

# The Syntax of Music Syntax is the Syntax of Language\*

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## 1. Introduction: Suspensions and a "Dissonance Paradox"

### • Language and music are both law-governed, complex phenomena.

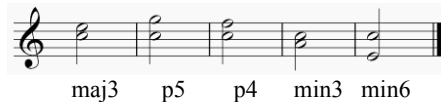
Each reflects a body of knowledge and a set of cognitive abilities that structure experience and performance. Much of this knowledge is "tacit": information we have in our heads but are not aware of, unless we acquire the specialized knowledge of a linguist or music theorist. (Lerdahl and Jackendoff (1983)

#### (1) Example from language: legal vs. illegal *wh*-questions

- a. Mary spoke to John.  
 b. \*Mary spoke to \_\_. *to* must be followed by its object...  
 c. I wonder [[which person] Mary spoke to \_\_].  
 d. \*I wonder [Mary spoke to [which person]] *wonder* must be followed by a *wh*-phrase

#### (2) Example from music: consonance vs. dissonance

##### a. some consonant intervals



##### b. some dissonant intervals



#### A puzzle:

Western tonal music that most people will classify as supremely "consonant" is almost always full of "non-chordal" tones, many of which yield dissonances.

### • Accented non-chordal tones:

#### (3) Suspension

- a. A *suspension* is a tone held over from one chord (the **preparation**) to the next one, with which it forms a **dissonance**. It then **resolves** by moving to a chord tone.

- b. The resolution must take place on a beat or beat division which is **metrically weaker** than that of the suspension proper.

(adapted from Sessions (1951, 132-134))

#### (4) Appoggiatura

An *appoggiatura* is a suspension without a preparation — an accented dissonance that *might* have belonged to a preceding chord that was not heard. Like the suspension, the appoggiatura resolves to a chord tone on a weaker beat, just like a suspension.

- **Note:** In the European classical tradition, resolution of both suspension and appoggiatura is typically to a neighboring scale note. Also, there is a prescriptive tradition requiring an appoggiatura to be "approached by leap, resolved by step". I do not deal with these facts here..

#### (5) No suspension



#### (6) Types of suspensions

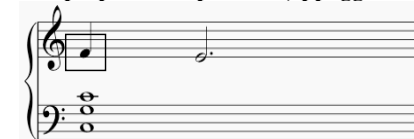
##### a. Prepared suspension



##### b. Somewhat unprepared suspension (or "prepared appoggiatura")



##### c. Unprepared suspension (appoggiatura)



\* Deepest thanks to Jonah Katz for discussion and comments on this work and many related issues, and to John Halle, Morris Halle, Fred Lerdahl, Andrew Nevins, Aniruddh Patel and Norvin Richards for helpful discussion and correspondence.

(7) Suspensions in everyday life

a. Mozart piano concerto K. 482, bars 9-13



b. Barber *Adagio* from String Quartet Op. 11



c. Beatles "You never give me your money" (*Abbey Road*).



d. Tárrega *Gran Vals* (excerpt)



• Unaccented non-chordal tones:

(8) Anticipation

"An *anticipation* is a tone which anticipates on a weak beat the note to which the voice in question is moving on the following strong beat."

(9) Passing tone

(10) Escape tone

(11) Neighbor tone

The "Dissonance Paradox"

1. **Humans find consonant intervals more pleasing than dissonant intervals — including infants:**

**Zentner & Kagan (1998):**

Adult (undergraduate) subjects and 4-month old infants were played an unfamiliar melody, in two distinct harmonizations: consonant (3rds), and dissonant (2nds and 7ths).

**Adults:** Preference judgment was asked. Twenty-three showed a preference for the consonant version and, when asked to comment on this preference, frequently answered that the dissonant versions were "hurting their ears."

**Infants:** Infant behavior was monitored. "Eight of 32 infants fretted or showed avoidance during the dissonant versions, but neither fretted nor avoided during the consonant versions. No infant fretted or avoided only during the consonant versions but not during the dissonant versions...Similarly, 7 infants vocalized during the consonant, but not the dissonant versions, while 1 infant vocalized during the dissonant but did not do so during the consonant versions. Infants looked significantly longer at the speaker and were less motorically active when hearing the consonant as compared to the dissonant versions of each melody. Although only a small number of infants vocalized, fretted or turned away, the occurrence of these behaviors was differentially distributed over the consonant and dissonant stimuli. **These data support the hypothesis of an innate bias favoring consonance over dissonance.**"

**Trainor, Tsang & Cheung (2002):**

Infants 8-10 weeks and 15-17 weeks were played two-pitch musical intervals (separated by silence) alternating between consonant and dissonant. Looking time (at a bulls-eye with a flashing light) was measured. "In sum, the results indicate that infants as young as 2 months of age prefer to listen to consonant over dissonant intervals and that they find it difficult to recover interest after a sequence of dissonant trials."

