TRAVERSÉE:
TIMBRAL PROCESSES IN KAIJA SAARIAHO'S *L'AMOUR DE LOIN*

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BACKGROUND: KAIJA SAARIAHO & *L'AMOUR DE LOIN*

Kaija Saariaho (1952-) has steadily risen to the forefront of European contemporary music with an oeuvre of some 139 works,[1] including music for the stage, large orchestras, virtuosic solo music and electronics. Her international identity has only strengthened since 1986, when she was awarded the Kranichsteiner Musikpreis in Darmstadt. She is a member of a generation of Finnish composers who identified with the 1960s European avant-garde and sought to challenge a prevailing Finnish nationalistic trend in music with the formation of *Korvat auki!* ("Ears Open!"), a student composers' collective that included Esa-Pekka Salonen and Magnus Lindberg. Saariaho and Lindberg both studied under Paavo Heininen at the Sibelius Academy. Heininen was one of few post-serialist Finnish composers and taught accordingly, although he encouraged students to seek out their own musical syntax. For Saariaho, a young female composer in an aesthetically conservative society, this also meant instilling the confidence to do so.

Saariaho's frustration with her status in Finland and later with the serial orthodoxy of Darmstadt led to her eventual relocation in Paris, where she formed concurrent relationships with the IRCAM and GRM electronic music studios and where she now resides with her children and husband, composer Jean=Baptiste Barrière. Barrière also developed the IRCAM software Chant, which models voice and speech synthesis techniques traceable in Saariaho's music. While at IRCAM Saariaho became acquainted with French spectralism and learned its synthesis techniques.[2] Saariaho has also been categorized as a member of a second generation of spectral composers who reconcile frequency analysis procedures with the serial methods once abandoned by earlier spectralists in search of a new aesthetic model.[3]

Inspired by a 1992 performance of Messiaen's *Saint François d'Assise*, Saariaho set out to craft a dramatic work of similar psychological intimacy and intensity. Her interest in the 12th century legend of troubadour Jaufré Rudel and his distant love

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[1] *Kaija Saariaho: List of Works*, Finnish Music Information Centre (accessed April 20, 2013).

[2] Moisala, 7-15.

[3] Pousset, 67-110.

provided ample material for her first opera *L'amour de loin* ("Love from Afar"). The opera concerns Jaufré (Prince of Blaye) and Cleménce (Countess of Tripoli), and the Pilgrim who unites them. Elaborating the themes of longing, distance, travel from the West (medieval) to the East (Orient), and highlighting the characters' inner emotional states throughout, *L'amour de loin* culminates in the eventual journey to Tripoli during which Jaufré falls ill and eventually dies in Cleménce's arms during their first encounter.[4] The opera was written in 1999 over the course of a year and begins with *Traversée* ("Crossing"), a gradual timbral journey that develops through the orchestra and introduces the opera's sonic environment. It captures many of the opera's themes and character associations and serves as the focus of this paper.

ACTIVE SPECTRAL CONCEPTS IN *TRAVERSÉE*

When electronics are not involved, the live instruments of an ensemble often serve as *instrumental resynthesizers* in that they collectively sum the component frequencies of an analyzed spectrum. Analysis has led to the expansion of knowledge about timbre, in which Kaija Saariaho has been especially interested.[5] As *Traversée* demonstrates, Saariaho focuses on the smooth transformation between parameters of brightness and noisiness. This process is known as *interpolation* because two stable values are first identified (usually a minimal and maximal) and a transition is calculated at a defined number of intermediary steps. Interpolation may be non-linear, for example, by means of a logarithmic or break-point function.[6]

Brightness increases with a concentration of higher partials in a spectrum, and noisiness increases with progressively fewer sinusoidal components (that is, of a periodic waveform whose partials are integer-related multiples of a fundamental). A noisier spectrum has fewer harmonics, and maximal noisiness (white noise) includes equal energy in all frequency bands across the spectrum. Since the early 1980s

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[4] Iitti (2002), 17-20.

[5] Saariaho (1983), 271-73 and (1987), 94.

[6] Battier (1999), 63.

Saariaho has written of a sound/noise axis along which her source materials smoothly interpolate between the stable states of harmonicity and noise at its poles.

