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Audible Ecosystems and emergent sound structures in Di Scipio's music. Music philosophy enhances musical analysis

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Background in music philosophy. What emerges from listening? What phenomena does listening create? These two questions extend the field of music research by incorporating phenomenology (Merleau-Ponty, 1964) and discussions about the notion of “emergence” (Varela, 1989, 1996). A simple and short answer to these two relatively similar questions could be: (musical) sound. But if we closely examine the birth of sound, its emergence as a structure, then new questions arise: what are the spatial and temporal limits of this emergence? From what is it made of? How does it appear as a structure?

Background in musical analysis. In recent music, many composers have adopted the paradigm of complexity, and are working with chaos theories, with cellular automata, etc. The idea of “emergence” is sometimes central to this way of thinking about musical composition. This new musical paradigm challenges musical analysis, which is not used to dealing with sound structures that emerge. How is it possible to analyse structures that have no independent existence not only from musical material, but also from the listener and from the space in which they take place?

Aims. This paper will focus on Agostino Di Scipio's compositional research into “audible ecosystems” and emergent sound structures (Di Scipio, 2003, 2005a, 2005b; Solomos, 2005; Meric, 2008). It will try to show that music philosophy can help musical analysis.

Main contribution. While composing with an ecosystemic approach, Di Scipio creates an audio system that interacts with the environment, i.e. space. This space, in which and from which music emerges, is also the listener's space. The notion of emergence is complex: what emerges is the result of a confrontation between the listener's cognitive system *and* the audio system used in the musical work. This emergent result can be termed musical “structure” or sound “structure”, but it is difficult to define it with precision. Its general outline is unpredictable and unstable. It is dependent on a dynamic musical space, which is constructed by active listening and by active audio system simultaneously. To choose either the first or the second as a starting point for the emergent structures is impossible. “I am interested in *composing desirable interactions* among available elements or components, such that the music is heard as the empirical epiphenomenon of that network of interactions, not as an abstract discourse written by me and diligently spoken by others”, says Di Scipio (2005a: 385). This is why his music is so difficult to analyse. While analysing it, one must focus on the ephemeral moment where music emerges in the interaction between the listener and the product of the audio system, and inside a specific space.

Implications. This paper draws on music philosophy, with a focus on listening, in order to show that musical analysis can not limit itself to “objective” structures (“sound”, “form”, etc.), particularly in the case of Agostino Di Scipio's music where these structures seem to be only sonic dust.

Keywords: Agostino Di Scipio, emergent structures, phenomenology of music, ecosystem, feedback, space, granular paradigm.

Agostino Di Scipio's music: emergent sound structures and audible ecosystems

The Italian composer Agostino Di Scipio (b. 1962) is well known for his musical works for electronics, for live electronics, for electronics and instruments, and for his sound installations (Di Scipio, 2005b, 2005c). In these works, he explores new that he has developed in numerous (cf. Di Scipio, 1994, 1999, 2003, 2005a, 2008; Anderson, 2005), and that have been discussed by musicologists (Solomos, 2005; Prominski; Meric, 2008). In this paper, our aim is to inquire into how musical analysis can shed light on Di Scipio's musical works. Therefore, rather than discuss his theories at length, we offer a brief summary by way of two important concepts:

1. Emergent sound structures

Analysing Xenakis' hypothesis (Xenakis, 1992: 103) of an (auto-)creation of "higher order sonorities" in Xenakis' *Analogique A et B* (1958-59, for 9 strings and tape), a composition which uses the granular paradigm, Di Scipio makes a small shift in Xenakis' concept: "Today cognitive scientists and epistemologists would probably describe the hypothesis of 2nd-order sonorities as a question of *emergent properties of sound structure*" (Di Scipio, 2001: 72). The question of emergent structures can be formulated as follows: "In this case [concerning *Analogique B*], the distinction can hardly be made between a model of musical articulation and a model of sound design, insofar as the composer's action is meant to let the musical (macro-level) structure emerge from sound itself and its internal organization (micro-level)" (Di Scipio, 1997: 165). Whereas the "failure" of *Analogique* to create second order sonorities is probably viewed by Xenakis as a failure of the grain's fusion, Di Scipio views this failure as one of emergence, and attributes it to the limits of Xenakis' mathematical tools: "One may ask whether the stochastic does really provide as good a means for higher-order sonorities to emerge from a ground-level pattern of minimal sonic units" (Di Scipio, 2001: 73/79). For this reason, Di Scipio opted for complex dynamic systems in his own music: "Chaos and the dynamics of complex systems, as accessible with iterated numerical processes, represented for me a way to compose small sonic units such that a higher-level sonority would manifest itself in the process" (Di Scipio *in* Anderson, 2005). These systems enable him "[to] exploit [... a large] palette of grain arrangements, ranging from random to more patterned textures, across a variety of other behaviors" (Di Scipio, *in* Anderson, 2005). Thus, unlike other composers who worked with the help of the granular paradigm, such as Xenakis or Horacio Vaggione (Solomos, 2006), Di Scipio tends to get rid of everything that might have been composed as a macroform design. For instance, in his music, there are no dramatic gestures, no dramatic intentions. In one of his first articles (Di Scipio, 1994), he elaborated a "Theory of sonological emergence", where form (macroform) is viewed as "a process of timbre formation" (Di Scipio, 1994: 205).

