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On relationships between Tonal and Rhythmic Structures in Western Multipart Music

By Ingmar Bengtsson

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In spite of the impressive progress which has been made in musicology during the present century, our field can still scarcely be said to possess as well-founded and effective conceptual systems for descriptive and explanatory purposes, that is, for the analysis of musical structures and styles as one might wish.

One reason for this seems to be that a great many concepts and terms of so-called music theory are still bound to traditions and conceptions of a primarily practical-pedagogical, almost "handicraft" nature. Most of the systems constructed for scientific purposes are encumbered by inconsistency, vagueness, and ambiguities which reveal this origin.

Some of the shortcomings which are most serious from a methodological point of view can obviously be traced to the confusion of such essentially different phenomena as sign-relationships within the notation, successions of physical sound events, and the perception or "experience" of such events. To these must be added a number of more special shortcomings which are inherent in music theory as a heritage from certain specific musical and pedagogical traditions.

Within the framework of these traditions, major/minor tonality and "functional harmony" *(Funktionsharmonik)* play a prominent role. Musicologists are certainly agreed that these phenomena have a limited historical and geographical validity. Western multipart music from about 1720 to about 1850 might be set as a center, preceded by a period with modal "remains" and succeded by a period of tendencies towards dissolution (through chromaticism, expanded tonality, and so on). Beyond these periods one might add both "forerunners" (if we adopt an evolutionary point of view) at least as far back as the end of the 15th century, and, later, different kinds of "epigonic" trends down to the present day.

However, we must take into account the fact that many other types of musical reference systems and tonal relationships existed during these five centuries — approximately from Dufay to Boulez.

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Considerable efforts have also been made in order to find adequate ways of describing some of these structures (for instance in terms which were used at the time the music was written). Nevertheless, major/minor tonality and functional harmony occupy a privileged position not only in present-day elementary teaching of so-called music theory (which might be justified from a pedagogical point of view) and within the majority of comprehensive systems for harmonic analysis (which is understandable historically) but also in our musicological habits of thinking and in our basic "theoretical" terminology.

This situation — combined with the fact that we use a set of concepts which are modeled in part on physical explanations and which have been assembled mainly for pedagogical purposes (with simple numerical operations with interval fractions, scale degrees, piling of thirds, and the like) — has had some peculiar consequences which are clearly disadvantageous from a theoretical standpoint. Three of these will be mentioned here very briefly.

1. Widespread beliefs have come to prevail to the effect that certain musically relevant structural relationships between tones are "given by nature". There have been efforts to support such beliefs in a very elaborate manner by referring to numerical relationships based on physical findings. (Consonant intervals *can* be defined in terms of simple fractions, and so forth.) Moreover, such beliefs have been associated with value judgements, often in combination with evolutionary viewpoints. According to one such view, there has been a development towards an "ideal" state, succeeded by a period of dissolution and decline. With the "ideal state" as a point of departure, possibly elevated to an estethic norm, a closed descriptive system has been constructed. On the basis of such a system a number of sufficiently closely related structures can be described as deviations from the norm, yet others cannot be described at all in the terminology of the system.

Ethno-musicology should have taught us, if nothing else has, that musical structures which are considered to be "natural" are essentially products of specific, local traditions of musical upbringing and learning. The things to which we are most accustomed or which are most strongly "ingrained" *are* most "natural" for us. The factor of tradition or habit has without any doubt functioned in a decisive and very complicated way in the development of Western music. Could it be that the conceptions of what is "given by nature"

(as well as the attempts at physical explanations) have hindered the unbiased analysis of *these* functions?

2. Our terminology — if not our conception of music as well — is marked to a very great extent by the fact that the concepts of major/minor tonality and harmonic function are defined and used as undifferentiated entities. This *is* or *is not* major/minor tonality; that *is* or *is not*, for example, a subdominant or a dominant seventh chord, and so on. We might even imagine that these entities have a definite historical existence, despite the fact that we become embarrassed if we are forced to take a position on whether this existence can be localized, for example, in Handel's, Mozart's, Schubert's or perhaps some later composer's work. One sensible answer is, of course, that we use such concepts to refer to something which is a common denominator for the music of all these and many other composers, and that our conceptualizations must be of a sufficiently general nature to be of practical use in comparative research. To this we must nevertheless reply that such a broad common denominator is a rather clumsy dissecting instrument. Let us assume that the tonality-conditioning harmonic structures of composer X can be described completely with the symbols T, S, and D, that of composer Y with the symbols T, S, and D plus A—D, and that of composer Z with the symbols T, S, and D plus A—Q. What right do we have to maintain that "tonality" — except as a very rough generalization — is the same in the three cases? What right could we have even to maintain that the symbols "T", "S", and "D" represent exactly the same things or functions in these three different complexes of relationships?