Battier and Nouno are both IRCAM developers who identify *source/filter synthesis* as an integral electronic technique in *L'amour de loin*.[7] It is analogous to the glottis of the vocal folds (a source signal) exciting the resonant peaks of the vocal tract (implemented as a bank of resonant bandpass filters).[8] The *source/filter* method is a kind of cross synthesis that allows virtually anything to play the role of an excitation source or resonant space: a violin bow exciting a different instrumental body or any resonant space, large or small, is possible and produces very interesting synthetic timbral structures. The authors also reveal chords assigned to each of the opera's characters (Fig. 1), and then offer a glimpse into how Saariaho may have used these chords (Fig. 2) in combination with other sounds (presumably excitation sources).[9]

CONSTRUCTING TIMBRAL HIERARCHIES

In her writing Saariaho expressed interest in developing a hierarchical system for timbre, similar to the way pitch and rhythm have been organized in scale and chord structures within tonal music:

> "The [sound/noise] axis is, nevertheless, only one-dimensional, and I wonder if there might be ways to organize timbre in more complex — hierarchical? — ways."[10]

Composer and theorist Fred Lehrdal has attempted to organize brightness into a logical timbral space. However, his method is rooted in perceptual organization, and he has dismissed attempts to devise a space that would promote serial

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[7] Battier and Nouno (2006), 23-25.

[8] Battier (1999), 93-94.

[9] We cannot be sure how these chords were derived, though it is my prediction that Saariaho obtained many of them from vocal analyses and then selectively removed octave repetitions and other undesired pitches (Howell, et al., 170). Dawn Upshaw's voice played a prominent role in the electronics of *Lonh* (Saariaho, 1996, preface), a piece which served as preparatory material for the opera (Iitti 2002, 10). The source sounds analyzed for the opera included recitation of the libretto by speakers (Battier and Nouno, 23). Therefore, it is highly likely that analyses of Dawn Upshaw's voice served as the basis for the static harmonies associated with Cleménce, or possibly Jaufré, and that other sounds were used to excite their resonance models.

[10] Saariaho (1987), 93.

transformations of timbral models. He is especially critical of Slawson's 1985 *Sound Color*:

> "If after all these years the serial structure of a Schoenberg piece is not spontaneously apprehensible by an experienced listener, what is one to do with combinatorial timbral rows? The result inevitably sounds incoherent." [11]

As an alternative, Lehrdal constructs branching systems (Fig. 3) to describe structural movement between speech vowels. By adapting this intuitive, perceptually based method, one can begin to organize the timbral variance of *Traversée*. His method can be combined with Saariaho's axes to observe structural motions to and from stable points, similar to what Lehrdal terms structural psychoacoustic "prototypes."[12] It is unhelpful to search for pitch class set transformations of Saariaho's material since frequency components within a spectrum require a designation of relative register. Conceiving of these spectra as *pitch fields*[13] is far more appropriate because it preserves pitch space, and since *Traversée* mostly consists of repetitions of the same pitch field, observing Saariaho's subtle choices in orchestration reorient analysis towards her ever-present focus on timbre.

FIRST PERIOD: TOWARDS STABILITY AND RETURN TO INSTABILITY

The pitch field built up at the outset of *Traversée* remains constant for most of the piece, and when not fully intact some of its partials still remain. I will refer to this pitch field as J_aC_e for its hybridization of partials taken from Jaufré chord A and Cleménce chord E. It is well worth noting that Jaufré's chords contain lots of perfect fifths, deliberately connoting both the modal nature of the troubadour's songs and the practice of organum that defined his historical epoch.[14] Among the first sounds heard in the opera are strings playing *sul tasto* (S.T.) and *senza vibrato* (S.V.) and the flutes playing airy breath tones. As the piece develops the flutes transition to normal

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[11] Lerdahl, 158.
[12] Ibid., 144-45.
[13] Lambright, 22-23.
[14] Ibid., 87.

playing while the strings interpolate between states of S.T. and S.P. (*sul ponticello*), mm. 4-10. From a timbral stance, *sul tasto* playing is considerably dull as compared to *normale* or *sul ponticello* methods, as it weakens the higher harmonics.[15] Saariaho indicates in her score preface that S.P. should always been executed with extreme proximity to the bridge, i.e. where the fundamental frequency completely disappears and where upper partials emerge most resonantly (maximal brightness). We can order these three types of string articulation on an axis of brightness, showing how various interpolations between them promote further timbral stability or instability (Fig. 4). The combination of *senza vibrato* causes dissonant fission,[16] and combined with the flutes, who are producing lots of noise components in their airy low registers, we can be sure that Saariaho is starting from an unstable, noisy, perhaps distant point of origin and may be taken loosely as a perceptual prototype.

Throughout this first section the strings are constantly participating in movement to and from these stable states, and one can follow their movement as structural indicators (Fig. 5). As it progresses the harp's enharmonic trills become audible, and the muted brass further enhances fluctuating states between brightness and dullness; a study on straight mutes (the same used in this piece) confirms their dulling effect on trumpets[17] and is also true for other brass instruments. This is analogous to string *sul tasto* playing in its dulling effect. Out of the 4th partial (pitch F, m. 13) emerges a bassoon solo built on the modal D-dorian melody of Jaufré Rudel's song *Lanquan li jorn son lonc en mai* ("When the days are long in May"), which characterizes Jaufré's singing style in the opera's *Premier tableau* and connotes his character.