The idea of emergent sound structures is related to the elaboration of a *sub-symbolic* theory. In the “Theory of sonological emergence”, the emergence of a high level should happen through grains and samples, neither of which are symbols as they are located on a low level (cf. Di Scipio, 1994: 207). With composed interactions (cf. *infra*), Di Scipio puts the interaction at the signal level: all the information exchanges have a sonic nature (cf. Di Scipio, 2003: 272). We can draw a parallel between this strategy and the model of emergence in cognitive science. To the question: “What is cognition?”, the “computationalist” model answers: “Data processing: the manipulation of symbols from rules” (Varela, 1996: 42), while the emergence model answers: “The emergence of global states in a network of simple components” (Varela, 1996: 77). As regards music, the issue at stake here is as follows: if we want the higher level (the macroform) to appear as an emergence and not as an independent construction, we have to work only at the lower level, abandoning the intermediate level, which is the level of symbols.

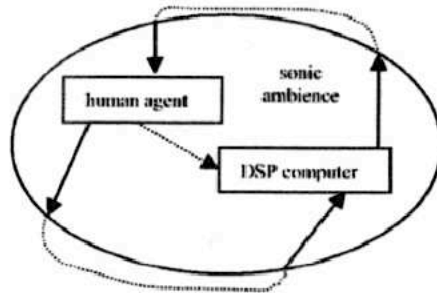
2. Audible ecosystems

According to the emergence theory, the emergence of sound structures is possible due to the fact that the composer develops *systems* (in the sense of cybernetics) close to living systems, which are characterized by their capacity for *auto-organization*: “The passage of a system or process from a given structural organization to a new state of order which is recognized as a function of the qualitative properties of the former, is what we call here a phenomenon of emergence [...]. Similar phenomena can be described with rules of *morphostasis* (conservation of coherence, identity) and *morphogenesis* (dynamical behavior, change), which together capture the main peculiarity of social and living systems: self-organization” (Di Scipio, 1994: 206). To make sure that the system is auto-organized, Di Scipio uses “circular causality” (Di Scipio in Anderson, 2005), which extends the idea of feedback. For instance, in *Due di Uno* (2003, for violin, piccolo recorder and adaptive DSP), the instrumental sounds, which are electronically transformed, are also used as input for controlling these transformations (cf. Di Scipio, 2005a).

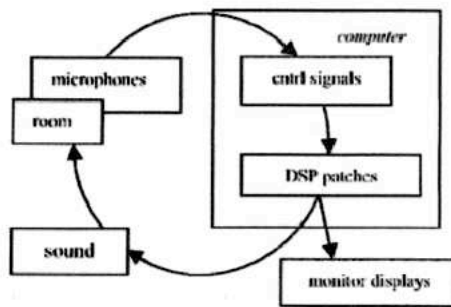
As a result of this circular causality, Di Scipio redefines the usual notion, in live electronics, of “interaction” (cf. Di Scipio, 2003). According to the usual notion, interaction operates as an information flow: a sound source is transformed. The system is therefore not very interactive. For Di Scipio, the process of composing itself might be (“the actual process of composing”?) the action of *composing* interactions. Thus, “a principal aim would be to create a *dynamical system* exhibiting an adaptive behavior to the surrounding external conditions, and capable of interfering with the external conditions themselves. [...] A kind of *self-organization* is thus achieved [...]. Here, ‘interaction’ is a structural element for something like a ‘system’ to emerge [...]. System interactions, then, would be only *indirectly* implemented, the by-products of carefully planned-out interdependencies among system components [...]. This is a substantial move from interactive music composing to composing musical interactions, and perhaps more precisely it should be described as *a shift from*

creating wanted sounds via interactive means, towards creating wanted interactions having audible traces" (Di Scipio, 2003: 271).

We could say that for Di Scipio, the notion of *process* is decisive: the process is more important than the result—and also than the origin.



Triangular recursive ecosystemic connection.



Basic design of the Audible Eco-Systemic Interface.

Figure 1. Agostino Di Scipio (2003: 272): composed interactions for the Audible Eco-Systemic Interface.