2. **Western tonal music of all sorts is full of dissonance...**

Notice also that the dissonance is often not hidden or subtle. Suspensions and appoggiaturas fall on strong beats.

3. **...including music that might fairly be described as "pleasing."**

*Since the dissonances here...cannot please by themselves, being offensive to the ear, they must get their euphony from the resolution into the following consonance*

- Johann Joseph Fux (1725, 55-56), describing suspensions

- (12) **Beginning of Mozart Piano sonata K. 282** (Bharucha (1984, 388)): non-chordal tones are marked with + (total: 20, dissonant: 13)



So what's going on? The answer in brief: *syntax*.

**A slightly more detailed preview of the answer:**

- **Harmonic structure:** Pitches are hierarchically organized into headed, binary branching structures, i.e. **Phrase Structure** — according to their **harmonic properties** Lerdahl and Jackendoff (1983).
- **Rhythmic structure:** The constituents of this **harmonic structure** are "set to rhythm" by what syntacticians know as **syntactic movement**, which moves them into an upper, rhythmically interpreted portion of the musical tree.

• **Grand Conjecture:**  
The laws that govern the syntax of music are *identical* to the laws that govern the syntax of language.

- **Specific Proposal:**  
In language, the performance/perception system (phonology) interacts with syntactic movement in several different ways.

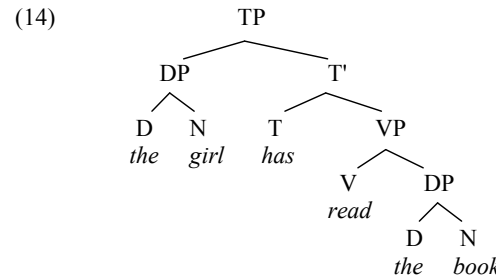
This is true in music as well, and offers an explanation for the suspension and appoggiatura — for the accented non-chordal tones in a musical idiom that otherwise privileges consonance.

**2. Phrase Structure and External Merge (Language)**

- **Sentences of language have hierarchical phrase structure.** This can be understood as the result of the repeated application of a recursive rule "**Merge**".

- Merge takes two elements (either of which may be a lexical item or the output of a previous instance of *merge*) forms a set called a **phrase**. One member of the phrase, which gives the phrase its name, is its **head**.

- (13) **"The girl has read the book"**
  - a. Merge (the, book) (lexical item, lexical item)
  - b. Merge (read, [the book]) (lexical item, a.)
  - c. Merge (has, [read [the book]]) (lexical item, b.)
  - d. Merge (the, girl) (lexical item, lexical item)
  - e. Merge ([the girl], [has [read [the book]]]) (d., c.)



**3. Syntactic Movement and Internal Merge (Language)**

- Merge of the sort that produces (13) is called **External Merge** — because the elements that undergo Merge start out entirely independent.
- In a head-initial language, like English we expect the direct object to follow the verb. Sometimes, however, the object is displaced. This phenomenon is called **syntactic movement**.

- (15) **Wh-movement to the left of complementizer position (sometimes null)**

- a. [Which book has Mary read \_\_\_]?
- b. Je me demande [quel livre **que** Marie a lu \_\_\_].  
I wonder which book that Marie has read [colloquial French]
- c. I wonder [which book C Mary has read \_\_\_]

- Should we be surprised to discover the phenomenon of movement? No, syntactic movement is just Merge with a twist (Chomsky (2000; 2001)

The element that merges with X is a *subpart* of X (i.e. **Internal Merge**)

(16) "(I wonder) [which book the girl has read \_\_\_]."

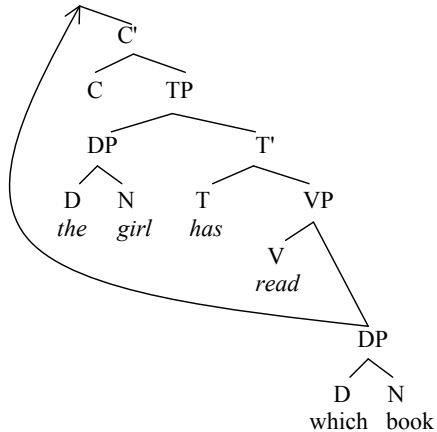
**External Merge**

- a. Merge (*which*, *book*) (lexical item, lexical item)
- b. Merge (*read*, [*which book*]) (lexical item, a.)
- c. Merge (*has*, [*read [which book]*]) (lexical item, b.)
- d. Merge (*the*, *girl*) (lexical item, lexical item)
- e. Merge ([*the girl*], [*has [read [which book]]*]) (d., c.)
- f. Merge (C, [[*the girl*] [*has [read [which book]]*]]) (lexical item, e.)