The difficulties which the "system-builder" meets here can be illustrated by the following two dissimilar examples. (a) If we take a chord out of its musical context, simple descriptions of it are available. Let us say that, for instance, we have (starting from the bottom) "a major third plus two minor thirds". This is a description in terms of a conventional diatonic scale system. Its agreement with traditional notation is obviously fairly good, since certain notation-symbols are derived from the same scale system; from the physical standpoint it of course can be regarded only as a very rough approximation. Now, if we use the symbol "V^7", based on the scale degrees, for this tone-combination (German: *Zusammenklang*), we have given it a relatively neutral designation — that is to say, we have taken refuge in the mere mechanics of a basic scale. In a large number of contexts, however, the tone-combination can be said to have what we call a dominant function; in our terminological embarrassment we make this functional interpretation precise by adding a mechanical thorough-bass numeral.

(There does exist a "minor seventh", that is, "D^7" — a queer sign-combination indeed.)

However, when the same tone-combination appears in Debussy, for example, both symbolic devices (V^7 and D^7) are often unsuitable if not misleading. Neither the scale structure nor the functional relationships which they imply need be relevant in this connection. Most of us would agree that this is an entirely different situation. But the problem which arises is not only how we should describe the entirely different functions of this "chord" in Debussy's work. The problem extends further: which different types of functions of this tone-combination do we have reason — from the standpoint of analysis of structure and style — to attempt to keep separate and to describe within a given historical period (let us say, for instance, between Mozart and Debussy)? Even if it could be demonstrated here that the problem is incorrectly formulated and that the differentiation we seek can never be achieved, there still remains the fact that the descriptions which are derived from an "ideal state" (for example, the one so to say summarized in the symbol D^7) are obviously both rougher and more mechanical than we usually wish to admit.

(b) Harmonic relations which at one time were considered to be daring, perhaps shocking, have sometimes later become *commune bonum*. This well-known fact implies that changes have taken place in perception, changes which, by the way, we have all experienced to some extent. (Consider, for example, Paul Hindemith's change in position in the listeners' current perspective from "radical" to "traditional".) Here the factor of tradition enters the picture in a decisive way, yet at the present time it has seldom been adequately taken into account in the deliberations and descriptive systems of "music theory". The difficulty of setting up reasonable points of reference or base-lines for comparison which are relevant from a given viewpoint are without doubt very great. (And, of course, the "change factor" to which we have referred cannot be taken into account in any comprehensive system of analytic formulae either.) Nevertheless, it seems clear that as important a factor on the perception or phenomenal side as, for instance, the forming of hypotheses in the psychological sense of the word (for instance of the expectation type) and their confirmation or non-confirmation (in the form of "surprises", for instance) certainly might be used as a legitimate — and perhaps very effective — link in a system for describing musical structure and style, regardless of all the well-established symbol-systems of functional harmony.

3. Included in the habits of thinking within "music theory" is the belief that one can *a priori* distinguish three basic elements in or aspects of musical textures: melody, rhythm, and harmony. This division is certainly often useful as a systematic device for practical and pedagogical purposes. It is at any rate of relevance when describing the kinds of multipart music in which these three categories have influenced the composers' musical thinking. In such music,

successions of varying pitches *do* exist, each tone *does* have a definite relative duration, and the texture *can* often be regarded as a succession of chords. All this is true, at any rate, if we use the notation as a starting point — and indeed our conceptual tools are largely bound to our notation conventions.

But even when the concept of melody alone is involved, this trichotomy reveals itself to be questionable. A melodic *Gestalt* does not lend itself to description exclusively in terms of tone qualities or frequencies; the slightest attempt to change details shows that many melodic structures are considerably more sensitive to changes in duration than to changes in pitch.

The distinction between two "elements" which we cannot fully accept in connection with melody, we nevertheless approve to a surprisingly large extent in connection with successions of tone-combinations, which we usually call "harmony", for better or for worse. Certainly it does occasionally happen that musicologists mention and even stress the existence of "harmonic rhythm". But in many of the ordinary systems for harmonic analysis little attention is paid to the time factor except for the use of the simple relations "before — after". The exceptions rather prove the rule and at the same time show how problematic these distinctions are. As examples one might cite most of the traditional conventions for resolving dissonances, which cannot be described as harmonic *or* as melodic *or* as rhythmic phenomena.

