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Part 2
Experimental Systems in Music

Chapter 3

Experimental Systems
and Artistic Research[*]

1. AN EPISTEMOLOGY FOR ARTISTIC RESEARCH?

The preceding two chapters proposed a renewed mode of thinking about past musical entities, presenting a new image of the musical ~~work~~, crucially questioning traditional ontological accounts, and arguing for wider, less essentialist, and more practice-based ontological perspectives. Moving away from the work concept, and grounded in the notions of strata, assemblage, and diagram, such a perspective views musical works as *multiplicities*, as complex conglomerates of *things* and *intensities*, containing innumerable and potentially never-ending components, which are continuously rearranged and reassembled in their specific modes of appearance throughout history. Chapters 1 and 2 are thus concerned with ontogenetic processes of constitution, formation, and transmission of musical entities throughout time. The next two chapters, starting with this one, have a more epistemological perspective: given the entities we accept are part of our world of music performance, how can we concretely operate with them? How can we reduce their epistemic complexity? Which of their characteristic properties must we operationally retain, eliminate, or transform? How is it possible to open them and make them contribute to the generation of new knowledge? How can such new knowledge be made accessible and discussable to others? What kind of daily praxis can we develop that is adequate to the new image of *work* as multiplicity? How can one claim that a performance, in addition to its intrinsic aesthetic value, has epistemic content?

One possible approach to start addressing these questions systematically is to appropriate for the arts (and for music in particular) those kinds of laboratory mindsets and set-ups well known from science, especially from the life sciences, that deal with ever changing organs, organisms, and forms of life. Situating my research project at the crossroads of music, philosophy, and science, I particularly looked to post-Kuhnian epistemological discourses, such as those presented by Ian Hacking (1983), Bruno Latour and Steve Woolgar ([1979] 1992), Steven Shapin and Simon Schaffer (1985), and Hans-Jörg Rheinberger (1997). Crucially, all these authors move away from the hegemony of theory and

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[*]   I first discussed the topics covered in this chapter at the annual conference of the Society for Artistic Research, Helsinki, 30 April 2017. Following the prescribed mode of presentation for that particular conference, a web-based exposition containing the texts of my presentation and hyperlinks to the cited publications and audio and video recordings was published on Research Catalogue. See https://www.researchcatalogue.net/view/351463/351464/0/2512.

consider science to function on a practice-driven rather than theory-driven basis, an aspect that intimately resonates with practice-led modes of artistic research. For these theorists, there is no science "in general," only concrete, ever-changing, and unpredictable reconfigurations of matter, connectors, and functions. More than the *context of justification* so often addressed by scientists, they shift the focus towards *contexts of invention and discovery*. In the place of absolute rules and axioms, they try to clarify how knowledge is constituted in and through practices. Applied to art practice, with its inherently polysemic objects, such epistemologies allow for the questioning of their function as vehicles of research. How can artworks participate in the production of knowledge? As Borgdorff (2012, 187) has phrased it: "How can [artworks] function not just as objects of research, but as the entities in which, and through which, the research takes place—and in which and through which our knowledge, our understanding, and our experience grows."

My principal reference in this respect has been the work of the historian of science Hans-Jörg Rheinberger, particularly his notion of *experimental systems* (Rheinberger 1997).[1] Such *systems* (which are described further below) are extremely concrete, defining units of research that operate in a specific time and place, with particular individuals, and under concrete social, institutional, technical, and instrumental arrangements. Within such systems, sequences or series of experimental activities take place, replicating and changing conditions, parameters, scales, and observations. Given a research problem, infinite experimental iterations of precisely calibrated experiments generate expected results (predictable), but crucially also generate unexpected ones (unknown). Experiments are, thus, not simple methodological events made to confirm or reject certain hypotheses (knowledge already theoretically formulated); instead, they function as the actual generators of knowledge, adding knowledge that the system had no knowledge of before. It is through this unexpected and unknown part of the results that science advances, not by confirming or rejecting pre-existing knowledge. Thus, experimental systems become literally "machines for making the future," as Rheinberger (1997, 28), quoting François Jacob (1988, 9), wrote. So conceived, science appears not as a distant set of laws and axioms, but as a very concrete operating system based upon daily experiences and unpredictable experiments conducted in the lab.