**Internal Merge** (*wh*-movement)

- g. Merge ([*which book*], [C [[*the girl*] [*has [read [which book]]*]]) (a. within f., f.)

(17)



**Internal Merge and Agreement**

- **Internal Merge with a phrase requires agreement with the head of the phrase (sometimes, but not always visible in languages).** Thus, Internal Merge of a *wh*-phrase with a sentence headed by C requires agreement between that phrase and C.

(18) **Wh-C agreement in Kinande (Bantu, NE Congo)**

- a. IyondI yO kambale alangIra \_\_.  
who (cl.1) that (cl.1) Kambale saw
  - b. aBahI Bo kambale alangIra \_\_.  
who (cl.2) that (cl.2) Kambale saw
  - c. EkIhI kyO kambale alangIra \_\_.  
what (cl.7) that (cl.7) Kambale saw
- (Schneider-Zioga 1987; quoted by Rizzi (1990))<sup>1</sup>

**4. Pronunciation of Internal Merge (Language)**

- **The Internally merged (i.e. moved) phrase *which book* occupies two different structural positions in (17). How do we pronounce a word that occupies two positions in the same structure?**

Languages make different choices:<sup>2</sup>

(19) **Pronunciation after movement (*wh*-movement taken as example)**

- a. **overt movement:**  
In languages like English or Kinande, pronounce a moved *wh*-phrase in its **new position**.
- b. **copying:**  
In some languages and registers, e.g. non-literary German, Afrikaans, and others, a moved *wh*-phrase may be pronounced in **both positions**.
- c. **split:**  
Sometimes, as in split construction, **the beginning of the moved phrase may be pronounced in one position, and the end in another**.
- d. **covert movement:**  
In languages like Chinese, Japanese, Korean or Pirahã, pronounce a moved *wh*-phrase in its **former position**.

**Overt movement**

(20) **Which book** has the girl read \_\_\_?

<sup>1</sup> See Schneider-Zioga (2006), however, for a different view of these constructions. Thanks to Norvin Richards (p.c.) for discussion of Kinande.

<sup>2</sup> Of course, the analysis of each of these cases is controversial, and there are different proposals, e.g. remnant movement for splits, treatments of covert *wh*-movement as actually overt, etc. In some cases, the proposals made here for music may be translated so that they correspond to alternative analyses for language. In other cases, they may conflict with such analyses.

**Copying**

(21) **German *wh*-questions**  
Wen denkst du wen sie liebt?  
who think you who she loves  
'who do you think that she loves'

(22) **Trinidadian English focus-cleft constructions (Cozier, in prep.)**  
a. **non-verb focus: pronounce new position**  
Speaker 1: What you cooking?  
Speaker 2: Is **beans** I cooking \_\_.

b. **verb focus: pronounce both positions ("predicate cleft")**  
Speaker 1: What you doing?  
Speaker 2: Is **cook** I **cooking** beans

**Split**

(23) **West Ulster English *what all* split (McCloskey (2000))**  
a. **What all** did you give \_\_\_\_ to the kids?  
b. [**What** \_] did you give [**all**] to the kids?

c. [**Who all**] did you send \_\_\_\_ to the shops?  
d. [**Who** \_] did you send [**all**] to the shops?

**Covert movement**

(24)a. **Chinese *wh*-questions (Huang (1981))**  
\_\_ ta song-le Zhangsan **shenme**?  
he gave John what  
'What did he give to John? (lit. he gave what to John?)

b. **Pirahã *wh*-questions (Everett (1986, 1987) Nevins et al. (2007))**  
\_\_ xabagi **go gũso** xigi xog-i (hix)  
Xabagi WH DEM ASSOC want-PROX (INTER)  
'How much does Xabagi want? (lit. Xabagi wants how much?)

**How Linear Order is specified**

• **Cyclic Linearization (Fox and Pesetsky (2005)):** The construction of certain phrases (*Spell-out domains*) triggers linearization. Linear order, once established by the process of linearization, may not be contradicted by later instances of linearization.