The question as to whether proper attention has always been paid to what might be called the positional function of the chords may also be raised. If we notice, for example, the variability of chords in cadences of the type "S D T" ("IV V I"), it appears that this is determined to a large extent by the positions "antepenultimate", "penultimate", and so on. In the case of the "antepenultima" the positional function often dominates so strongly that the symbol "S" becomes fictitious.

The problems discussed above constitute the background for the main theme of the following little essay. The purpose is neither to set forth a new analytic system, nor even to lay some cornerstones of such a system, but only to attempt to present briefly the outlines of a "synthetic" approach to tonal and rhythmic phenomena which might possibly prove worthy of further development in a more systematic direction. Both the conceptual analysis on which the reasoning is based and the musical material which will be discussed must be presented summarily for reasons of space; however, this

may result in a clearer presentation. Concerning the use of terms, we shall wherever possible keep to what might be called "musicological common-sense language", where no other meanings have been specified.

Since any sampling of the great mass of musicological, "theoretical", philosophical and psychological literature which is relevant to what follows might seem to have been chosen arbitrarily, I have refrained from all such references, just as I have refrained from entering into polemics against particular writers or doctrines.

The music examples have been abstracted in such a way as to make them as complete yet as condensed as possible.

Should the choice of English terms seem unsatisfactory to English-speaking readers, this should be blamed to a large extent on the fact that the translation of the text presented great difficulties, aggravated by the fact that musicological terminology in the English language does not seem to be highly developed in every respect, at any rate not if we compare it with the well-developed sets of terms developed within philosophy and psychology in English.[1]

According to current music theory, every musical process can be viewed either from an harmonic-tonal or from a rhythmic point of view. But the perspective changes radically if one maintains instead that tonality (including "harmony") and rhythm present certain symptoms of covariation, that is to say, that specific kinds of tonality and harmonic relationships "belong together" with specific kinds of rhythmic structures, and that changes in one of these factors often are connected with specifiable changes in the other. The expression

[1] I regret that the recently-published book The Rhythmic Structure of Music (Chicago 1960) by G. W. Cooper and L. B. Meyer did not reach me before this article had been written and translated. In this pedagogically outstanding textbook the authors propose and use consistently some of the terms I had been searching for or had been in doubt about in connection with the translation into English. I wish to record here my indebtedness to these authors for the expression "superior rhythmic levels" which I adopted and in connection with which I have chosen the term "super-group(s)". I had already adopted the distinction between "accent" and "stress" which several writers, among them L. B. Meyer in his Emotion and Meaning in Music (Chicago 1956), have used.

In some respects, I feel, Cooper's and Meyer's use of the concept of "rhythmic structure" is somewhat unwarranted (for example, when it is expanded to include whole compositions in sonata-form). At the same time, several basic theoretical aspects of the concept of rhythm are never taken up in their book, which is mainly of a pedagogical nature. Nevertheless, I should emphasize the fact that in this work are to be found several of the basic points of view which I have attempted to use. In general, Cooper and Meyer discuss the significance of the perceptual aspect, the occurrence of superior levels, and the significance of melody and harmony for the structuring of rhythm in such a way that the critical attitude I have occasionally expressed may no longer apply to the extent that it did previously.

"belong together with" is intentionally vague: it is not safe to predict a given causal relationship in such a way that certain rhythmic structures "cause" certain types of tonality or vice versa. Might it not be, rather, that they in some ways influence or condition each other?

The thesis which I want to present and attempt to support in the following pages is that the class of superordinate or "whole"-determining structural relationships which we call major/minor-tonality does not imply merely certain types of "tonal" and harmonic-functional reference systems, but also specific types of integration between "tonal" *and* rhythmic reference systems, and that structures which occur within these systems — and which are very stable from the point of view of the listener — should be considered in this "synthetic" way. It may seem, in the following pages, as though only a double aspect (the harmonic-rhythmic) were being presented. This is an unavoidable consequence of the present state of our theoretical terminology (for which the separation into three "elements" has certainly been decisive). With its help, the phenomenon of covariation between tonal and rhythmic structures however can be illustrated, at least roughly. Still another reservation should be made at the outset: for the sake of simplicity the expression major/minor-tonality is used in this text on the customary assumption that "major" and "minor" are really equivalent as tonal reference systems.