At m. 13 the order of partial entrances has changed (we can simply refer to this as the *attack envelope*), and this indicates a way in which *source/filter synthesis* enters into the score. When convolving signals in the *source/filter* method, the set of resonant frequencies become audible only when points in the source spectrum excite

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15 *Articulation and vibrato on the violin* (accessed April 5, 2013).

16 Lerdahl, 142.

17 Formosa, 7.

them. Among the list of sound sources used for excitation in *L'amour de loin* are the tam tam and bowed cymbal.[18] I have collected and analyzed samples of these proposed sounds sources and have found that the tam tam and bow cymbal offer opposing attack envelopes that can be useful for our understanding of Saariaho's integration of *source/filter synthesis* (Fig. 6). The characteristic attack envelope of a tam tam is made of progressively higher partials entering and ringing while the bow cymbal shows that its first 4-5 partials seem to enter in reverse order, with a swelling of extreme high partials linked to the front of attack. Until now the partials of pitch field J_aC_e have entered successively as if their resonances were excited by a tam tam or otherwise gong-like structure, but at m. 13 the envelope has changed and resembles an attack given by a bowed cymbal or related source. The entrance of crotales playing the highest 3 partials of J_aC_e indicate an elaboration of this bowed cymbal structure. Structurally these changes may be perceived as an elaboration of timbral instability and are linked to the opening of the piece. The various interpolations between points of brightness and noise indicate movements to and from this state, but the *normale* (*ordinato*) strings at mm. 24 herald the arrival at a more stable state, perhaps closer to the listener. This is confirmed by woodwinds in their higher registers (which offer more sinusoidal components than noise, an indication of periodicity and stability) and the brass playing without mutes, also revealing more of their sinusoidal higher partials. A near repetition of the *normale* string pitch field further supports this arrival, and it is summarized in Fig. 7.

Curiously the pitch structures of the high woodwinds at m. 24 don't conform to the J_aC_e pitch field, but these repeating, melismatic gestures embody the themes of distance (the Orient) in the opera and help to personify the Pilgrim character, who is responsible for transporting Jaufré to Tripoli and whose melismatic lines are often built on pitch fields resembling hexatonic collections and other gapped scales[19] associated with Middle Eastern folk scale forms. Further, the repetitive structure of these motives link Saariaho to her Finnish musical heritage and to Sibelius, who used

[18] Battier and Nouno, 23.

[19] Lambright, 90-93.

similar organically-developing rotational forms in his late works.[20] Hepokoski elaborates,[21] claiming rotational forms as wavelike varied repetitions evolving from a Kalevalaic or Finnish folk recitation style. Saariaho cites the influence of nature and natural-occurring sounds,[22] and also her willingness to exercise flexibility with rigid spectral processes. Additionally, the very personal themes of longing and distance[23] allow Saariaho to share a dialogue with Sibelius and other Nordic composers on themes of isolation and connection with nature.[24] It should be no surprise that octave displacement and even new pitch material appears in this context.

Similarly, a return to relative instability can be traced by taking the unmuted brass in m. 32 as a structural starting point, leading to a swell in mm. 46-7 that connotes instability with elaborating events in between (Fig. 8). The first entrance of the trumpets connote a high degree of timbral brightness, which is more dissonant and unstable than dullness. It is well worth reminding that the dullness conveyed by the *sul tasto* strings in the piece's opening fluctuated with the extremely bright *sul ponticello* counterpole along its axis. In this way we can begin to view states of timbral stability and instability as existing along multiple planes in an array, as Lerdahl proposed.[25]

SECOND PERIOD: INCREASED INSTABILITY

The overlapping, wavelike structural motion continues, this time taking the iterations of the pitch field from m. 44. From here various subsets of the pitch fields associated with Jaufré begin to break out as the piece heads into a dynamically section in mm. 48-64. The rapidly shifting chord forms have been grouped into Fig. 8 and show their perceived structural relation to the return of veiled, distant instability

[20] Ibid., 14-17.
[21] Hepokoski, 325.
[22] Moisala, 77.
[23] c.f. Moisala, 14, and 97.
[24] c.f. Ross, 157-78.
[25] Lerdahl, 146.

in the section that follows, marked by the *sul tasto* strings and breath tones once again in the flutes.

The interpolating events include simultaneous iterations of subsets from pitch fields J_b (m. 47), J_cC_e (m.52), J_d (m. 56), and J_e (m. 59) articulated by expanding and contracting instrumental subgroups. In this setting the bassoons, marimba and clarinets play hybrid roles as they continually break off from one pitch field and join another. The return of J_aC_e from m. 59 onward and thinned orchestration exposes the clarinets' hybrid role of sharing invariant partials between the J_aC_e and J_e subgroups in m. 63, one last hint of brightness before the texture again recedes into a dulled, distant shade.