We appropriated this epistemology of the concrete for music, adopting it as the basic model for the daily practice of MusicExperiment21. This created a unique modus operandi, based upon a precise mapping of the research materials and components in terms of *technical objects*, *epistemic things*, the *space*

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1   References to Rheinberger's experimental systems and to their potential for artistic research have been pioneered by Michael Schwab and Henk Borgdorff (see Borgdorff 2012, 184–98; Rheinberger and Schwab 2013; Schwab 2013a; 2013b; 2014a; 2014b; 2014c; 2015). I am especially indebted to Michael Schwab for having introduced me to Rheinberger's thought in the first place, and for having created the conditions for my personal acquaintance with him on the occasion of a working meeting organised at the Orpheus Institute (5–6 July 2012). In addition to reading his essays, I had further conversations with Rheinberger during the annual conference of the Society for Artistic Research (Helsinki, 28–30 April 2017), at the Summer School of the École Polytechnique Fédérale de Lausanne (Lausanne, 11–14 July 2017), and at the second international conference on Deleuze and Artistic Research (Ghent, 20–22 November 2017).

of representation, the *space of graphematicity*, and *machines for making the future* (on these notions, see Rheinberger 1997, especially 27–31, 223–29). Furthermore, it enabled the development of a creative notion of experimentation in the arts, based upon sequential series of research outcomes and performances, which became one of the hallmarks of MusicExperiment21 (a selection of which will be presented at the end of this chapter). This effective hybridisation of research strategies (from life sciences to artistic research), and its intrinsic search for the future possibilities of the materials at hand, relates to the following statement by Rheinberger: "The minds of inventors and scientists, much like those of artists, are not oriented toward recognizing what exists; they 'turn more upon future possibilities, whose speculations and combinations obey an altogether different rule of order, described here as a linked progression of experiments composing a formal sequence'" (Rheinberger 1997, 80, incorporating quotation from Kubler 1962, 85).

Before describing the basic characteristics of Rheinberger's experimental systems, I will introduce the specific working methodology I developed (in the framework of MusicExperiment21) for artistic research in music. This is crucial in order to understand the precise place for *experimental systems* in my overarching research construction. They have been used in a specific moment of the research trajectory, namely in what I call the *problematisation* of the available materials and their reconfiguration in new combinations and arrangements.

2. A METHODOLOGY FOR ARTISTIC RESEARCH

As thoroughly explained in Chapters 1 and 2, the new image of ~~work~~ as a multiplicity made of actual and virtual components is crucially grounded upon the notion of strata and processes of stratification. In this respect, I have proposed a taxonomy of strata into six types, referring to musical materials that physically exist in the real (graspable) world: *substrata* (treatises, manuals, iconography, period instruments, descriptions of concerts, critics, archives, lists of personnel, payments, etc.), *parastrata* (sketches, drafts, first editions, letters, writings by composers and performers, annotations, etc.); *epistrata* (period editions, editions over time, analysis, reflexive texts, theoretical contextualisations, recordings, etc.); *metastrata* (future performances, expositions, recordings, transcriptions, etc.); *interstrata* (infiltrations and contaminations of different types of strata generating this hybrid type); and *allostrata* (materials that even if not directly relating to a given work can enter productive relationships with it). All these strata are manifest as individual singularities and can be seen as *sources* or *documents* in a more conventional historiographical sense. By focusing on these innumerable documents, musical *works* are considered as historically constructed conglomerates of *things*,[2] a view that (quite straightforwardly) allows different

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2 The notion of *thing*, which Rheinberger took from George Kubler's *The Shape of Time: Remarks on the History of Things* (1962), is central to conveying the "not yet determined" character of research results and materials under investigation. As Borgdorff (2012, 190) put it, "Rheinberger has deliberately chosen the term 'thing' rather than 'object,' in order to signify the indeterminate, not yet crystallised status of the knowledge object. Epistemic things are chronically underdetermined."

modes of research to be productively integrated within the creative fabric of an artist.

