Experimental Systems

Future Knowledge in Artistic Research

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Epistemic Complexity and Experimental Systems in Music Performance

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INTRODUCTION

In a process that was particularly enhanced in the twentieth century, the performance of musical "works" became a complex articulation of different types of data, information, and knowledge, retraceable in diverse material sources (including sketches, instruments, editions, recordings), in reflective discourses (*in*, *on*, and *about* music), and in multifarious performance "styles." The continuous accumulation and sedimentation of such kinds of knowledge represents an exponential growth of complexity that involves technical, artistic, aesthetic, and epistemic components. Such "complexity" might be labelled—borrowing a concept from the sciences (Dasgupta 1997; Kováč [2000] 2013; Kováč 2007)—"epistemic complexity."

Considering musical works as highly elaborated semiotic artefacts, I will situate different elements (such as sketches, manuscripts, editions, recordings, and articles) involved in music performance in terms of "epistemic complexity." By deconstructing works in this way, the tokens of their respective and variable complexity emerge as "boundary objects" (Star and Griesemer 1989), objects that change their ontological and epistemological nature depending on the context in which they are used.[1]

The dismantling of musical works into their graspable constitutive elements reveals them as complex accumulations of singularities, as multi-layered amalgamations of "things" (Kubler [1962] 2008; Brown 2001), disclosing open-ended possibilities for infinite new assemblages—raising questions of traceability, control, and critical assessment of the results. Hans-Jörg Rheinberger's notion

1 On the concept of "boundary object" in the context of artistic research, see Henk Borgdorff's interview with Michael Schwab (Borgdorff 2012, 174–83, particularly 177). Borgdorff attributes the concept of "boundary object" to Thomas F. Gieryn. However, Gieryn's concept is that of "boundary work," which has a different meaning, referring to instances in which frontiers, boundaries, limits, and demarcations between fields of knowledge are created, established, advocated, or reinforced (see Gieryn 1983). Borgdorff's use of the notion appears to be situated somewhere between "boundary work" and "boundary object" in the way I use the term here, which follows Star and Griesemer (1989).

of "experimental systems" seems to be a promising conceptual and methodological framework for the concrete practice of such new aesthetic-epistemic assemblages. In the central part of this chapter I will describe Rheinberger's thinking, preparing the reader for the application of this theory to music performance.

Beyond the mere (re)creation or (re)production of a work through performance, at stake in this chapter are processes that constitute musical "things" as objects for thought through performative devices. From this perspective the notion of epistemic complexity is just one element among many that contribute to a new mode of exposing musical objects. Methodologically this new mode is organised by different but interrelated approaches: identifying and scrutinising musical "things" that define a given musical work (in the sense of an "archaeology"); studying their "epistemic complexity"; extracting them out of their traditional *Umwelt* and inserting them within the confines of experimental systems; and, finally, "exposing" them anew, in previously unheard reconfigurations of materials.

EPISTEMIC COMPLEXITY

In his essay "Experimental Complexity in Biology: Some Epistemological and Historical Remarks," Rheinberger (1997a, S245) states that "reduction of complexity is a prerequisite for experimental research." In other words, the overall context of research is characterised by complex configurations and arrangements of complex "things" that must be filtered and precisely selected to become part of the experimental setup. A vast number of components, interactions, behaviours, and embedded knowledges precede the experimental research itself. In order to do research and to arrive at some kind of result, the ontic complexity of the research object has to be reduced while retaining its fundamental and specific "epistemic complexity." Despite the title of his article, Rheinberger does not really address the topic of "complexity," since his central concern is with the experimental situation. Even when he writes that "experimental systems are machines for reducing complexity" (ibid., S247), he does not enter into a discussion of exactly what characterises this "complexity," a characterisation that would inform the "epistemic horizon" that enables the research in the first place. Further elaboration of the notion of "complexity" thus seems pertinent.

Biologist Ladislav Kováč and the philosopher Subrata Dasgupta—working separately and in different disciplines—have produced stimulating reflections on the topic of "epistemic complexity." According to Kováč (2007, 65), "biological evolution is a progressing process of knowledge acquisition (cognition) and, correspondingly, of growth of complexity. The acquired knowledge represents epistemic complexity." Dasgupta (addressing "technology and complexity") uses the same term in relation to artificial (i.e., human-made) things, defining complexity as "the richness of the knowledge that is embedded in an artefact" (Dasgupta 1997, 116).