In order to indicate the direction of the discussion, its outlines can be sketched in the following way. In certain types of 16th century multipart music, there are clear tendencies towards a major/minor tonality. These tendencies appear, as is well known, most obviously in homophonic textures, particularly in music influenced by dance or dance-derived rhythms, that is, rhythms which are conditioned by more or less overt motor reactions. Both the motor aspect and major/minor tonality become more firmly established during the Baroque era, and a clearly defined major/minor tonality as well as distinctly accent-differentiated and multi-level rhythmic patterns combined with regular meters are finally achieved in the "Viennese classicism" in the latter half of the 18th century. In the course of the 19th century a dissolution of this closed type of tonality as well as of rhythmic-metric regularity takes place; and with Debussy, for instance, we arrive at a situation in which "non-functional" chords (*i. e.*, tone-combinations lacking the *traditional* harmonic functions) occur in combination with conspicuous weakening

of the regular meters or pulse-groupings. The comparison can be extended even further to radical tendencies in present-day composition, for example to applications of "serial integration", where traditional "tonal" relationships as well as traditional "pulse-grouping" are eliminated.

In an historical bird's eye view such as this, it is apparent that what we are accustomed to calling regular meters and what we usually call major/minor tonality belong together in a way which cannot be altogether accidental and which should attract our particular interest.[2] Furthermore, we may well wonder whether the existence of certain types of deviations from such a covariation (for instance, the appearance of novel harmonic details in combination with more tradition-bound rhythmic-metric patterns) could not be used to advantage for the purpose of describing and classifying style.

Even a brief review of these relationships between tonal and rhythmic structures presupposes certain conceptual and terminological distinctions, some of which must be introduced here, or at least intimated.

The concept of rhythm is among the vaguest and most controversial within music theory. The definitions which have been put forward can be counted in the hundreds, and new definitions are continually being presented. (An indirect demonstration, by the way, of the fact that music theory still has not become cumulative in the natural scientists' meaning of the term, but is often burdened by an inordinate stress on the history of ideas.) The search for "the only correct" definition of rhythm might be regarded methodologically as an unrealistic manifestation of "term absolutism"; we are probably fully justified in taking into account and using more than one concept of rhythm (for example, for different purposes and within different descriptive systems). As a background for the present discussion, however, the following provisional distinctions must be specified.

1. Wherever necessary in the following discussion, we shall indicate the *physical* and the *phenomenal* (*i. e.* perceptual) aspects of sound phenomena and the *notation* symbols with the index letters f, φ and n, respectively.

[2] It need hardly be pointed out that the role that vocal texts have played in the development of particular rhythmic structures certainly is significant. But it does not add any serious theoretical complications in so far as fundamental sensory-motor conditions must be considered as common to verbal as well as to "musical" rhythmic utterances.

2. We can talk of perceived or experienced rhythm, *i. e. phenomenal rhythm* (rhythm$_\varphi$).[3] Its occurrence in conjunction with acoustical stimuli is probably the result of intersensory and in particular sensory-motor conditioning — that is, it is not purely auditory. We assume that the perception of "regularity" (not identical with physical or chronometric regularity) is among the necessary conditions for the perception of rhythm. Furthermore, the perceived qualities of accent($_\varphi$) and tension($_\varphi$) are assumed to be two of its basic components.

3. The term *metric* in general refers to the measurement of any variable. But in accordance with the special meanings of the term established in poetics and musicology, it will be used here only for measurement of durations and durative relationships. Metric$_n$ can be exemplified by any sequence of notes, such as ♩ ♪♪; metric$_f$, let us say, by the values 720, 330, and 370 milliseconds for the same sequence in a certain rendering. The notation ♩ = M. M. 108 represents a relationship between metric$_n$ and metric$_f$. We are even justified in including metric$_\varphi$ which is not to be confused neither with the perception of "meter" (which is part of rhythm$_\varphi$) or with rhythm$_\varphi$. Space prevents further comment on these distinctions.

4. An important part of the perception of rhythm in connection with "meter-bound" music can be described by the terms *pulse* and *pulse-group*. The term pulse-group allows us to distinguish between a perceived phenomenon on one hand and the bars in the notation on the other. If we indicate the written bar by t_n (t for German and Swedish *Takt*), it can be distinguished from the phenomenal pulse-group, which might be indicated by another symbol (let us say, by g_φ). In the notation, then, we can let the pulse-group (g_φ) be represented by a suitable symbol for the concept $t_{n\varphi}$ or, for the sake of simplicity, t_φ (preferably by means of some sort of bar-line — dotted, for instance — which can coincide with all, some, or, in the exceptional case, none of the bar-lines of the original notation). Thus we can express relations between t_φ and t_n, for example, $t_\varphi = 2\ t_n$. We must also consider groupings on different levels, especially doublings and redoublings of pulse-groups; for such phenomena we shall choose to use the prefix *super-* (corresponding to the expression "*übergeordnet*" in German). These super-groups can be affected by a

[3] The term perception is of course used here in its modern and wide sense (as defined, for instance, in S. H. Bartley: Principles of Perception, New York 1958, pp. 20 ff.) which differs greatly from the use of "perception" and "sensation" in older psychology.

number of different factors, one of which is tempo. (In the interest of simplicity, tempo is defined here provisionally as phenomenal pulse-rate.)