But interaction also happens with the acoustic environment: another important element in Di Scipio's approach is the idea of "ecosystem". In the set of pieces called *Audible Ecosystemics* (2002-2005, live electronics solos; Di Scipio, 2005b), which offers implementations of composed interactions (cf. **figure 1**), the ecosystem is a triangular interaction between the musician, the DSP computer and the sonic ambience (cf. Di Scipio, 2003: 272-275). This idea has noise play an important role. To simplify, we would say that in Di Scipio's music, noise is not disturbance (as in traditional music) nor sonic material (as in modern music). It is one of the agents of the interaction, since it is produced by the concrete place where the interaction occurs: it is part of the system. In *Audible Ecosystemics*, "the role of *noise* is crucial [...]. Noise is the medium itself where a sound-generating system is situated, strictly speaking, its *ambience*. In addition, noise is the energy supply by which a self-organizing system can maintain itself and develop" (Di Scipio, 2003: 271).

About musical analysis

Emergent sound structures, processes and composed interactions, sub-symbolic strategy, ecosystems: all these elements converge. What is music? asks Di Scipio. Is it a sonic result? No, as what must be composed is the process and not the result. Is it a voluntary gesture enacted by one or more humans, the composer, the performer or the listener? Not only, as the environment is also a component. Is it a language (where the mediation of the symbol creates a dichotomy between matter and meaning)? No... “I am interested in *composing desirable interactions* among available elements or components, such that the music is heard as the empirical epiphenomenon of that network of interactions, not as an abstract discourse written by me and diligently spoken by others” (Di Scipio, 2005a: 385).

For musical analysis, the question is: how should we analyze Agostino Di Scipio’s music?

Musical analysis—music theory—is an old practice. Born in the framework of teaching instrumental performance and above all composition, it became progressively an independent discipline, even if it was often criticized either for being uselessⁱ or for the fact that it seeks to isolate music from its Other (this last criticism is very widespread nowadays because of the influence of cultural approaches, which reject for instance the idea of “structural listening” (cf. Dell’Antonio, 2004)). For those who believe in the utility of music analysis, and for those who subscribe to the idea that the so-called “autonomy” of music is a way to speak about its heteronomy (cf. Adorno, 1970) and not a way to get rid of it, the question is: what approach to choose? The choice of approach is crucial, since the research method determines the result. And there are many analytical approaches to choose from. Indeed, after explaining how a musical composition works (description), the analyst can pursue very different directions. It is possible to divide analytical approaches into two categories.

The first category examines how the music was composed. The research can involve biographical, psychoanalytical, cultural, aesthetic, etc. factors; however, this approach often goes beyond the limits of analysis. The research can involve (studies about) sketches, different versions, etc. of the musical work, a traditional approach that has recently been renewed in this case by the so-called “genetic” method. With this type of research, the analyst focuses on philological aspects. If he combines them with the question of the “rules” of the piece, he tries to find—or even to (re)invent—the generating process of the musical work.

The second category of approach focuses on the level of music “itself”. It starts from the “result” (of the generating process), i.e. from the musical work “itself”. With this approach, the analyst believes that “the ‘rules’ given by a composer prove nothing about the consistency of his music, in contrast to the case of the scientist, for whom the rules (collectively understood, if not shared) are all that he can show to legitimize his work” (Vaggione, 1997: 270)ⁱⁱ. So he has to deal with music as a determinate and finished world. In this view of analysis, what we listen to is as important as—or even more important than—what “lies under” the perceived structures, or the compositional intentions. The analyst starts from the hypothesis that music (the

musical work to analyze) is an entity, which is fixed, which is there, ready to be analyzed as a construction. In the case of electroacoustic music, the result—the “world”, the “entity”, the construction, which is “there”—is “sound”: it is a sound world, a sound entity, a sound construction. In the realm of electronic music, an important analytical tradition uses this approach, and is based on one (or more) of the following methods: the Schaefferian notion of “sound object”, Denis Smalley’s spectromorphology, methods inspired by phonology, the “paradigmatic”, “functional”, “generative” or “implicative” methodsⁱⁱⁱ, methods that are more or less empirical, etc. Sometimes the focus is on the question of sound’s visualization, and the analysis consists in visual transcriptions—as is the case with GRM’s software *Acousmographie*—, also showing articulations or other meta-sonorous elements. In our research about Agostino Di Scipio, our aim is not to find the generating process of his music, nor to study philological details. We are not searching for how the music was composed. This leaves us with the second category. But what is meant by music itself? And what is a *result*? We saw that Di Scipio does not perceive music as a “result”. More precisely, what is a *sound result*?

