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“WHAT IS AN EVENT? The EVENT Schema in Relation to Listening and Electroacoustic Cognition”

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WHAT IS AN EVENT?

*The EVENT Schema in Relation to Listening and Electroacoustic Cognition*¹

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1. INTRODUCTION

The concept of 'event' is fundamental to most discussions of electroacoustic music and yet has not been carefully studied as a subject in itself. We often treat 'events' as self-evident, but this cursory impression masks a world of complexity. We might have the impression that the recognition of an 'event' is automatic, but how did we come to that decision and, more importantly, what do we mean by that designation? Such self-evident instances of 'event' are signposts to the hidden complexity of the mind and the ease with which we arrive at complex decisions with deceptively little conscious effort. Consider also that our understanding of 'event' in electroacoustic music is shaped by a larger domain of experience than just electroacoustic music or even auditory perception. We characterize and organize much of the activity in the world around us as 'events', and any thorough explanation of 'event' in electroacoustic music must acknowledge both the scope and the levels at which 'event' appears to operate. We need a concept of 'event' that can be related to the art of electroacoustic music and at the same time be informed by our broadest experience.

2. LINGUISTIC INSIGHT INTO 'EVENT'

While the concept of 'event' has been treated in many fields from physics to philosophy, the treatment of 'event' in linguistics is particularly rich with potential significance for electroacoustic music. The way in which we communicate about 'events' in language reveals universal features of how we think about 'events'. In particular, the concept of 'event' has been studied in relation to what is termed linguistic *aspect*, the way in which language communicates about the temporal flow of an event. While tense captures the time at which an event occurs (or the temporal relationship between events), aspect captures the state and progress of an event. Aspect in English can be demonstrated in the comparison of the statements "I eat" with "I am eating" (present simple vs. present progressive) or "I have eaten" with "I have been eating" (present perfect vs. present perfect progressive). The first statement in each pair communicates that the event is concluded while the second, the progressive one, communicates that the event is still in progress. The study of aspect in language has helped to reveal the common perspectives and considerations that human beings bring to the characterization of 'events'.

In this regard the work of Srinu Narayanan [2] is very informative. Narayanan has demonstrated that a single schematic structure can characterize both high-level sensorimotor movements and linguistic aspect. Narayanan says that his general schema, CONTROLLER, "captures the

basic temporal structure of our conceptualization of events" [2]. A simplified graphic representation of CONTROLLER is shown in Fig. 1, and its relationship to linguistic aspect is illustrated in Fig. 2.

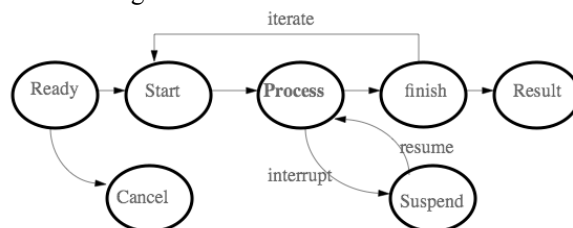


Figure 1. A simplified representation of Narayanan's CONTROLLER schema [3].

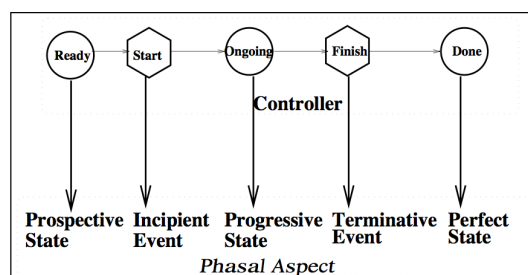


Figure 2. Linguistic *aspect* in relation to Narayanan's CONTROLLER schema [3].

3. THE EVENT SCHEMA

Inspired by the work of Narayanan [2], an EVENT schema is first proposed and then explored in relation to auditory phenomena in general and to the art of electroacoustic music in particular. Based on Narayanan's CONTROLLER schema, this EVENT schema is a generic model that captures the essential temporal structure by which auditory experiences may be *understood* as 'events'. Its potential usefulness for electroacoustic music analysis is explored in numerous domains. Emerging as it does from Narayanan's analysis of sensorimotor activity, it provides a framework for discussing the relationship of electroacoustic musical content to embodied experience. As a model that executes through time, the EVENT schema is valuable in extending our understanding of realtime process such as listening.

