THE ALLEMANDA OF BACH'S SECOND SOLO VIOLIN PARTITA (BWV 1004)

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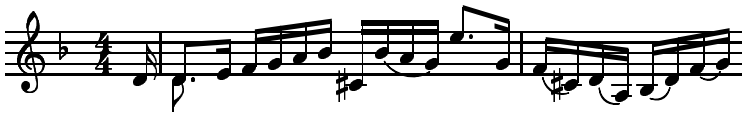

The apparent simplicity of Bach's score for the first movement of his second solo violin partita is misleading. With nothing more than a lonesome, linear voice[1] Bach weaves an amazingly complex and deeply moving musical passage possessing delicate and intricately interconnected structures. The listener senses, both on a local and global scale, a completeness and closure of musical thought. But whence comes this impression? Precisely what properties of the musical line—what patterns, what structures—are perceived and how do these impress both added dimension and closure? How does the single-dimensional line fold in the listener's imagination to assume a highly complex and structured form—like a children's pop-up book bursting open with life, color and dimension? A full answer surpasses the resources of this paper; we consider only the most fundamental harmonic and rhythmic aspects from a rather conservative theoretical viewpoint. We analyze first the ability of Bach's single line to suggest local harmonies, illustrate how these harmonies lead to a sense of closure both locally and globally, study the structure of their coherent global conglomeration and, finally, identify the organization of the rhythmic motives and analyze how they contribute to the perception of musical dimension and closure.

Although in some aspects premature, we provide the following rough description of the movement's overall structure to simplify the following discussion. The movement is in the key of d minor and follows the standard binary form so common among the stylized dances of the baroque era. We follow the familiar convention of referring to the parts as A and B, respectively. The first half is punctuated by a semicadence; the second continues to expand upon the dominant (but immediately no longer as a distinct key area) and closes with the much anticipated authentic (tonic) cadence. We will see, in general, that the B part elaborates in many ways upon the material of the preceding part. Another general observation is the accelerating rhythmic pace of development in structural periods of all kinds.

[1]The violin here earns many times over its reputation as the most voice-like instrument in western music.

1. Local and Global Harmonic Structure

The ability of the single linear line to suggest a harmony is clearly rooted in the capacity of the listener to recall at once several of the past notes and to reconstruct them mentally into a functional harmonic framework. As we shall later see, rhythmic motives help the listener organize past musical material, which eases this reverse search.[2] As an aside, we note that this approach—considering how a piece is perceived, rather than how it is strictly performed—will lead to more meaningful answers to our stated questions.

We outline our general routine for analyzing the local harmonies. It is one depending deeply at each step upon musical intuition. It could conceivably be made with great effort much more formal and rigorous, but the appeal to intuition would then be merely embedded within the elaborate rules. We partition the notes into groups of constant harmonic context—typically metrical units no shorter than a single beat. If this group does not embody a simple arpeggiation of a triad, then we search within the group for the most dominant interval of a third. This third is often determined by the lowest note within the group, especially in the case of stepwise ascent. We find that this third alone has the power to suggest an entire triadic harmony. Indeed, it may be successfully argued that the perfect fifth of a triad is so familiar as to be unconsciously supplied by the listener. Such an argument may find firm foundation in the classical theory of overtones[3] (a theory which certainly finds use in the analysis of pitch generated by the acoustic violin). Moreover, we find that in the exceptional case of a diminished triad

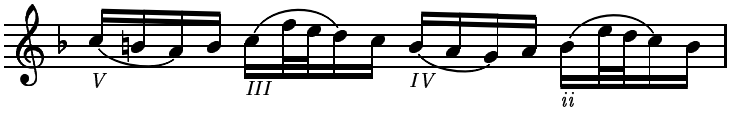

Figure 1. Perhaps the most useful general local technique for identifying the structurally important notes in a block which fails to directly outline a triadic harmony rests upon the identification of its most dominant interval of a third. The base of this third is often the root of the active harmony. This, the seventh measure is a case where this approach proves both useful and inadequate.

in which the perfect fifth above the root should clearly not be inferred, the line most often outlines the chord in its entirety as it does the half-diminished seventh of the third measure, illustrated in Figure 2. Finally, a complete harmonic analysis requires the determination of harmonic function. This sometimes can be aided by figuration, but is typically achieved by an

[2]The structure of rhythmic motives also lead the listener to discover harmonic structure where the two are similar.