5. The rhythm$_\varphi$-components accent$_\varphi$ and tension$_\varphi$ can be affected by several different physical variables. Phenomenal accent, for example, is by no means exclusively (nor even mainly) conditioned by changes in amplitude, but by a number of interacting factors with varying significance in different types of music — whether we consider durational relationships, changes in intonation, or melodic and harmonic factors. (The role of the latter can strikingly be demonstrated in examples where ambiguity exists as regards rhythmic-metric grouping — for instance, at the beginning of many organ compositions — and in examples of "rhythmic dialects" with strong and typical durational deviations from the rational metric$_n$ scheme, for example, in the Viennese waltz.)

6. From point 5 it follows that among other possible concepts of rhythm we have good reason to work with one which represents phenomenal rythm *as a totality* affected by all or most of the physical variables in interaction with one another.

It is this concept of "total rhythm" which writers like G. Becking, W. Danckert, and, before them, the Sievert-Saran school, and others, were trying to characterize, and whose existence we must accept regardless of possible objections to these writers' descriptive methods. We are aware that there exist both "basic attitudes" or "behavioral types" with regard to rhythm which are characteristic of different historical periods, and also individual rhythmic "behavior patterns" which differ for Mozart and Beethoven, for Mendelssohn and Schumann, for Stravinsky and Schoenberg, and so on. The relevant distinguishing features of these patterns, which are time-bound and often personality-linked must be assumed to be somehow "hidden in the notation" because of the fact that one can, with the notation as a point of departure (complemented by conventions for reading and performing which cannot be discussed here), deliver interpretations which give the listeners "spontaneous" impressions of these stylistic patterns and differences.

The total rhythm can be characterized phenomenally as (to use the phrase of the *Gestalt* psychologists) a complex quality which includes different kinds of *movement perception*; these have still not been sufficiently recognized and analyzed. Actually, total rhythm results — even if "unconsciously" in a non-cognitive sense — as a product

of complicated relationships between variables which are incompletely symbolized in the notation and which can interact or work against each other in their capacity as accent- and/or tension-conditioning factors.

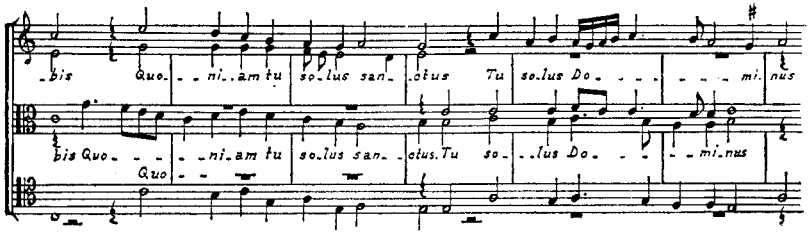
7. At a given point in history there usually exists, within a given type of major/minor tonal and rhythmic-metric reference system, a relatively limited number of typical harmonic successions and patterns of pulse-grouping. The formulary functions of the chord successions are determined at this point not only by their internal "harmonic" relations and their relationships to a center of tonality, but also by the way in which they are distributed within and co-determining for specific rhythmic-metric schemes. (Conformity to formula can apply to both cadential successions and themes, as well as to many other kinds of sequences. A characteristic example from the 18th century offers developments of the *Fortspinnung*-type based on descending fifths, *i. e.* subdominant sequences progressing down the cycle of fifths.) A thorough investigation of such harmonic-rhythmic formulae should certainly yield results which would be of benefit for style-analytical methods of description.[4]

Now let us proceed to the historical review. In the history of multipart music, "Dufay's period" stands out as something of a revolution. Regardless of what the final conclusions turn out to be with regard to the roles of England and the continent in the "faburden-fauxbourdon"-problem, it is clear that the first half of the 15th century signifies a radical stylistic change in relation to the *ars nova/trecento*, concerning not only the treatment of harmony but *also* the basic rhythmic character.[5] As early as this the question arises as to whether the harmonic and rhythmic changes do not constitute two aspects of a *single* change of style.

