

Spectral Composition and Percussion: Contemporary Concepts of Timbre and Time

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This article is an introduction to the use of selected Spectral compositional techniques for percussion using Gerard Grisey's "Tempus Ex Machina" and Canadian composer François Rose's "Points d'émergence" as models of repertoire for chamber and solo percussion. For those familiar with Spectralism, the common surface perception of this music is that it utilizes orchestrations and vertical harmonies based upon concepts of the harmonic overtone series. Given this assumption, the primary question this article addresses is the following: How are the compositional concepts of Spectralism used in percussion, particularly unpitched instruments?

A BRIEF BACKGROUND OF SPECTRAL COMPOSITION

Spectral music is a set of musical ideals and compositional practices that seek to bring *timbre* to the forefront of composition. Its language often centers on orchestrations of harmonic series partials as its pitch material (rather than tonal or atonal pitch collections) that are, in turn, varied and transformed throughout the composition. By creating instrumental scoring combinations built on specified pitch frequencies, spectral textures "melt together," sounding more like new instrumental timbres composite rather than a vertical sonority/harmony.

Originators of this genre performed computer-based analyses, such as the Fast Fourier transform, on sound sources to see a visual spectrogram of harmonic frequencies that define their timbres. For example, performing a spectrogram on a single trombone pitch will show which frequencies are present in the trombone's sound, defining its timbre. An analysis of a bass clarinet playing the same pitch in the same octave will yield the same fundamental, but a different collection of partials that distinguish its timbre from that of the trombone. The composer could then base a work around a source spectrogram by orchestrating the frequency profile (often to the nearest available microtone) followed by transformations of timbre profiles and interconnections between new timbres.

Twentieth Century composers, such as Messiaen, Stockhausen, Varèse, and Xenakis, orchestrated in a manner that is considered by some to be "proto-Spectralist." The first codified and concentrated use of this musical philosophy and technology took place in France during the early 1970s at Paris' Institut de Recherche et Coordination Acoustique/Musique (IRCAM). Tristan Murail and Gérard Grisey are the canonical names in this movement, but other composers studying throughout Europe were also breaking musical ground in this idiom, including the late Quebecois composer Claude Vivier, who symbolically links Spectralism as a French-Canadian expression. This influence is, as a general observation, a key trait that distinguishes much Canadian composition as stylistically different from that of its United States neighbors, whose post-Schoenbergian developments in the academy defined a broad basis in compositional pedagogy. François Rose studied composition with both Grisey and Murail, but some of his compositional sensibilities were also informed by his work at the University of California–San Diego, where he worked with

Brian Ferneyhough and composed works for Steven Schick and several of Schick's students.

Spectralism has maintained a consistent presence in concert music and has continued to evolve over the past thirty years. This is notable in that the music marks a cognizant departure from academic trends in postwar composition and yet exhibits an uncompromising aesthetic that one would not describe as "accessible" like a neo-tonal or minimalist score. Certainly, the fact that spectral music is based upon natural acoustic phenomenon lends the movement a degree of intrigue and credibility. More importantly, however, Spectralism has thrived as an ideal because of its flexibility and lack of strict dogma in regard to technique. Even the founders of the movement regard the music as an aesthetic rather than a style with a wide range of techniques. Spectral composition innovator Tristan Murail describes the music simply as "sound evolving in time." Any composition that showcases timbre as a primary structural feature may be viewed on some level as a Spectralist work. That said, unpitched solo and ensemble percussion music undeniably have a place in Spectral music.

SPECTRAL PERCUSSION AND "HARMONICITY" IN UNPITCHED INSTRUMENTS

In Spectral music the concept of harmony is related to the organization of timbre rather than that of chordal pitch sonorities. Unpitched materials then, as a timbre, must conceptually have a basis in this music. Musical figures in Spectral music whose orchestrations contain pitch partials of the harmonic series are said to show "harmonicity" by replicating this naturally occurring acoustical phenomenon. Harmonicity should not be confused with a tonic or consonance due to the fact that higher partials, when played with the fundamental, can produce dissonant intervals. Moreover, true harmonic series partials contain microtonal pitch material.

We can see from spectrograph analyses that "unpitched" percussion instruments, in fact, do not lack pitch. The opposite is true: Their sounds contain too many pitch frequencies to audibly discern the fundamental. Joshua Fineberg's article "Guide to the Basic Concepts and Techniques of Spectral Music" includes a spectrograph of a cowbell whose fundamental pitch is B4 (see Figure 1), but the pitch is obscured by a plethora of pitch frequencies that are not members of the harmonic series or that are in displaced octaves that disrupt the order of the overtone series partials. This principle is called *inharmonic*. Inharmonicity is not an undesirable state, and this concept should not be thought of as a tonal versus atonal dichotomy. Instruments such as the triangle and cymbals require inharmonicity. If these instruments contain too few overtones and too clear a fundamental, they will sound undesirable in an orchestral setting when they clash against the predominant harmony.