THIRD SECTION: HYBRIDIZATION AND STASIS

What follows is a hybridized section of considerably less timbral movement than we have experienced so far, including subgroups in the bassoons, who share perfect fifths from the J_a and J_b pitch fields. The horns continue to sustain subsets of the J_b pitch field as well. The harps begin a rapid glissando between registers using this same hybridized pitch material (a variation of the harps iterating J_a and J_b perfect fifths in m. 15). This static, though gently oscillating, activity is curiously punctuated in m. 76 by a rapidly descending brass figure. These pitches resemble a descending figure associated with the Pilgrim's vocal lines and accompaniment in the *Duxième tableau* (Fig. 9) and is the herald of the merge into another pitch field as articulated by the strings: the Pilgrim's chord A, or P_a (again, Fig. 1).

Characteristic of this pitch field is that it comprises stacks of intervals one quarter tone less than an octave apart,[26] and itself represents a kind of gapped set that is similar in construction to the Eastern scales and collections associated with the Pilgrim and the Orient he thematically embodies. The "crossing" has taken place through many waves of simultaneous interpolation, and we have perhaps arrived in a kind of Eastern, Tripoli-oriented state of consciousness. Dramatically it make sense to perceive this sonic form, since the upcoming *Premier tableau* begins the action of the

[26] Lambright, 75.

opera in Jaufré's state of longing for a distant love, singing his songs and accompanying himself on the *vielle*. The remaining measures of *Traversée* prepare the arrival of a fully immersed Jaufré pitch field; the percussion becomes much more static and the orchestration much thinner and more intimate.

The depiction of wavelike sea movement seems apparent in *Traversée*, and it suggests the long period of intercontinental travel on which Jaufré must embark to satisfy his longing. Some comparison between *Traversée* and other symphonic sea music, such as Britten's *Four Sea Interludes*, might be worth exploring, although in this context there seems to be a stronger connection to expansive nature through Sibelius and the Nordic tradition.

CONCLUSION: CAVEATS & FRENCH OPERA

A close inspection of Saariaho's musical language requires a relaxation of strict orthodoxy in any known aesthetic discourse, whether it is spectralism or not. Despite studying with Brian Ferneyhough, Saariaho did not conform to strict serialist principles, and she has demonstrated flexibility in her scores that incorporate frequency-based spectral processes as well. She does not elaborate on what she means by "stasis" or "tension,"[27] so this leaves a particular challenge for analysis. Her work is more imaginative than what any of these organizational systems of offer.

Still, it has been well worth the exploration to search for patterns in her thinking about timbre and interpolation. Using Lerdahl's approach one can only begin to shed light on the organization of large, hierarchical timbral systems. These elementary exercises provide a fruitful look at what Saariaho is synthesizing in her scores, bearing in mind that she works mostly from an imaginative standpoint as opposed to a technical one. This happens more often in spectral music than what might seem apparent; even Tristan Murail, one of the grandfathers of the spectralist school, has been known to work from a purely imaginative standpoint by inventing spectrums from how sound is shaped in his memory, as in his *Le Lac*.[28]

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[27] Howell, et al., 160.

[28] Hirs, 77.

If one were to attempt to search for a formal structure for *Traversée*, a connection to the traditional French overture is suggestive. This would not seem surprising since Iitti has already demonstrated how *L'amour de loin* shares characteristic traits with French grand opera in its five-act construction.[29] This may be due, in part, to director Peter Sellars' close involvement in the collaborative process, and his incorporation of other French elements in similar newly-commissioned operas in the early 2000s.[30] Whereas the traditional French overture, for example in the operas of Lully, usually consist of two sections built on the slow-fast model, Saariaho's opera opens with a kind of overture that reverses the roles of these two sections. *Traversée* is built on a first section of simultaneously interpolating structures that move in waves between states of timbral consonance and dissonance (or more abstractly, states of stability and instability), but after m. 64 this timbral movement slows down considerably. The traditional French overture might be characterized as two sections of relative stasis and movement, but Saariaho's overture reverses them. And as we have come to understand of the opera, stasis — obsession, longing — is the psychological state that characterizes Jaufré at the opening of *L'amour de loin*.

[29] Iitti (2002), 11.

[30] For example, Sellars' incorporation of ballet into the 2005 premiere of Adams' *Doctor Atomic* is a characteristically French element.

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Fig 1. Chords assigned to Jaufré, the Pilgrim, and Cleménce

source: Battier and Nouno, 24.