3.1. Definition

The EVENT schema is a dynamic model that includes component parts representing processes and others representing state. The model is dynamic in several respects. First, it is a pattern that executes through time. It changes

¹ An extended paper on this topic is available as "What is an Event? The EVENT Schema, Circumstances, Metaphor and Gist." *Proceedings of the 2008 International Computer Music Conference*, Belfast, UK.

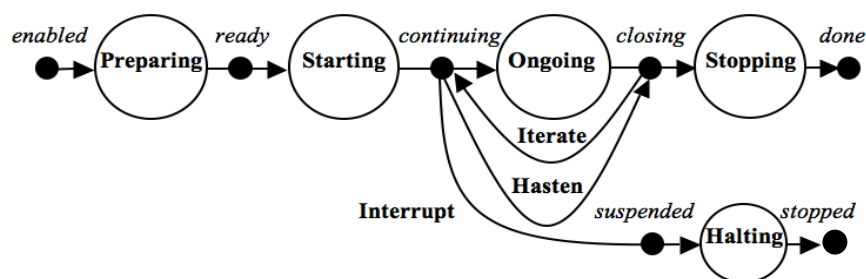


Figure 3. Representation of the EVENT schema. Processes are represented as circles and states as dots.

state during the process of its execution. Second, it has junctures at which the execution can be directed along alternative paths. As shown in Fig. 3, execution runs from beginning to end, but can also include interactions and interruptions. This schema also includes steps that are often inaudible such as ‘Enabled’, ‘Preparing’ and ‘Ready’ that capture the preparation for the start of an ‘event’.

3.2. Properties of EVENT

3.2.1. Types of Events

The EVENT schema must be able to accommodate the diversity that exists in the types of ‘events’ that we encounter in everyday life and in the multi-level meanings that we ascribe to ‘events’. There are types of EVENTS that are themselves recurrent patterns by which we understand more specific kinds of acoustic behavior. For example, we may generalize the pattern of sound produced by the action of striking an object, whether it is a snare drum or gong, as starting with a gathering of energy followed by a quick release. The listener apprehends the sound of a particular strike in terms of the specifics of the moment: the temporal pattern to the flow of force as well as the specific characteristics of the physical object receiving the energy. The sound produced by blowing on a flute can also be understood in terms of the flow of force that sustains the sound in the ongoing process and the nature of how the object responds to the force. These two situations can be understood as specific instances of different general patterns of energy flow---the first, the ‘burst’ of energy and the second, the sustained ‘disbursement’ of energy. Fig. 4 illustrates BURST as a subclass of EVENT in which the ‘Ongoing’ process is by-passed. Fig. 5 illustrates DISBURSE as a subclass of EVENT in which the ‘Ongoing’ process is sustained over time. These schemas are characterized by both their sequence of states and their energy profiles. Wishart would likely associate the BURST schema with *intrinsic* morphologies and DISBURSE with *imposed* ones [6].

A similar notion to ‘types of events’ is discussed by Denis Smalley as *morphological archetypes*, essentially patterns of “temporal shaping” which are “extensions of human action.” [5]. In this context, BURST can be related to the *attack-impulse archetype* and DISBURSE to the *graduated continuant archetype*. While Smalley uses different language, he clearly thinks of the *morphological archetypes* similarly to schemas. A conceptual difference is that Smalley blurs the distinction between the mental ‘event’ and the acoustic one. While the temporal profile of an *attack-impulse* might be transient, the understanding of it also requires the notion that energy was stored in preparation for the initiation of sound. In this way, the EVENT schema

represents a pattern for understanding, not just a perceived temporal shape. Smalley also conceives of these *archetypes* as constituting a small set of base patterns out of which a larger set of *morphological models* are constituted. A contrasting property of the EVENT schema is that it reflects the commonality of mental processes that engage and make sense of such a diversity of acoustic patterns. Rather than categorizing experience in terms of a small set of basis patterns, the listener adapts the EVENT schema flexibly to the progress and the dynamic flow of a potential ‘event’. Consider too that sounds produced by electronic means can be understood in terms of familiar patterns or novel ones. The variety of temporal pathways through the EVENT schema provides a flexible framework for managing unfamiliar situations as well as recognizing recurrent patterns.