HARMONICITY IN ROSE'S "POINTS D'ÉMERGENCE"

The percussion scoring in François Rose's multiple percussion work "Points d'émergence" consists of three woods, three drums, and three

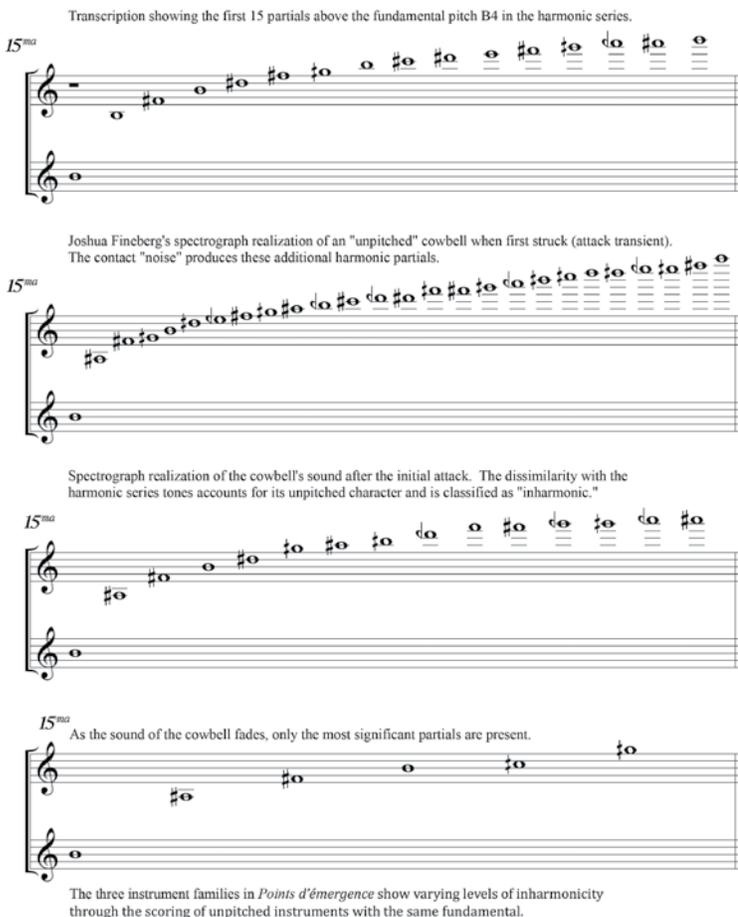
metals or “bell” instruments. The performer determines the actual instruments, but Rose stipulates that each family of instruments should have the same pitch content. Finding like-pitched groups of instruments for the piece is not an easy task. Most conventional wood (woodblocks and temple blocks) and metal instruments (cowbells and brake drums) have higher fundamental pitches than our highest pitched drums (bongos or high tom-toms). Performers of this piece often have to build at least one family of instruments to heed Rose’s nomenclature. The author’s choice of instruments are three almglocken (resonant tuned cowbells), a Latin Percussion practice conga, two bongos, and one-foot by four-foot oak planks tuned to the pitches C4, D4, and F-sharp 4 (see Figure 2). David Shively, who premiered the work, performs on three fabricated tuned aluminum bar metals (like those commonly used as Xenakis’ Sixxen in the “Métaux” movement of “Pléiades”); conga and two bongos; and three tuned samatras of purple heart wood tuned to a different pitch set altogether.

While these percussion instruments in an orchestral sense are said to be unpitched, Rose knows that one can hear a general fundamental pitch in drums, wood, and metal percussion instruments. It is the concept of “relative inharmonicity” that is at play in Rose’s “Points d’émergence.” The composer scored the metals, woods, and skins to have the same pitch set. The set is determined by the performer, but the pitch choices, while

Figure 2: Sample Setup for *Points d’émergence*



Figure 1



aesthetically and logistically important to the performer, are to a great extent irrelevant to the piece. What is pleasing to the ear is not necessarily the sonority of the three pitches selected but the timbre shifts present within a tightly woven polyphony between the timbre groups.