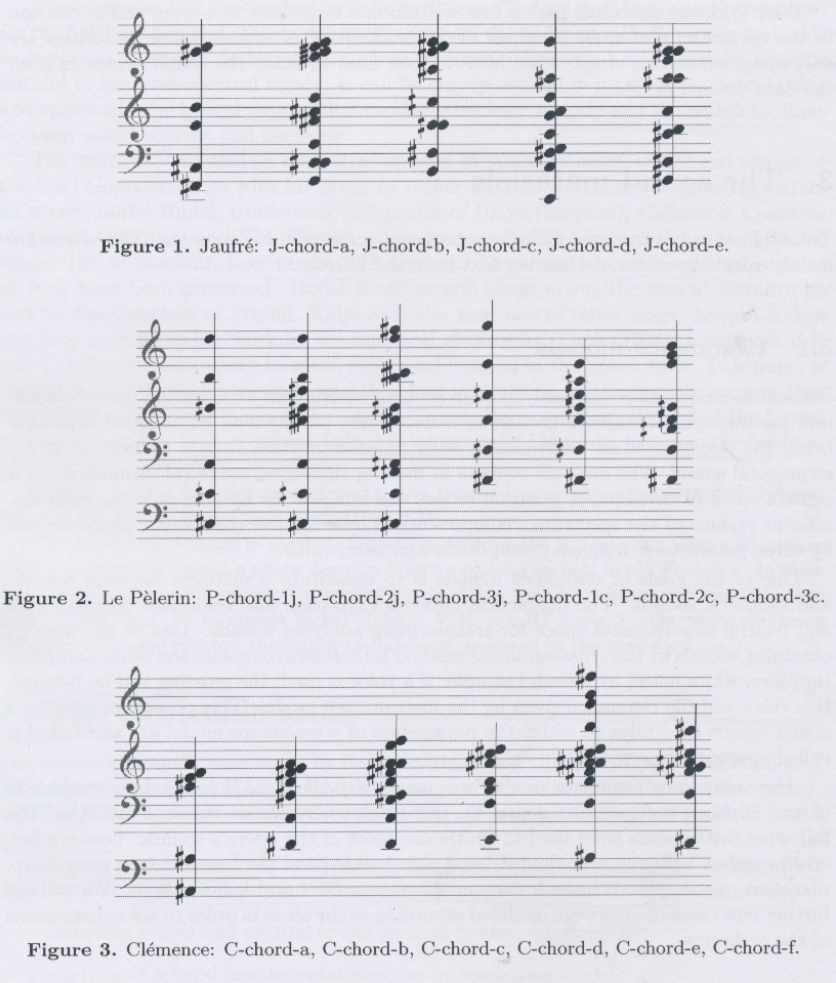


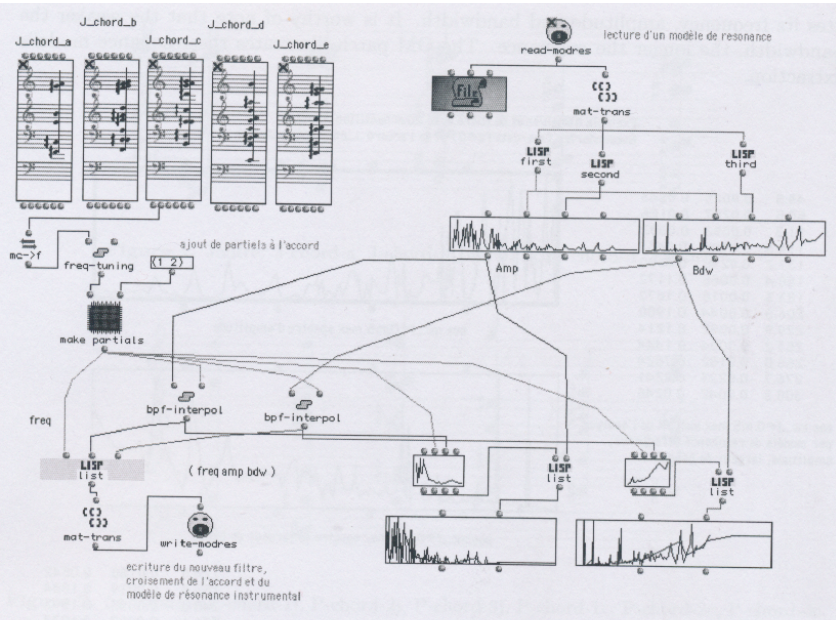
Figure 1. Jaufré: J-chord-a, J-chord-b, J-chord-c, J-chord-d, J-chord-e.

Figure 2. Le Pèlerin: P-chord-1j, P-chord-2j, P-chord-3j, P-chord-1c, P-chord-2c, P-chord-3c.

Figure 3. Clémence: C-chord-a, C-chord-b, C-chord-c, C-chord-d, C-chord-e, C-chord-f.

