IV Fragile collaborative processes

On the epistemic potential (live) electronic music
Essay-in-progress[1]

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Introduction

The following text is intended as a reflection on the status of contemporary electronic music. The wider context is the research on the performance practice of electroacoustic music conducted at the Institute for Computer Music and Sound Technology at the Zurich University of the Arts (ICST) under my direction since 2012. This practice-based research is being realized along different projects and bodies of repertoire. It encompasses a wide diversity of aesthetic and technical approaches to composition, different practices such as the performance of historical tape pieces, works combining instruments and pre-produced electronic sounds, pieces for self-developed instruments, and recent works involving live electronic systems.

Throughout all its phases and projects, this research has been based on two methodological premises: exchange within a network of composers, performers, researchers, scholars, archives, and institutions, and the development of our own performance practice in the rehearsal space, concert hall, and recording studio. This has led so far to different output formats: a dedicated database containing articles about specific performance issues of individual works, essays and analytical texts, surround mixes of multi-channel works and, of course, live performances (see Bennett/Toro Pérez 2018; Toro Pérez 2016–2021, 2020). It is additionally informed by the ongoing composition and performance practice of the members of our team and by my continuous exchange with composition students over the past two decades.

In addition to its practical impact for performers, the currently ongoing research into *live electronic music*[2] initiated in 2018 was envisioned as a chance to offer an actualized view of the practice of composed electronic music requiring *interpretation*, of the conceptual approaches it is based on, the kind of aesthetic

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1   The present text is a first approach towards the definition of a theoretical framework for the review of the current repertoire of electronic music, which has emerged from research into its performance practice. It is based on the hypothesis formulated at the beginning of the ongoing research project (see footnote 2). Since the practice-based study of the selected repertoire has not yet been completed, it has a work-in-progress character.

2   *Performing Live Electronic Music* 2018–2022, Funded by the Swiss National Science Foundation, https://www.zhdk.ch/forschungsprojekt/performing-live-electronic-music-558720 (accessed 02 November 2021).

experience it offers to musicians and audiences, and the impact it might have on the development of contemporary art, as related to the expectations, premises, and discourses which have emerged since the introduction of digital systems in the early 1980's.

These discourses are based on analysis of the potentialities of digital technology in relation to analogue electronic devices, as well as the extension of acoustic instruments, the voice and the body through electronic means. From its earliest beginnings, musicians envisioned the possibility of processing digital sound in *real time* as a way to expand the creative and performative limits of electronic means in terms of efficiency, agency, and expression. *Liveness* and *interaction* became key concepts to describe and qualify musical practice involving computers, interfaces, and electronic devices.[3] Moreover, the impact of digital information, through new forms of storage and distribution, allowed *sampling* to emerge as a fundamental practice in electronic music at the turn of the millennium. Broad access to technology and computers drove hybridization and cultural pluralism among creators. Simon Water's (1997, p. 6) reflections[4] on the transformation of electronic music in the digital age make clear that an understanding of live electronic music today asks for a multilayer view in which technique and technology are only two threads among many others, including: concepts, theories, traditions, performance attitudes, audience's behavior, institutional relations, and forms of access.

From its very beginning, electroacoustic music has been closely related to *research*, even if it was soon integrated in the traditions and rituals of modern music. Its close relation to natural sciences (for example, acoustics, physics, perception, computer science), its inherent *experimental* character, and the multiple forms of practical research, carried out by composers and performers in artistic contexts are unequivocal signs of the privileged *epistemic vocation* of electronic music as its ability to access knowledge through our senses. The debate about research in the arts in the new millennium—which coincides with a shift in the practice of new generations of composers and performers—has also awoken the interest of philosophers in respect to the epistemic entanglements of artistic practice.

These insights give us today, together with a wide corpus of cases and examples, the possibility of revisiting the practice of electronic music in general, and of live electronic music in particular, taking into account its specific relation to *knowledge*. Dieter Mersch's work constitutes therefore one fundamental reference for this text. While his book, *Epistemologies of Aesthetics* (Mersch 2015b), makes many references to contemporary arts and music, it is his specific studies of the

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3   See Hagan (2016) for a critical and systematic review.