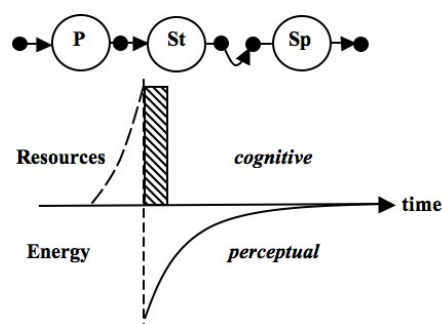


Figure 4. Representation of the BURST schema, also illustrating its relationship to Resources and Energy.

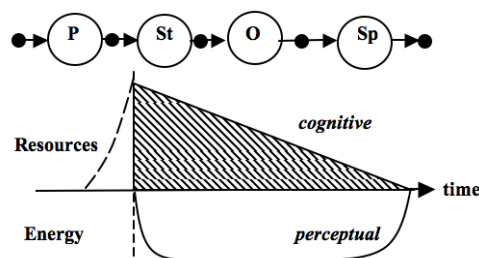


Figure 5. Representation of the DISBURSE schema and its relationship to Resources and Energy.

3.2.2. Resources

The energy and effort associated with force and motion can be generalized through the concept of resources. Resources are certainly consumed in support of sensorimotor activity (although there are other types of resource consumption). In electroacoustic music ‘events’ can be separated on the basis of those that require the concept of resources and those that do not. Some ‘events’ are more closely related to mental experience than to the physical, such as those instanced in juxtaposition or shifts of context. ‘Events’ that do invoke a

relationship to resources may vary in their kind of the resource consumption. 'Events' that we relate to gesture are linked with the sense of bodily effort required for the gesture. We understand that the progress of such an 'event' consumes physical energy. Figs. 4 and 5 illustrate the relationship between the perceived expenditure of energy and the understanding of resource consumption. These energy profiles are analogous to the criteria of Schaeffer's *plan dynamic* and Smalley's *morphological archetypes* [4,5] while the resource profiles capture a cognitive perspective on the resource expenditure supporting the flow of energy through time.

There are some circumstances in which the consumable is something different from physical energy. In Dhomont's *Artifices* we experience the consumption of burning matches, exploding fireworks, etc. In Paramerud's *Les Object Obscures Part III* it is the emptying of marbles onto a hard surface. These examples from acousmatic music highlight an important aspect of electroacoustic music in relation to resources. The exact nature of the resources may not be known (as in the case of these two examples), but the impression of resource expenditure is understood just the same. We infer the relation of resource consumption to 'events' even when we cannot identify the physical situation. Then too, the listener's estimate of the resources expended during an 'event' is deduced through their expenditure. When an 'event' occurs, we typically do not know the magnitude of the event's 'resources' at the start; we take measure of the resources during the course of the 'event'. Our estimate is accumulated and adjusted during the event's progress toward completion. In this sense, our understanding of the total resources of an 'event' unfolds in just the opposite way to which resources are depleted during the execution of the 'event'.

3.2.3. Nesting

An important property of the EVENT schema is that component processes (such as Preparing, Starting, Ongoing, etc.) might themselves be instantiated as EVENTS. Every human being has a large repertoire of EVENT types that are learned during the course of everyday endeavors. Once these types of EVENTS are internalized, they are available to be spontaneously associated within encompassing 'events'. This is an important way in which the listener begins to grasp more and more complex experience in terms of the EVENT schema. A group of 'strikes' may be understood as an 'event' that involves iteration and imparts its own sense of dynamic flow.