(25) **Consequences of Cyclic Linearization**

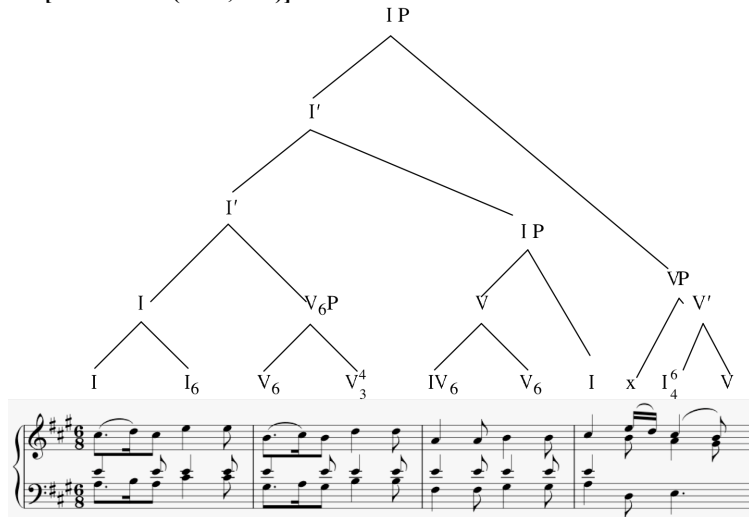
1. Any instance of movement that alters the linear order of X and Y must take place before the first process of linearization that orders X and Y. Otherwise, we would first linearize *X before Y* and later linearize *Y before X* — a contradiction.

2. Consequently, the norm is that **linear order is preserved when more than one element moves. Apparent movement across long distances must generally proceed in smaller iterated steps** (successive-cyclic movement) to avoid ordering contradictions.

**5. External Merge in Music: Lerdahl & Jackendoff's Prolongational Reduction**

- **Smallest units:** In Western tonal music, a melodic line is composed of smaller units (phrases) each of which has a harmonic interpretation in the context of the melody. Listeners detect the harmonic implications of melody, even if the chords that might realize these harmonies are not performed (Bharucha (1984, 1996)).
- **Larger units:** Lerdahl and Jackendoff (1983) and Lerdahl (2004), identify a hierarchical structure for the harmonic implications of melody, which they call "**prolongational reduction**". The structures of prolongational structure are **binary branching** and involve **headed phrases**. They are thus characterizable as products of **External Merge**.
- **Labels:** Lerdahl (2004): the hierarchical organization represents a hierarchy of "tension-relaxation", with the more "relaxed" element of each merged pair functioning as the head (in effect; his terminology is different).

- (26) **Prolongational reduction of opening of Mozart's piano sonata K. 331**  
 [redrawn as a linguist's tree, some details omitted, one detail changed]  
 [Jackendoff (1987, 231)]<sup>3</sup>



- In this talk, I will assume that the structures posited by Lerdahl & Jackendoff and by Lerdahl are generally correct -- and that they result from **External Merge**.

**Two questions:**

**1. How is prolongational structure "set to rhythm"?**

Prolongational structure specifies relations among tones and chords, but not their rhythm. How are the constituents of prolongational structure linked to rhythm?

**2. Does music have Internal Merge?**

**Claim:** These two questions are closely related, the answers to them will lead us back to suspensions and the "Dissonance Paradox". In fact, **prolongational structures are "set to rhythm" by Internal Merge**.

**6. A rhythmic interpretation for syntactic structure**

Music has a rhythmic structure governed by a regular pulse. It is sometimes claimed that this property is missing from (non-poetic) language, and represents an irreducible difference between music and language (Patel (2006), among others)...

- In fact, however, there is a syntactic domain in which pronunciation of language does invoke a steady pulse: lists and other conjunction structures.**

**Regular beats and subdivisions**

(27) **Shopping List (monosyllables, no and)**

Peas, corn, rice, milk, bread, beer, wine, soap

(28) **Shopping List (monosyllables + and)**

Peas and corn and bread and beer and wine and soap

(29) **Shopping List (initial-stressed disyllables + and)**

Carrots & lemons & coffee & pepper & yoghurt & bagels

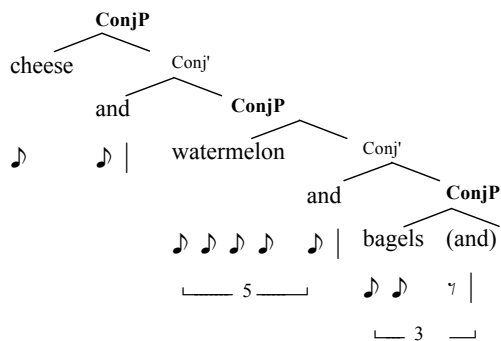
(30) **Shopping List (varied syllabicity + and)**