What makes hearing the same fundamental pitches across the percussion instruments theoretically interesting is their varying levels of harmonicity inherent in each instrument group. For example, the almglocken, as tuned percussion instruments in the author’s setup, not only have the most harmonicity, but also have a complex overtone profile that prevents them from sounding precisely “in tune.” Moreover, the almglocken have the longest decay rate. Some “noise” frequencies are present in the striking of the instrument (known as the “attack transient” in Spectralist terminology), which decay immediately, while other frequencies remain as the instrument rings. One can hear a reasonably clear fundamental in the bongos and conga, but the decay rate of the “pitch” is faster than the almglocken. The oak planks (samatras) have a short decay and a less clear fundamental pitch due to allegedly having more inharmonic spectral frequencies. In the author’s choice of instruments then, there is a progression from the metals, to skins, to woods—from more to less harmonicity.

Rose, in his score nomenclature, seems aware of the decay properties of the instrumentation. In the score he suggests some possible muting for the metals (bells) to make the decay rates more equal. He also suggests placing a tam-tam near the setup to elicit sympathetic resonance from the woods to artificially lengthen the decay rate. By calling indeterminate metals “bells” he is also suggesting that they are generally the instruments exhibiting the most harmonicity or discernable pitch. Performers experimenting with this principle in their setup design could use marimba bars as woods and traditional cowbells as metals if they wished to realize the piece with a different contrapuntal interaction between relative harmonic and inharmonic timbres. “Points d’émergence” could certainly succeed as a solo percussion work on its rhythmic writing alone with a freely tuned setup between timbres, but from a spectralist perspective, experiencing levels of harmonicity between like-pitched, but varied timbral surfaces, is paramount to the work.

OTHER COMPONENTS OF PITCH IN SPECTRAL MUSIC

One concept worth mentioning in regards to Spectral Music is

Combination Tones. These resulting tones are sympathetic sounds or overtones present when two tones are played simultaneously. “Summation tones” are resultant notes of two frequencies being added together. For example if A4 (A = 440 or 440Hz) and E5 (659.26Hz) are added together, you get 1099.26Hz, which corresponds to a note just flat of C-sharp 6 (1108.73Hz). A justly tuned perfect-fifth interval would likely produce a purer purer-tenth interval as a combination tone. Another concept is “Difference Tones,” where two frequencies are subtracted from one another. Using the same pitches, E5 (659.26Hz) minus A4 (440Hz) is equal to 219.26Hz, which is a pitch very slightly below A3. These pitch concepts may be employed by the composer melodically, harmonically, or as an element of orchestration. Composers may round microtones to the nearest half step, while others may ask for microtonal notes in their score or electronic sound texture. These combination tones may naturally sound sympathetically when two pitches are played simultaneously, or the composer may determine combination tones of two pitches and add them to the orchestration to simulate this acoustical phenomenon.

SPECTRALISM AND MACRO-RHYTHM: AUDIBLE FORMAL ORGANIZATION THROUGH TEMPORAL STRUCTURES

It is clear that spectral procedures have some basis in the timbral organization of “Points d’émergence,” but it is arguable that the audibility of temporal and rhythmic structure is the work’s most noticeable compositional strength. Temporal and rhythmic structure is another musical component that one does not initially associate with Spectralism, a compositional philosophy that on the surface is concerned primarily with issues of pitch frequencies combined to form timbre based sonorities. Gérard Grisey’s Darmstadt International Summer Courses for New Music lecture turned article, “Tempus ex Machina: A Composer’s Reflections on Musical Time,” has served, to some extent, as a manifesto on temporal proportions and procedures in spectral music. The article is aesthetically bold in that it questions the audibility and, by extension, the validity of formal procedures such as Fibonacci and Golden Mean proportions as well as symmetrical and palindromic rhythmic structures. His criticism of these devices is simple: If listeners cannot hear these principles in the music, or retain in their memory the musical events that shape these formal proportions, then the formal design is essentially a self indulgent exercise on the part of the composer. At best, these formal structures are tools for composing that should not warrant any special merit, because to Grisey, the music should not require a score to appreciate the compositional architecture. “Avatars” of modern music such as Boulez and Bartók were, for the first time, not beyond reproach in regards to their formal methods.

Grisey’s goal in this assessment was not a call for formal simplicity or accessibility, but to outline a number of temporal criteria that could maintain a level of complexity and yet be audible conceptually to the listener. He goes on to discuss a basic listening rubric of larger temporal structures and their relative level of predictability to the listener. Rather than referring to dualities such as short/long or binary/ternary, Grisey uses principles of Information Theory as a model for time structures in sound.