Inspired by Hans Kuhn's understanding of life as an unceasing process of accumulation of knowledge that starts with self-copying nucleic acids (Kuhn 1972, 1988), Ladislav Kováč (1986) developed a "bottom-up" approach to

epistemological problems—an approach that may be associated with "cognitive biology"[2] and that conceives life as "epistemic unfolding of the universe" (Kováč [2000] 2013, 1). Biological evolution, based on a logic of self-replicating entities, is a continual growth of knowledge that involves the "creation of *subjects* with ever greater embodied knowledge" (ibid., 18, emphasis added). This principle presupposes that "there are levels of complexity in the living world and that, in the course of biological evolution, there has been a continuous growth of complexity" (ibid., 14). This tendency toward the epistemic unfolding of the universe constitutes what Kováč calls the "epistemic principle" (ibid., 14–20). According to this, but omitting the normative connotation of the word "progress," there is a general tendency toward ever more complex organisms. However, there is no teleology and no guiding principle with a clear end. What are observable are several *teleonomic* processes that simply produce complex products without any guiding foresight. The simplest teleonomic system (a self-copying molecule, for example) is already a *subject* facing the world as an object. A system (in this case a biological species) is situated in a given environment with (a) *surroundings* (the part of the environment that interacts with the system and has a detectable influence on it), and (b) an *Umwelt* (the specific part of the surroundings that interacts with the sensors of the system).[3] However, only that part of the *Umwelt* that is experienced by the subject (Husserl's *Lebenswelt*) is effectively internalised as the basis for construction(s) and operationally used as the initial input for solving problems (cf. Kováč 2007, 66). As Kováč says: "At all levels, from the simplest to the most complex, the overall construction of the subject, the embodiment of the achieved knowledge, represents its *epistemic complexity*. It is the epistemic complexity which continually increases in biological evolution, and also in cultural evolution, and gives the evolution its direction" (Kováč [2000] 2013, 17).

Coming from a completely different field of inquiry, with a background in computer science, artificial intelligence, and cognitive sciences, Subrata Dasgupta's theories on systemic and epistemic complexity open up new avenues for understanding human creativity and its tendency to continuously generate new artefacts. Whereas Kováč is focused on biological species and entities, Dasgupta's interests revolve around human-made artefacts and their origins, evolution, and epistemic content. According to Dasgupta, *artefacts* are "useful things that are produced or consciously conceived in response to some practical need, want or desire" (Dasgupta 1996, 9). But artefacts possess another

2 According to Boden and Zaw (1980, 25), "a cognitive biology would be one in which biological phenomena were conceptualized for theoretical purposes in terms of categories whose primary application is in the domain of knowledge." Moreover, according to Kováč ([2000] 2013, 1) "knowledge is embodied in constructions of organisms and the structural complexity of those constructions—which carry embodied knowledge—corresponds to their epistemic complexity" (Kováč [2000] 2013, 1).

3 The subtle differentiation between "surroundings" and "*Umwelt*" goes back to the work of Jakob von Uexküll (cf. Uexküll 1982). Jesper Hoffmeyer (2012) describes this difference as follows: "In everyday German, Umwelt means simply 'surroundings' or 'environment,' but through the work of the German biologist Jakob von Uexküll (1864–1944) the term, at least in scientific literature has acquired more specific semiotic meanings as the ecological niche as an animal perceives it; the experienced world, phenomenal world, or subjective universe; and the cognitive map or mind-set."