Starting from conventional research on the available things that pertain to a given musical work (see figure 3.1, "Archaeology: sources, documents, things"), one selects and isolates some of the things, subjecting them to historiographical, analytical, and comparative research (figure 3.1, "Genealogy"), so that, finally, (figure 3.1, "Problematisation in and through practice"), they are exposed in unprecedented reconfigurations and arrangements. As soon as a new arrangement is presented, it inevitably becomes another document or thing, thus feeding the process circularly. This is, in its shortest formulation, the three-step methodology created and used by MusicExperiment21 for the generation of all its research outcomes (see figure 3.1). First, the innumerable material traces and things are *archaeologically* identified and retrieved for further consideration; second, the relations and connectors they entertain with one another, as well as their transmission over time, are studied in terms of a *genealogy*, disclosing singularities (i.e., particular points of high energy or concentration of forces); and, finally, specific selections of things are brought together as arrangements, or, in Deleuzian language, as "concrete machinic assemblages" (Deleuze and Guattari 1987, 555) that *problematise* them anew.

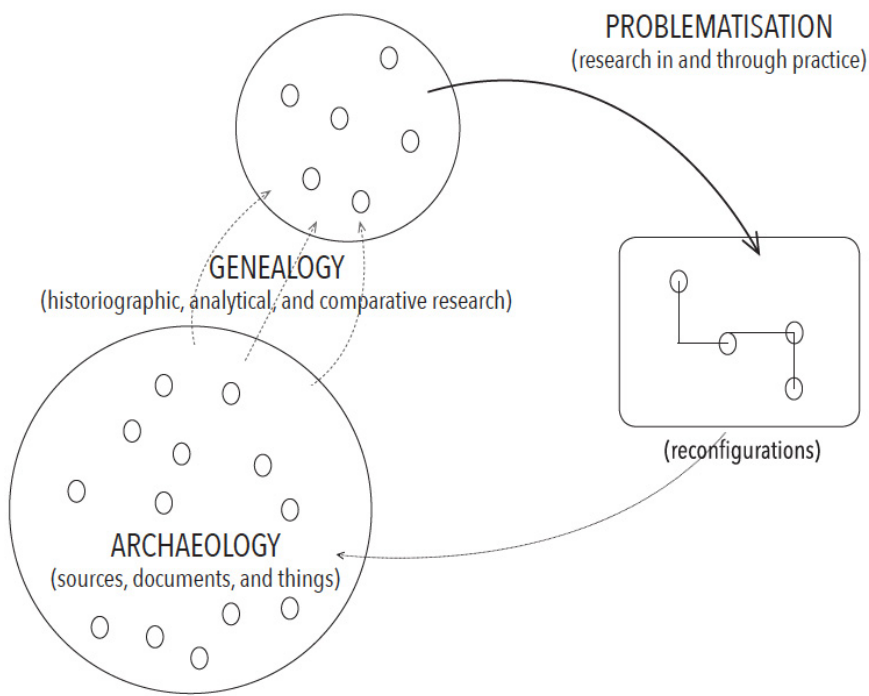

Figure 3.1.

Figure 3.1. MusicExperiment21's working methodology.

This methodology has several relevant features:

(1)   It allows the integration into performance of diverse materials that go beyond *the score* (sketches, texts, images, and videos), offering a broader contextualisation of works within a transdisciplinary horizon.

(2)   It fosters new modes of conducting research in music, overcoming traditional divisions and boundaries between music theory or musicology and creative practices; the practitioner becomes profoundly rooted in scholarly research, and in turn this research is a meaningful and integral part of the artistic results.

(3)   It creates the conditions for a unifying approach to *performance* and *composition*, as the three steps and their respective operations are very similar for composers and performers.

(4)   It makes graspable the potential of performance and composition to operate as knowledge-producing activities.

(5)   Beyond the mere (re)creation or (re)production of a musical "work," it enables an understanding of musical *things* as objects for thought through performative or compositional devices.

(6)   It overcomes traditional artistic and scholarly partitions between "success" and "failure," as any resulting *reconfiguration* results in a new finding being added to the system.[3]

The archaeological moment relates to conventional scholarly research, including archival and source studies; genealogy calls for interpretation, semiotics, and transtextuality; and problematisation happens by constructing new and experimental arrangements. With the latter, the artistic dimension becomes inescapable, requiring a kind of artist and researcher who can cohabit in the same body. It is in this phase of the research process that the notion of experimental system becomes particularly relevant and fruitful. In this moment, differential repetitions of combinations and reconfigurations of the objects under investigation take place. All the things taken into consideration to be used in the new arrangements (reconfigurations) must be precisely defined, calibrated, and evaluated from the point of view of their intrinsic energies, intensities, speeds of change, relation to the other components of the arrangement, and so on. This is the place for numerous new inscriptions, registering the unprecedented effects of the problematisation upon the objects under inquiry. In this sense, my appropriation of Rheinberger's notion of *experimental systems* for music is not arbitrary, nor is it vague or abstract. On the contrary, it is radically material, concrete, and precise. To make this clearer, the following section offers a compact overview of the notion of experimental system, clarifying some terminology and suggesting modes of appropriating such systems for artistic research.