An analytic image

We have mentioned that, for Agostino Di Scipio, the process is more important than the result. This idea becomes problematic when we attempt to analyze his music. To get a result—a sound one—by way of delimitation and analysis, may be a misinterpretation of his music. With *Audible ecosystemics*, the only result we may have is subjective and ephemeral listening. What “I” have listened to cannot reappear. This assertion is not a pure solipsist idea, but stems from the fact that we take into consideration the emergent particularity of these musical works. In *Audible ecosystemics*, the ecosystem is not only a triangular interaction between the musician, the DSP computer and the sonic ambience; it also includes a close interaction between the work and the listener. Both are components of the ecosystem: “Listeners are a very special kind of external observer or hearer, because their mere physical presence in the room acts as an element of acoustical absorption. Hence they are rather an internal component of the ecosystemic dynamics. As is well-known, audience-less rehearsals are far from replicating the real performance context, and even a relatively small audience can deeply modify the room response. In the AESI [Audible Ecosystemic Interface] project, this is not considered as a problem, nor an element irrelevant to the music: changes in the ambience will reveal peculiar changes in the overall ecosystemic dynamics, and therefore in the audible results themselves” (Di Scipio, 2003: 274).

The listener and the work are in the same space-and-time-domain: it is not possible to delimit a special space-domain and a special time-domain for music (cf. Meric, 2008). This point is crucial, since making this kind of demarcation is usually the first step for musical analysis. In other words, the analyst begins by choosing a point of view, and by delimitating what he considers to be objective from what he considers to be

subjective. Thus the work obtains a specific space and a specific time, as if it were a specific world, an entity with its own structure.

From this viewpoint, the work is nothing but an image. Indeed, musical analysis of a work can be considered as image analysis. The analyst uses different tools to describe, to dissect, to simplify. He does not directly observe the musical work or what he is listening to, but the image he has built. What does that mean? When the analyst translates the musical work into an image, he dreams up a static and universal entity. Anton Ehrenzweig's explanation of the opposition between "syncretistic vision" and "analytical vision" may account for this situation: "The undifferentiated structure of primary-process phantasy corresponds to the primitive still undifferentiated structure of the child's vision of the world. Piaget has given currency to the term 'syncretistic' vision as the distinctive quality of children's vision and of child art. Syncretism also involves the concept of undifferentiation. Around the eighth year of life a drastic change sets in children's art, at least in Western Civilization. While the infant experiments boldly with form and colour in representing all sorts of objects, the older child begins to analyse these shapes by matching them against the art of the adult which he finds in magazines, books and pictures. [...] What has happened is that the child's vision has ceased to be total and syncretistic and has become analytic instead. The child's more primitive syncretistic vision does not, as the adult's does, differentiate abstract details. The child does not break down the shape of some concrete object into smaller abstract elements and then match the elements of his drawings one by one. His vision is still global and takes in the entire whole which remains undifferentiated as to its component details" (Ehrenzweig, 1967: 5-6).

The analytical vision must be static. Each element, each detail must have a specific place in time and space, more precisely: in the time and the space of an image. There is no more room for movement or transformation. Conversely a syncretistic vision implies continuous movement, with no specific limits.

Imprint [*empreinte*]

It is very difficult to have an analytic perception of Agostino Di Scipio's music. Nothing in his music can be considered as static. In *Audible ecosystemics*, there are no specific sounds—no instruments, samples, or recordings. For instance, *Audible ecosystemics* 3a – *Background noise study* "starts with 'nothing' [we usually do not pay attention to barely audible sound events; unconsciously, we remove them from our auditory focus] and attempts to make 'something' with it" [Di Scipio, 2005b: 20]. In *Audible ecosystemics* 3b – *Background noise study, with mouth performer*, "the source is any small sound involuntarily produced in the mouth and throat" [Di Scipio, 2005b: 20]. All these sounds are unpredictable and usually inaudible. They are picked up by 2 microphones in the room (only one in *Background noise study 3b, with mouth performer*, which is placed inside the mouth or close to the lips), and they are routed—having become numerical signals—in the DSP unit. Inside this DSP unit, there is no linearity or direct run: the input signals are routed through different ways. Some signals go through different audio signal processing blocks and others go

through control signal blocks. Analyzing the DSP network for *Audible ecosystems* allows us to discover a multitude of loops: when it exits a block, a signal is routed many times through other blocks—which control or process the signal—and it can follow various paths. Sooner or later, the original signal—which was routed through different blocks—will return through the first block (cf. **figure 2**).

Every signal—and each part of the signal—can be considered simultaneously as sonic data and as processing data. In other words, the signal is both the material and the gesture that shapes it. The process takes place when a sound emerges from one of the 8 loudspeakers: this sound intensifies the background noise (the loudspeakers are turned backward, facing the walls and close to them), which is immediately picked up by the two microphones. We thereby come back to the beginning, making a loop. In conclusion: there is neither end nor beginning. Each element is both end and beginning of the ecosystem: “Eco-systems are systems whose structure and development cannot exist (let alone be observed or modelled) except in its permanent contact with a medium. There are *autonomous* (i.e. literally, self-regulating) as their process reflects their own particular internal structure. Yet they cannot be isolated from the external world, and cannot achieve their own autonomous function except in close conjunction with a source of information (or energy). To isolate them from the medium is to kill them” (Di Scipio, A. 2003: 271).