fundamental and interesting property, one that relates to Kováč: "like organisms, they manifest *evolution*" (Dasgupta 1997, 114). The production of "things" and their evolution over time are, therefore, central topics of his reflections. In approaching these topics, Dasgupta distinguishes *systemic complexity* from *epistemic complexity*. Referring to Herbert Simon's (1962) article "The Architecture of Complexity," Dasgupta argues that "a system ... is said to be complex if it is composed of a large number of parts or components that interact in nontrivial ways" (Dasgupta 1997, 113). Complexity depends, then, on quantitative characteristics and on intricate operational behaviours—aspects that tell us *what* the nature of an artefact is. Dasgupta calls this kind of "complexity" *systemic complexity*. It does not tell us *how* that artefact assumed the form it did, nor does it give us any clues about what it might produce in the future. The crucial claim of Dasgupta is that beyond *systemic complexity* there is another, deeper kind of complexity in the universe of human-made things: "*the richness of the knowledge that is embedded in an artifact*. I shall call this *epistemic complexity*. It consists of the knowledge that both contributes to, and is generated by, the creation of an artifact" (Dasgupta 1997, 116). Any artefact is, therefore, surrounded by knowledge that is prior to its emergence and also by knowledge that appears only after the artefact was made. In addition to these *ex-ante* and *ex-post* moments, the specific moment of invention or design is itself a knowledge-rich, cognitive process. Furthermore, artefacts themselves are also knowledge: a design embodies and encapsulates one or more operational principles, to start with. "And, in the case of true invention, when the artifactual form is *original* in some significant sense, the operational principles it encodes constitute genuinely *new* knowledge" (ibid., 117). Whereas the *systemic complexity* of an artefact requires it to be made up of a large number of parts or components that interact in complicated, non-trivial ways, *epistemic complexity* adds to it two wholly new dimensions: the artefact's capacity for producing unexpected behaviour; and the amount, variety, and novelty of the knowledge embedded in it. It is this embedded knowledge that Dasgupta calls "the epistemic complexity of an artefact" (cf. ibid., 118).

Epistemic complexity, in the sense exposed by Dasgupta, is also linked to creativity and original thinking. Even if systemic and epistemic complexity are not necessarily coupled, "epistemic complexity is entirely related to the originality of artifacts and, hence, to the *creativity* of the artificer" (Dasgupta 1997, 130). Someone doing "normal design" or working within a "mature technology" is certainly creating artefacts of potentially considerable systemic complexity; but if that system is an exercise in normal design, it will not be original but will be simple, epistemically speaking. Epistemic complexity is also avoided when the designer takes recourse in well-established styles or when a chosen style is adapted to the specific needs of the technological problem at hand. On the other hand, when the designer rejects several traditional solutions, striving for truly original configurations, knowledge may emerge in wholly surprising contexts. In such cases, "epistemic complexity is, then, a measure of the maker's creativity" (ibid., 131). However, the question of how such complexity can be assessed is not sufficiently addressed.

Dasgupta proposes the identification and enumeration of the "significant knowledge tokens" that constitute an artefact as a first step toward an evaluation of its epistemic complexity. However, as he says, the risk is that such an enumeration will stay within the limits of the artefact's *systemic complexity*, conveying "nothing of the intricacy of the interactions of these knowledge tokens, nor the manner in which they came to participate in the cognitive act, nor (in the case of old knowledge) why they were invoked at all" (ibid., 136). And here is where Rheinberger's experimental systems (and his proposed methodological reduction of systemic complexity) might be extremely useful, helping to situate better the "significant knowledge tokens" at hand. In turn, this would allow precise calibration of the diverse objects/things involved in the experimental set up and to produce graphematic outputs that allow for traceability and for the constitution of new tokens (involving epistemic gain). However, before describing Rheinberger's experimental systems, and to facilitate the understanding of its use in music performance, it is necessary to turn first to the exploration of epistemic complexity *in music*.