Fig 1. Source/filter synthesis in IRCAM program OpenMusic

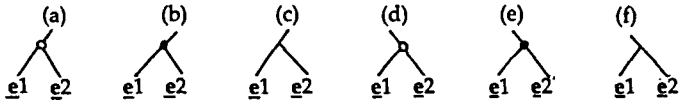
source: Battier and Nouno, 26.



Here it appears that Saariaho is crossing the amplitudes and bandwidths of an instrumental sample with the frequencies of the character-associated chords. Her entire process is not clear from the minimal description given. For example, there is a sub-patch in this figure labeled “make-partials” (on the left) whose contents cannot be seen here. Still, the source/filter technique may likely be modeled on a more imaginitive level into the acoustic components of the opera.

Fig 3. Timbre groupings & prolongational reductions prepared by Fred Lehrdal

source: Lerdahl, 139 & 146.



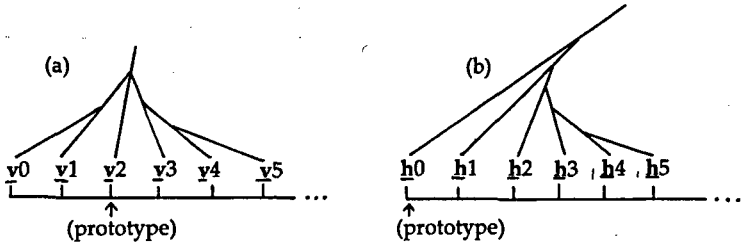
a-c) a tensing, right-branching motion from stable event to an unstable event;
d-f) a relaxing, left-branching motion from an unstable event to a stable event;

(e = a timbral event)

Both a-c and d-f demonstrate three kinds of prolongational nodes in the tree structure:

1. The open circle denotes strong prolongation, a near repetition of the previous event;
2. The black circle denotes weak prolongation, a modified version of the previous event;
3. No node resembles no prolongation, or progression to an entirely new event.

In my analysis of Saariaho, I adopt a similar approach, but since there are simultaneous multiple timbral interpolations at work within a dense orchestral pallette, I use the branching nodes to compare events locally and search for similarity relations based on relative instrumentation choices, concentration of spectrally bright or dull components based on the tessitura of the sounding instruments, use of mutes, *sul tasto*, or *sul ponticello* playing techniques.



A timbral prototype is selected based on its maximally stable condition. Both a) and b) show how linear motion to and from a prototype is demonstrated in this notation system.

Fig 4. String articulation techniques on an axes of noisiness (x) and brightness (y)

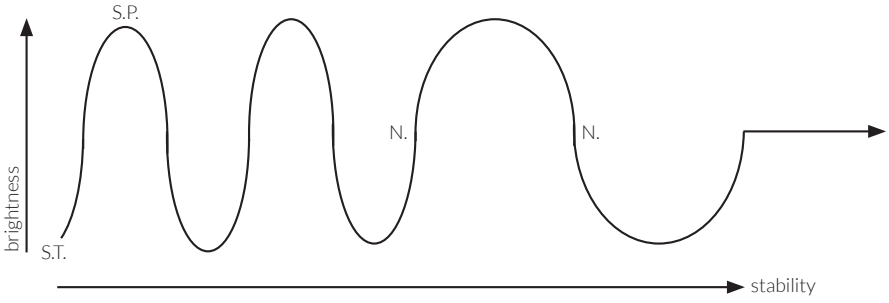


Fig 5. Progression towards relative stability (mm. 1- 36)

(measure number given in parentheses)