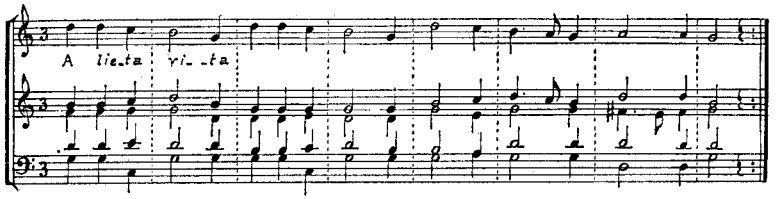
During the century following (from about 1430 to about 1530) a more and more imitative, "flowing" polyphony is developed, in which the simultaneous conception of the parts (explicitly pointed out in Josquin by contemporaries) is accompanied by a light *tactus*-pulsation and a technique of composition still circumscribed by the church modes. This type of texture we consider to be characteristic

[4] Of course taking proper account of (but preferably without dogmatic belief in) systems like that of Schenker.

[5] Cf., on this point, H. Besseler: Bourdon und Fauxbourdon, Leipzig 1950: "Entscheidend war nicht so sehr das zahlenmässige Vordringen des Tempus perfectum, als die darin sich kundgebende Erneuerung der Melodik." (P. 123.)



Ex. 1a. G. P. da Palestrina: Missa Papae Marcelli (Gloria)



Ex. 1b. G. Gastoldi: Balletto

of the late Middle Ages and a great part of Renaissance polyphony.[6] In contrast to this tendency we can set the impulses, emanating mainly from Italy, which, during the late 15th century and the 16th century, spring from such genres as the *canti carnascialeschi*, *frottole*, *villanelle*, *balletti*, and so on. (Of course, a great deal of dance music and the post-Josquin French chanson also belong to the picture.) In all these genres of composition we can note a homophonizing tendency which is accompanied by tendencies towards major/minor tonality *as well as* tendencies in the direction of regular, physical-motor rhythmic patterns.

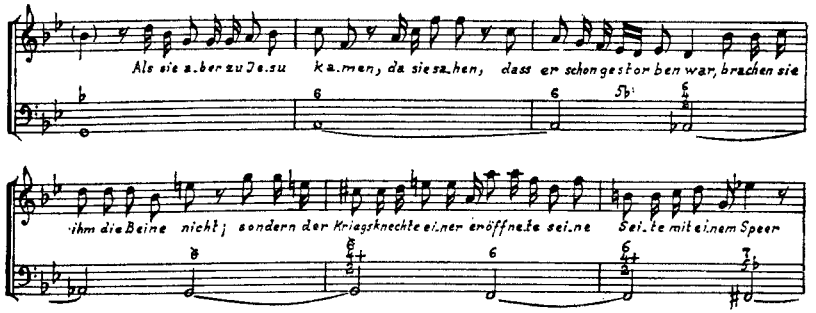
In Palestrina — long held up as an ideal but actually not representative of the 16th century as a whole — we find a discernible differentiation between "accented" and "unaccented" beats, without which his consistent treatment of dissonance could not be explained. That Palestrina appears to be representative in this respect of a "*Spätstil*" which is individual and unique in several respects but is also influenced by some kinds of sonority which dominated secular music at the time, seems to be beyond doubt. Nevertheless, Palestrina's polyphony, with its remains of modality, stands out in sharp contrast to G. Gastoldi's *balletti* or Th. Morley's "*fa-las*", for example, in which the rhythm, with a marked dance-like, motor character, so manifestly "goes together with" a harmonic style which is just as clearly marked by major/minor tendencies. (Ex. 1 a—b.)

[6] Cf., for example, B. Meier's analyses of Josquin's and Petit-Coclico's motets, in Musica Disciplina X (1956), p. 67 ff.

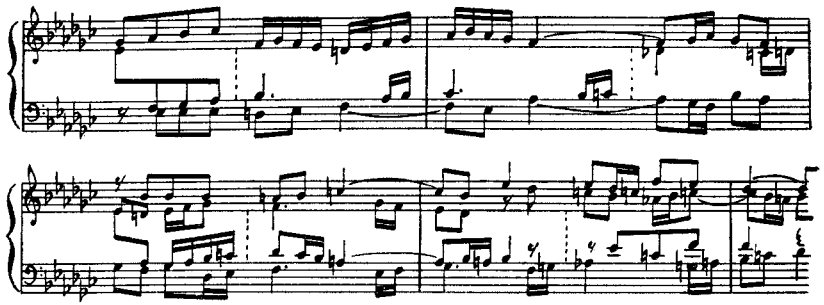
The "*Generalbasszeitalter*" brings with it not only thinking in terms of chords but also a more widespread use of dance-derived rhythmic patterns. Reservations must be made, however, about both developments as far as the 17th century is concerned. Just as we still have modal remains with respect to tonality, so we find that the bar-line notation functions mainly as a mechanical device to orientate visually. The pulse-groups are often short and the super-groups irregular or ambiguous. (In general, the bar-line symbol is used from this time on with a great many varying meanings and functions. This may be a well-known fact, but so far as I know, no exhaustive analysis of these functions has yet been presented.)

