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Composing with Objects, Networks, and Time Scales: An Interview with Horacio Vaggione

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In the context of electroacoustic and computer music, Horacio Vaggione (see Figure 1) has emerged as one of the most original composers working today. Characterized by an unrelenting flow of energy, the textures of his music often display dense streams of very small sound particles evolving at different densities and rates of speed. He has developed a unique approach to sound composition on multiple time scales.

Born in Córdoba, Argentina in 1943, Mr. Vaggione has been involved in the field of electronic music from an early age. He was co-founder of the Experimental Music Center of the University of Córdoba, Argentina. In Spain, he was a member of the ALEA live electronic music group and worked at the Computer Music Project at the University of Madrid. Later he produced music at the Groupe de Musique Expérimentale de Bourges (GMEB), Institut National de l'Audiovisuel/Groupe de Recherches Musicales (INA-GRM), the Institut de Recherche et Coordination Acoustique/Musique (IRCAM), the Institute of Sonology in The Hague, and the Technical University of Berlin.

Currently Horacio Vaggione carries on multiple activities as a composer, teacher, and researcher. Since 1978 he has been living in France, where he is currently a professor of music at the Université de Paris VIII and director of the Centre de Recherche Informatique et Création Musicale (CICM) attached to the École Doctorale Esthétique, Sciences et Technologies des Arts of the University.

In 1997–1998, I visited the Université de Paris VIII where I attended Mr. Vaggione's graduate seminar in computer music. The following interview was started then and later continued via electronic mail.

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Career Path

Budón: Since the beginning of your activity, you have worked in several countries, namely Argentina, the United States, Spain, and France, where you presently live. Throughout this journey, what are the experiences and encounters that you recall as being particularly influential or meaningful?

Vaggione: I was born in Argentina, where I lived until 1968. I studied music composition at the National University of Córdoba. My principal teachers were César Franchisena and Nicolás Alessio. Franchisena was an experimentalist: he wrote pieces in which the instruments had to be systematically disassembled, producing a kind of *concrète* instrumental music (Franchisena 1994). Alessio, closer to tradition, had a very large technical knowledge and a broad view of music history. By the same time (early 1960s) I was in contact with Juan Carlos Paz, who introduced serial music in Argentina (Paz 1998). He composed his first serial pieces in 1934, and wrote books about new music, including an important essay on Schoenberg's work (Paz 1956, 1959). Many Argentinean composers did benefit from his teachings and musical activities over four decades; so did I. I remain deeply grateful to him. Juan Carlos Paz encouraged me to experiment in electronic music. I started my experiences in 1961 (I was 18 by then), working at the Center for Research in Acoustics (CIAL) of the University of Córdoba, and since 1965 at the Arts School of the same university. There some other musicians (Graciela Castillo, Oscar Bazán, Héctor Rubio, Virgilio Tosco) and myself created the Experimental Music Center (EMC), having obtained, with the help of Juan Carlos Paz, a grant from the National Fund for the Arts (Davies 1967). In 1964 (I was then 21) I went to Paris for the first time, met Pierre Schaeffer, visited the French Radio Studio and

Figure 1. Horacio Vaggione. (Photo by Alex Derben, Bremen.)

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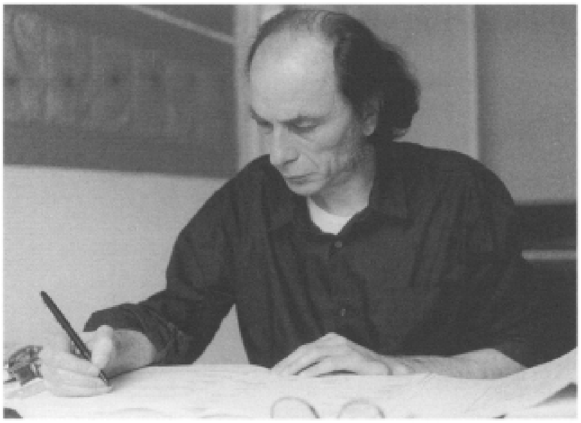

heard works from composers such as Iannis Xenakis, Pierre Henry, and Luc Ferrari, which interested me deeply. Then in 1966 I spent some time in the United States with a grant for young composers, visiting several universities and electronic music studios (Columbia-Princeton, Yale, Illinois). I met John Cage and David Tudor, who were at that time concerned with live electronics. Thanks to Mario Davidovsky, I could see in action the legendary RCA synthesizer. Lejaren Hiller was very influential, because he introduced me to the charm of digital computers, gave me the source code to his programs, and made me aware of the work of Max Mathews on sound synthesis. Unfortunately I had to come back to Argentina before visiting the Bell Laboratories, as it had been planned.

But in the meantime, Argentina suffered a hard military putsch, and the University of Córdoba was closed. So I decided to move away. I went to Spain in 1968, at the age of 25. The Spanish composer Luis de Pablo invited me to join the ALEA group (a private foundation) and to develop its electronic music studio. With this group, we gave many live electronics concerts in Europe and created the Computer Music Project at the University of Madrid. There I produced in 1971 my first digital sounds, working with an IBM 7090 mainframe and still using punch cards. In the mid-1970s, I came to Paris where I got my doctorate at the Université de Paris VIII. My main interest at the university was the thought-provoking seminar on philosophy of music given by Daniel Charles, my thesis director. Specially important for me, among the work of faculty members at Paris VIII, were the computer music experiences of Giuseppe Englert (Englert 1981), the theoretical work in artificial intelligence and music analysis of Patrick Greussay (Greussay 1973), and the formalized music modeling techniques of André Riotte (Riotte 1980).