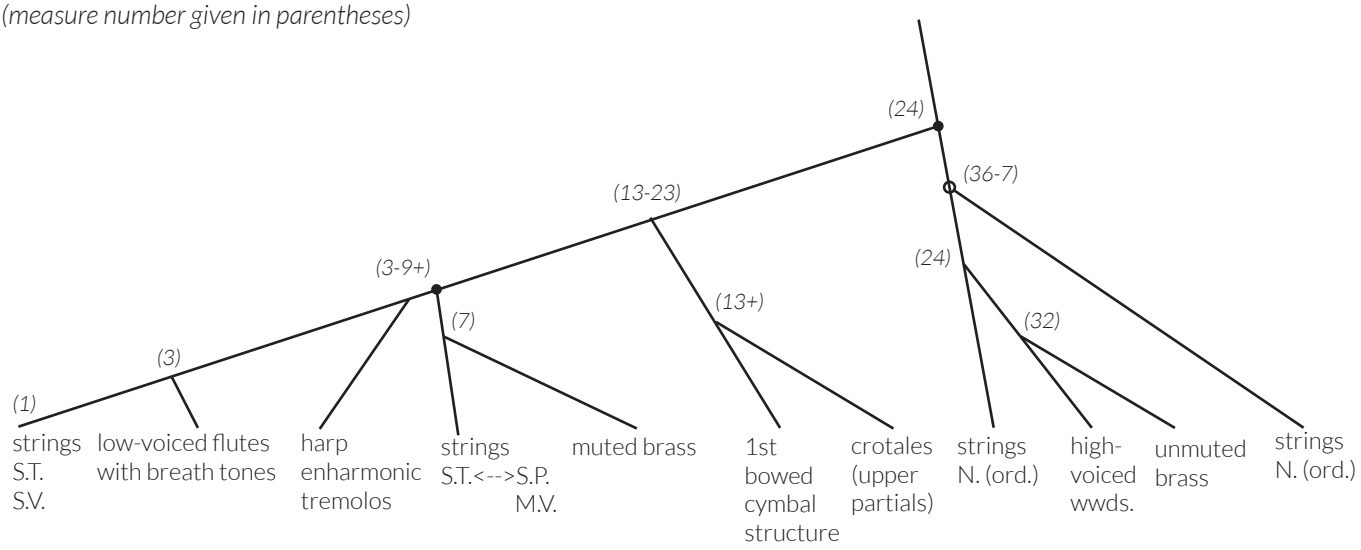
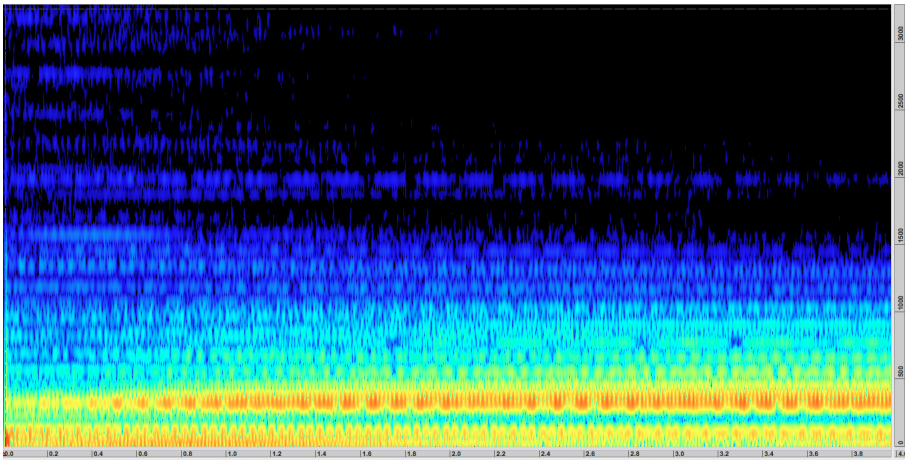


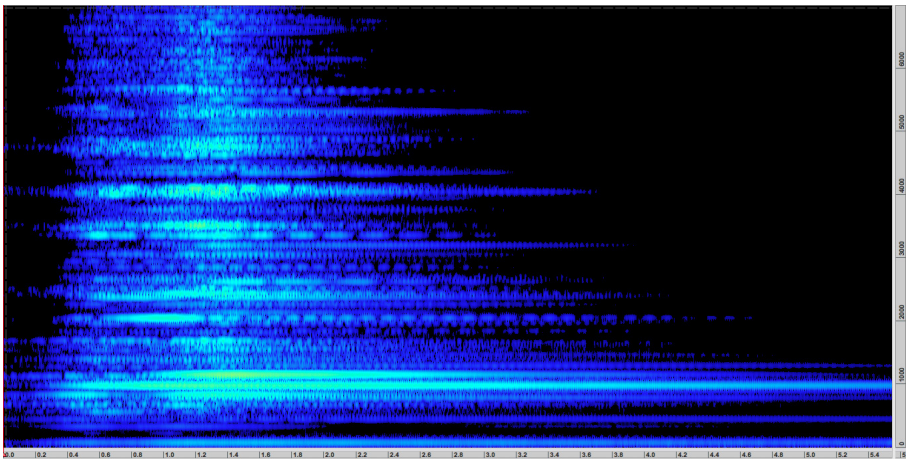
Fig 6. comparison of spectrograms for a) tam tam and b) bowed cymbal samples

source: prepared by Louis Goldford in IRCAM software AudioSculpt



a) Excitation of a tam tam

x axis = first 3.8 seconds of time
y axis = 0 - 3500 Hz



b) Excitation of a bowed cymbal

x axis = 5.6 seconds of time
y axis = 0 - 7000 Hz

Fig 7. Return to relative instability (mm. 32-47)