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3   Discussing the value of "results" in the sciences, Rheinberger notes the following: "What is a result? A—positive—result is a finding that, in principle, can be reintegrated as a component of the system and can thus enlarge or change the setup" (Rheinberger 1997, 135).

3. Hans-Jörg Rheinberger's experimental systems

On the first page of his book *Toward a History of Epistemic Things*, Rheinberger (1997, 1) states: "In a post-Kuhnian move away from the hegemony of theory, historians and philosophers of science have given experimentation more attention in recent years. This book is an attempt at an epistemology of contemporary experimentation based on the notion of 'experimental system.'" By situating scientific practices and research methodologies in their respective historical periods, Rheinberger closely addresses the problem of historicising epistemology, which so crucially contributed to a movement from science-as-a-system to science-as-a-process (see also Rheinberger 2010, 1). This change happened in parallel with a profound shift of interest from a system of knowledge production based upon the finding and presenting of a "correct" scientific method to a more concrete interest "in what scientists actually do in pursuit of their specific research" (ibid., 3). Instead of *testing theories*, research happens on a daily basis, through the concrete (and still most often) manual manipulation of objects. Researchers appear as *doers*, not as illuminated academics delivering proof of a given theory. It was within these broader frameworks of interest (hybrid modes of research and materially based experimentation) that Rheinberger's notion of experimental systems became so central to the concrete practice of MusicExperiment21, providing a basic modus operandi to the team and to the design of the overarching research strategy.

Importantly, there have been two different yet complementary approaches to Rheinberger's theories within MusicExperiment21. On the one hand, Michael Schwab—an artistic researcher and philosopher, who has been in charge of the project's epistemological strand—investigated the wider epistemological consequences of such systems, particularly focusing on how to adapt experimental systems for contemporary art. While Rheinberger's experimental systems discuss the spaces of experimentation and the spaces of representation, Schwab situates contemporary art in the *graphematic* rather than *representational space*—as might still have been the case, arguably, for modern art (see Schwab 2015). In this line of thought, Schwab links Rheinberger's experimental systems to his own concept of *expositionality* (see Schwab 2014b). Notions such as the fragmentary, the untimely, or the contemporary are, therefore, central to his approach, which aims to look at transformations both in the work and in the system itself.[4]

On the other hand, Rheinberger's experimental systems have been used to design artistic-research differential instantiations, leading to a large number of outputs. By "differential instantiations" I mean series of different performances and/or presentations made as part of a particular research project within MusicExperiment21. There were, for example, twenty-six different instantiations of the Rasch project, seven of Diabelli Machines, seven of Nietzsche Z, and so on, each of which explored different materials and arrangements. This approach, which I have designed and developed since the beginning

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4 This research focus, led by Michael Schwab, generated important events and outputs, such as a study day (Orpheus Institute, 5–6 July 2012), an interview with Rheinberger (Rheinberger and Schwab 2013), a research questionnaire (Schwab 2014a), and the collective volume *Experimental Systems: Future Knowledge in Artistic Research* (Schwab 2013a).

of MusicExperiment21, has been focused on the concrete conditions of the experiments and on the generation of aesthetico-epistemic differential repetition. It looked at the distinction between *technical objects* and *epistemic things* and between the space of experimentation and the space of representation, and at the question of multimedia inscriptions resulting from and at the same time generating new modes of presenting artistic research.

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 notion, specifically, for example, in relation to the activity of writing: "Writing is an experimental system in its own right" (Rheinberger 2007, my translation; Das Schreiben, so behaupte ich, ist selbst ein Experimentalsystem). That Rheinberger mentions "writing" [*das Schreiben*] as a potential field for applications of his theory certainly reflects his conception of the experimental space and of the scientific object itself as a complex "bundle of inscriptions" (Rheinberger 1997, 111). The idea of *inscription* might be traced back to Derrida, whose seminal book *Of Grammatology* Rheinberger translated into German (with Hanns Zischler) in 1983. Taking Rheinberger's own suggestions further, I propose to extend the use of his theory also to the performance of past musical works.