[3]in which the fifth above a pitch ($\frac{3}{2}$ of the base frequency) is more prominent than its reciprocal modulo 2 (multiplicatively)—the perfect fourth ($\frac{4}{2}$ of the base frequency).

iterative examination of the possible combinations of harmonic function for the present and neighboring chords.

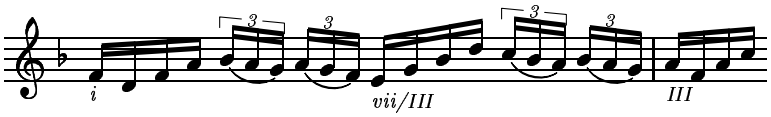

FIGURE 2. When inference of the perfect fifth above the root is not appropriate, the entire chord is typically outlined as is the half-diminished vii/III of the third measure.

A sense of local closure is achieved by resolution of strong local tendency tones.[4] Measures 7-8 provide a good example and are presented in Figure 3. First V resolves to i, followed immediately by an analogous resolution of V/V to V. The listener perceives also the clear parallelism in pitch contours. This

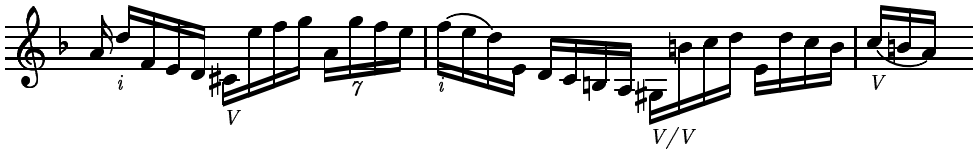

FIGURE 3. Two parallel periods of local tension and resolution reinforced by similarity in pitch contour.

phenomenon generates a period from tension to resolution that is perceived as a locally closed structural unit similar to a phrase in spoken language.

[4]A precise definition of tendency tone is difficult. A possible attempt might be undertaken by axioms concerning motion by semitone or descending root motion by fifth. Another approach might rely upon the definition of a distance between pitches rooted in a comparison of their harmonic series and its extension to a distance between entire harmonies in a way familiar from distances in Euclidean vector spaces or perhaps by some weighted means based upon some measure of the significance of each tone within a harmony by utilizing stacking by thirds or more general notions from distance geometry. We might then say that two harmonies have a greater tendency to one another the closer they are to one another as measured by this distance—a notion analogous to the dependence of the gravitational attraction between two objects upon their distance from one another. To attain the desired asymmetrical situation of one tending to the other (but not the other way around) one might resort to a historical, statistical or metrical analysis: the harmony which occurred first, which occurs most frequently or which receives the most metrical emphasis is recognized as the tonic to which the other tends. The last approach might be achieved by defining a hierarchical valuation of beats which extends both infinitely 'inward' within a measure and 'outward' into the hyper-meter. Yet another possibility might utilize the average distance between members of a harmony as a measure of its 'stability.' Then we might assume that less stable harmonies tend towards more stable ones. These approaches would reduce psychoaccoustical considerations to a lower level, but not eliminate them altogether. However, for the present analysis we appeal merely to musical intuition for the identification of tendency tones.

The same forces act also at larger scales in the work; the binary form which this piece typifies embodies this notion. The first half modulates to and cadences in the dominant key, which seems locally stable, but which, in fact, on a global scale, seeks resolution—a resolution which is fully achieved only in the final authentic (tonic) cadence. These global tendencies are reinforced by the immediate abandonment of the dominant as a separate key area in the opening of the second part (this also avoids what would be an awkward transition in the final performance of the B part).