Table 1: Temporal Structures in Music As Defined By Gérard Grisey

Temporal Structure	Predictability	Level of Order
A. Periodic	Maximum Predictability	Order
B. Continuous-dynamic	Average Predictability	Partial Order
1. Continuous Acceleration		
2. Continuous Deceleration		
C. Discontinuous-dynamic	Slight Predictability	Partial Disorder
1. Acceleration or deceleration by stages or by elision.		
2. Statistical acceleration or deceleration.		
D. Statistical	Zero Predictability	Disorder
Serial or other division of event durations for maximum discontinuity.		
E. Smooth	n/a	n/a
Rhythmic silence		

These temporal movements are described below, but also summarized in Table 1.

Periodic structures are the most orderly and the most predictable. Most conventional music we hear falls into this category. In this state, there is an audible hierarchy of pulses (i.e., harmonic rhythm) in consistent tempi. Grisey believed that episodes of periodicity were essential to allow temporal repose in the music’s overall trajectory. What he felt was limiting about post-Webern serial ideals was the fact that the absence of periodicity, in both rhythm and pitch, was alarming and too unpredictable. While these textures may have a successful general effect to the listener, the actual intentions of the music are not necessarily disseminated past the composer, conductor, or performers.

Continuous-dynamic temporal structures, on the surface, suggest continuous accelerations or decelerations of durations due to shifts of tempi or different durations within a static tempo. Grisey is primarily referring to relationships reflected in the lengths of phrases, or musical events, rather than local note values. For example, an opening phrase of 8 measures could be followed by phrases of 6, 4, and 2 measures respectively, showing a gradual “acceleration” of time. These arithmetical and geometric accelerations are considered to be of average predictability. Used locally within a composition these structures can be effective. George Antheil’s 1950s revision of “Ballet Mécanique” contains some moments of building temporal tension by creating an acceleration of time by subtracting pulses in the same tempo. One measure of 4/4 is followed by one of 7/8, then 6/8, and so on. There is no change in tempo during this phrase, but a sensation of temporal acceleration is created.

To avoid a point of predictability or even boredom of a set algorithmic method for accelerating or decelerating structures, Grisey is a proponent of composing *discontinuous-dynamic* structures. For example, rather than accelerating at a set rate or formula, events could move forward with elisions or discontinuous jumps forward or backward in tempo or rhythmic density. Another means of discontinuous accelerations or decelerations is to use statistical proportions in a work of increasing speed or frequency of events.

Grisey’s motivation in this argument is not only to create works that are temporally audible, but also because he likens discontinuous dynamics to a spectrum with the absence of certain frequencies. In this way, Grisey is describing time and rhythmic structures as analogous to the frequency spectrums that define the basic premise of Spectral composition. Some composers in the medium even use their tempi/metronome markings as a means of time-based consonance and dissonance. Rose uses 72 bpm and 96 bpm as his periodic/stable tempi in “Points d’émergence,” while other tempi are present in changing or instable rhythmic episodes. Grisey might consider these tempo markings to serve as time “frequencies.” Discontinuous dynamics help unify the tenets of timbre and rhythm in Spectralist thought.

Other temporal structures include *Smooth* structures that entail large structural units of rhythmic silence or sustained textures that do not have a true sense of temporal motion. Certain types of ambient music would qualify in this category. Finally, there are *Statistical* structures, which refer to total serialism or other discontinuous structures that have a limited or zero predictability on the part of the listener.

TEMPORALITY AND FORM IN “TEMPUS EX MACHINA”

Gérard Grisey’s “Tempus ex Machina” (1979) for percussionist sextet serves as a treatise composition in applying his notion of form and time in Spectral music. The work is approximately twenty minutes in duration, and the first major section (roughly the first nine minutes) clearly utilizes concepts of acceleration and deceleration in musical time.

In order for the musical material to be easily coherent and recognizable to the listener, Grisey uses a very limited language in the beginning of the piece: pulsing drums and rhythmic interjections on wood instruments. Table 2 illustrates the levels of acceleration present in the music. The timings in the table correspond to the Ensemble S recording of the work found on the album *Gérard Grisey Solo pour deux* (Kairos CD

0012502KAI). The events are recognizable enough that a score is not necessary to hear the entrances, just as Grisey attests. The players enter one by one with their drum pulses and wood instrument interjections. Looking at the right column of Table 2, one can see that the opening solo is about 2:38 in duration before player 2 enters. This duet lasts for about 1:18 before the next player enters. Each subsequent phrase is incrementally shorter in duration, which in Grisey's estimation, creates a sense of acceleration as the events occur in quicker succession.