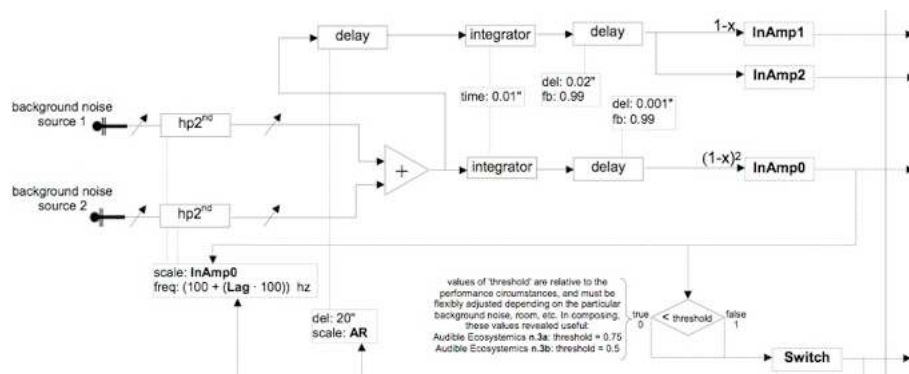


Figure 2. Part of the DSP schema for *Audible ecosystems 3a/3b* [Di Scipio, 2004-2005: 6]. On this figure, we can see a loop: [Hp2nd] → [integrator] → [delay] → [InAmp0] → [scale: InAmp0 / freq: (100+(lag·100))hz] → [Hp2nd].

Every part of the ecosystem—inside or outside the DSP—is always a source of energy for the other parts, and always uses the energy that the others have processed. In this closed structure, the listener can be considered as an element of the structure too, likewise a block in the DSP schema, with an input (the background noise he is listening to and which emerges from the loudspeaker) and an output (the modification he makes to this background, before it is picked up by the microphones).

This description of the listener situation might seem simplistic and caricatural. However, the “input” of the “listener block” is simply the ordinary answer to the question: “what are we listening to?”. It is what comes out of the loudspeakers... The

traditional identification of “music” with the loudspeaker-sound seems inappropriate. Why? A music analyst who begins his investigation with the question: “what are we listening to?” —, is looking for a static image, an image with its own structure (its own space and its own time). While doing so, he isolates the listener from the ecosystem and considers “sound” merely as musical material, the only “heard” material. However, we have observed that in every step of the ecosystem, sound—more precisely sonic signal—is both the material and the gesture that shapes it. In *Audible ecosystemics*, what we are listening to is not a sound. It is its own “imprint” [*empreinte*].

To understand the idea of *empreinte*, we cite the philosopher and art historian Georges Didi-Huberman. In his book *La ressemblance par contact*, Didi-Huberman explains the importance of the ichnologist’s (the paleontologist specialized in the study of fossil tracks) work for the art theorist. We could say the same for music, and especially for understanding the notion of musical structure, particularly in the case of Di Scipio’s ecosystemics structures: “[The ichnologist] has to recognize the complexity of forms, he has to know that *shapes are processes*, and not only processes’ results; that these processes do not have an end, that the image, which is seen, is only the ‘anachronistic present’ of an uninterrupted play of deformations, alterations, deletions, and ‘feedbacks’ [*revenances*] of different kind. The ichnologist does not have to question what he is looking at as the content iconography or the expression of a mimetic desire. The likeness in every imprint [*empreinte*] is of another order; in it, nothing can be disentangled, for instance we can not separate forms from matter. Here, *shapes are substrates*; there are dialectical process of the substrate’s modifications caused by an ordinary gesture. The ichnologist knows that what he sees is not a history’s single, intangible, point. [...] He knows that *shapes are times at work*, contradictory times entangled in the same image: time of the earth, time of the foot, which in one instant has left its imprint forever”^{iv}. (Georges Didi-Huberman, 2008: 324-325; our translation)

Back to musical analysis: What is moving...

If we analyze a musical work as a static image with its own structure, we do not take into consideration what Didi-Huberman says about shapes (“shapes are processes” (and not only processes result); “shapes are substrates”; “shapes are times at work, contradictory times entangled in the same image”). When we find a structure in a musical work, we must bear in mind that it is merely a fragment of space and time. In *Audible ecosystemics*, this assertion is even more obvious: we are listening at the same time to the process and the sound. The sound (that we are listening to) is a single step of this overall process and, consequently, of the overall structure.