Stated simply, the outstanding types of total rhythm in high and late Baroque music can be illustrated with three typical cases: a) recitative without very pronounced accent-differentiation and with more or less irregular sequences of pulse-groups; b) polyphonic or pseudo-polyphonic texture, with rather marked accent-differentiation within simple pulse-groups (often with more than one such group to the written bar), but in which supergroups are non-existent, unclear or ambiguous; c) patterns which bear the stamp of dance rhythms, sometimes with clear tendencies toward set forms of accent-differentiation within the pulse-groups and toward regular super-groups (particularly in so-called periodic formations of, for instance, 8 t_{q}). On the harmonic side we have as parallels: a) a non-centered progression of different tonality levels, in spite of the frequent stereotype cadences often marked by modulatory "openness"; b) relatively rapid harmonic rhythm marked by frequent transitions to related keys (German: *Zwischenkadenzen*), suspension effects or other melodic-harmonically conditioned changes of tension$_{q}$, and c) comparatively calm "harmonic rhythm" with an emphasis on the chief chord functions which establish an unambiguous tonality and also appear with definite "positional functions" within the rhythmic — metric schemes.

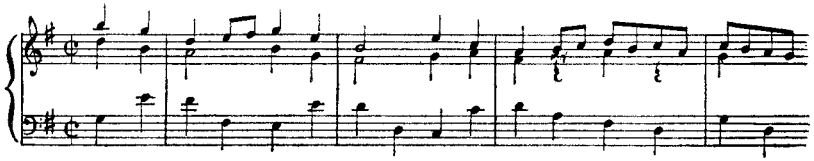
This sketchy review could be elaborated in a great many directions, and a number of interesting stylistic details could be suggested as possible indicators of harmonic and rhythmic covariation. (Take, for instance, the transformation of *hemiolia* from a grouping function on the basis of a low degree of accent-differentiation to a syncopated tension function on the basis of a marked accent-differentiation.) Here our illustrations must be limited to three examples from J. S. Bach, in whose work all three types mentioned above appear



Ex. 2a.



Ex. 2b.

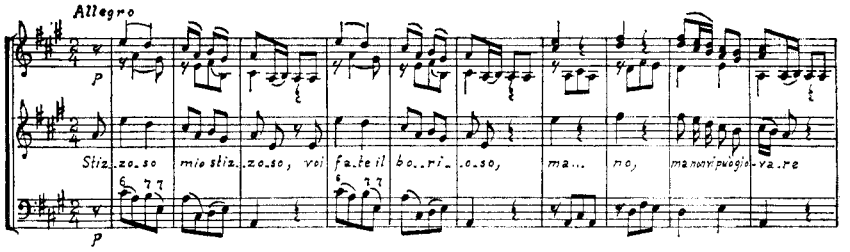


Ex. 2c.

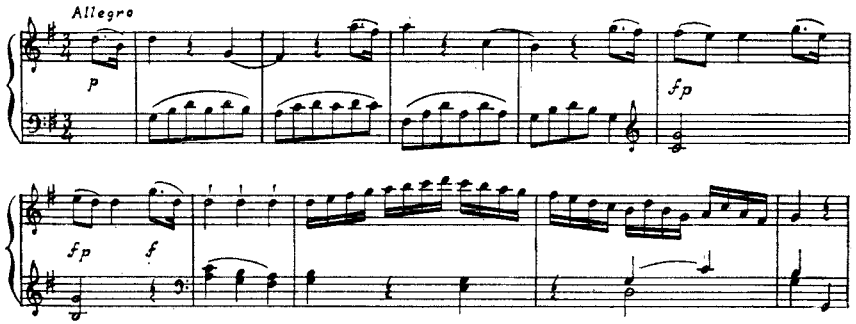
Joh. Seb. Bach: St. John's Passion, no. 64 (ex. 2a); Wohltemperiertes Klavier II, Fugue VIII (ex. 2b); French Suite no. 5, Gavotte (ex. 2c)

rather clearly, although the middle type (b) must be said to be most characteristic of Bach's personal total rhythm with its strong motoric qualities. (Ex. 2 a—c.)