Table 2: Temporal Acceleration and Climax in part 1 of Gérard Grisey's *Tempus Ex Machina*

Timing on Recording	Event Description	Length of Event
0:02	Player 1 begins playing (drum pulses with wood interjections) at 45bpm	2:38
2:40	Player 2 enters playing at 60bpm	1:18
3:58	Player 3 enters playing at 75bpm	0:48
4:46	Player 4 enters playing at 90bpm	0:32
5:18	Player 5 enters at playing at 105bpm	0:28
5:40	Player 6 enters at playing at 120bpm <small>Note: This event is somewhat longer to accommodate for the acceleration and closer spatial distance between each player's wood instrument gestures.</small>	0:56
6:36	Unison meter/tempo/timbral contour – all players playing at same tempo (eighth = 120). Unison has local continuous acceleration through the use of beat subtractive meter.	0:09
6:45	Unison meter/tempo/timbral contour achieves climax as a periodic rhythmic state (2/4 time) and builds in dynamic.	0:21
7:06	Gestures begin local continuous decelerating by adding a 16 th beat to each bar.	0:16

Adding to the sense of acceleration is that the entrances of each player become faster in tempi. Player one begins the work playing at quarter note = 45, player two begins playing at quarter note = 60, and each subsequent entrance is faster in tempo. The music becomes faster at some level over the course of the section, and it certainly becomes increasingly dense and rhythmically complex.

Grisey's acceleration requires that all six players perform at independent tempi for approximately six and a half minutes before arriving at a unison texture in a unified tempo. This is challenging from a performance practice perspective. The players must operate in a chamber setting, each reading from a score to stay coordinated, or the players would require technological aid from synchronized click tracks. On the other hand, Grisey's notation allows the performers to play natural quarter-note pulses and not rely on polyrhythmic notations that do not reflect the composer's goals. Grisey is able to elicit a sense of dramatic build that retains musical momentum for over six minutes using a very limited collection of compositional materials.

The climax of the section occurs shortly before the seven-minute mark when the players achieve a *periodic* time state (a groove, if you will, on drums and woods) in unison that continues to build in volume. Just after the seven-minute mark, the texture elicits a sense of slowing down by adding a sixteenth note to each subsequent measure. The 2/4 measure is followed by a 9/16 measure, then a 5/8 measure, an 11/16 measure, and so on. The energy created by the downbeats slows progressively each measure.

Rehearsal numbers 16–22 bring about a deeper structural level of deceleration that brings the first part of “Tempus ex Machina” to a close, as shown in Table 3. This section consists of ten pulsing drum gestures that slow down until the next gesture begins. Decelerating pulses is what is happening at the surface level. More importantly, each successive musical gesture is longer in duration as well, making this deceleration occur at the temporal phrase level as well. The first gesture is just three seconds, and each group of attacks becomes gradually longer until the close of the section. The tenth gesture is the longest pulse deceleration lasting 21 seconds.

Simply slowing pulses is an effective rhythmic technique, but will not usually prove to be musically engaging unless other musical ideas are at play. In this case, Grisey creates temporal deceleration of almost two full

Table 3: Deceleration of Time in the Closing Events of Gérard Grisey's *Tempus Ex Machina*, part 1

Timing on Recording	Event Description	Length of Event
7:22	Rehearsal #16: Drum gestures being decelerating rhythmically in addition to the previous meter expansion	0:03
7:25	Gesture #2	0:06
7:31	Rehearsal #17: Gesture #3	0:06
7:37	Gesture #4	0:07
7:44	Rehearsal #18: Gesture #5	0:08
7:52	Gesture #6	0:11
8:03	Rehearsal #19: Gesture #7	0:11
8:14	Rehearsal #20: Gesture #8	0:14
8:28	Rehearsal #21: Gesture #9	0:17
8:45	Rehearsal #22: Gesture #10	0:21
9:06	Conclusion of Part One, begin senza misura	n/a

minutes derived of conceptually simple slowing gestures. The lowering tessitura of the drums and woods also contributes greatly to the effect, but it is clear that the composer has successfully put his concepts of musical time in to practice in a nine-minute sequence of music.

Grisey's later work “Le Noir de l'Etoile” (1990) has received more recent publicity and performances with its enhanced theatricality, site specific performance venues, use of live electronics, and astronomical programmatic content. It should be noted, however, that the first section of this work is taken verbatim from “Tempus ex Machina.”