The fundamental question of musical analysis—what are we listening to? —reveals its own limits, as it is looking for a static image with separate space and time. As the listener is a part of an ecosystemic work, he belongs to the same time, the same space as the work, as the sound. We have to set up the question in another way: what is moving inside what we are listening to? When we search for what is moving inside

what we are listening to, we are not looking for a result, but for a structural process. The listener thus remains inside the ecosystem. The movements or the processes we are listening to are an ephemeral emergence of the entire ecosystem. What emerges can be considered as both objective and subjective: it is not an end of the circular interactions. The movements that we can hear, describe and analyze constitute a small part of the various other movements we can only imagine. For instance, a little click that we hear in *Audible ecosystemics* cannot be considered as an object among others or as a detail of a structured image (which would make up the entire work). It is the emergent tip of interweaving, of matching and clashing movements, which are not emerging and which are not audible. Only our imagination can reach this part of the ecosystemic structure. The click is of no interest without this imaginary and inaudible history. Every sound constitutes a moving *empreinte* of an underlying moving structure. If we start an analysis with the question: “what is moving inside what I am listening to?” instead of: “what am I listening to?”, we aim to be fully immersed in the genesis of the click. In this way, we do not concentrate on an object—a delimited part of time and space—but on why and how a particular sound emerges simultaneously in music and in the listener's imagination.

To go back to musical analysis: we could start an analysis by searching for the genesis of a sound—in other words: a process—that we can listen to in *Audible ecosystemics*. Such a sound may be *any* sound, which we would grasp at random. It would emerge from a particular process and a particular way of listening, namely an ecosystem. As mentioned above, we should not consider this sound as a delimited and static structured entity: it appears just once and never emerges again. We should not consider it as being more than a particular case, an example.

What is moving inside this particular sound? With this question, we do not analyze a “sound”—a sound object—but a moving phenomenon. Thus, one specific sound becomes a complex and multiple phenomenon—a single sound is composed by many movements. When we look at what is moving, we need to define the space that is created by the movements, and in which they emerge. We must question the relationships between all these movements. By doing so, we question what we perceive and what we imagine. Little by little, and from movement to movement, this sound—as an entity—vanishes, and we build up an imaginary complex structure. In this imaginary complex structure, listening is not the result, the aim or the end of musical analysis but rather the beginning. In Agostino Di Scipio's *Audible ecosystemics*, structure is an underlying phenomenon; strictly speaking, it is inaudible and invisible. The question: “What is moving inside this particular sound?” allows us to partially reveal a structure.

This question also allows us to tackle the musical composition. The answers—the movements we are looking for—concern the composed process as well. We can try to understand why and how this particular sound—this process—emerges. Understanding the composed interactions (cf. *Audible ecosystemics*' DSP score) can help us to understand the origin and the form of the specific sound we want to analyze.

Finally, a musical analysis of Agostino Di Scipio's *Audible ecosystemics* involves an analysis of the relationships between what we have listened to, what we can only imagine, and the compositional techniques.

A sample taken at random

This paper focuses its analysis on the *Audible Ecosystemics 3b. Background noise study, with mouth performer* (2005), for one performer, two microphones, one in the room, and one used by the performer who puts it into his mouth, a DSP unit (*Kyma* work station or *Pure Data*) and 8 loudspeakers in the room turned backwards, facing the walls. The score is shown in **figure 3** (this score is intended for the mouth performer and is followed by detailed instructions). However, without audio support, we cannot analyze a specific sample—for instance, a one-second well-delimited sample—extracted at random from the *Audible ecosystemics study*. We shall merely outline the potential of such an analysis

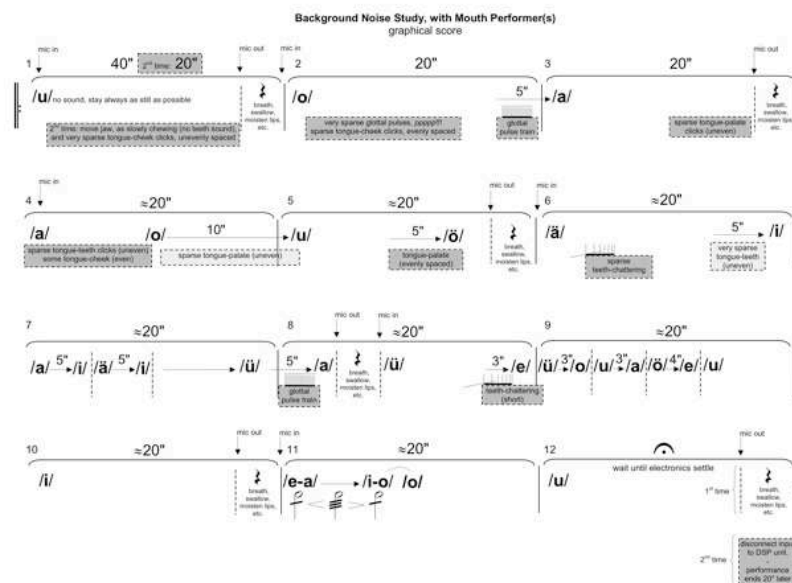


Figure 3. Agostino Di Scipio: *Audible Ecosystemics 3b. Background noise study, with mouth performer: score*. [Di Scipio, 2004-2005: 11].