This notion of compositing component 'events' into encompassing, long-term 'events' is fundamental to the apprehension of most music. We can conceptualize the listener's hierarchic layering of 'events' with the component 'events' at the lowest, bottom stratum and the encompassing 'events' at successively higher levels. The bottom stratum may exhibit simultaneous streams of 'events' with their own separate hierarchies that the listener may combine together at higher levels. Then too, not all strata are equally important to the listener. Some layers are the primary carriers of significance and meaning, the strata that can be identified as the *focal layers*. For example, in Barry Truax's *Riverrun* the level of individual sonic events, the level of grains, is of relatively little significance to the listener. The *focal layer* is the one at which the grains are slowly transformed. The first five and a half minutes of *Riverrun* can be understood as

several simultaneous 'events' at the focal level, all of which combine into the single 'event' of the first section as illustrated in Fig. 6. A similar point can be made about the first seven and a half minutes of Xenakis's *La Legende d'Eer*.

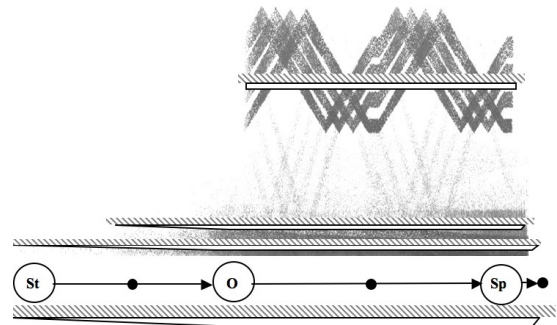


Figure 6. Representation of the initial 5½ minutes of *Riverrun* by Barry Truax. In the background is a sonogram. Superimposed are representations of three essential layers of sound that are made up of many individual grains. At the *focal layer* the entire section can be heard with its own EVENT structure.

4. LISTENING

The EVENT schema presents a general framework by which the listener to electroacoustic music makes sense of the flow of perceptual information. The EVENT schema executes in realtime as the listener is continually forming an understanding. States change, processes unfold and resources are evaluated as the listener assimilates new information moment to moment.

4.1 Binding to Circumstances.

The EVENT schema is in itself a general pattern that can be associated with many kinds of situations. While it captures the essential states and processes that we associate with 'events' in general, it lacks all of the specifics that we associate with an actual 'event.' It is only one aspect of forming an understanding. In the realtime process of listening, the listener must combine the EVENT schema with particular 'circumstances'. The specific way in which the listener binds these together is the act of understanding that unites the abstract with the concrete. The *Circumstances* may include information about the sounding object, the physical processes---in short, all of the information that takes the abstraction of EVENT and links it with specifics. But it is not simply a matter of filling in all of the blank parameters for the EVENT schema with data from the *Circumstances*, because the blending of such disparate elements requires a creative act. Then too, *Circumstances* may include information that goes well beyond the scope of the EVENT schema, information that enriches the general pattern of the EVENT with context and associations.

EVENT and *Circumstances* are a pregnant combination that quickly gives birth to the 'event', the *Instantiated Event*. This *Instantiated Event* is the result of a mental act that binds the EVENT schema with the *Circumstances* and blends the information of the *Circumstances* with the pattern of EVENT. Then too, the particulars of the combination create a rich domain for artistic association, especially when the elements of the *Circumstances* create unusual or unprecedented combinations, such as Normandeu's merging

of a cello and a hurdy-gurdy in *StrinGDberg* or Dhomont's references to Machaut and Schaeffer in *Novars*.

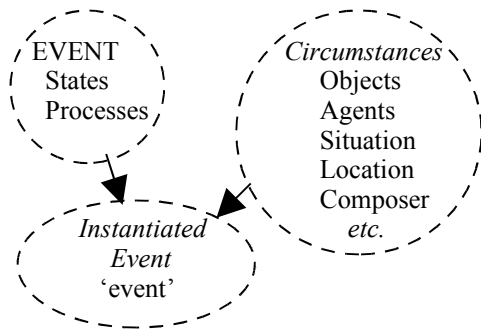


Figure 7. The binding of EVENT with *Circumstances* to form an *Instantiated Event*.