TEMPORALITY AND FORM IN “POINTS D'ÉMERGENCE”

François Rose's “Points d'émergence,” composed in 1996, is organized in seven distinct, large sections. Each section is clearly audible to the listener due to a clear change in instrumentation or behaviorism in a particular family of instruments. More importantly, each section of the piece explores a different aspect of temporality. While there are high points of rhythmic density and dynamics within each section, Rose, like Grisey, is concerned with exploring different temporal designs as well as distinct instrumentation to make each formal section reasonably apparent to the listener without any prior knowledge of the work or access to a score. This article discusses only the *discontinuous dynamic* structure of the first major section of the piece after a brief discussion of the piece's opening gesture. The form and temporal design of the remainder of the piece is outlined in Table 4. The timings in Tables 4 and 5 correspond to the author's recording of the work on his album *Points of Departure* (Centrediscs CMCCD 20715), which can be heard at http://www.nicholaspapador.com/?page_id=10.

On the surface, Measure 0 of the piece foreshadows the climactic conclusion of the piece and begins the work with a gesture of maximum density. More importantly, each voice in this measure is playing the main thematic motive that will develop in the first section and serve as the inner fabric for the remainder of the work. This theme is deliberately simple (a low pitch, two medium pitches, and a high pitch within or between the metal, skin, and wood instrument groups) so that it can remain audible in each section of the piece even in the most rhythmically complex passages. This measure also, by illustrating the maximum density in scoring and by sharing the same main thematic motive within the voices in close canon, allows the three instrument families to melt together and sound as one timbre. The main motive is ever present in this measure, occurring six times across the three instrument families, and yet the listener will not audibly recognize it until the end of Section I. With this in mind, however, Rose has succeeded, in the Spectral sense, in melding the theme and timbres into a single musical entity. Moreover, with the double-stop attacks happening in such short succession, one will hear a reasonably complete

Table 4: Formal Diagram of Points d'émergence

Section	Timing on Recording	Scoring	Instrument Roles	Temporal Structure
Measure 0	0:03 – 0:10	Woods, Drums, Bells	All compressed, playing main motive in close canon.	n/a
I. (m. 1-85)	0:11 – 3:31	Woods, Drums, Bells	Bells and Drums are "dilated." Woods are compressed, assuming a melodic role.	Discontinuous-dynamic Acceleration
II. (m. 86-131)	3:32 – 5:00	Drums	Compressed, but "elastic" time through metric modulations with varied rhythmic groupings.	Changing tempo, which modulate from 72 bpm to 96 bpm.
III. (m. 132-218)	5:01 – 7:07	Woods & Drums	Compressed with motive revoiced and embellished across the two instrument groups.	Periodic (96 bpm)
IV. (m. 219-308)	7:08 – 9:57	Woods, Drums, Bells	Shift dilated time between bells, drums, and woods while remaining voice appear in compressed time.	Development with changing rates of speed in both dilated and compressed voices.
V. (m. 309-368)	9:58 – 11:48	Woods	Compressed time. Motivic transformation built on accented tones in metric hemiola.	Periodic (96 bpm)
VI. (m. 369-455)	11:49 – 13:51	Woods & Drums	Compressed time. Contrapuntal voice exchanges between the instruments based on the main motive.	Mixture of small periodic phrases with varying rhythmic stability.
VII. (m. 456-end)	13:52 – 15:26	Woods, Drums, Bells	All instruments move between dilated at compressed roles eventually converging to an all compressed state and ending similar to measure 0.	Dilated voices shift between instruments with some elasticity of time, but within "stable" periodic.

Table 5: François Rose: Points d'émergence: Discontinuous Dynamic Acceleration in Section I

Phrase	Measures	Tempo Marking	Projected Duration	Timing on Recording	Performance Duration
1	1 – 16	Quarter Note = 48	60 Seconds	0:11 – 1:11	60 seconds
2	17 – 28	Quarter Note = 60	36 Seconds	1:12 – 1:47	35 seconds
3	29 – 38	Quarter Note = 90	18.67 Seconds	1:48 – 2:11	23 seconds
4	39 – 49	Quarter Note = 68	19.41 Seconds	2:12 – 2:33	21 seconds
5	50 – 59	Quarter Note = 81	17.78 Seconds	2:34 – 2:52	18 seconds
6	60 – 71	Quarter Note = 108	13.33 Seconds	2:53 – 3:06	13 seconds
7	72 – 85 (72 – 78, beat 2)	Quarter Note = 72	23.33 Seconds (10.83 Seconds)	3:07 – 3:18	11 seconds

composite of the percussion instrumentation's full frequency spectrum or high point of inharmonicity.