Originally taken from the everyday practice and vernacular of mid-twentieth-century life scientists, the concept of an *experimental system* is frequently used to characterise the space and scope of the research activities conducted by researchers in the life sciences, particularly in biochemistry and molecular biology. Importantly, this is, in the first place, a practitioner's notion, not an observer's (see Rheinberger 1997, 19). This observation is of the utmost relevance for any attempt to appropriate experimental systems to artistic or musical activities: those operating the system must be music practitioners, that is to say, not music historians, music sociologists, or music theoreticians. Such musicologists can analyse a posteriori what the practitioners did, but the doing itself, the making of artistic research, remains in the first instance in the hands of those doing music not in those *observing* music from outside.

In his most succinct formulation, Rheinberger (1997, 23) states that "experimental systems are arrangements that allow us to create cognitive, spatiotemporal singularities." 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 2004, 2). Rheinberger, himself a molecular biologist and philosopher, developed "a framework in which experimentation takes meaning as a set of epistemic practices that constitute a specific kind of material culture" (Rheinberger 1997, 19).

More specifically, experimental systems are characterised by four main features, which Rheinberger thoroughly described on several occasions—notably in the prologue to *Toward a History of Epistemic Things* (1997) and in the essay "Experimental Systems: Entry Encyclopedia for the History of Life" (2004). In short, these features are as follows:

(1)   An experimental system is a specific working unit 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 1997, 2)

(2)   Within such a system, mechanisms of reproduction and repetition aim at the generation of differences (*differential repetition*):

> 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 1997, 3)

(3)   An experimental system is a space of representation where inscriptions are made in order to generate and preserve traces (*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 1997, 3)

(4)   Finally, experimental systems can 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* (see Rheinberger 1997, 3).

Terminologically, and to avoid conceptual misunderstandings, some explanation of terms is necessary here. First, Rheinberger's use of the term *system* does not relate to an enclosed, perfectly defined set of rules and axioms, but to "simply a kind of loose coherence both synchronically with respect to the technical and organic elements that enter into an experimental system and diachronically with respect to its persistence over time" (Rheinberger 2004, 3). Furthermore, the notions of *technical objects* and *epistemic things* reveal that technicity and epistemicity are not ontologically opposed to each other but 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 1997, 238), paradoxically embodying what one does not yet know (see ibid., 28). *Technical objects* (sedimentations of earlier epistemic things) are scientific objects

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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; "whether an object functions as an epistemic or a technical entity depends on the place or 'node' it occupies in the experimental context" (Rheinberger 1997, 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 these 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 the compositional process, the research moment, its performance, or its recording.

Critically, when appropriating experimental systems for the arts, what is at stake are the epistemic qualities of art, and not an understanding of art as science, or of art as an object for science. When using the term *epistemic thing*, Rheinberger clearly avoided using "scientific thing," denoting that these *things* are not independent of the resources and media that allow them to exist (see Rheinberger 2008, 13'30"–13'45"). For artistic research, the most important questions are related neither to quantifiable data nor to subjective phenomenological observations. In my view, artistic research in music should not be addressing (or, at least, not in the first place) measurable phenomena, which are the domain of performance science, performance studies, organology, philology, historiography, and applied musicology. The crucial questions of artistic research are of a different nature, involving the epistemic power of art and its transformation from an object of aesthetic appreciation to an object of and for thought. These are the concerns that have the potential to redefine artistic practices, to generate conjunctures, bifurcations, and hybridisations of forms and materials.

On the other hand, the four basic characteristics of experimental systems, taken together, enhance the constitution of "thought collectives" (*Denkkollektiv*), a term coined by Ludwik Fleck in 1935 to which Rheinberger often refers. Such thought collectives, each with a special "thought style" (*Denkstil*), are fundamental to the production of knowledge in artistic research, moving beyond the individual "genius" to more distributed modes of creativity and reflection, which liberate the production of knowledge from disciplinary compartmentations. They extend practice and reflection beyond disciplinary thinking, avoiding what Bachelard called the "cantonisation" of science—a danger of which artistic researchers from any discipline should be well aware.