4.2 Gist

Clearly one of the common challenges in listening to electroacoustic music is the experience of a situation that is difficult to assimilate in realtime. This could be a passage with many simultaneous streams of 'events' or one in which the relationships between 'events' is particularly difficult to follow. Whatever the situation, in-depth listening to electroacoustic music often surpasses the listener's mental resources of the moment. But even when 'events' cannot be completely assimilated, the listener can hold onto the 'gist' of 'events' [1]. Fig 8 shows the sonogram of a short segment of Dhomont's *Novars*. There are two components in the texture. The more continuous one concentrated in the bottom third of the graph is a stream of particles taken from Machaut's *Masse de Notre Dame*. Just as in the case of the grains in *Riverrun*, it is far more meaningful to focus on the 'gist' of the entire assembly, rather than individual particles.

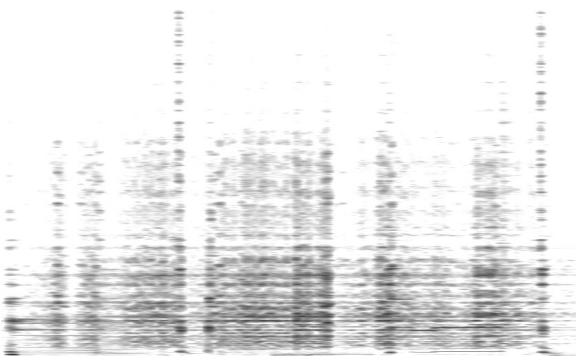


Figure 8. Sonogram of Francis Dhomont's *Novars* from 2' 58'' to 3' 35''.

The situation of incomplete assimilation reveals that listeners are always constructing the 'gist' of 'events'. 'Gist' is often described as what the perceiver acquires from a brief glimpse of something and usually includes the most salient features of the situation. The formation of the 'gist' is essentially automatic and nearly instantaneous. Its content typically includes perceptual features and conceptual relationships. 'Gist' enables the listener to construct a working hypothesis and to keep up with the realtime flow of 'events' even when the details cannot be absorbed. It is a kind of abbreviation for what is going on. "Gist" guides the listener's attention to a *focal layer* which tends toward the listener's foreground just as ambience tends toward the background.

4.3 Incomplete Circumstances and Art

In acousmatic music the *Circumstances* of an 'event' are often intentionally impoverished in comparison to situations in everyday life. Because the basic information about the sound source and context may be unknowable, the listener's attention is shifted to the elements of the *Circumstance* that are clear or to the specific characteristics of the EVENT schema itself (such as the dynamic flow of resources). In such ways our everyday habits of listening to 'events' are broken and reshaped for artistic purposes. Smalley discusses acousmatic source identification in terms of *surrogacy* that ranges from first-degree to remote [5]. It is important to recognize in these situations that the listener is still able to grasp the 'gist' of the 'event' despite its remote relationship to everyday experience (though the act of listening might require more effort). In this case, the lack of information about the source is not only intentional, but also clearly part of the artistic content of the work. The EVENT schema provides a context for meaning even when *Circumstances* are incomplete. It gives cognitive support to the seeming abstraction of the 'objet sonore' [4]. Clearly, an essential aspect of artistic expression is the intentional abbreviation, the situation in which the lack of information highlights content and engages the imagination of the listener.

5. CONCLUSION

We have explored the concept of 'event' in relationship to electroacoustic music and especially in relation to its artistic content. This exploration has produced a rich set of outcomes, ways in which the act of understanding electroacoustic music is illuminated and its hidden mental processes are made evident. Artistic play with sonic material and organization is a hallmark of electroacoustic music and we have observed the creativity by which listeners bind the EVENT schema with the *Circumstances* of the moment, facilitating artistic abbreviation and widening the scope of imagination. The consideration of 'event' is an essential component of a comprehensive understanding of the cognition of electroacoustic art.

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