Later, in 1981, I went to IRCAM, thanks to an invitation from David Wessel, where in the following years I composed several pieces using the Music 10 and Cmusic languages. Thanks to a grant from the German Academic Exchange Agency (DAAD)—and the willingness of Folkmar Hein—I was able to work in 1987–1988 at the electronic studio of the Berlin Technical University, continuing my experiences with the CARL system. I should also mention the SYTER system of the INA-GRM, which has been for me a source of discoveries, through its powerful real-time sound-processing capacity. All of these computer music systems are not operational anymore: they belong to history—that's why I recall them, as they were for me the locus of many meaningful musical experiences. Talking about meaningful experiences and encounters, I should include the many years of attendance at two major international gatherings related to our field: the International Computer Music Conference (ICMC), and the Bourges Festival of Electroacoustic Music, both of which continue today.

Musically, I would say that the work of Jean-Claude Risset has been for me one of the most influential, as it opened a huge continent to explore; it was actually through Risset's work that I became aware of the importance of clearly defining microtime scales in composition.

Electroacoustic Composition

Budón: In more than three decades of composition work you have produced pieces in very different technological environments (tape-editing studios, modular analog synthesizers, various computer-based facilities, etc.). How have the different technologies available interacted with your creative work?

Vaggione: Pen, paper, and mechanical instruments were my first doors to music, but the electronic means became available to me very soon afterwards. Retrospectively, I would say that I found a medium that was challenging our notions of causality, divisibility, simultaneity, interaction, energy, and so on. It offered to us the possibility to make a completely new music and to work in a new compositional situation. Yet I had the impression that it was emerging from the core of Western music practice, bringing a new light to all its manifestations.

The tape editing studio made me understand the energetic substratum of sound, and therefore the importance of morpho-dynamical manipulations as well as the action/perception feedback loop inherent to the studio's working situation. It was also pointing to multiplicity, as an alternative to a simple combinatorial approach. (Perhaps we will have the opportunity to further elaborate on this point.)

Of course, after a while I became quite critical about the analog studio. Even if many great compositions were realized within this environment, analog manipulations remained heavily manual and imprecise and, most importantly, impossible to store as codes in order to reproduce and refine them. What we got was only the result of an operation, but not the definition of the operation itself as a symbolic entity. I have often insisted that this opacity is inherent to the analog medium (see, for example, Vaggione 1991). The computer has been for me the ideal tool, because it brought the capacity to deal with discrete symbols at the level of the sound matter, hence to literally write sounds, yet it allows the connection of this level with any other in the time scale. The digital medium has produced a qualitative leap, allowing any compositional manipulation to become transparent and reproducible.

Budón: How does the classic opposition between *concrète* and synthetic sound material resonate in your present work? Do you feel that this opposition is still relevant?

Vaggione: I suppose that this opposition is not really relevant, at least not as a strict opposition as it used to be considered. In the digital domain, we have refined the cycle of analysis-transformation-synthesis, which applies to any kind of sound. If you start with an acoustic sound, the first thing you will do is digitize it; the transformation and resynthesis processes that follow will make this sound "ontologically" electronic, while retaining some of its original energetic or morphological features. Analysis and synthesis allow us to deal with really complex sounds and to choose the features to which we want to give priority in the development. Of course, causality has been enlarged, and people with an ear that has been trained in electroacoustic music start to hear sounds without identifying the cause. Sometimes what is identified is the type of synthesis or transformation employed. I would even say that as composers, we have developed a kind of new "inner hearing," as we can sometimes imagine what will be the result of our digital manipulations.

Budón: How do musical structure and sound materials interact during the composition of a piece?

Vaggione: I consider sound itself not as something already given, but as something to be composed. So the tiniest sound already has a structure on which we can operate, that is, articulate, projecting onto it our own musical desires. Consequently, I assume that there is no difference of nature between structure and sound materials; we are just confronting different operating levels, corresponding to different time scales to compose.

Instrumental Music and Computers

Budón: Throughout your career, electroacoustic and purely instrumental compositions have been fairly equally represented in your output. What is common and what is different in your approach to composing in these two fields?

Vaggione: The former common paradigm of instrumental music (of which the "total chromatic" serial approach was one of the last manifestations) required a kind of "neutrality of the material" (see for example Boulez 1964, 1990), an imperative for a compositional practice that was based on the autonomy of symbolic manipulations. To realize a pure permutational combinatorics, it was necessary to play with notes as "atoms," or primitive building blocks. Here, electroacoustic music has caused a

real paradigm shift, introducing the sound-object and the idea of morphological multiplicity. This shift has contaminated not only electronically produced music but also the music played with acoustic instruments as well as the music combining acoustic instruments and electroacoustic extensions. The new situation includes explicitly a criticism of the dualistic distinction between macroscopic symbols and sonic materials, as I have already stated. In other words, I have the feeling that the radicalization of the dichotomy between notes and sounds cannot open any new perspective for us. We are instead going beyond this old duality by articulating the functionalities particular to each category and making them interact.

This leads us to work in the frame of a multiscale approach to composition. Detailed development of musical figures at the macro level of notes should take into account the sonic structures that are called upon below this level, in the microtime domain. Conversely, any work on the microstructure of sound cannot have a musical meaning if it is not realized with the care needed to project it over more global time domains.

Budón: What is the role of the computer in the composition of your purely instrumental works?

Vaggione: Once you are sensitive to a multiscale approach to composition, you don't see the note as an atomic entity—a primitive building-block—anymore, but rather as a layered object containing many interacting time scales. A note as an object is not only a C-sharp, for example, but a pitch/time cluster showing its spectral substratum as well as its multiple dynamic shapes and processes present at different time scales, all of them contributing to the emerging sonic morphology. So what is to be composed is not only an array of atomic surface entities, but also the multilayered context in which the notes are placed.

The computer is an ideal tool that allows us to deal with this situation. With this tool we can reach any level of operation and explore all the desired and possible links between different levels. It is true that we are forced to use different systems of representation, choosing the ones more adequate to each particular level. This is why we are confronted with disjunctions and nonlinearities; a symbolic system that describes well a given morphology at a particular level can become nonpertinent when applied to another level. I will refer to this situation in a moment. For now, I would like to stress the availability of these clusters of representations only accessible with the help of the computer.