EPISTEMIC COMPLEXITY IN MUSIC

Musical works are highly elaborated, complex semiotic artefacts with intricate operational functions. They are made of a variable, though normally large, number of constitutive parts that interact in non-trivial ways. This gives them, in the first place, *systemic complexity*. But they are also the products of invention and embed a rich array of interconnected knowledge encapsulating one or more operational principles. Their conception, creation, and concrete making (and/or performing) inherently involve pre- and post-knowledge, as well as a vast combination of refined cognitive processes. Like organisms, they also manifest evolution (but not necessarily "progress"), doing this in three ways: (1) in terms of "pure" creation, that is, new, original compositions; (2) in terms of re-creation, that is, the performance of past musical works; (3) in the sophisticated process of their preservation over time (editions, recordings, theoretical reflections, etc.). Taking a closer look at the history of musical "things" (without adhering to traditional visions of music history, compartmentalised in styles and periods) and adapting George Kubler's statement regarding a "history of things," a "history of musical things" would include both material artefacts and aesthetic positions, both replicas and unique examples, both tools and expressions—in short all materials worked by human hands under the guidance of connected ideas developed in temporal sequence (cf. Kubler [1962] 2008, 8). New pieces are a combination of old knowledge with new cognitive extensions, and—in the most interesting cases—with unexpected and surprising elements. In addition to their systemic complexity, music things aim at producing unprecedented events embodying new knowledge. In this sense, through the amount, variety, newness, and richness of the knowledge that they embed, they have a considerable epistemic complexity, being artistic examples of what Rheinberger (talking about "experimentation" and following François Jacob) designates as "a machine to make the future" (Rheinberger 1997b, 33).

As Dasgupta writes: "Paintings, sculptures, novels, poems and plays, symphonies, fugues and ragas are all infused with epistemic complexity, especially in the intricate ways their creators summon the past and integrate it into their works" (Dasgupta 1997, 137). Just like technological artefacts, musical artefacts are characterised by systemic and epistemic complexity.

Musical works are surrounded by and encapsulated in specific epistemic settings, which are made of elaborated collections of historically produced (and inherited) "things," such as sketches, drafts, first editions, recordings, or essays concerning a given musical work. After two centuries in which the "work-concept" dominated (see, among others, Goehr [1992] 2007), in recent decades attention has turned to what may be called an *extended work-concept* that takes into consideration the deconstruction of musical works into their graspable constitutive elements, revealing them as complex accumulations of singularities and as multi-layered conglomerates of "things" with the utmost diversity (cf. Kramer 2011, chapters 11 and 14). The closer one gets to such constitutive things, the clearer the epistemic complexity of musical works and performances becomes.

From the perspective of a performer dealing with a musical work from the past (which might also be a very recent past), types of relevant objects loaded with variable degrees of epistemic complexity include:

1 Materials generated by the composer (sketches, drafts, manuscripts, first prints, revisions of prints, etc.)
2 Editions of a "piece" throughout time
3 Recordings of works
4 The reflective and conceptual (musicological, philosophical, analytical, etc.) apparatus around musical works (including thesis, articles, books, etc.)
5 The organological diversity; that is, the musical instruments in use (for example, historical versus contemporary)
6 The performative/aesthetic "orientation" of the performer (historically informed practice, "Romantic interpretation," "new objectivity," "modernising approach," etc.)
7 Arrangements of works
8 The practitioner's own body, which is biologically, technically, and culturally organised

One important observation is that until quite recently many of the items in this list were not generally available since they were the "property" of an exclusive group of experts. In the current, increasingly democratised knowledge-society more and more people have access to them. The items on the list are just the main tokens of a musical work's epistemic complexity and may be extended by potentially infinite further sub-tokens. They build a complicated network of things with embedded knowledge. At some point, they all were reifications or sedimentation of a specific creative or reflective situation. Now, they might function as (1) objects of inquiry (What are they? How many parts do they have? How do they function?) or as (2) "things" for further inquiries (How can they become productive again? How can they build reconfigurations of the work they belong to? What futures do they enhance?). The first approach has to do with a work's systemic complexity, the second with its epistemic complexity.

Moreover, making explicit the epistemic complexity of musical works allows us to understand works as made up of a myriad of "boundary objects" (see also Star and Griesemer 1989). To make performances using selections of such "boundary objects" is an act that discloses open-ended possibilities for new assemblages. Crucial to these new assemblages—and necessary to enhance their epistemic complexity—is the inclusion of a productive "not-yet-knowing," the creation of room for what is yet unthought and unexpected. Under this light, processes of *becoming* appear as more productive than statements of *being*. Works, just like "objects of knowledge," in general remain essentially open. The fundamental incompleteness of any attempt to "close" or narrow down a human-made invention becomes the starting point for epistemic games. As Knorr Cetina (2001, 181) states: "I want to characterize objects of knowledge ('epistemic objects') in terms of a lack in completeness of being that takes away much of the wholeness, solidity, and the thing-like character they have in our everyday conception." In the place of a clear-cut ontology of the artwork, we find an unfolding becoming, where experimentation and the concrete production of new incomplete assemblages become the central artistic activity.