Carrots & cheese & cinnamon & pepper & watermelon & bagels

<sup>3</sup> V="five" (i.e. a chord built on the fifth note of the scale, called the *dominant*), I="one" (a chord built on the first note of the scale, called the *tonic*). The subscripted arabic numerals following the Roman numeral indicate which note of the chord is the lowest note heard, and whether there are any pitches in the chord besides the three pitches of the basic triad.

(31) **Structure of a shorter version of (30)**

(Ross (1967, 163ff); Munn (1993), among others)



**Principles of rhythmicization**

- Where  $\alpha$  and  $\beta$  are ConjPs, and  $\beta$  is the complement of the conjunction heading  $\alpha$ , we call  $\beta$  the *successor* of  $\alpha$ .

(32) **ConjP-induced pulse**

Given a sequence of ConjPs  $C=(\alpha_1, \dots, \alpha_n)$ , where each member  $\alpha_{i+1}$  is the successor of  $\alpha_i$ , *the duration from the left edge of each member of C to the left edge of its successor is the same*, (as is the duration from the successor-less  $\alpha_n$  to its right boundary).

- Call this duration the *pulse span of  $\alpha$* :  $\pi(\alpha)$ .

(33) **Subdividing the pulse**

$\pi(\alpha)$ , is subdivided evenly among the **rhythmic units** of  $\alpha$ .

(34) **Rhythmic units**

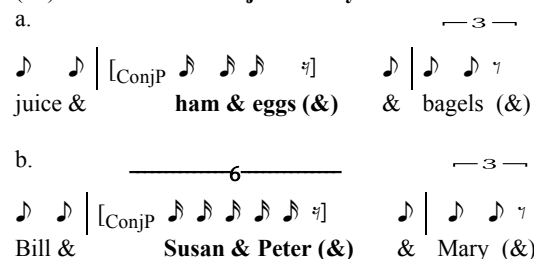
X is a *rhythmic unit* of  $\alpha$  iff

1. X is linearized within  $\pi(\alpha)$ ; and
2. X is a syllable or a ConjP ( $\neq \alpha$ ); and
3. X is not dominated by another rhythmic unit of  $\alpha$ .

**Subdivisions of subdivisions: recursive embedding**

(inspired by Wagner (2005, 2007))

(35) **Embedded ConjP as a rhythmic unit**

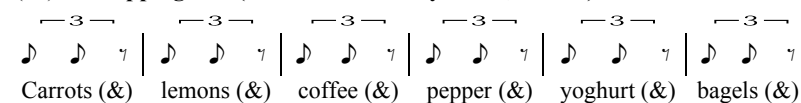


- The fact that an embedded ConjP may function as a rhythmic unit produces a rhythmic *recursive effect*, explored in recent work of Wagner (2005, 2007).

**Rests**

- **Null conjunction:** The complement of ConjP is itself a ConjP (which may be headed by a **silent conjunction that counts as a rhythmic unit**)...with consequences for *asyndetic* conjunction (i.e. without *and*) — and for the final conjunct in a list:<sup>4</sup>

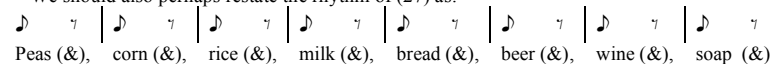
(36) **Shopping List (initial-stressed disyllables, no and)**



**The mental representation of musical rhythm**

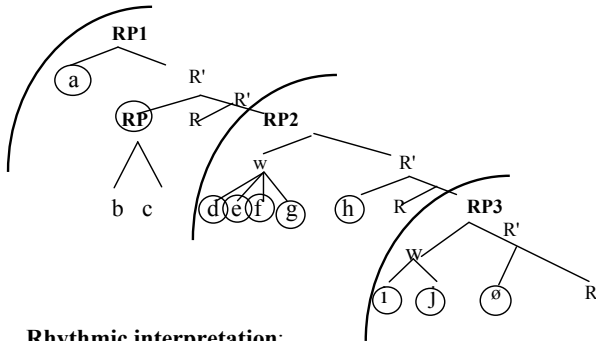
- The rhythmic interpretation of coordination syntax shows:
  - a. regular pulse;
  - b. subdivision of the pulse into any number of equal sub-beats;
  - c. silent terminal elements (in music: "rests").
- These are properties familiar to us from musical rhythm.