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4. Thought collective and ensembles of experimental systems: MusicExperiment21

MusicExperiment21 (2013–18) was an operative thought collective, a group of artistic researchers, including music performers, composers, musicologists, philosophers, artists, dancers, choreographers, video-makers, and music ensembles working closely together, mainly within the spaces of the host institution, but also through web-based platforms such as Research Catalogue. To be sure, the project was conceived and designed by myself alone (back in 2011), but from its very beginning it became a collective endeavour, with almost all its outputs being the result of collaborative efforts in which every single researcher acted as a component part of complex artistic machinery. Thus, for example, when I commissioned six new compositions from six young composers for the project Diabelli Machines, the compositions were not meant to be completely autonomous musical works; rather, they served a specific function in a wider performance context. In this way, composition itself became simply one more parameter in the overall research trajectory—an aspect that was explained and fully accepted by the composers involved, who saw the potential of a working methodology based upon the notion of collective agency. Moreover, MusicExperiment21 had a dozen projects running in parallel, including projects for performance in concert halls (on the musics of Schumann, Beethoven, Nietzsche, Schoenberg, Nono, Maderna, and Stockhausen), others of a more speculative nature (on music ontology, on the notion of the contemporary, on the politics of performance), and others that were part of doctoral programmes conducted by the students within the project. This extreme diversity of interests and focuses of their respective research transformed the idea of collective thinking into a felt necessity. Every team member could only work productively when situated in a complex network of connectors and links between the different projects. Instead of diluting responsibility, this had the opposite effect, making everyone feel the distributed ownership of every single subproject. Each subproject, with all its numerous constitutive parts and its complex set of internal relations, was an experimental system in its own right. But if we take all the projects as a whole, which together make up MusicExperiment21, one can talk of an *ensemble of experimental systems*. Their intricate interactions permit us to conceive the whole as "an articulated experimental network of objects and practices whose coherence, just as in the case of individual experimental systems, is a tinkered and patched-up coherence with a collateral constitution" (Rheinberger 1997, 137). What held all these subprojects together, and what became increasingly "easier" to control, was not some kind of hidden referent to all of them but its horizontal concatenation, which is based upon the circulation of "model compounds, technical subroutines, and tacit knowledge throughout the network" (ibid.). Despite being different from one another, all the subprojects of MusicExperiment21 shared the same infrastructure, the same operating people, the same technical devices, the same spaces, daily schedules, and so on. In this sense, MusicExperiment21 conducted in artistic research in music exactly what experimental systems have done in biology and chemistry, enabling the "transition from the microdynamics of

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localized and situated experimental systems to the macrodynamics of broader fields of experimentation. . . . Within such ensembles, the systems interact and remain connected through the exchange of sufficiently stabilized procedures and epistemically attractive objects" (ibid.).

Finally, on an even wider level of consideration, "experimental systems come in populations of multiple variants inhabiting overlapping areas of investigation" (Rheinberger 1997, 133), and MusicExperiment21 didn't exist in a bubble disconnected from the world. It was placed within a research centre—the Orpheus Institute—and was thus a part of a wider research community and international endeavour that aims at grounding and developing the burgeoning field of artistic research in music. In this sense, MusicExperiment21 was part of a research culture, part of an ensemble of other research projects, each of which can be seen as experimental systems in their own right: "such . . . systems tend to form ensembles that construe the experimental space, not of a single, localized group of scientists, but of a circumscribed scientific community" (ibid., 136). In this light, the whole of the Orpheus Institute functions as an articulated experimental network of objects, concepts, and practices. It can be seen as an ensemble of experimental systems operating "as clusters of materials and practices," which can "evolve through drift (conjunctures), fusion (hybrids), and divergence (bifurcations)" (ibid., 137–38). Ultimately, such complexification of interactions leads to what Rheinberger calls *experimental culture:*[5] clusters of ensembles of experimental systems, that "share a certain material style of research" (ibid., 138).

Thus, MusicExperiment21's application of Rheinberger's terminology has been part of a major attempt to establish a wider horizon of practice for artistic research in music. At the same time, it also emphasised the need to provide as many concrete examples of such application as possible, and it produced copious amounts of outputs, including lectures, performances, recordings, essays, seminars, conferences, and books. The tripartite methodology described above enabled the permanent generation of differential repetition and the constant production of *results*, in the sense given to this word by Rheinberger, leading to the proliferation of synchronic *series of experiments* and diachronic *modules of research*.