HANS-JÖRG RHEINBERGER'S *EXPERIMENTAL SYSTEMS*

Rheinberger developed his theory of "experimental systems" in relation to the empirical sciences, particularly to molecular biology. However, it was Rheinberger himself who opened the door for other potential uses of this theory, specifically, for example, in relation to the activity of writing: "Das Schreiben, so behaupte ich, ist selbst ein Experimentalsystem" (Rheinberger 2007, my translation; Writing, so I claim, is an experimental system in its own right). That Rheinberger mentions "writing" [Das Schreiben] as a potential field for applications of his theory has certainly to do with his conception of the experimental space and of the scientific object itself as a complex "bundle of inscriptions" (Rheinberger 1997b, 111). The idea of "inscription" might be traced back to Derrida, whose seminal book *De la grammatologie* [*Of Grammatology*] Rheinberger translated into German (with Hanns Zischler) in 1983. Taking his own suggestions further, I propose to extend the use of his theory also to the performance of past musical works.

In the prologue to his book *Toward a History of Epistemic Things*, Rheinberger stresses that "in a post-Kuhnian move away from the hegemony of theory, historians and philosophers of science have given experimentation more attention in recent years" (Rheinberger 1997b, 1). Reflecting that, Rheinberger's essay is "an attempt at an epistemology of contemporary experimentation based on the notion of 'experimental system'" (ibid.). Originally taken from the everyday practice and vernacular of mid-twentieth-century life scientists, the concept of "experimental system" is frequently used, as in Rheinberger, to characterise the space and scope of the research activities conducted by researchers in those sciences (particularly in biochemistry and molecular biology). Importantly, this is, in the first place, a practitioner's notion, not an observer's (see Rheinberger

1997b, 19). In his most succinct formulation, Rheinberger states that "experimental systems are arrangements that allow us to create cognitive, spatiotemporal singularities" (ibid., 23). And in a later publication Rheinberger writes, "It is only at the beginning of the 1990s and in the context of an ongoing replacement of theory-dominated perspectives of scientific change by practice-driven views on research that the concept of experimental systems has found entrance into the historical and philosophical literature on science (Rheinberger 1992, Rheinberger and Hagner 1993, Rheinberger 1997[b])" (Rheinberger 2004, 2).

Rheinberger, himself a molecular biologist and a philosopher, developed "a framework in which experimentation takes meaning as a set of epistemic practices that constitute a specific kind of material culture" (Rheinberger 1997b, 19). On several occasions—notably in the "Prologue" to the book *Toward a History of Epistemic Things* and in the online essay "Experimental Systems: Entry Encyclopedia for the History of Life" (Rheinberger 2004)—Rheinberger gives a thorough description of the four basic features of an experimental system. These features are summarised in table 1.

(a) Working units of contemporary research	—"Experimental systems … are the genuine working units of contemporary research in which the scientific objects and the technical conditions of their production are inextricably interconnected. They are, inseparably and at one and the same time, local, individual, social, institutional, technical, instrumental, and, above all, epistemic units. Experimental systems are thus impure, hybrid settings" (Rheinberger 1997b, 2).
(b) Differential reproduction	—"Experimental systems must be capable of differential reproduction … in order to behave as devices for producing scientific novelties that are beyond our present knowledge, that is, to behave as 'generator[s] of surprises.'… To be productive, experimental systems have to be organized in such a way that the generation of differences becomes the reproductive driving force of the whole experimental machinery" (Rheinberger 1997b, 3). —"Differential reproduction conveys a peculiar kind of historicity to experimental systems. They can acquire, to speak with Ian Hacking 'a life of their own'" (Rheinberger 2004, 5, including citation of Hacking 1983, 215).
(c) Graphematicity	"Experimental systems are the units within which the signifiers of science are generated. They display their meanings within spaces of representation … in which graphemes, that is, material traces … are produced, articulated, and disconnected and are placed, displaced, and replaced. … scientists create spaces of representation through graphematic concatenations that represent their epistemic traces as engravings, that is, generalized forms of 'writing'" (Rheinberger 1997b, 3).
(d) Experimental cultures – conjunctures – bifurcations – hybridisations	—"Experimental systems get linked into experimental ensembles, or experimental cultures … [through] conjunctures and bifurcations" (Rheinberger 1997b, 3). —"Finally, conjunctures and ramifications of experimental systems can lead to ensembles of such systems, or experimental cultures." (Rheinberger 2004, 6).