<sup>4</sup> We should also perhaps restate the rhythm of (27) as:

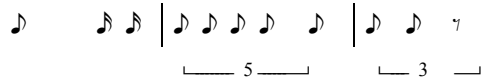


**Hypothesis:**  
The syntax of language provides the representation of rhythm used in music.

(37) A representation of musical rhythm as language-syntactic structure  
(RP = "Rhythmic Phrase" and substitutes for "ConjP" in (32)-(34))



**Rhythmic interpretation:**



**Some issues**

- **Something new, but not music-specific:**  
R (the head of RP) in (37) is not a rhythmic unit, unlike the silent conjunctions seen above. In this, however, it behaves like numerous proposed silent elements in syntax that do not behave as rhythmic units in conjunction. Silent conjunction in this respect is different. [I return to this topic below.]

(38) **Some silent elements that do not count as rhythmic units**  
I need a guidebook that will tell me...  
[where PRO to eat *pro*] (&), [what PRO to eat *t*], and [how PRO to eat *pro*] (&)

- **Something new and music-specific:**  
The notion of a "tie" is missing from the linguistic pronunciation of conjunction structures (and with it the related notion of syncopation; Molly Diesing, personal communication). I leave this issue open.
- **A significant missing piece:**  
The *symmetrical hierarchical organization* of rhythmic beats (Lerdahl and Jackendoff (1983); Fabb & Halle (forthcoming)) does not follow from the theory of this paper.  
  
If this talk is on the right track, this property must be the product of a distinct system

that provides an additional kind of organization (perhaps absent in some styles, e.g. chant or recitative) for the rhythms generated by the structures considered here.

**Dotted rhythm and the upbeat (anacrusis)**

- Pronunciation of a conjunction may be shifted rightward, so that it is pronounced immediately before the next pulse, and feels metrically grouped with it.
- This happens obligatorily when Conj is adjacent to a ConjP that has already undergone semantic interpretation, either because it constitutes an independent group (*Standard Theory and [Government and Binding] and Minimalism*) or because of logical non-commutativity (*A and [B or C]* vs. *[A and B] or C*):

(39) **Delay of the undercored Conj**  
a. Bill *and* [Fred and Sue] vs. [Bill and Fred] *and* Sue vs. Bill and Fred and Sue  
b. Bill *or* [Fred and Sue] vs. [Bill or Fred] *and* Sue

- Wagner (2005, 2007) develops an algorithm that marks the left and right edge of the constituents bracketed in (39), with the rightward shift of Conj sensitive to this boundary. The precise duration of the rightward shift is proportional to the degree of embedding (his major evidence for prosodic recursion).
- The same process may be identified with the phenomenon of **dotted rhythm** in music, closely associated with the concept of the **upbeat (anacrusis)**. I will not explore the topic further here, however.
- **Note:** In the pronunciation of lists, unaccented initial syllables are also pronounced as dotted-rhythm upbeats (*Rice, potatoes, tomatoes and beans*).

**7. Syntactic Movement (= Internal Merge) in Music**

(40) **Setting Prolongational Structures to Rhythm (Music)**

**The tree:** Harmonic and rhythmic structure are the *lower and higher portions*, respectively, of a single syntactic structure or substructure.

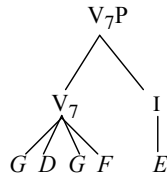
**Internal Merge:** The upper, *rhythmic portion* of the structure is populated by the constituents of the lower, harmonic portion of the structure— moved there by order-preserving *Internal Merge*.

**Agreement:** This movement is triggered by rhythmic heads that *agree harmonically* with the constituents that move to them and do not move on to a higher head.

These are the heads labeled "R" in (37), which are not rhythmic units. These heads may, however, (optionally) be performed as chords sounding simultaneously with the melodic line (a harmonization of the melody).