4   Waters argues that digital sampling techniques dramatically enhanced the impact of storage and recall, not only by being able to access any point in the disc in any order (random access instead of linear access by tapes) but through the amount of data being stored, leading to the emergence of large digital archives and their access through internet. He speaks of a digital 'sampling culture' after an analogue 'acousmatic culture'.

work of Alvin Lucier (Mersch 2019) that serve as a *prime example* of research through arts, providing additional elements for the investigation of the constitutive vocation of live electronic music for giving access to knowledge through aesthetic experience.

Expanding concepts of philosophy into the realm of the arts, from the perspective of a composer, bears the risk of misinterpretation. This text therefore has an experimental character. My main interest is to find an adequate framework to help us understand, discuss, and perform live electronic music today. I argue that the epistemic, *horizontal* dimension[5] of electronic music is the place where new concepts, musical forms, representation systems, techniques, and practices have emerged, complementing and challenging approaches to composition in contemporary instrumental music. In fact, live electronic music brings together musical traditions that have been following parallel paths, such as electroacoustics, computer music, and contemporary instrumental composition. It is additionally informed by other artistic practices and by research in natural and social sciences. The intention is therefore to understand live electronic music as a network of discourses, theories, technologies and practices in which the sensory exploration of phenomena becomes as important as otherwise predominant aesthetical categories, such as artwork, material, form, and expression.

Nevertheless, the *vertical* dimension, where power relations manifest, must be equally examined, since *composing* entails the act of taking decisions, *disposing* means, and even *imposing* behavior patterns during the processes of performance and reception. This fact is not exclusive to artistic settings involving technology. It should therefore be asked how live electronic music as a social practice is able to redefine new attitudes, roles and identities of the artists and audiences involved through new forms of expertise, agency, and access. A further level of research in the context of performance practice would be to introduce these enquiries in the context of performative approach to specific works.

Aesthetic-explorative situations

The review of electronic music practice in relation to the production of and the access to knowledge builds the very core of this essay and leads to the main thesis: *(live) electronic devices and setups*[6] *have an inherent potential to generate aesthet-*

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5   The terms *horizontal* and *vertical* are borrowed from Jürgen Link's description of the interrelations between *knowledge* and *power* in regard to Michel Foucault's concept of *dispositive*, where Link mentions that the interdiscursive dimension of knowledge might be imagined topically as 'horizontal' and the socially stratificational dimension of power as 'vertical' (Link 2014, p. 239). See Mersch (2012) for a discussion of dispositives in relation to mediality and artistic practice.

6   See Toro Pérez (2018, pp. 10–11) for a differentiation between *instruments*, *instrumental devices* and *instrumental setups.*

ic-explorative situations and expose our senses to a multiplicity of phenomena. As such, their configurations vary according to various parameters and the current conditions; they must therefore be tuned and adapted, rendering different, *perceivable* results each time, for each situation. Electronic devices and setups are engaged in the generation of singularities.[7] This is the sense in which the term *experimental* has been recurrently understood in electronic music. The phenomena addressed can be related to acoustics, signal processing, space, body, gesture, touch, spectrum, materiality, form, formalization, representation, perception, cognition, emotion, speech, communication, mediality, visuality, multimodality, social processes, among many others. In the end, this can extend to all aspects of music and musicality, to all possible relationships involving sound and music. This implies that aesthetic-explorative situations are not only able to *access* knowledge through musical experience but to *produce* it as well. They allow phenomena to emerge, reveal, and transform themselves before our eyes, to become audible, tangible, visible. They *show* what otherwise cannot be revealed.[8] This epistemic potential gives *liveness* and *interaction* an additional sense: a specific condition for the emergence of insight here and now, as well as the agency to intervene in the process. Moreover, *live* electronic setups expose their own experimentality: they not only show, they show themselves.[9]

Of course, epistemic potentiality has been present in every kind of musical instrument since the monochord. However, electroacoustic devices and systems, as well as their proliferation in the digital domain, have a specific constitutive *predisposition* in this regard. Through repurposing of any kind of technology—simple or complex—they build multiple, dynamic and heterogenous instrumental constellations in networks of micro- and macro-temporal relationships. Coding and mapping permit transformative and systemic relations with any digitally represented object. Therefore, electroacoustic instrumental constellations radically open up the scope of musical thinking and practice. This predisposition can be described as their *instrument* character in the sense of *measurement devices*, of tools intended to access knowledge and expand human perception, which are different from the *instrumental* character of musical instruments understood in a general sense as *means of expression*.[10]

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7   See also 'singular paradigms' (Mersch 2012, pp. 33–8; 2015, pp. 157–8) and 'singularity' (Vaggione 2010, 55–56).

