (Link 2001: 34). They signify passed time and passing time. On the one hand, as an indexical trace of the operations of recording and reproduction technologies, they resonate the temporal irreversibility and finitude of physical signals. Signifying how we, as listeners, are always running out of time, they emphasise we can never achieve the immortality that Kittler associates with the Fourier domain. On the other hand, due to their fundamental irregularity and transience, these traces resonate with the continuous flow of time through the present. Signifying how we are always inside time, they tend toward the irrepresentable short energy discharge of a Dirac impulse and emphasise a sense of being, as Derrida puts it, infinite.

Throughout the ages, music has always been a balancing act between such periodicity and non-periodicity, between change and repetition, redundancy and entropy, static states and transience. Although the singularity of the unfolding of sound in time has thus always been an important aspect of musical appeal, I suggest it became even more fundamental with the advance of technological sound reproduction. Because technical media create the possibility to endlessly repeat sound again and again and again, by virtue of this repetition the sheer transience of everything that escapes the symbolic bottleneck of music notation can be scrutinised and weighted. This is how the transient traces of physical filtering operations gained in significance. However, as I conclude in Chapter Five, the physical presence of these sounds unfolding in time also continuously emphasises how the moment of their production—the

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121 In “Vers Eine Musicologie Concrète. Bemerkungen zu Richard Voss,” Kittler remarks how physicists Richard F. Voss and John Clarke, by measuring the frequency of frequencies in different types of music, proof that the statistical distribution of frequencies in almost all music adds up to pink noise. This means that “Rauschen [...], wenn ein Signal als Musik wahrnehmbar sein soll, muß in der Mitte zwischen Ordnung und Chaos liegen, also nicht weiß, sondern rosa sein” and that, on the basis of the statistical frequency of frequencies, “Stockhausens kühnste Experimente sich von Bachs Brandenburgischen Konzerten kaum unterscheiden” (1995b: 112).
physical cuts of technical filters—still fundamentally escapes our control.

Hence, noise does not remain “out of reach” because, as Hainge puts it, it is nothing “in and of itself” (2013: 273). The inevitable presence of noise, I argue, remains fundamentally irrepresentable because, following Kittler’s conceptualisation of sound recording, the physical filtering operations that produce the signal in the first place constitute the fundamentally irrepressible Lacanian Real itself. As the sonic traces of the cuts of physical filters, noise and distortion reveal how technical media do not generate ever greater clarity and sharpness, but always also produce what Carol White in her study of Heidegger calls the “incalculable, the unpredictable and unthinkable, which lies beyond our capacities to represent” (2005: 74). Noise does not remain out of reach because it is nothing. It remains out of reach because it is the basis for everything.

“I do not know if talking of filters,” Serres writes in The Five Senses, “will help us understand how thunder, noise, the vibration of sound waves [...] subtly become meaning” (2008: 115). Connecting the logic of filtering with the noise resonance of sound reproduction, I argue that talking of filters indeed helps us understand how sound technologies create what Kittler calls “unforeseeable, unthinkable, unimaginable acoustic events”—singular sound waves, fundamentally shaped by the filtering channels through which they travel. Resolutely doing away with the conceptual logic of noise reduction and the idea that sound recordings are incomplete reproductions of some original source, the noise resonance of sound reproduction emphasises how a logic of filtering produces the sonic Real of technological sound. It emphasises that technologically (re)produced sounds are no symbolic representations created by and for human subjects, but physically present, complex signals shaped by irrepresentable moments of technological filtering; and the more autonomous and advanced these filters become, the more their operations slip from our control.

The transient noise of sound reproduction therefore emphasises the inaccessibility and irrepresentability of all technological sound. Produced by the autonomous operations of technical media, the sound of the ‘other music’ continuously escapes our grasp. This is what Kittler calls “pure media technology, pure control flow” (1995: 99). Hence, although the
notion of an ‘other music’ marks the end of all anthropocentric interpretations of music, talking of the way that filtering operations produce the noise resonance of sound reproduction nonetheless helps us understand the impact of the “media explosion of our day” and the music it created (Kittler 2015a: 16). This is why a project that set out to reevaluate the role of noise in musical practices turned into an analysis of the way technological sound reproduction fundamentally changed the sound of music. As a sonic trace of fundamental filtering operations, the noise of the ‘other music’ resonates the irrepressible presence of the Real in the receptive ears and brains of listeners. As such, I argue, the noise resonance of sound reproduction constitutes an essential element of the sound of music in the media age.