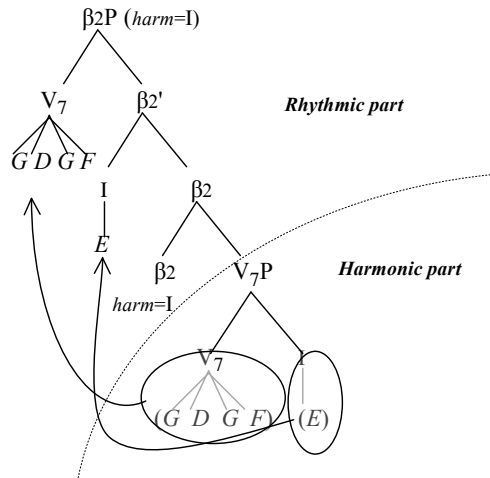
(41) A toy derivation of (5) and (6a-c)

**step 1:** External merge builds the *harmonic part* of the tree (internal structure of  $V_7$  suppressed)

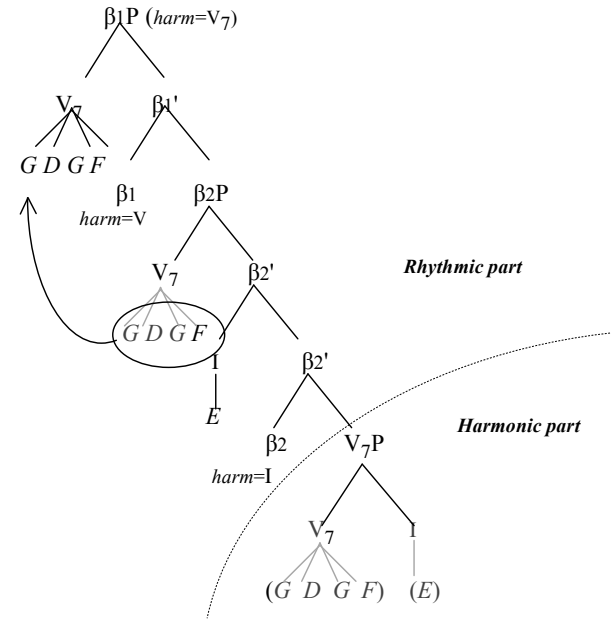


This structure undergoes linearization. Consequently, no later operation may reorder the pitches G-D-G-F-E (as in the cyclic linearization theory of Fox and Pesetsky (2005)),

**step 2:** Merge one of what will be two rhythmic heads (" $\beta_2$ ").  $\beta_2$  attracts  $V_7$  and I, and agrees harmonically with I (the inner of its two specifiers).



**step 3:** Merge another rhythmic head (" $\beta_1$ ").  $\beta_1$  attracts  $V_7$  from the specifier of  $\beta_2$  and agrees harmonically with it.



**later in the derivation:**

Since  $\beta_1$  agreed with  $V_7$ ,  $\beta_1P$  bears the harmonic features of its syntactic head. It is therefore not only a rhythmicized  $\beta P$ , but also a  $V_7P$  in its own right. As such, it may undergo later merge operations, forming a new harmonic part of the structure that includes the tree above as a subpart. When the larger harmonic part is rhythmicized,  $\beta_1P$  will count as a single beat in that structure (cf. the *ham* and *eggs* examples of (35)).<sup>5</sup>

<sup>5</sup> If the harmonic part were labeled IP, rather than  $V_7P$ , there is a remnant movement derivation in which what raises to  $\beta_1P$  and gives its label to  $\beta_1$  is  $[G-D-G-F-t_E]$  — i.e. a constituent labeled I rather than  $V_7$ , containing the trace of E. When  $\beta_1P$  participates in further Merge under this scenario, it would count as a I. This raises issues and possibilities that I have not so far explored.

- Recall now the different patterns of pronunciation after movement:

(42) **Pronunciation after movement [from (19)]**

- overt movement:**  
pronounce in **new position**.
- copying:**  
pronounce in **more than one position**.
- split**  
**pronounced partly in new position,**  
**and partly in former position**
- covert movement:**  
pronounce in **former position**.

**step 4: Performance:**

- A **"normal"** performance divides  $\beta_1P$  rhythmically among *G-D-G-F*, and  $\beta_2P$  consists of *E*.  
[Compare: overt movement.]

(43) **Normal**

- A **prepared suspension** performance also performs *F* in  $\beta_2P$ , in which case  $\beta_2P$  is divided evenly among *F-E*.  
[Compare: copying movement.]