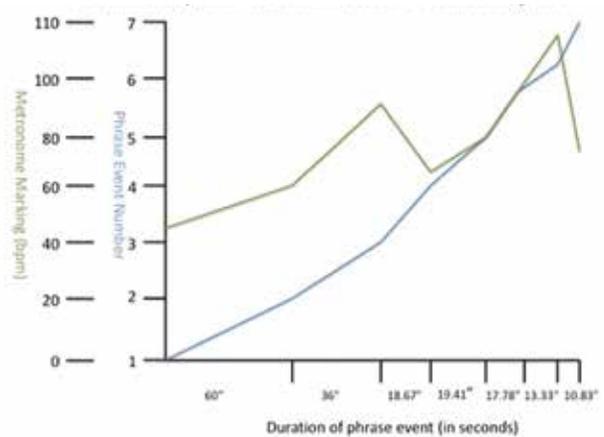
One technical observation should be mentioned here: While a percussionist will most likely perform the work with four mallets throughout, Rose composes only double stops. Three or four instruments are never scored simultaneously, and while this frequency composite could conceivably be fuller, the contrapuntal nature of the theme would be absent. In any case, the instruments do not then, in reality, melt literally into a single timbre, so this limitation serves as an asymptote to the theoretical concept for the work's moment of complete inharmonicity.

Section I (measures 1–85) features the bells and drums in continuous rhythmic unison with various melodic relationships between the pitches in these two groups. The woods develop in density over the course of the section and are heard as primarily melodic in nature. In terms of temporal design, for the opening of the piece, Rose has faithfully realized Grisey's notion of a *discontinuous dynamic* acceleration. The section is divided into seven phrase events clearly designated by different tempo markings. The acceleration is not a surface procedure where each phrase increases in tempo. In fact, the phrases tend to oscillate between fast and slow tempi. The acceleration is a function of each successive phrase event being shorter in duration.

As one can see by looking at Table 5 and Figure 3, the events do become generally shorter over time to create a temporal acceleration; but as a *discontinuous dynamic* structure there are some inconsistencies. Phrase number four is slightly longer than phrase three, but the argument

could be made that the sudden jump to 90 beats per minute, between phrases of 60 and 68 bpm respectively, creates a different sense of pulse acceleration. The last phrase of the section is also longer by the previous one by about ten seconds. This can be explained by the fact that the bells and membranophones begin playing the main motive in unison and in regular eighth-note pulses in beat 2 of measure 78 to culminate the first section of the piece. Measures 78 (beat 2) through 85, then, are climactic cadential material and not part of the temporal acceleration. The markings in parenthesis in Table 5 show that phrase seven is indeed a consistent part of the accelerating process.

Figure 3: Discontinuous-dynamic Acceleration in Section I of Points d'émergence



When describing his own writing, Rose uses terminology referring to how the listener hears the tempi in the piece without referring to their note values or contrapuntal concepts. In this first section, the bells and membranes are described as "dilated" or slow time. They are in rhythmic unison throughout the section, but an investigation of the voicing reveals a number of unequal rhythmic cycles and an organic set of canons. For example, in measures 1–4 the bells are playing an ascending three-note cycle, while the drums are playing a five-note cycle. This interplay develops in an organic fashion as the section accelerates and culminates in measure 79, where both voices join together in unison revealing the main theme to the listener. The wood instruments are in "compressed" or fast time and also contribute to organically developing the main motive while also serving as a melodic voice above the other voices.

The overall speed of the "dilated" bells and drums also accelerates on a more audible surface level along with the phrase structure. These instruments do not merely pulse in time with the given tempo, but make small local accelerations, delayed/syncopated pulses, and hemiolas against the tempo, which often prepare metric modulations to subsequent phases at a new tempo. The concurrent accelerations in both phrase event durations, as well as the contrapuntal pulses in the bells and drums, create a remarkable trajectory that is both compositionally intricate and dramatically effective. The section has a feeling of constant, gradual acceleration that remains coherent and interesting for over three minutes. Section II of the work is clearly revealed to the listener with its scoring of drums only and its use of the main motive, which was the developed outcome of the discontinuous dynamic acceleration.

ASSESSING "POINTS D'ÉMERGENCE'S" EMINENCE IN PERCUSSION REPERTOIRE

"Points d'émergence" is a prime example of what multi-percussion virtuoso Steven Schick calls a "second wave" work of the solo percussion repertoire: a score that consciously employs a small instrument setup of limited sound sources rather than a large setup with a full inventory of instruments. On the surface, this seems to be antithetical to the Spectralist notion of timbre-defined music, but again, compositional formalism in

Spectralism consists of acoustical and musical ideas that are meant to be conceptually audible without the use of a score. Arguably, by using this small setup and producing a 15-minute piece based almost entirely on a single motive/timbre melody, “Points d’émergence” allows ample time for the listener to take in some of these concepts on a sensory level as early as the first hearing. While “Points d’émergence” is certainly a complex score, the concepts of motive, temporal structures, and blending of timbre are more audible to the untrained ear than that of the serial or chance formal proportions in “first wave” percussion solo repertoire such as Stockhausen’s “No. 9 Zyklus,” Wuorinen’s “Jannisary Music,” or Cage’s “27’ 10.554” for a Percussionist.”