8   See Mersch (2015a, p. 131) for a discussion about different modes of relation to truth in philosophy and arts through the difference between *saying* and *showing* [*sagen/zeigen*].

9   'At the same time, and this is a particularity of artistic epistēmai, they always also refer to their own mediality. [...] There is no work or conceptual statement that does not thematize itself' (Mersch 2015b, p. 144).

10   Any acoustic instrument is fundamentally a sensing device. The difference *instrument-instrumental* is not intended here to the detriment of *expression* as aesthetic category.

Electronic devices and acoustic instruments

It is well known that electronic devices originally conceived and built as measurement tools were functionalized in the electronic studio as musical devices. The prototype is doubtless the sine wave generator. Bernd Alois Zimmermann's (1968, p. 56) characterization of the sine wave as 'pre-sounding' (*vorklanglich*) due to the absence of a spectrum and 'surprisingly reluctant to all differentiated transformation methods' is meaningful. On one hand, he acknowledges its different behavior as material, nevertheless he has no doubt about its instrumental character and is willing to manipulate it as a further musical instrument (Zimmermann 1968, p. 57).

For anyone working with sine waves in the studio or in the classroom, their function as tools for exploring, understanding and explaining phenomena of acoustics, psychoacoustics and signal processing is evident. Sound waves, as artificially generated ideal atoms of sound have an inherently epistemic character; as a tool of insight, they have the same analytical status as the ancient monochord. They also continue to serve as measurement tools for the calibration of electronic devices and systems. The same can be said, for instance, of noise generators and analytical devices such as envelope and pitch followers.

Of course, acoustic instruments also have the potential to activate epistemic insight. However, even if it has been re-activated in contemporary music—at least to a certain extent—these instruments are understood in the first place as means of expression. This reflects the discursive foundation of Western art music, in which speech articulated by way of instruments and voices has been predominant. In the German language, fundamental musical terms are homonyms used in grammar, revealing the impact of language on the very concept of music: for instance, *Stimme* (meaning inter alia *voice* and *musical part*), *Satz* (meaning inter alia *sentence* as well as *movement* and *musical text*), *Phrase* (meaning inter alia *expression* and *chunk* as well as *basic melodic unit*). These terms stress the model character of the voice as the carrier of expression and meaning, a character that afforded vocal music a predominance in western art music lasting until the late nineteenth century (Dahlhaus 1986, pp. 39–48).

Perhaps this explains why it was a matter of course, even for composers with established experience in the electronic studio like B.A. Zimmermann, to consider electronic instruments as an additional instrumental family, as a further class in the organological tableau. However, what applies to the ondes martenot and perhaps also to the theremin, cannot be extended as it is to a sine wave generator, a microphone, or an envelope follower. It is no longer necessary to *elevate* electronic devices to the category of musical instruments for the sake of dignity or in order to claim their artistic validity. Musical systems integrating electronic devices have a different genealogy. Edgar Varèse (1962, p. 23) was aware of this fact and of the

consequences this different nature of electronic devices—including the computer—would have on musical thought and practice.

The understanding of electronic instruments as a further extension of the hitherto available instruments is nevertheless a characteristic of modern European electronic music. Although for the post war European, avant-garde electronic music became a symbol for the renovation of modern music, its epistemic potential was neglected at first. The musical artwork and its constitutive elements such as musical language, material, formal disposition, composition technique, notation, and playing technique remained in the foreground, even if electronic music also served as a means for social critique and the representation of human utopias.