There are two sequential passages—one in each part (measures 11-12 and 20-21); each is shown in Figure 4. Each leads once again to the harmonic context from which it sprung. As such, they are prolongations, rather than structurally functional transitions. In both cases the unfamiliarity of the sequential harmonies is countered and the sequentiality reinforced by the repetition of both rhythmic motive and pitch contour. The structure and development of these and other rhythmic motives will later be examined in greater detail.

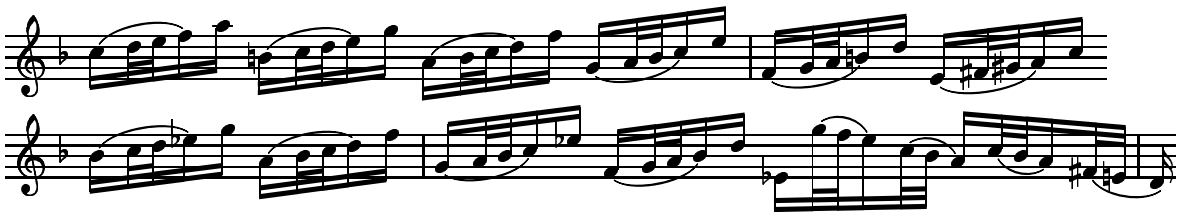

FIGURE 4. The two sequential passages. Note the repeated rhythmic motive and pitch contour.

To study the global harmonic structure, we resort to some of the most fundamental ideas from the theory of formal languages[5]; we assemble a deterministic finite state automaton from the transition data assembled from local harmonic analysis in which the alphabet is the set of possible chords. (Because embellishment never exceeds the degree of secondary, we may consider the harmonic alphabet a subset of the finite set $\mathbb{Z}_7 \times \mathbb{Z}_7$.[6]) We obtain, the directed graph shown in Figure 5.

[5]Of course, when composed directly by humans, music is typically not a formal language, rather a natural one. As such it defies complete analysis by formal means. But because the harmonic language of Bach is by now so well studied and understood and because we examine this single piece of music in complete isolation we find our approach more than adequate, nonetheless. It is like analyzing the biochemical essence of an amoeba as frozen in evolutionary time in place of an exhaustive analysis of the total, global complexity of the biosphere.

[6]If equal temperament is assumed, an equivalence relation may be introduced to further reduce this alphabet that would account for the identical spelling of some chords. For example, I is equivalent in spelling to V/IV. Further reduction is possible through enharmonic equivalence. One might be tempted to contend that these chords should not be considered equivalent since they clearly differ in function. But it is the structure of the walks by which the harmonies are traversed in this context, not the harmonies themselves,