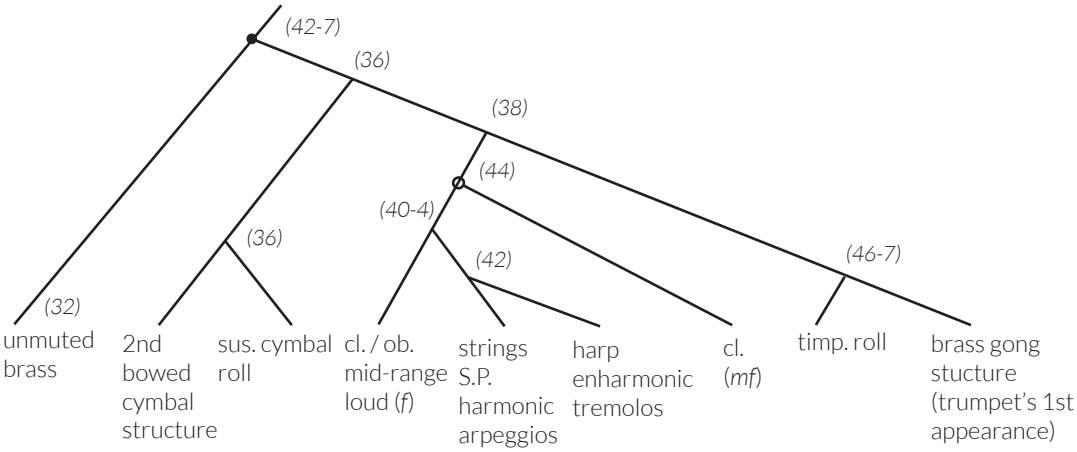


Fig 8. Hybridization of models: rapid waves of progressive instability (mm. 44-66)

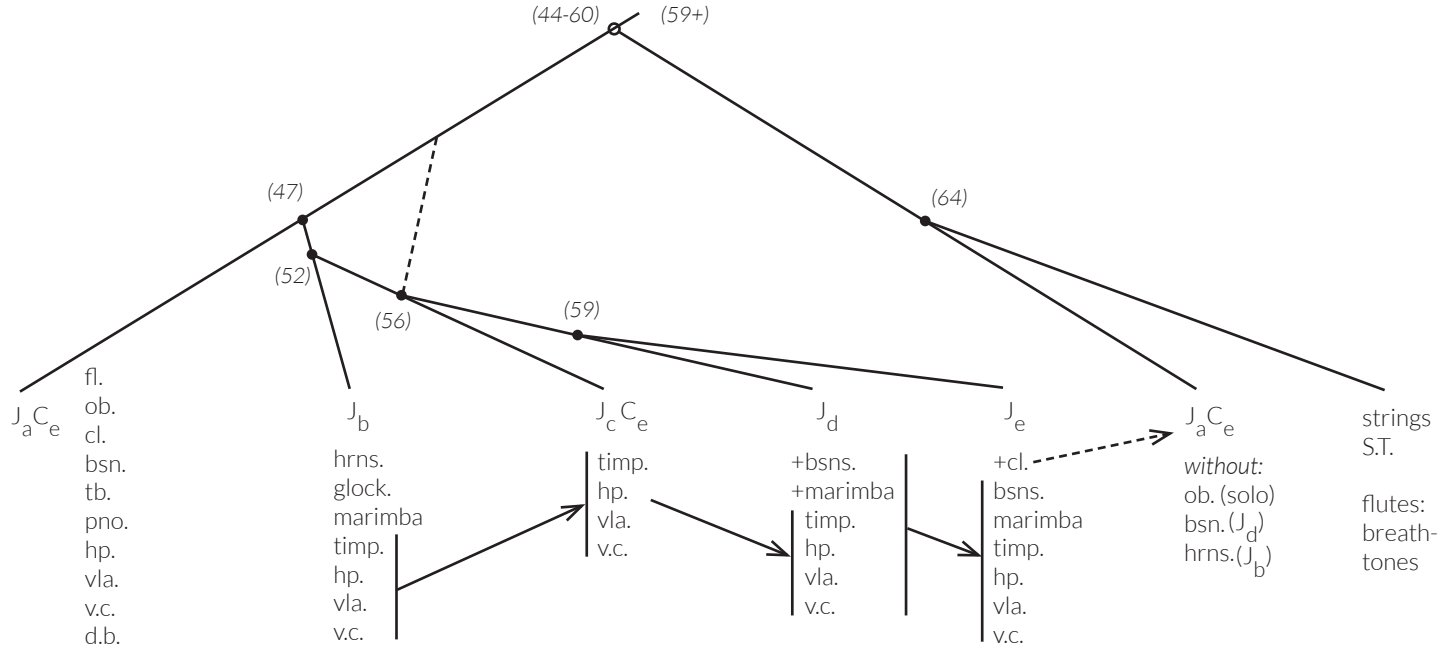


Fig 9. Reduction of rapidly descending woodwinds in mm. 475-84 (c.f. *Traversée*, mm. 76-81) *source: Lambright, 263.*