Budón: Can you summarize your algorithmic approach in relation to composing instrumental music?

Vaggione: My approach to computer-assisted composition is based on the idea of integrating direct local choices (as in procedural common music notation) with algorithmic processes, and amplifying these local choices by applying transformational manipulations. A transformational system works not only on the basis of generative formulae but also on that of operations dealing directly with the formal properties of the data to be processed; the idea behind it is of connective (contextual) nature rather than purely combinatory or generative. In such a system, every local choice (or procedure or determination) can be considered as a declaration of a particular attribute of a given morphology; this attribute can afterwards be applied to all or to some successive instances of this morphology instead of being used in one instance only. Thus, a local action, purely procedural, has here the possibility of being integrated to one or several algorithmic processes; symmetrically, the product of any algorithmic process can be transformed or redirected by a new local action. This symmetry means that the system is conceived as an interplay between the two categories of action, integrating choices and constraints, changes and heritages, focalization, and vectorization. I can start a composition writing (by hand) in musical or alphanumeric notation a collection of pattern objects to which I will later apply some kind of constraints in order to create a controlled (algorithmic) variation. I can also proceed in the opposite way, that is, generate some materials by constraint propagation and then "overqualify" some of the resulting patterns by direct local procedures.

By the way, the production and transformation of musical patterns is, in my compositional work, based on operations of fragmentation and agglutination of objects of all sizes; several time scales

are worked out simultaneously, including those belonging to the microtime domain (which I try to link to the level of the note by means of several strategies using sonograms, synchronizing waveforms, pitch-to-MIDI conversion, and so on). One important feature of this approach is that the patterns are not only considered as an ensemble of parameters but also as entities that can be manipulated in the sense of their parts. To understand this point, we can recall Cantor's mathematical formulations after which the set of the portions of a given set is always bigger than the set of its elements. The electroacoustic music experience confirmed this insight. We can call this approach "morphological," as opposed to the one based on elements, which in turn we can call "parametric." These two operating modes, morphological and parametric, are of course complementary; we can isolate "saliences" (morphological details) contained in a given pattern to create other derived patterns, using the first ones as modulators. For my own use, I have implemented (in Max as well as in SuperCollider) modulation techniques (such as waveshaping) and impulse-response algorithms (such as convolution) that are normally used for digital signal processing but reformulated to be applied as well to macroscopic symbolic manipulations in the case of pure instrumental music (Vaggione 1996).

Objects and Time Scales

Budón: The electroacoustic tape for *Tar*, for bass clarinet and tape (1987), consists mainly of manipulations of sampled instrumental sounds that are also used in the instrumental part. These materials grow and proliferate mostly by means of agglomeration of patterns (objects) of different sizes. I'd like you to comment on the composition process of this piece with respect to your interest—developed in your writings—in working with networks of objects.

Vaggione: By mentioning *Tar* you are probably referring to an article written in 1987, but published in 1991, in which I deal with these ideas in the context of this composition. In fact, the approach of composing with networks of objects is explicitly present in my work since the mid-1980s, and it has been described in several papers (Vaggione 1984, 1985, 1987, 1991, 1994, 1995, 1996, 1998a, 1998c). I should mention *Fractal C* (1983–1984), *Thema* (1985), and *Ash* (1989–1990) among my first attempts to build large networks of objects (within the CARL/Cmusic software environment, and, in the case of *Ash*, coupled with the SYTER system).

Another electroacoustic piece, *Schall* (1994), has been often cited as an example of this approach, perhaps because it shows an interplay of objects of different sizes (time scales) which is clearly perceived (Roads and Alexander 1997; Vaggione 1997; Gómez 1996). The switching from one time scale to another can also be perceived in other pieces, such as *Nodal* (1997) and *Agon* (1998). I intend to pursue the development of this approach. However, it should be clear that the concept of composing with networks of objects is above all operative, its main purpose being to allow working at several simultaneous time scales, hence linking microtime features, which are not always directly perceived, with "surface" activity, where these features can clearly show their incidence on larger time scales.

Let's try to see why, in the context of electroacoustic composition, it can be interesting to define object networks. First of all, we must say that an object—in the computer software sense of the term—is a complex unit that may simultaneously contain different representations, or codes, related to as many procedures (specific actions) as there are data elements (sounds and time structures) covering many scales or operating levels. It should be mentioned that this concept of the object has nothing to do with the notion of an "object of cognition," nor with the subject-object duality that the latter implies. Neither does it have anything to do with the "object as a representational model" of a reality, which may be "out there." Kandinsky's question, "What replaces the object?" has no meaning in an auto-referential art such as music. Indeed, these two meanings have subtended the definition of the sound-object proposed by Pierre Schaeffer (1966): the first expresses a de-

sire for objectification (this is the taxonomic aspect, the *solfège* of the object as conceived by Schaeffer). The second, a descendant of the first, gives rise to the vast subject of the semantics of *concrète* sounds (and which Schaeffer himself attempted to short-circuit by means of the notion of "reduced listening" derived from phenomenology).

But more importantly, the concept of object that I am discussing here must also be clearly distinguished from Schaeffer's sound-object, because the present concept not only designates a purely macroscopic entity (a building block that supplants the "note") but above all a multiscale ensemble that includes events of different order of magnitude. Thus our object is an operational category, that is, a technical concept developed to realize a given musical action, capable of incorporating (encapsulating) different time levels into a complex entity which nevertheless has defined boundaries, and thus can be manipulated within a network.

Seen from such a viewpoint, composing objects means creating active entities, each of which is endowed with specific behavior modes (methods), determined in digital fashion (codes), and whose functions depend on their own methods as much as on the context in which they are being used. The objects may be functions (algorithms), lists of parameters (scores), scripts (successions of actions to be accomplished), or they may be sounds (products as well as sources).