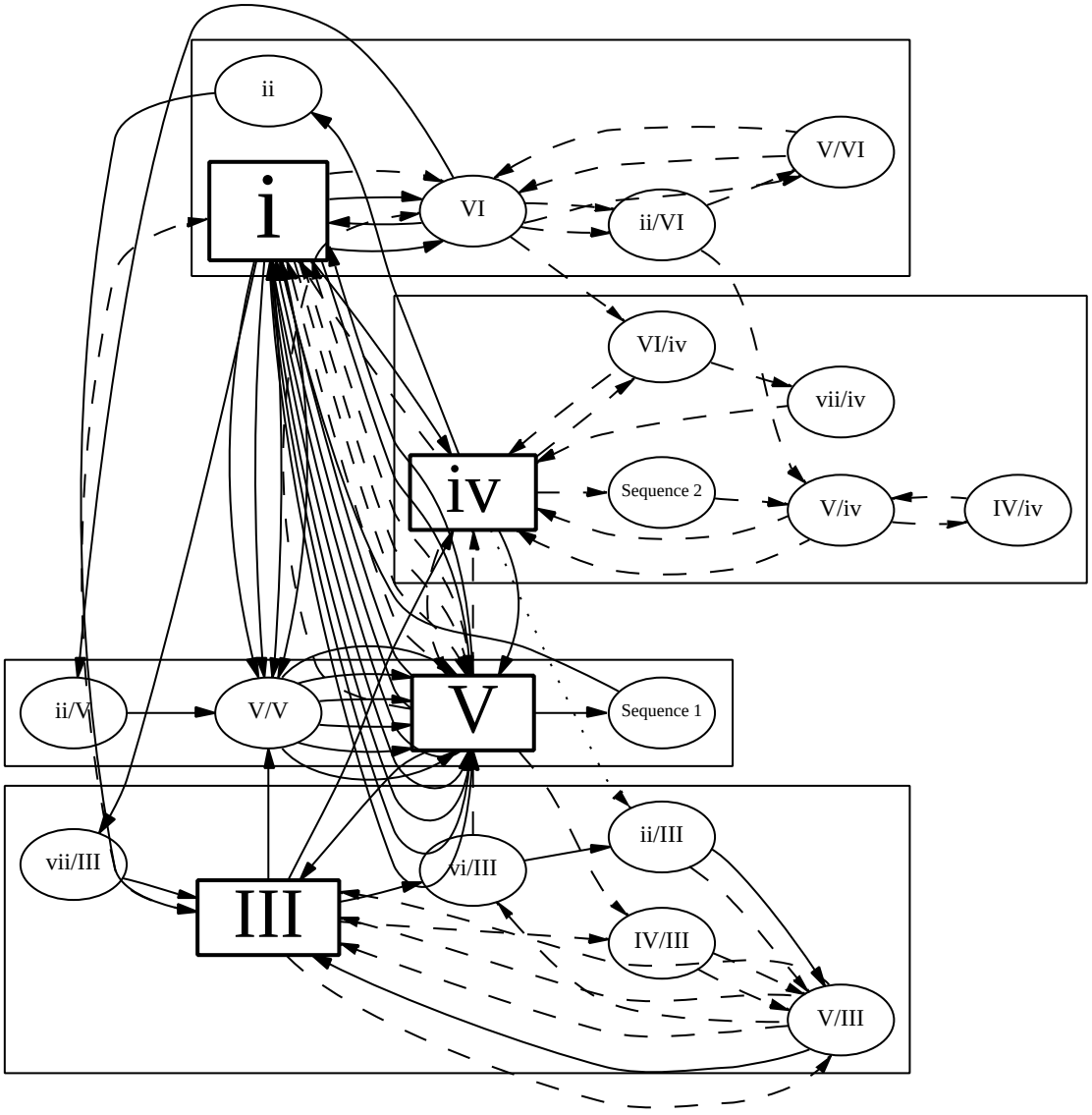

FIGURE 5. Dispensing with the notion of global time and retaining only that of local temporal succession, we may view the entire movement as a simple directed graph. The chords have been organized into the most dominant key areas. The solid and dashed edges represent progressions of the A and B parts respectively. The dotted edge indicates functional reinterpretation.

which embody their function. However, since these notions add nothing to the present analysis, they constitute little more than an aside and we dispense of them immediately.

Several significant qualitative observations may be made from the graph. We see immediately the marked dominance of the i-V relationship. We see also that the most significant key areas are i (the tonic), V (its dominant) and III (its relative major). Each of these key areas has its own local diatonic structure resembling the global one. Very frequently a new key area is reached through secondary dominant—especially in the case of the dominant key area. We notice also that ii functions overwhelmingly as a dominant preparation and that the relatively week function of IV and vi are often exploited as pivots to provide smooth passage from one key area to another.[7] Finally, we see that the B part is much more harmonically diverse than the A. This reinforces the observation that the B part is an elaboration of the first.

2. Rhythmic Structure

A remarkably consistent rhythmic progression pervades each of the parts of the piece, providing an additional layer of syntax which coincides with the harmonic one and provides additional impressions of aesthetic unity. We identify six rhythmic 'words' built from five rhythmic 'letters' defined in Table 1. The family of progressions observed in the piece is summarized in Table 2. The principal component of the progression is diminution; in fact, the overall motion of the progression is embodied by the progression $b(de) \to de \to d$. The successive abbreviation of rhythmic motive leads to successively shorter rhythmic periods which accompany an accelerated harmonic rhythm. The progression is somewhat altered and extended in the second part; the order of the second and third words are reversed, the first two are elided and an additional bc is inserted between fifth and sixth words of the original progression. This progression reaches its conclusion in measure 23 at a transition from iv to III and is followed by an abbreviated recapitulation of the progression (labeled B' in Table 2) which leads to the final authentic cadence.