Table 1: The four basic features of experimental systems.

In short, an experimental system is a specific unit of research, spatiotemporally precisely located, wherein two kinds of "things" interact: technical objects and epistemic things (whose difference is functional and not ontological). Within such a system, mechanisms of reproduction and repetition aim at the generation of differences. Furthermore, an experimental system is a space of representation where inscriptions are made in order to generate and preserve traces. Finally, experimental systems might establish links to other experimental systems (conjunctures), be divided into several experimental systems (bifurcations), or merge with other experimental systems (hybridisation). At some point an articulation of ensembles of experimental systems might emerge, generating what Rheinberger calls "experimental culture" (cf. Rheinberger 1997b, 3).

Rheinberger's use of the term "system" has nothing to do with Luhmann's "systems-theory," nor with other hermetic or closed systems such as Maturana and Varela's "autopoeisis." As Rheinberger states: "'System' means here simply a kind of loose coherence both synchronically with respect to the technical [objects] and organic [epistemic] elements that enter into an experimental system and diachronically with respect to its persistence over time" (Rheinberger 2004, 3). As the use of the terms "technical object" and "epistemic elements" reveals, *technicity* and *epistemicity* form an intricate relation at the inner core of an experimental system. "Epistemic things" are the entities "whose unknown characteristics are the target of an experimental inquiry" (Rheinberger 1997b, 238), paradoxically embodying what one does not yet know (cf. ibid., 28). "Technical objects" (sedimentations of earlier epistemic things) are scientific objects that "embody the knowledge of a given research field at a given time" (ibid., 245); they might be "instruments, apparatus, and devices which bound and confine the assessment of the epistemic things" (Rheinberger 2004, 4). Epistemic things are necessarily underdetermined, while technical objects are characteristically determined. Technical objects and epistemic things coexist simultaneously within the experimental system, and "whether an object functions as an epistemic or a technical entity depends on the place or 'node' it occupies in the experimental context" (Rheinberger 1997b, 30); "within a particular research process, epistemic things can eventually be turned into technical things and become incorporated into the technical conditions of the system" (Rheinberger 2004, 4). Between the two extremes, there is room for a gradient scale, for diverse degrees of hybrid things and for vague material entities whose function in the experimental system changes. An example of such an entity, when applying these notions to music, is the score, the material inscription of a complex set of signs and symbols that might be considered as either an epistemic thing or a technical object depending on the role it plays at any particular point during a performance.

Experimentation in Music Performance: How to Make the Future?

The application of Rheinberger's terminology and research architecture to music performance is an attempt to establish a wider common ground for

artistic research in music performance. This application is not obvious, nor is it straightforward. Rheinberger developed his theories in a very specific field of inquiry. In transferring these theories to other fields (especially to artistic and creative areas), one must proceed cautiously. This said, however, there are several musical entities that might be considered as being "technical objects" and/or "epistemic things," depending on the specific use and context of their presentation. Accepting the risk incurred in applying Rheinberger's theories to music, one might say that scores, instruments, or tuning systems, for instance, may be seen as technical objects that are brought into particular constellations (such as "the concert" or a CD recording), to produce art. The same entities may, however, operate as epistemic things, whose qualities can be divided into two main groups: those already known and those still to be known (discovered). Musical works participate, therefore, in two different worlds: one related to their past (what constitutes them as recognisable objects), another related to their future (what they might become). If we require the performance to be an idealised act of interpretation (be it hermeneutic or performative[4]) and if we reduce it to the repetition of the score (understood as an instrumental technical object), we take away the possibility for epistemic things to emerge or to unfold into unforeseen dimensions. We would be dealing mainly with the work's past. If we want to give credibility to performance as an instance, among others, of epistemic activity, we need a concept such as "experimentation" that creates space in relation to the score (which would otherwise overdetermine and close down the epistemic potential of performance practice), allowing unpredictable futures to happen. And we also need Rheinberger's experimental systems as a basic methodological tool to frame our artistic experimental approach.