Budón: Can you elaborate further on the idea of networks of objects?

Vaggione: In a general way, the concept of the network applies to all types of relationships possible between object ensembles and subensembles (classes and subclasses). These objects (codes, scores, sounds, all articulated in a multiple entity containing various time scales as well as various representation modes corresponding to each time scale) possess attributes that are carried over from one "version" to another. In this way, an object may be derived from another object by inheriting certain attributes that demonstrate its belonging to a class of objects. However, the classes themselves may vary from quite small to extremely big, and they may possess many branches. Objects may be created that are farther and farther away from their roots.

Here there is no external criterion at work—be it a universal law or a law of permutations, rates, or percentages, and so on—but rather a morphological process which targets details, parts, and singularities contained within the object, which are capable of generating other singularities. Such a morphological process thus constitutes a generating strategy starting with multiples, in contrast to a strategy based on the permutation of atomic building blocks (as is the case with serial combinatorics). It is from morphological characteristics contained in objects of all sizes that we may define classes and contexts that carry and propagate their specificities.

Considering the creation of objects in this way allows us, among other things, to define them by strata or in steps, in descending order, starting from a global stratum and moving toward smaller and smaller details, starting from a root object and proceeding to its most distant descendants. An interesting type of heritage arises when several descending strategies work in parallel to create a heritage network—of enhanced attributes, details generating other details—that defines a field very rich in connections between objects.

We must also consider those instances of dynamic heritage in which the strategy consists of going from the local to the global, that is, going back toward the root of the class. Here, it is a case of taking one of the descendants and summing up its salient points while moving in the direction of the root—all the while following singular paths that include turnoffs and byways. Just as interesting are cases in which one composes a network allowing movement of instance variables in both directions. Last, and in addition to what has been said regarding the possibilities of "negative" inheritance (that which creates new classes), we must also take into account that an object may belong to several classes at once and thus carry a mixture of attributes.

Budón: What would be the main difference between this object-based composition process and other algorithmic approaches?

Vaggione: Besides what I have said about working with different time scales, another advantage of considering composition environments as net-

works of objects springs from the fact that the declarative, purely functional aspect of algorithms (all algorithms consist of a series of function-carrying, conditional instructions) is counterbalanced by a procedural relationship that favors that which is prospective—in other words, sidelines and byways surrounding possibilities that have been opened up by a microworld that was defined by the composer. I believe that here is the very heart of the process that allows one to rise above the primitive notion of "automatic composition," since the musician's action is no longer limited to formulating linear processes, the implications of which must all be thought out in advance.

Budón: In several of your writings, you have expressed your concern with the relationship between different temporal dimensions of a piece of music and how these are articulated. Discussing the nature of different levels of temporal organization, you wrote "there is no linear continuity between different time scales, from the micro-local to the macro-global" (Vaggione 1994). This statement contradicts the idea of the temporal continuum set forth by Stockhausen in his article "...how time passes...." (1957) and anticipated to some extent, decades earlier, in Henry Cowell's book *New Musical Resources* (1930). Could you amplify your thoughts on this matter?

Vaggione: As a matter of fact, all compositional manipulations articulating relations between different temporal levels depend essentially on the paradigm adopted by the composer. Evidently, a decision has to be made concerning the status and the nature of these interactions: to consider them as taking place in a continuum organized as a fixed hierarchy (this is Stockhausen's attitude) or to assume the existence of discontinuities, of nonlinearities, considering (in the last case) microtime, macrotime, and all intermediate dimensions as disjoint (or relative) realms. Of course, if we adopt the second option, there will be as a corollary the necessity of building musical syntaxes that might confront (and articulate) all kinds of nonlinearities, covering different time levels, without deriving them from a homogeneous structural field. The purely Euclidean space—as the one underlying the kind of operations only possible on a sheet of paper—was the frame for all linear transformations, as, for example, term-to-term transpositions. But it should be relativized if we want to integrate different time dimensions belonging either to micro- or macrotime (or any fractional dimension in between) into a multilevel compositional process. In this way, we can pick up the challenge of electroacoustic music, letting every singularity manifested at every time scale emerge as a product of the interactions between multiple dimensions.

We can resume this situation in terms of a double articulation. On the one hand, since the different time levels present in a musical process interact, the morphological characteristics can circulate from one level to another. On the other hand, the establishment of such circulation cannot take place unless it is assumed that in any case it can never be strictly linear; some types of representation that are valid on one level cannot always retain their pertinence when transposed to another level. Thus, the relations—if we want them to be composed—are to be defined through their content of interaction, which, by opposition to a linear one-to-one relationship, does not exclude fractures, distortions, and mismatches between time levels. To recognize the reality of these mismatches does not drive us to paralysis; on the contrary, it gives us the possibility to explore the passages between different dimensions, allowing us to articulate them inside a syntactic network covering the whole spectrum of composable relationships.

Budón: Very often your mixed pieces present an electroacoustic part built of manipulated samples of the instrument that is played live. That is, for example, the case in *Till*, for piano and tape (1991), and *Myr-S*, for violoncello and tape (1996). How do you organize the relationship between the electroacoustic and the instrumental materials?

Vaggione: I have written pieces for many solo instruments (woodwinds, strings, piano, percussion) and computer-generated tape, as well as some for ensembles of variable size and audio sequences generated and controlled in real time by one or more computers. For the electroacoustic part (tape or audio sequences), I generally use sampled sounds of the instruments played live as material to be

processed by digital means, including analysis-resynthesis techniques. The main reason for this is that it allows the source instruments to shift to the electroacoustic world, that is to extend their range and their virtual palette of possibilities, sometimes carrying them as far as to be cut from their origins—in which case they are no more perceived as belonging to the source—while at other times managing to retain some of their original energetic, gestural, or morphological features. So the tendency is to integrate the acoustic instruments to the electroacoustic domain rather than to add some electroacoustic sounds to a "normal" instrumental part. You can find this model in *Thema* (1985) for saxophone, *Tar* (1987) for bass clarinet, and *Scir* (1988) for bass flute. They belong to a series of pieces, the last items of which are, for now, *Myr-S* (1996) for violoncello and *Chants Parallèles* (1998) for tenor saxophone. In all these works, the samples were provided by the musicians to whom the works were dedicated (Daniel Kientzy, Harry Sparnaay, Beate-Gabriela Schmitt, Jean-Charles François, and Christophe Roy, among others).