(44) **Prepared Suspension**

- A **somewhat unprepared suspension** performance divides  $\beta_1P$  among *G-D-G* (triplet) and divides  $\beta_2P$  evenly among *F-E*.  
[Compare: split movement]

(45) **Somewhat Unprepared Suspension**

- A **completely unprepared suspension (appoggiatura)** performance performs the moved material entirely within  $\beta_2P$ . This would be hard to parse in the case given, but straightforward with less moved material, e.g. a lone *F*:  
[Compare: covert *wh*-movement]

(46) **Completely unprepared suspension (appoggiatura)**

*"The suspension, the third basic type of dissonance, differs markedly from the passing and neighboring tones, [which] both result from melodic activity. The origin of the suspension, on the other hand, is **not melodic but rhythmic.**"*

Salzer & Schachter (1969, 79)

(47) **Pronunciation after movement**

a. <b>overt movement:</b> pronounce in <b>new position</b> .	<i>no suspension</i>
b. <b>copying:</b> pronounce in <b>more than one position</b> .	<i>prepared suspension</i>
c. <b>split</b> <b>pronounced partly in new position,</b> <b>and partly in former position</b>	<i>somewhat unprepared suspension</i>
d. <b>covert movement:</b> pronounce in <b>former position</b> .	<i>completely unprepared suspension</i> <i>(appoggiatura)</i>

## 8. Music has no lexicon: a consequence

- **A question:** The four pronunciation patterns discussed in connection with *wh*-movement distinguish among *languages*. For this reason, we do not expect a single discourse to show all four patterns, unless the speaker is code-switching. In music, by contrast, all four patterns may be present in a single piece of tonal music — i.e. they do not seem to distinguish musical "languages". Why?
- **The answer requires an important digression:**

For all their similarities, there is a key difference between music and language: **music has no lexicon**. The properties of a given rhythmic head, for example, are not stored once observed — unlike the properties of a functional head in language, e.g. C in English vs. Kinande vs. Japanese. xical acquisition. **Music and language may follow the same recipe, but they use different ingredients.**

This means, among other things, that each time we hear music, we are simultaneously engaged in analogues to language parsing and language acquisition — discerning the "words" on-line by analysis of discontinuities (and perhaps statistical properties) of the input.

- In language, an infant acquiring Chinese or English learns what kind of C or Tns is being used in the linguistic environment, and stores this information in the lexicon. Forever after, the lexical entry for C or Tns helps dictate the pronunciation pattern of *wh*-movement or verb-raising in that person's language.

In tonal music, by contrast, comparable information is discerned anew each time music is heard. For this reason, we expect that the syntax of tonal music has the ability to display the union of the pronunciation patterns of movement across languages — that is, to be Chinese, English, German, etc. wherever it pleases. This seems to be what we find.

- **A new question:** Then what distinguishes culture-specific musical idioms from one another (e.g. Western tonal music vs. Indian classical music)? Are these differences unlike the differences among languages?

**Answer: I don't know.**

- **Another consequence of the absence of a lexicon:** The *absence of lexical semantics* for the building blocks of music, and our sense that music displays *pure syntax*.
- **Pure syntax? No semantics? But don't we sometimes sense that music is communicating something?**

## 9. Internal merge that changes linear order?

- The instances of internal merge discussed here preserve linear order, and the evidence for internal merge comes from varieties of interaction with harmonic rhythm, rather than from linearization alternations, the bread and butter of linguistic demonstrations of internal merge. Do we also find linearization alternations in tonal music, i.e. instances of internal merge that "change" linear order?
- If Cyclic Linearization is correct, such operations would have to take place before the first spell-out domain is fully constructed: this, for us, is the harmonic structure. And we do appear to find filler-gap phenomena at the harmonic level: most notably, tense chords (e.g. dominant V or V<sub>7</sub>) at the conclusion of a phrase that are not followed by the expected relaxation (e.g. tonic I). This phenomenon has a name in traditional music theory: the *half cadence* (also called *imperfect cadence*).
- **Proposal:** The *half cadence* is an instance of order-changing local fronting within harmonic structure. A V (especially at the end of a musical sentence) creates the expectation of a following I, which is not met in the half cadence (and is met in the **full cadence**).

**The pseudo-semantics of the half-cadence:** Subjectively, a *half cadence* feels like a "question", and is one place where listeners often do have a vague feeling that the music has a semantics. A phrase that ends with a half-cadence is often followed by an extremely parallel phrase that "fills the gap" with the expected I-chord, felt to be the "answer".

### (48) Movement in the Harmonic Part of the Structure: Half cadence - Full cadence (*Westminster Quarters*)

Question: [ I A F ] [ V G C ] gap. Answer: [ V C G ] [ I A F ]

- **A conjecture about the pseudo-semantics:** Though music lacks a semantics, a listener nonetheless associates the musical structure in (48) with its nearest counterpart in language: a discourse of two sentences, parallel except that where the first sentence shows movement leaving a gap, the gap in the second sentence is filled — and the filler occupies an accented position as well.



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