From this perspective, experimentation, methodologically conducted through experimental systems, might allow for "making the future" of past musical works, something of which "interpretation" is far less capable. Moreover, artistic experimentation has the potential to bring together the past and the future of "things," enabling and concretely building (constructing) new assemblages—something that non-artistic modes of knowledge production cannot do.

But how can such new assemblages appear? Under what conditions and responding to which criteria? How to evaluate their quality? How to assess their constitutive parts and define them as contributions to knowledge? To suggest possible lines of answer to these questions a brief summary of the concepts and practices exposed so far in this chapter—as well as a reference to the Foucauldian concepts of *archaeology* and *problematisation*—will help better situate and explain not only the concept of "experimentation" in use in this chapter but also my own conception of artistic research and its role in our knowledge society.

The first fundamental concept presented in this chapter was that of *epistemic complexity* as defined and developed by Kováč and Dasgupta. For Kováč epistemic complexity is the result of the epistemic unfolding of the universe (*epis-*

4 For the distinction between hermeneutic and performative "interpretation" see Hermann Danuser's entry on "Interpretation" for the German Encyclopaedia MGG (Danuser 2007).

temic principle), while for Dasgupta it concerns the richness of the knowledge that is embedded in an artefact. If we think in terms of simple time coordinates such as past-present-future these two perspectives share one characteristic: they both scrutinise things (biological organisms or human-made artefacts), looking at and analysing their respective pasts. What things *are* in the present is understood to be an accumulation of epistemic features throughout time, from the past until the present. Even if this approach might inform us how an organism or an artefact might behave in the near future, the main concern of those two authors is not with the future but with identifying, articulating, and evaluating the evolution of such things.

Second, I presented the concept of *things* as developed by Rheinberger, inspired by Kubler. This concept allowed me to consider the epistemic complexity of the natural and human worlds as a potentially infinite galaxy of things, entities that escape closed definitions and that might have different functions according to the context in which they are temporarily immersed. In the second section I mentioned some graspable examples of things that constitute musical works, things that I defined as tokens of a musical work's epistemic complexity. This breakdown of the epistemic complexity of musical works into its manifold constitutive elements (things) is crucial because it enables open-ended possibilities for new assemblages.

In this constellation of potentially infinite things the concept of *archaeology*, as elaborated by Michel Foucault, becomes a helpful methodological tool. According to Clare O'Farrell, "'Archaeology' is the term Foucault used during the 1960s to describe his approach to writing history. Archaeology is about examining the discursive traces and orders left by the past in order to write a 'history of the present.' In other words archaeology is about looking at history as a way of understanding the processes that have led to what we are today" (O'Farrell 2007). In this sense, archaeology is a way to look at the past from the present, with the goal of better situating/understanding the present (and, crucially, *not* the past). It describes a boomerang-like route: from the present to the past, and back from the past to the present. It does not aim at disclosing "how things really were" but rather "why things are what they are" *today*. In Foucault's words:

> Archaeology does not try to restore what has been thought, wished, aimed at, experienced, desired by men in the very moment at which they expressed it in discourse... it does not try to repeat what has been said by reaching it in its very identity. It does not claim to efface itself in the ambiguous modesty of a reading that would bring back, in all its purity, the distant, precarious, almost effaced light of the origin. It is nothing more than a rewriting: that is, in the preserved form of exteriority, a regulated transformation of what has already been written. It is not a return to the innermost secret of the origin; it is the systematic description of a discourse-object. (Foucault 1972, 139–40)

The link to Michel Foucault is explicit in Rheinberger and is very important to his theories of experimental systems in several regards but particularly to the definition of epistemic thing: "[Foucault's] 'discourse-object' is what I call an epistemic thing" (Rheinberger 1997b, 8). For Rheinberger, epistemic things are

"things embodying concepts" that "deserve as much attention as generations of historians have bestowed on disembodied ideas" (ibid.). To give epistemic things the attention they deserve is (1) to extract them out of the *chaos* of systemic complexity, and (2) to allow them to contribute to the formation of new entities, new epistemic things that, in turn, will add new things to the archaeology of epistemic things, that is, to epistemic complexity. From this perspective, archaeology appears almost as a necessary consequence of epistemic complexity.