A short sample from this study can be described as several little sounds: a lot of grains, some impacts, several little clicks, different whistles... In spite of this brief description, every sample which we could analyze is very difficult to define and to describe. All the little sounds, which we can listen to in a sample, cannot be well delimited in time and space. All these sounds are manifold and heterogeneous movements: the sample is always a complex interlacing (network) of disparate and multiscale movements. In other words, different time scales and different spaces are entangled in a sample: these time scales and these spaces go beyond the sample limits.

During the performance, sound is dispatched from 8 loudspeakers turned backwards, facing the wall. Thus, any sample is heard as a background noise and any sample emerges from the background noise. For this reason, it is impossible to define a duration for each movement entangled in the sample. For instance, we cannot say when a whistle or a grain appear and when they vanish because they cannot be disconnected from the moving background noise from which they emerge. The 8 loudspeakers turned backwards facing the wall, indeed create several transverse spatial dynamics and indirect sound: every event is immersed in a dynamic jumble, while remaining an active element of it. Every single sound is not an independent entity (an object): it is a spatial and temporal link. For this reason, each sound or each event is directionless. In other words, every little sound heard in a sample can be considered simultaneously as a movement, a single part of larger movements and a combination of movements.

What is the root of these different movements we can listen to in a sample? A part of them is emitted directly from the ambient and barely audible background noise (audience noise, air-conditioning...), another part of them arises from the amplified background noise and the amplified performer's vocal tract noises, which were recorded 20 seconds earlier. The last part of the sample movements arises from the DSP processing (the recording background noise is processed in this instance). Thus, when a sample is heard, all these parts are mixed together, compiled and made to clash: each movement from the sample can be one of these parts or the result of the confrontation and the interweaving of these various parts.

When we want to analyze a sample taken from the *Audible Ecosystemics 3b*, we are aware that some movements of the sample arise from ambient background noise, but we cannot recognize and delimit them. We also know that some of the movements are an amplification of the previous 20 seconds, which are in themselves an amplification of the previous 20 seconds, and so on. Thus, in the analyzed sample, we can listen to and recognize what happened in the previous 20 seconds, 40 seconds or 60 seconds: some present movements—which we can listen to in the analyzed sample—take root in these different past processes, in these various spatiotemporal strata. In the present space (the sample space), previous spaces are entangled or fossilized (like an “imprint” [*empreinte*]). Finally, we have to analyze the more complex part, which arises from the DSP processing.

When we focus on the DSP processing, we can first observe that what we are listening to in the sample is spatialized on 8 loudspeakers which are sharing out 7 outputs (cf. **figure 4**; in the *Audible Ecosystemics 3. Background noise study* score, Agostino Di Scipio provides a network of live-generated control signals, the network of audio signals and the loudspeakers assignments schemas; cf. Di Scipio, 2004-2005: 6-8). Two outputs (out 1 and out 2 in **figure 4**) emit the amplification of the previous 20 seconds. Five other outputs (outs 3, 4, 5, 6, 7 in **figure 4**) are dependent on a switch. The latter is activated depending on the input amplitude and it controls different programmed triggers in various ways. But the input amplitude is based on erratic sound waves caught by the two microphones: thus we cannot foresee when each output will be activated.

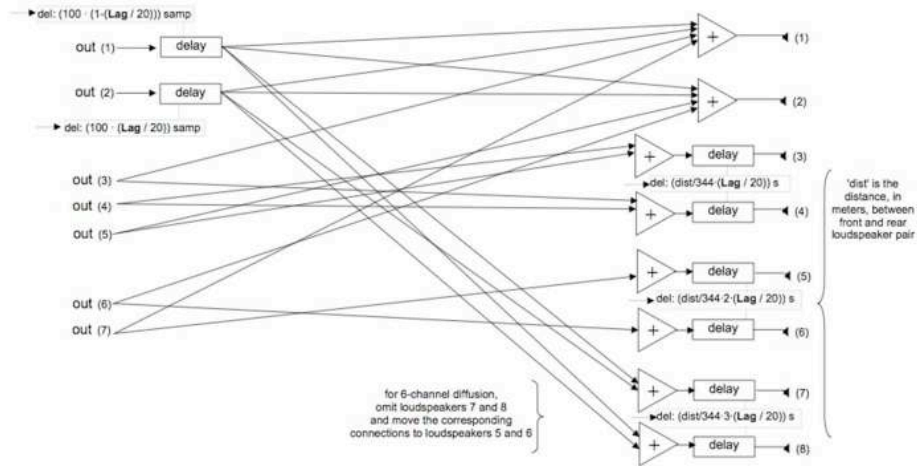


Figure 4. Loudspeakers assignments schema for *Audible ecosystems 3a/3b* [Di Scipio, 2004-2005: 8].