Pierre Schaeffer's understanding of electronic means was different. Although he was likewise interested in formal questions, such as the morphology of sound, he understood musical devices from the very beginning as part of experimental settings and used them to explore auditive phenomena within the context of an aesthetic practice intended as *recherche*. In North American computer and electronic music, this approach soon stood in the foreground, for instance in the work of such composers as Steve Reich, Terry Riley, Pauline Oliveiros, La Monte Young, Jean-Claude Risset, Éliane Radigue, and others. It constitutes the basis for an artistic practice that found its most distinctive expression in the work of Alvin Lucier, Maryanne Amacher and other composers of their generation. Live electronic systems and practices are here understood as experimental settings and used to create aesthetic-epistemic situations.

However, one must be wary of underestimating the epistemic aspect in early European electronic music. In the collaboration between Luciano Berio and Umberto Eco at the early days of the Studio di Fonologia, in Karlheinz Stockhausen's early live electronic music, or in the work of Iannis Xenakis, Bernard Parmeggiani and Luc Ferrari, we find examples of experimental projects in which phenomena have a fundamental form-building function, for example with language in Berio's *Thema. Ommagio a Joyce*, the behavior of acoustic instruments in *Mikrophonie I*, the exploration of the space between micro- and macro sound in *Analogique B* (see Di Scipio 1998, p. 219), the relation between sound morphology and hearing in *De Natura Sonorum*, or the exploration of everyday sounds in *Presque Rien*. Nevertheless, these phenomena remain side elements of a musical discourse—both in terms of the instrumental avant-garde and the electroacoustic—in which, in spite of experimental attitudes, traditional aesthetical values such as the artwork, musical language, and individual expression predominate. In fact, current electronic music practice today could be seen as an heterogenous field in which expression, representation, and experience coexist, even within individual works.

Network and system

In the digital age, two concepts have emerged in electroacoustic music that help us to further evaluate the concept of instrumental setups: *network* and *system*. Both have a remarkable impact on the disposition of technical means, sound material, formal concepts, composition processes, performative and reception modalities.

The concept of *network,* as introduced by Horacio Vaggione in the context of electroacoustic composition in the digital domain, is immediately related to *objects* in the sense of the elements of computer languages, which define a network's topology through their multiple interrelationships. Objects can include sounds, functions and methods as well as other objects at various levels. Different instances of objects can appear on different places in different timescales, including of course the micro-time level. Their transformations generate cascades of sub-classes.[11] This concept promotes a system of variations of materials and methods that yield figures and singularities. It enables composition processes where the elements proliferate simultaneously at different places, instead of being disposed along a linear causal logic. A further level of non-linearity is due to jumps in perception produced by changes in the time scale.

The concept of *systems* has been fundamental for the description of signal processing phenomena. Agostino di Scipio's interest in systems within the context of live electronic processes was motivated by a critical reflection on interaction forms limited to the action-reaction model. Inspired by the work of cybernetics researchers Heinz von Foerster, Humberto Maturana and Francisco Varela, Di Scipio proposes the *composition* of interaction modalities by defining interdependencies within the elements of the system. This led to the conception of complex systems as *ecosystems*, integrating the real acoustic space and eventually the audience (Di Scipio 2003).

Both *network* and *system* conceptualize manyfold approaches to electronic music composition and have several common features: first, the property of *emergence,* meaning that sound and musical relations result from the network relationships and the system behavior themselves, rather than from a teleological formal conception or intention. Secondly, and in consequence, they have an inherent formal *openness*, even if the result is a fixed electronic piece, as in the case of Vaggione's *24 Variations* (see Mouritzen, Toro Pérez 2017, pp. 222–224). Thirdly, their multiple and branched relations result *in non-linear processes*. Fourthly, they change the performer's function and agency, which are strongly determined by the behavior of the system, as in the case of Di Scipio's *Modes of Interference / 2* (see Bennett, Toro Pérez 2021 [online]). Finally, the composition of networks and systems entails the integration of iterative experimental processes, in which observing and understanding the relationships and behaviors between their ele-

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11   See *encapsulation*, *inheritance* and *polymorphism* in Vaggione (1991, p. 212).