5. Series of experiments and modules of research

In 2014, Michael Schwab (2014b, 31) noted that "over the last few years, Hans-Jörg Rheinberger's theory of 'experimental systems' . . . has gained currency in debates around art and research. . . . [However,] it is striking that, in the literature to date, no coherent picture has emerged as to how his theory may productively be employed in this context. . . . Authors who focus on epistemological implications may identify 'epistemic things' in general within artistic practice, while failing to account for the specificity of experimentation in this context." In the same text,

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5   Critically, what Rheinberger calls *experimental cultures* is to be understood in the first place as an epistemological and not as a sociological concept (see Rheinberger 1997, 138).

Schwab addresses the relation between Rheinberger's notion of experimental systems and his own concept of *exposition*, which is defined as "the exposition of practice *as* research" (ibid., 35), insisting on the link between Rheinberger's graphematic space of experimentation and the inherent graphematicity of any thinkable form of *representation* of the results of such experimentation. It was partly to address this question that MusicExperiment21 aimed to generate as many "results" as possible and to display them in as varied media as possible. I insist on the specific Rheinbergerian sense of the word *results*, which means "a finding that, in principle, can be reintegrated as a component of the system and can thus enlarge or change the setup" (Rheinberger 1997, 135). To keep things under control, a set of five simple basic rules was put in place:

(1) The choice of the objects of research (strata) for every single case study must be rigorous, taking into account their potential to act sometimes as a *technical object* and at other times as an *epistemic thing*.

(2) Every case study must systematically generate differential repetition of some kind.

(3) To enhance this differential repetition, every case study must be presented in a series of experiments (synchronically), which are to be numbered according to specific parameters (thus, not necessarily strictly chronologically).

(4) Every subproject is presented in as many and diverse modes as possible through different modules of research (diachronically), each resulting from a different research method or perspective.

(5) Research Catalogue is to be used (in addition to the performance stage) as one of the main channels for experimentation and public communication of processes and results.

Thus, by using Rheinberger's experimental systems as a reference, MusicExperiment21 developed a sort of musical lab, sustained by a series of experimental performances that contributed to a substantial turn away from conventional performance practices and musicological methodologies. In all case studies, projects, and subprojects, MusicExperiment21 insisted on the precise definition of the technical objects and epistemic things at play. Considering these objects and things as parameters within an experimental set-up allowed for differential combinations, regulations, and calibrations of material things and affective forces. The spaces of experimentation and representation are often intermingled; however, as a starting position, the spaces of experimentation were considered to be the physical spaces of the host institution and the music halls and art galleries where MusicExperiment21 performed, while the spaces of representation were books, journals, recordings (CDs, LPs, DVDs), and websites. In this latter respect, Research Catalogue took a particular position, being at the same time a space of experimentation and a space of representation. It was used not only to store, archive, and document research but also as a working tool, a virtual space where research can be produced as at a researcher's desk.[6]

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6   An example of such "working use" can be seen in Schwab (2014c).

Unfolding Waves

A good example of the diachronic model of modules of research presented in parallel is MusicExperiment21's first official publication, an article published in the *Journal for Artistic Research* titled "Con Luigi Nono: Unfolding Waves" (Assis 2014). From an epistemological point of view, one of the journal article's goals is to contribute to the development of artistic research methodologies and innovative modes of communicating knowledge that include aesthetic components. Therefore, it is organised around a modular structure with a very simple idea: to show the fluidity, flexibility, and continuity of the borders between "academic" and "artistic" practices and outputs. The numerical sequence of the modules (1 to 7, or left to right as they appear on the entry page) indicates a progressive displacement from *factual* historiographical and analytic data to *creative/imaginative* appropriations of the researched materials. Thus, Module 1 is mainly historiographical, Module 2 archaeological, Modules 3 and 4 analytical, Module 5 interpretative, and Modules 6 and 7 creative and exploratory. On the one hand, the modules move from "more scholarly" towards "more artistic." On the other hand, each module enacts a different balance between these polarities, stressing that there can be neither a "pure" scholarly approach (without any creativity) nor any "pure" artistic practice (without any contextualisation and references). Additionally, the writing within the exposition is also experimental. Different modules have different types of writing, including conventional musicological discourse (Modules 1 and 6), spoken presentation (Module 2), diagrammatic inscriptions (Modules 3 and 4), and absence of text altogether (Modules 5 and 7). In respect to modes of writing, it is worth mentioning another MusicExperiment21 project, *Nietzsche 5: The Fragmentary* (Schwab and Assis 2015): the writing is also experimental in this exposition, yet a completely different approach is taken that enhances the fragmentary character of the research object. Thus, MusicExperiment21 experimented with context-situated solutions, looking for suitable formats and not aiming to develop a single solution that could fit all case studies.