In Figure 6 we graphically present the rhythmic progressions in a way similar to the preceding graph of global harmonic structure. Unfortunately the complexity of the graph in this case obscures some of its most simple and fundamental features. The progressions are cyclic but for the final one and exhibit a great deal of similarity.

In loose terms, the rhythmic 'letter' graph in Figure 7 is the power set of the 'word' graph in Figure 6. It represents the progressions between the individual rhythmic letters. An example helps attain precision *sine* a tedious appeal to formality. The progression of 'words' $ab \to bc$ would result in a 'letter' graph of three nodes and four edges: (a, b), (a, c), (b, b) and (b, c). In the graph we can see the diminutive attraction of d that is so notable

[7]From these observations we gain also the notion that the piece may be seen as a language accepted by a larger, more general automaton embodying the classical notions of the theory of functional harmony.

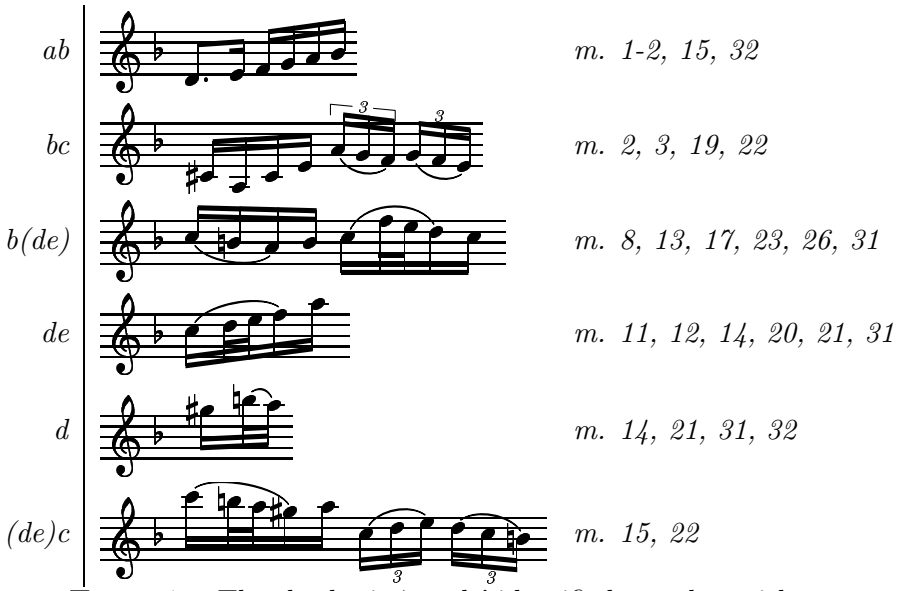

TABLE 1. The rhythmic 'words' identified together with an exhaustive listing of their appearances; the first appearance is shown in each case. The definitions for each of the rhythmic 'letters' may be completely inferred.

A:	*ab*	*bc*	*b(de)*	*de*	*d*		*(de)c*	*ab*
B:	*ab*	*b(de)*	*bc*	*de*	*d*	*bc*	*(de)c*	*ab*
B':	*ab*	*b(de)*		*de*	*d*			

TABLE 2. The progressions of rhythmic words in each of the movement's parts.

in the piece. We see also the closed nature of the interrelations—how the edges emanating from a are answered, but by a placid few as compared to the maelstrom whirling about d.

Before concluding, we note also that the only repeated notes in the piece occur at the beginning of each of its parts. Although this rhythmic figure is an established part of the Allemande idiom, it serves also as a marker of sorts—an initiation codon—which helps the listener comprehend the form of the piece.