But Foucault's "discourse-object" is not only to be described but must be productively resituated, involving *problematisation*, another Foucauldian concept that gained increased relevance in Foucault's late works: "The notion common to all the work that I have done since *Histoire de la Folie* is that of problematization." (Foucault 1998, 257). With this concept Foucault refers to the work one does to direct one's thought toward present practices which were once seen as stable but which the researcher shows to be problematic in some crucial sense.

> Problematization doesn't mean the representation of a pre-existent object, nor the creation through discourse of an object that doesn't exist. It is the totality of discursive or non-discursive practices that introduces something into the play of the true and false and constitutes it as an object for thought. (Foucault 1998, 257)

Problematisation has, therefore, to do with "objects," with things that are archaeologically retraced and transmuted from "neutral objects" into "objects for thought." In the context of the present chapter, archaeology and problematisation go hand-in-hand, and they both work as problematisation of the *aesthetic-epistemic complexity* described above.

Epistemic complexity, *things*, *archaeology*, *problematisation*—the concepts presented so far—all scrutinise things (biological organisms, human-made artefacts, and concepts) by enquiring into their past. The notion of problematisation might be understood as a highly elaborated form of *interpretation* of historical data. In this sense, looking backwards and applied to music, it is perfectly recognisable in disciplines such as, for example, music analysis, music theory, music historiography, organology, and biographical studies—in fact in the majority of musicological sub-disciplines.

However, there might be a different mode of problematising things, a mode that, rather than aiming to retrieve what things *are*, searches for new ways of productively exposing them. That is to say, a mode that, instead of critically looking into the past, creatively projects things into the future. Such is the final proposal of this chapter: to reverse the perspective from "looking into the past" to creatively designing the future of past musical works. In my view this is precisely what artistic research could be about—a creative mode that brings together the past and the future of things in ways that non-artistic modes cannot do. In doing this, artistic research must be able to include archaeology, problematisation, and experimentation in its inner fabric. The making of artistic *experimentation* through Rheinberger's *experimental systems* becomes a creative form of *problematisation*, whereby through *differential repetition* new assemblages of things are materially handcrafted and constructed.

In a deeper sense experimentation is not the act of conducting experiments (and even less of making tests). Aesthetic experimentation relates primarily to a completely new orientation of the senses and of the reason, aiming to reconfigure the sensible. As phrased by Ludger Schwarte in the opening speech of a conference on "experimental aesthetics" held in Düsseldorf in 2011: "Aesthetic experimentation starts when the parameters of a given aesthetic praxis are broken, suspended, or transcended, in order to work out a particular mode of appearance that reconfigures the field of the visible and of the utterable" (Schwarte 2012, 187, my translation).[5]

That such reconfigurations are only possible after a profound consideration of the epistemic complexity of aesthetic things is the inevitable and necessary condition for creative problematisation; that is to say: for artistic research. From this perspective, artistic research therefore happens when: (1) The epistemic complexity of a given object of inquiry is scrutinised; (2) the constitutive things of such objects of inquiry are identified and isolated; (3) an archaeology of such things is explored; (4) the results of this exploration are problematised with the purpose of enabling their projection into the future; (5) the problematisation happens in precisely calibrated frameworks (experimental systems); (6) inside an experimental system *differential repetition* is stimulated, enhanced, and achieved; (7) new assemblages of things emerge as the result of a constructive (and not only theoretical) endeavour.

5 "Das ästhetische Experimentieren beginnt dort, wo die Parameter einer gegebenen ästhetischen Praxis unterbrochen, suspendiert oder überschritten werden, um eine spezifische Erscheinungsform herauszuarbeiten, die das Feld des Sichtbaren und Sagbaren rekonfiguriert."

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