ments play a fundamental role, before a work—understood as a specific aesthetic and performative situation—finds its final state. A work results not only (if at all) from sound images, representation models and expressive intentions, but also to a large extent the manifestation of the network and the system itself, as a constellation of acoustic and perceptual phenomena, musical materials, technologies, functions, methods and modes of representation.[12] We see here several fundamental elements related to aesthetic epistemic processes: *visibility*, *self-referentiality* and the *emergence of singularities*. From a wider perspective, we also see their impact in the redefinition of composing processes, performing and hearing attitudes and the function of the real acoustic space. Different forms of curatorial practice and social interaction become visible on the horizon due to the integration of other—real and virtual—spaces, which opens up diverse forms of access, participation and institutional framing.

Analytical devices

A final remark on instrumental devices concerns a specific class of devices: those which are capable of sensing and measuring waves, movements and signals. In current live electronic practice, there are, in addition to all different kinds of microphones, devices used for instance to detect light and electromagnetic waves. There are also tools used to measure amplitude and pitch, as well as to extract and quantify other sonic features in the time and the spectral domain. Such analytical functionalities were foreign to composition and performance practice before electronic devices came into use, excepting the relevance of beats for interval estimation and the use of mechanical devices such as the metronome and the tuning fork. They are fundamental for the configuration of instrumental setups and systems, and exhibit the abovementioned *instrument* character, as a specific capability to give insight into sonic phenomena. These analytical devices opened up micro time and the spectral domain for composition and performance practice, bringing *perception* to the core of the artist's musical thinking and practice. Beyond their specific measuring functions, they act as interfaces between the material world and the world of signal and digital representation, reflecting our own ability to see, hear and touch.

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12 *Representation* is used here in the sense of a hybrid constellation of notation forms, including symbolic and graphic musical notation as well as different forms of digital representation of sounds, signals, processes, formal relations, performative actions and sonic results.

Provisory conclusions

Art is a different way of perceiving and experiencing the world, a '*different think-ing, different-than-thinking*' (Mersch 2015b, p. 53). In contrast to philosophy, art knows, 'not because it speaks but because it […] shows;'[13] it is 'thinking as practice, as performance' (Mersch 2015b, p. 11). But to *show* always means to *show itself*; it is a condition that implies that, through art, knowledge both *emerges* and is *self-re-flexive*. This applies to any artistic practice. The questions are therefore: What are the foundations of the specific epistemic force of (live) electronic music? How does it manifest itself in every singular work?

The origin of electronic devices in measurement tools reveals a predisposition: electronic music is based on experimentation through which the very nature of music and perception become visible, audible and tangible. Live processes allow the experimental settings to expose *themselves* as epistemic situations. This could be even said of purely generative situations—without human intervention—that produce singularities here and now, allowing us to perceive *difference.* Still, there must be a separate discussion of the recurrent topos of *otherness* in electronic mu-sic, alternately understood as a second dimension, shadow, immaterial presence or different nature. This could help to further differentiate the modes of epistemic experience inherent to (live) electronic music.

Although dichotomies such as expression/experience, instrumental/instru-ment, linearity/non-linearity, determination/emergence are useful, it must never-theless be made clear that there is some degree of overlap among these categories. I therefore prefer to speak of *potentialities* that manifest in different proportions in every case and situation, defining how musical form is produced and perceived. They define a dynamic field of forces in which art in general and electronic mu-sic in particular appear. The foundational proximity of electronic music to inter-disciplinary *research*, as well as the existence of sound as *signal* and *digital code* in systems and networks, define electronic music itself as an *interface* between modes of perception, artistic practices and genres, cultural phenomena, forms of representation and communication—between the material world and our senses. Practices in composition, performance and reception involving technology open up a field which is acted on by expressive and epistemic forces. Any precise esti-mation of their impact must be made through the analysis of specific works, while also taking into account their connection to other forces related to social interac-tion, identity and the construction of reality.

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13 'The parallelism of philosophy and art ends here, because art's sovereignty is something other than philosophy's insistence in the concept. Art does not know because it speaks, instead it makes recognizable by showing' (Mersch 2015b, p. 115).

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