In conclusion, we have described how the unaccompanied linear voice exerts the power to suggest entire harmonies and how these harmonies provide both a local and global sense of tension and release. We found also that the

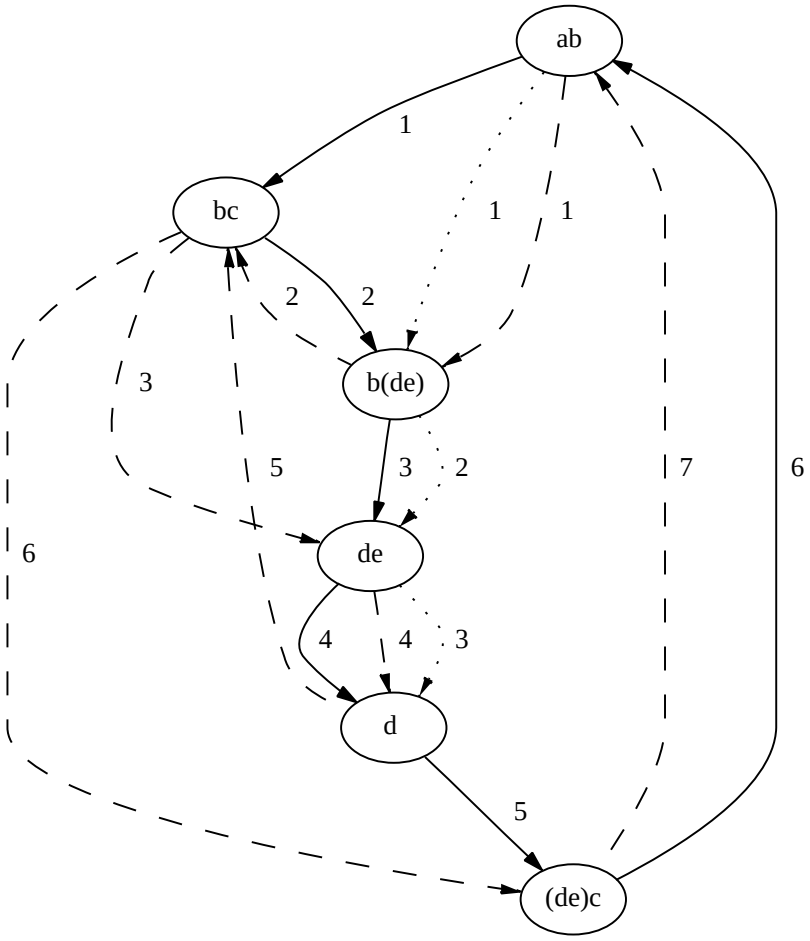

FIGURE 6. The progression of rhythmic 'words' may be visualized as a simple directed graph. The solid and dashed lines again represent, as in Figure 5 the progressions of the A and B parts, respectively. The dashed line represents the abbreviated progression that brings the piece to its final close.

global harmonic structure possesses an almost grammatical global construction that closely resembles that of the classical theory of functional harmony. We identified the essential rhythmic progressions which pervade the piece and provide it with an additional layer of unifying syntax, but which also provide additional layers of variational complexity. We found that the harmonic and rhythmic motives and structures share a similarity that together grant the listener the sense of closure and completeness of musical thought.

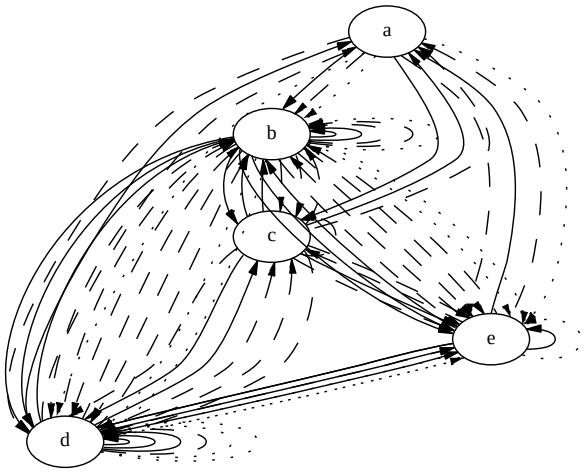

FIGURE 7. This somewhat more abstract, but much more explicit graph shows the progressive interrelations between each of the rhythmic 'letters.' The solid, dashed and dotted edges have the same meaning as earlier in Figure 6.