Till (1991) and *Leph* (1993), for piano and tape, both dedicated to Philip Mead, are a little different in the sense that the piano samples were not recorded by the pianist but by myself, and also because the piano part does not incorporate any extended playing technique. Other different cases include *Rechant* (1995), commissioned by the GRM, and *Frayage* (1997), commissioned by the Bourges Festival, both for variable sets of instruments, and existing in both mixed and purely electroacoustic versions. These pieces were built on samples of several instruments recorded during a residency at the Institute of Sonology in The Hague (played by students of the Royal Conservatory). I can also mention *Kitab* (1992), for clarinet, double-bass, and Disklavier, commissioned by the International Computer Music Association, for which the samples were performed by students at the Université de Paris VIII.

It has to be stressed that when I talk about "samples," I don't refer to recorded single notes but to very singular short figures or patterns that already have an implicit syntax at the macrotime level. So these samples are already multilevel sound-objects that can be manipulated as such in a network of digital processing objects. Sometimes these sound-objects have been played by the musicians on the basis of my verbal instructions; other times I wrote down the patterns in musical notation and asked the musicians to play from the score.

To give a concrete example: the bass clarinet sound-objects used in *Kitab* were recorded from a previously written score. Figure 2 shows a list of some of these. Note heads indicate the various playing modes to be used: normal, with abundant breath noise (pitched or unpitched), slaps, fluted, key clicks, and so on. Every pattern has to be played separately. (Bars do not indicate measures but simply the boundaries of each pattern.) These lists have a double function: on one side they form the core of the patterns developed in the instrumental score of the work, and on the other side they serve as sound material to be used in the electroacoustic part. In the last case, they are stored as separate soundfiles. These files can later be used as source objects and included in software instrument declarations. Various portions (parts) of these objects, selected by manual or algorithmic procedures (text based or graphic), can in turn be registered as different objects belonging to the same class or to some derived class, having their own names, so as to allow new instrument declarations and connections to various processing algorithms (phase vocoding, convolution, granulation, and waveshaping operations). The products of all of these procedures, as well as the sources, can in this way circulate through the composition's network, following the approach I have described above.

Music and Space

Budón: In the early 1980s you composed some electroacoustic works in 8–16 channels: *Octuor*, *Fractal A*, and *Fractal C*. What motivated the incursion into the multichannel format, and what is your evaluation of the experience?

Vaggione: The multichannel (8 or 16) format of these pieces was determined fortuitously while I

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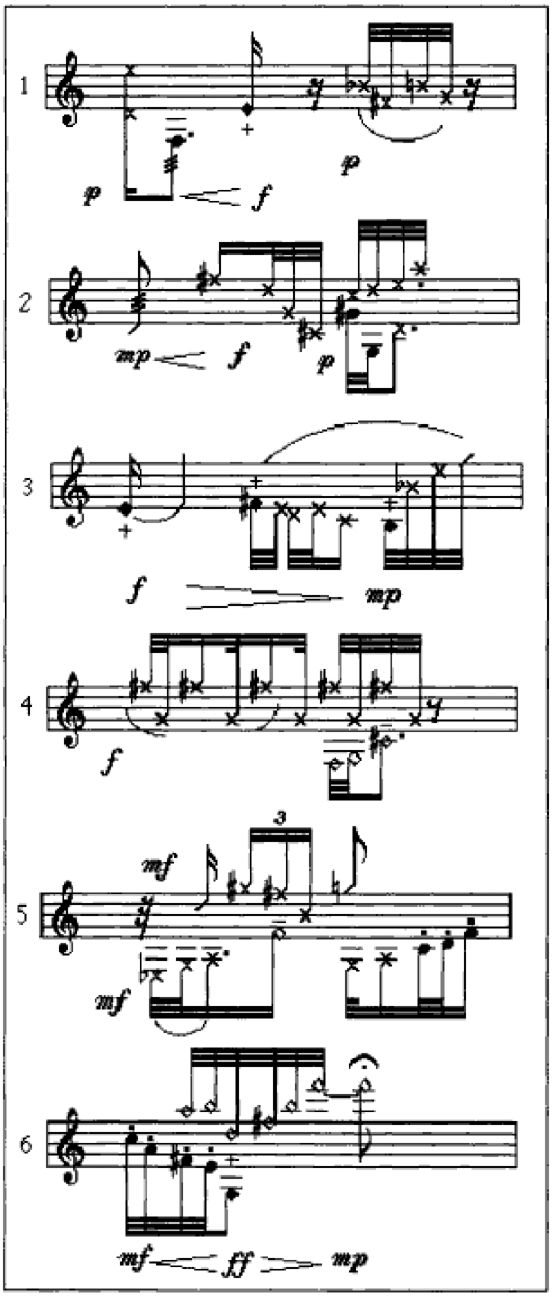


Figure 2. Some of the bass clarinet sound objects used in Kitab *(1992). These objects were performed from a previously written score, and sampled in order to be manipulated by computer. Noteheads indicate the various playing modes used: normal, filtered breath noise, slaps, fluted, and key clicks.*

worked at IRCAM in different multichannel studios. I have written a paper for the *Computer Music Journal* (Vaggione 1984) in which I mention, among other things, the role of multitracking in *Octuor* (1982): to record an automated execution of the piece by the computer (a DEC PDP-10), without using any analog editing. Today this sounds trivial, but it was not at the time, when computers had very small storage capacity. Later, working with the CARL system running on a Vax 780 computer at the University of Berlin, I used four- and eight-channel strategies allowed by the computer's multichannel digital-to-analog converters. The GRM's SYTER system had an eight-channel real-time processing capacity, and I used it in some works, especially *Ash* (1990). Even if in other pieces I have used mainly the stereo soundfield, enhanced by multiple-loudspeaker "dynamic" (performable) sound-diffusion systems such as the Acousmonium (GRM) or the Gmebaphone (Bourges), I did not abandon the multitrack idea, and some late pieces exist in both formats. By the way, these multiple-loudspeaker sound-diffusion systems (as well as others, for example, Birmingham's BEAST or the Creatophone at the University of California, Santa Barbara) support a variety of formats.