While a substantial composition and arguably the preeminent example of a Spectral work for solo percussion, “Points d’émergence” has received relatively few performances. The score is readily available for free loan through the Canadian Music Centre, but percussionists often seek repertoire solely from commercial percussion-specific publishers or publishing houses that hold the most canonical names in classical music composition. While only a small handful of players have presented this piece, there is no doubt that, with patronage of performances from visible percussion soloists, “Points d’émergence” will have an eventual place in this pantheon of masterful “second wave” percussion repertoire.

“Points d’émergence” is not Rose’s only percussion work and certainly not the only example of overtly Spectralist music for solo percussion or percussion ensemble. He composed “A Day at the Sea” (1999) for Patti Cudd. The piece is scored for speaking percussionist using e.e. cummings’ poem of the same name. The setup of this piece is quite similar to “Points d’émergence,” but with only two pitches per instrument family. Rose’s first percussion work, “Passages nuageux” for percussion trio, was written for Steven Schick.

SPECTRALISM AND MUSICAL GLOBALISM

François Rose, now a “Pacific Rim” composer on faculty at the University of the Pacific in California, was interested in the classical music of South India and the soloistic sound of the mridangam when composing the expanding and contracting phrase densities in “Points d’émergence.” However, he does not use this influence on any explicit level; there are no quotations or borrowing of South Indian rhythmic patterns. This is the opposite claim made in the score of Xenakis’s “Rebonds,” where the program note claims there is “no folkloric contamination” when ties to African and African-derived music are more noticeable than indicated. Rose’s deeper influence is the rate in which time events move and progress in these non-Western classical structures, just as Grisey asserts of a spectral concept for musical form.

It is a distinct possibility that Spectral composers are looking to other world cultures to find temporal structures and a macro-rhythmic kinship with music that elicits larger temporal sensations without the academic machinations and theory of advanced contemporary classical scores. Shortly before the time of this writing, Rose completed a sabbatical to study the traditional music of Japan, sharing an affinity with both Kaija Saariaho, who composed the Spectral associated work “Six Japanese Gardens” for percussion and electronics. In Kabuki theater, when one listens to the gradually accelerating high pitched wood sounds in conjunction with narrative climaxes drama, this seemingly simple musical texture becomes exhilarating and engaging in a manner not dissimilar to the works analyzed in this article. While Grisey asserted that his concepts of musical time were linear and of a Western aesthetic, Claude Vivier’s organization of the musical phrase proved to favor ritualism over the dramatic and exhibited a distinct Eastern sense of pacing and sensibility.

CONCLUSION

Spectral composers, at the core, appear to be establishing aesthetics by harnessing naturally occurring acoustical phenomenon. In the area of pitch, composers use the harmonic series as a measure of the sonic structures harmonic or inharmonic. In the area of rhythm, it seems that composers have identified temporal structures (periodic, continuous

dynamic, discontinuous dynamic, statistical, and smooth) and are seeking to establish these as a naturally occurring acoustical foundation by finding continuity in cultures throughout the world.

Seminal spectral works for percussion such as Grisey’s “Tempus ex Machina,” and as a solo work through Rose’s “Points d’émergence,” are, in some cases, establishing time structures as an analogous rhythmic equivalent to the harmonic series. Rose uses tempo markings as an analogous time equivalent to measured pitch frequencies. Unpitched percussion as a medium, on the surface, appears not to have much in common with the early spectral analyses and orchestral compositions in the medium. However, through the applications of these temporal structures, Spectralism has unified issues of timbre and time as a compositional identity with percussion as an integral participant.

RECOMMENDED LISTENING

Gérard Grisey: “Le Noir de l’étoile” (1989–1990); “Les espace acoustiques,” an umbrella title encompassing a series of his major works such as “Périodes” (1974) and “Partiels” (1975); “Tempus ex Machina” (1979), “Stele” (1995).
 Tristan Murail: “Gondwana” (1980); “Time and Again” (1985); “Winter Fragments” (2000).
 Claude Vivier: “Cinq chansons” (1980); “Lonely Child” (1980), “Et je verrai cette ville étrange” (1981), “Pulau Dewata” (1981).

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