Rasch

As for the principles of synchronic series of experiments, seriality, and *differential repetition*, the best example from MusicExperiment21 is the project Rasch (see Assis 2017), which consists of a potentially infinite series of mutational performances based upon two basic materials: Robert Schumann's *Kreisleriana*, op. 16 (1838, 1850), and Roland Barthes's 1979 essay "Rasch," which is exclusively dedicated to *Kreisleriana* (see Barthes 1985). To these materials other components may (or not) be added for each particular version: visual elements (pictures, videos), other texts (such as Barthes's further essays on music, on Beethoven, and on Schumann), or further aural elements (recordings, live electronics, etc.). The main goal is to generate an intricate network of aesthetico-epistemic cross-references, through which the listener has the freedom to focus on different layers of perception: be it on the music, on the texts being projected or read, on the images, on the voices, and so on. Situated beyond *interpretation*, *hermeneutics*, and *aesthetics*, the twenty-five instantiations (so far) of Rasch have been emblematic of what might be labelled *experimental performance practices*. These practices productively deviate

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from conventional (repetitive) performative strategies transforming familiar artistic objects into objects for thought. For an overview of all instantiations of this project, including video recordings of the majority of them, see "Rasch[X]" (Assis 2017).

Powers of Divergence

Powers of Divergence constitutes a particularly interesting case in as much as it is a substantial research project that was conceived, designed, and realised by the doctoral student Lucia D'Errico, working within MusicExperiment21. While all the other projects were essentially conceived before MusicExperiment21's official starting date, Powers of Divergence was made afterwards, benefiting from but also challenging the notions and practices MusicExperiment21 had already put in place. In its nine subprojects—dedicated to music ranging from Nicola Vicentino's *Madonna il poco dolce* (1555) to Schumann's *Kreisleriana* no. 4 (1838)—Powers of Divergence "consists [of] a series of performances, each of which takes as [its] departure point a given piece of notated music from the Western tradition (the 'primary work')," which functions more as a "generator of affects, of vectorial forces that impinge upon the here-and-now of the performer," than it does "something to be literally mirrored in performance" (D'Errico 2018). In her work with past musical objects, D'Errico (a classically trained guitarist and composer) does not aim to reproduce already known configurations of those objects. She is interested in performance "as a way to reflect, through practice, on the commonsensical limits of the interpretational approach to scores, in order to move beyond them" (ibid.). Embracing the notion of simulacra—as theorised by Gilles Deleuze in the first two appendices of *The Logic of Sense* (1990)—D'Errico radically departs from the scores of the pieces she performs, cutting the link with any illusion of an "original" sound and focusing on the concrete materiality of sound and of the performative gesture, which happens in the radical here and now of the performative event. This creates a state of suspension of accepted aesthetical codes and rules, enabling a glimpse into infinite other com-possible configurations of sounds and matter, generating an "encounter that exceeds both the (supposed) objectivity of the sign and the (supposedly existent) subjectivity of the performer," pointing to modes of "resemblance through non-resembling means" (D'Errico 2018).

Further examples from MusicExperiment21 are available online through a "portal" entry, from where it is possible to find all instantiations of the diverse projects, including audio and video recordings of most of them.[7] These projects are the results of series of experiments conducted in light of the notion of experimental systems as explained above. However, one critical notion for the functioning of experimental systems has not yet been discussed in detail— the notion of *complexity* and its derived notion of *reduction of complexity*, without which no experimental set-up could possibly function, since the existing data related to any musical piece vastly exceeds what can be exposed within a performance or within an essay. Thus, the reduction of complexity, especially the

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7 See https://www.researchcatalogue.net/view/470651/470652/3203/428.

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reduction of *epistemic complexity* while keeping the *ontic* and *systemic complexity* of a given system intact, is of paramount relevance for the productive generation of results and new insights into the objects under investigation. The next chapter addresses these concepts, making links to similar processes in biology and computer science.

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