These five unsteady outputs arise from two different processes. The first three out of five outputs (outs 3, 4, 5 in **figure 4**) send out the input signal depending on different delays and differently programmed triggers. This means that we may recognize some movements among previously heard movements. The last two outputs (out 6 and out 7 in **figure 4**) send the results from a granular sampling, which reads the mixed signal from the three previous outputs. The granular sampling parameters (grain duration, density, memory pointer, memory pointer jitters) are dependent on different shifting inputs (signal amplitude, switch...). Thus we cannot foresee how this granular sampling will react. In every sample, this granular sampling is very important because it forms a lot of grains. It is impossible to hear them independently and they are combined (with all sounds) as unstable movements.

Conclusion

This sketchy analysis—which can be used as a basis for further investigation—displays important features of Di Scipio’s *Audibles ecosystems*. Each moment (each sample) depends on various aspects, which are comprised of present and previous spaces. None of the samples or sound events are ever fully realized or well-delimited. In other words, they are never an object (a “sound object”) or an image, a point in front of us, in time and in space. They appear to be a moving articulation: a constantly acting and accomplishing metamorphosis. This short analysis attempts to grasp this complexity, to show the multiplicity of interleaved live roots, and to link various movements: those we can listen to (sounds) and those that are inaudible (DSP data).

Finally, the analysis of Di Scipio's *Audible Ecosystemics* gives a glimpse of a forgotten aspect of music. More than any other art, music consists not only in a design of (sound) apparitions or creations (temporal and spatial "sound images", which can be analyzed— whereby "analyze" means "breaking down" or "dissecting"), but in a design of disappearings or disintegrations (whereby "analyze" means "rebuilding"). The various process, the different delays and loops, which we can observe in the *Audible ecosystemics studies* show not only recurrences but also disappearing spaces. Sound is always both the emergence and the breaking-up of many movements.

Agostino Di Scipio's music—especially his *Audible Ecosystemics*—is a good example for emergent sound structures. In these specific structures, we can never study listening—which is music's subjective side—and the computer processing—its objective side—independently. We should always confront and question "conflicting sides". The notion of movement—and the question "what is moving inside what we are listening to?"—allows us to link these different processes and to focus on the instability of the emergent construction.

Confronted with Di Scipio's music, the traditional music analyst (who isolates separate, objective and static entities) can only conclude that this music is not analyzable. However, this music explores existing music technologies. Today more than ever, music philosophy can enhance music analysis.

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ⁱ “L’analyse est stérile par définition”, as Varèse used to say, 1983: 37.

ⁱⁱ The case of serialism is typical of this situation, and it is why Boulez himself says that, in analyzing serial music, he starts directly from the result: “Est-ce bien nécessaire d’analyser les œuvres à partir de leurs procédures ? Je pense qu’il est préférable de les analyser en tant que résultats. Je me suis moi-même très vite aperçu en analysant Webern à partir du comptage des notes de la série que cela ne me donnait pas de clé. Ce qui m’intéresse par exemple dans le premier mouvement de la *Symphonie* opus 21, ce n’est pas de voir que les douze sons ont été respectés, ou qu’il s’agit d’un canon, mais pourquoi on n’entend pas le canon, pourquoi il disparaît sous la sensation harmonique” (Boulez in Albèra, 2003: 10). For an analytical proposal of Webern’s *Symphony* “beyond” the analyses of the compositional structures, see Solomos, 1998.

ⁱⁱⁱ The four last methods are used in Stéphane Roy, 2003.

^{iv} “[L’ichnologue] est obligé de reconnaître la complexité des formes, il est obligé de savoir que les *formes sont des processus*, et pas seulement le résultat de processus ; que ces processus, à proprement parler, n’ont pas de fin, que l’image actuellement vue n’est que le ‘présent anachronique’ d’un jeu ininterrompu de déformations, d’altérations, d’effacements et de ‘revenances’ de toutes sortes. D’autre part, l’ichnologue n’a nul besoin de questionner ce qu’il regarde comme l’iconographie d’un contenu ou l’expression d’un désir mimétique. La ressemblance offerte dans chaque empreinte est d’un tout autre ordre ; en elle rien ne peut être désintriqué, les formes de la matière par exemple. Car ici, *les formes sont des substrats*, ou plutôt le processus dialectique des modifications du substrat par un geste quelconque. L’ichnologue, enfin, n’a pas la naïveté de situer ce qu’il voit comme un point unique, intangible de l’histoire. [...]. Il sait donc que *les formes sont des temps à l’œuvre*, des temps contradictoires intriqués dans la même image : temps de la terre et temps du pied qui, un instant s’y est posé pour toujours”. [Didi-Huberman, 2008: 324-325].