In general, I would say that each format has its special requirements, which reflects in the building of the internal space of the work as well as in the external sound projection. Material supports are active (Solomos 1998), and call for different strategies of sonic design—including phase correlations and decorrelations, and so on (Kendall 1995).

Budón: In recent compositions like *Nodal* (1997) for solo tape, one perceives an important concern with layered musical activity arranged in a spatial perspective. The establishment of a dialogue between the far and the near, and the sense of spatial depth of sound-objects and textures, seems essential to the conception of the piece. Could you tell us about your present concerns with space in electroacoustic music?

Vaggione: For a long time, I have been considering the spatial dimension of sound as something to be composed, as part of each morphology. It is true,

however, that in almost every new piece I have found new things to be done in this respect. I rarely use standard global spatialization devices, not even a simple reverberator. I try to give each sound-object a particular, unique spatial feature. The textures created this way are spatially polyphonic or "polyspatial." This is why you can perceive a dynamic spatial depth.

We can talk, in a proper manner, of spatial morphologies that are modulated by other spatial morphologies inside the field of composable attributes. If space is thought of as compositional material, this means that it is essentially a space of relationships—or, if you want, that the relationships which form the basis of a compositional work can be defined in terms of space: size, situation, extension, speed, phase correlation, and so on. These attributes define the spatial features of each object, texture, and musical process. In working with the values of these attributes, with relationships, we can postulate as many spaces as we want.

The definition of consistent methods of sound-object composition has to take into account a plurality of factors. Those that reveal a spatial content are part of a field of interactions in which they are correlated with several morphological factors (all time varying) as spectral energy, amplitude profiles, density profiles, phase relationships, and so on. All these contribute to the articulation of the space of the musical work. We can even say that in each case of correlation, as in the ensemble of all correlations, we are affirming (or risking) a compositional consistency. As an example of the opposite approach, we can recall what happens when we use all-global processing tools (e.g., reverberation) in a nondifferentiated manner—imposing them, so to speak, from the outside rather than integrating them as methods belonging to the composed objects. This attitude negates the singularity of the objects and hence makes fuzzy the definition of the work's internal space (Vaggione 1993, 1998b).

Of course, what I have said is not against reverberation or any global spatializing tool in itself, but certainly against one specific kind of use. To the extent that we use them as pure mechanisms, we forsake the space as a composable dimension.

Notation of Electroacoustic Music

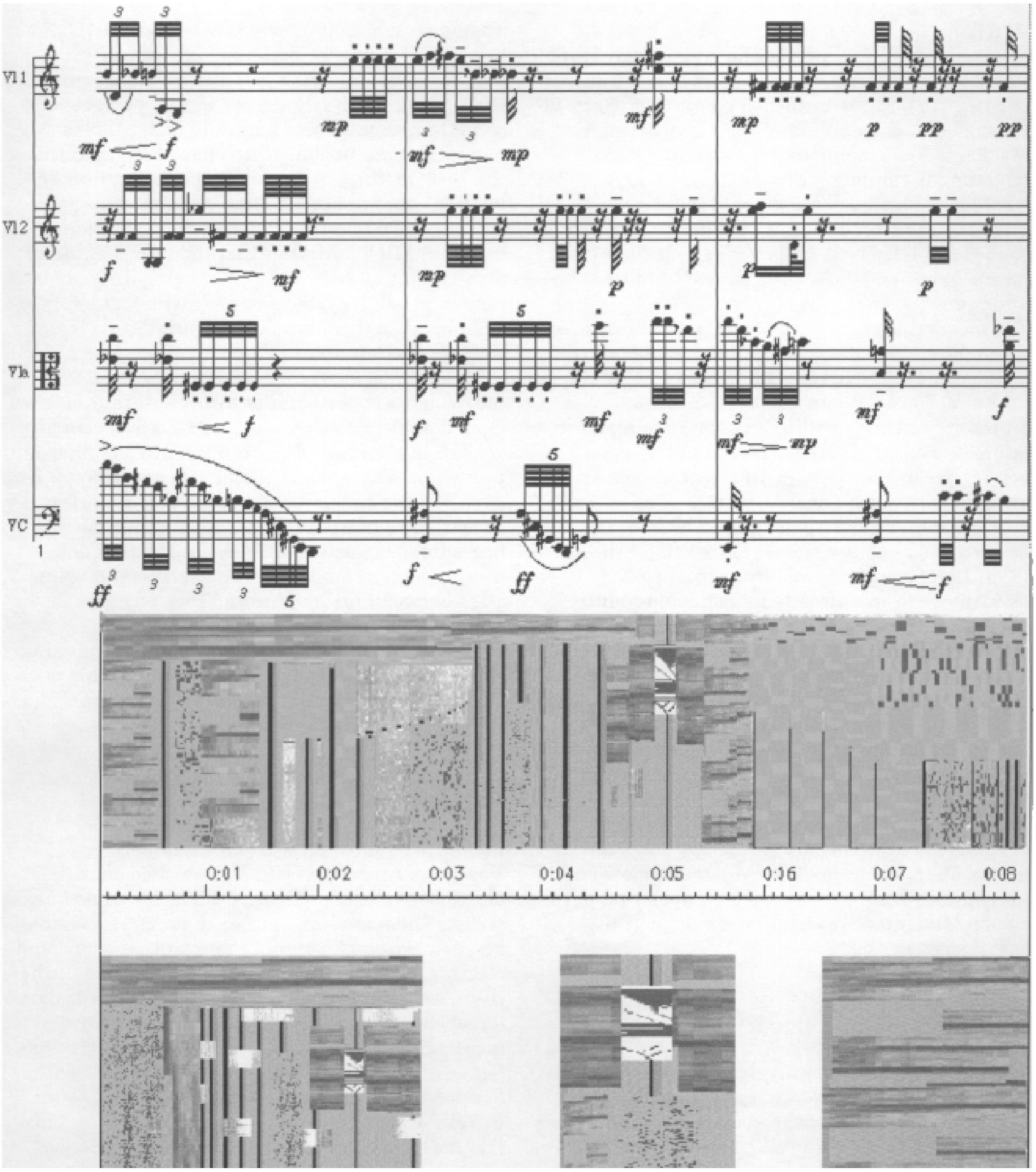
Budón: Electroacoustic music has so far lacked a comprehensive system of notation, in spite of the many attempts to deal with this issue. Presently there seems to be a growing interest in the computer-assisted transcription of electroacoustic works, and various systems are being developed for this purpose. What do you see as possible consequences of such development?

Vaggione: As I said earlier, the digital medium has brought on a qualitative leap, allowing any compositional manipulation to become transparent and reproducible. Jean-Claude Risset has recently pointed out the necessity to keep the traces of these manipulations as materials for analysis as well as for transferring musical works to other computer platforms (Risset 1997). Hence, there is already an important difference to be stressed between the ancient (analog) practice of electroacoustic music and the use of computers. Text codes and listings are, as Risset said, recipes for synthesis. The use of graphic editors can be memorized and replayed, and it can be integrated into compositional algorithms. Thus, where we used to solely have an aural feedback, we now have a confluence of the ear and the eye as well as the possibility to store our actions as codes. I think this is a very positive aspect of computer music.

Computer-assisted transcription techniques can be interesting if they are based on something more than pixels, that is, if they are based on true representation systems, not only involving subsymbolic pictures, but also symbolic representations capable of not just reproducing an image but also able to replay—to reproduce—what they represent. (Music, even made with computers, is by nature a "performing art.") Here there is a tendency toward a general notation concept, a manipulation of symbolic units in the frame of a "legal," well-defined pertinence, whatever this frame would be. The Acousmographe program developed at the GRM (Besson 1991) is a step in the direction of a multi-layered transcription of sonic entities. (See Figure 3 for an example.) Several systems are working together: a spectrogram analyzer is linked to disk-

Figure 3. A fragment of the score of MYR-11 (1997) for strings and electroacoustics. The images corresponding to the computer-generated part were made with the Acousmographe program. The whole score is linked with the audio files stored on a hard disk, and can be viewed as a "movie" on a computer screen.

PREV
NEXT



stored digitized soundfiles and, above it, to the pixels of a graphic, a personalized rendering layer. This last layer works by superimposing a transparent "paper sheet" over the spectrogram images, allowing us to draw on top of them (with MacPaint-like graphic tools). Once the graphic rendering is complete, the spectrogram layer can be hidden. This way, the graphic score remains linked to the stored sounds, and hence these sounds can be played (and even rearranged by means of cut-and-paste procedures) from the "front end" of the graphic score.

It seems that the ultimate step in this direction would be a reversible system, that is, one allowing us to go back analytically from graphic rendering to sound. This can only be possible if we find a procedure to keep the different levels of representation constantly linked. The difficulty, as I said before, lies in the way this linkage can deal appropriately with a multiscale situation. The Phonogramme program developed by Vincent Lesbros at the Université de Paris VIII (Lesbros 1995, 1996) can be viewed in this light, as it allows us to draw spectra directly by hand and to introduce them into the system via image scanning to convert them into sounds. The UPIC system is based on a totally different approach, since its graphic "pages" emulate a macroscopic pitch-versus-time score to which separate wavetables are assigned. Dealing directly with the spectral domain, Daniel Arfib has been investigating (at the CNRS-Marseille) the possibilities of sound synthesis by manipulating images (Arfib and Delprat 1993). We are looking also for something coming in this direction from Open Music, the new environment for computer-assisted composition developed by the music representation team at IRCAM (Assayag et al. 1997).

About MIDI

Budón: I remember you saying in your seminars at the Université de Paris VIII that MIDI and equal temperament were somehow similar turning points in music history. Could you comment on this?

Vaggione: What I probably said is that MIDI has a function similar to equal temperament as a standard of communication between musical sources, through the establishment of which, by necessity, something is lost. As a matter of fact, MIDI is a macrotime protocol in which have been codified the basic features of common music notation, including equal-tempered pitch class systems and power-of-two durations. However, in practice we can push MIDI a little further than the common music notation boundaries, not being limited by human physiology, but not too much further, however, because there is a definite limit in the speed of data transmission, and hence in the time scale.

So MIDI data streams can certainly be morphophoric (a carrier of form) within their own time domain. If this status of MIDI is accepted, we can incorporate the protocol into a composition network and benefit from its advantages. For example, we can establish some useful bridges between sonic morphologies and common music notation, or, pushing it to its limits, to produce morphologies standing somewhere at the boundaries between macrotime and microtime scales. I realized in 1991 a little Max patch called "Macrogranulator" to deal with this last possibility. Another Max application related to this is Serge de Laubier's MIDIFormers (de Laubier 1997).

Final Remarks

Budón: What are you working on now?
Vaggione: After *Agon* (1998), I finished another electroacoustic composition, *Préludes suspendus* (1999). There are some pieces in progress: one for acoustic ensemble, another for clarinet, piano, and electronics. I am interested in investigating further the relationship between meter (as a cyclic-hanging force) and rhythm (as a nonsymmetrical movement), and this not only at the level of macrotime, but at the most microscopic level reachable with our present tools. Some techniques related to the wavelet-transform approach seem to be useful in this regard. In general, I have the feeling that elec-

troacoustic music is going into a new qualitative leap. We are, if I can risk the image, in a situation somewhat analogous to the Mannheim composers paving the way for Haydn's symphonies; only this time, the world—as well as our historic perception of it—has become multiple and relative. So my reference to Haydn is not to be taken as if we were waiting for the great master to come, but rather as an insight into complexities to develop.

References

Arfib, D., and D. Delprat. 1993. "Musical Transformations Using the Modifications of Time-Frequency Images." *Computer Music Journal* 17(2):66–72.

Assayag, G., et al. 1997. "Problèmes de quantification et de transcription en composition assistée par ordinateur." In H. Genevoiset and Y. Orlarey, eds. *Musique et Mathématiques*. Lyon: Grame.

Besson, D. 1991. "La transcription des musiques électroacoustiques: que noter, comment, pourquoi?" *Revue Analyse Musicale* 24:37–41.

Boulez, P. 1964. *Penser la musique aujourd'hui*. Paris: Denoel.

Boulez, P. 1990. *Jalons (pour une décennie)*. Paris: Christian Bourgois.

Cowell, H. 1930. *New Musical Resources*. New York: Knopf.

Davies, H. 1967. *International Repertoire of Electronic Music*. Cambridge, Massachusetts: MIT Press.

de Laubier, S. 1997. "MIDIFormers." *Computer Music Journal* 21(1):39–40.

Englert, G. 1981. "Automated Composition, Composed Automation." *Computer Music Journal* 5(4):30–35.

Franchisena, C. 1994. *The Franchisena Collection*. Latin American Music Center, Indiana University. Available online at http://www.music.indiana.edu/som/lamc/collections.

Gómez, E. 1996. "Review: Horacio Vaggione: Musiques pour piano et électroacoustique." *Computer Music Journal* 20(4):73–74.

Greussay, P. 1973. "Modèles de descriptions symboliques en analyse musicale." Doctoral dissertation, Université de Paris VIII.

Kendall, G. 1995. "The Decorrelation of Audio Signals and Its Impact on Spatial Imagery." *Computer Music Journal* 19(4):71–87.

Lesbros, V. 1995. "Atelier incrémentiel pour la musique expérimentale." Doctoral dissertation, Université de Paris VIII.

Lesbros, V. 1996. "From Images to Sounds: A Dual Representation." *Computer Music Journal* 20(3):59–69.

Paz, J. C. 1956. *Introducción a la música de nuestro tiempo*. Buenos Aires: Nueva Visión.

Paz, J. C. 1959. *Schoenberg o el fin de la era tonal*. Buenos Aires: Nueva Visión.

Paz, J. 1998. *Juan Carlos Paz, Musical Works*. Audio compact disc CD FNA/V-001. Francisco Kroepfl, producer. Buenos Aires: Fondo Nacional de las Artes.

Riotte, A. 1980. "Analyse formalisée." Course material, Département Musique, Université de Paris VIII.

Risset, J.-C. 1997 "Problems of Analysis: Some Keys for My Digital Works." In *Analysis in Electroacoustic Music*. Bourges: Mnemosyne.

Roads, C., and J. Alexander. 1997. "Granular Synthesis: The Musical Possibilities of a Visionary Technology." *Keyboard* 23:42–44.

Schaeffer, P. 1966. *Traité des objets musicaux*. Paris: Seuil.

Solomos, M. 1998. "Musique et Support. Entretien avec Horacio Vaggione." *Revue Doce Notas* 2:23–35.

Stockhausen, K. 1957. "...how time passes...." *Die Reihe* 3:10–43. English trans. by C. Cardew, 1959. Bryn Mawr: Theodore Press.

Vaggione, H. 1984. "The Making of *Octuor*." *Computer Music Journal* 8(2):48–54.

Vaggione, H. 1985. "Opérations spectrales dans la composition de Thema." Internal Report, IRCAM, Paris.

Vaggione, H. 1987. "Computerunterstuetze Musikstrukturierung." Unpublished Manuscript, Technische Universität Berlin.

Vaggione, H. 1991. "A Note On Object-Based Composition." *Interface* 19:3–4.

Vaggione, H. 1993. "Determinism and the False Collective: About Models of Time in Early Computer Assisted Composition." *Contemporary Music Review* 7(2):91–104.

Vaggione, H. 1994. "Timbre as Syntax: A Spectral Modeling Approach." *Contemporary Music Review* 11:73–83.

Vaggione, H. 1995. "Objets, représentations, opérations." Paris: Ars Sonora Revue.

Vaggione, H. 1996. "Vers une approche transformationnelle en CAO." *Actes des Journées d'Informatique Musicale (JIM) 1996*, Les cahiers du GREYC, CNRS-Université de Caen. Available online at http://www.ipt.univ-paris8.fr/~arsonora/revue/.

PREV

Vaggione, H. 1997. "Schall." Program notes for *Computer Music Journal Sound Anthology, Vol. 21* compact disc. *Computer Music Journal* 21(3):120.

Vaggione, H. 1998a. "Composing with Networks of Objects." In *Composition and Diffusion in Electroacoustic Music*. Bourges: Mnemosyne.

Vaggione, H. 1998b. "L'espace composable: sur quelques catégories opératoires dans la musique électroacoustique." In M. Solomos and J. M. Chouvel, eds. *L'espace: musique, philosophie*. Paris: L'Harmattan.

Vaggione, H. 1998c. "Son, temps, objet, syntaxe." In *Musique, rationalité, langage*. Paris: L'Harmattan.