In the homophonically-conceived 18th century music which, for lack of a better term, we often label *style galant*, there is a clear affinity between "additive" seriation of paired pulse-groups and limitation in the range of harmonic combinations, with emphasis on the (consonant) main chord-functions. *Neither* the differentiation of the harmonic relationships *nor* any stabilized superior rhythmic structures makes it possible to construct, other than under exceptional circumstances, the more comprehensive designs which are a distinguishing



Ex. 3. G. B. Pergolesi: La serva padrona (Serpina's aria)

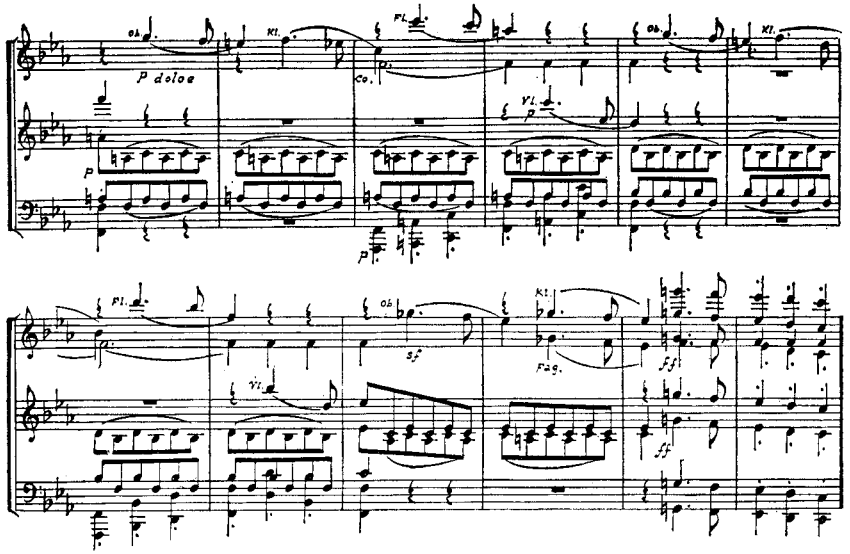


Ex. 4. W. A. Mozart: Piano sonata G major K. 283, 1st movement

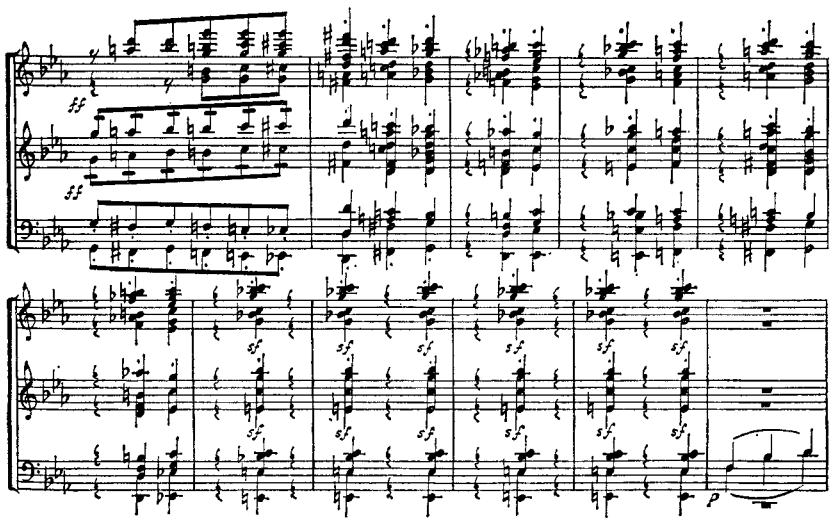
feature of mature Viennese classicism. (Ex. 3.) Domenico Scarlatti, by the way, constitutes an interesting border-line case in this connection; R. Kirkpatrick has pointed out certain peculiarities in Scarlatti's style which could easily be translated into the terminology employed here and used as the basis of a special investigation of harmonic-rhythmic relationships.

With Haydn and Mozart the adjustment between major/minor tonality, clear and stable yet flexible, and the subtly accent-differentiated pulse-grouping reaches a high point. In addition, both interact to create a multi-level system of rhythmic-metric structures, in which the frequent doubling and redoubling of subordinated pulse-groups is an outstanding feature. This architectonically important device, by the way, should not be confused with the so-called periodic closure which is also a characteristic of the style of that time. (Ex. 4.)

The super-grouping in several levels is clearly among the distinguishing features of Beethoven's symphonic architectonics. These super-structures are constructed essentially with harmonic relations as a base and occasionally assume dimensions unknown up to that time (Ex. 5 a), just as they can, with tremendous effect, break away



Ex. 5a.



Ex. 5b.

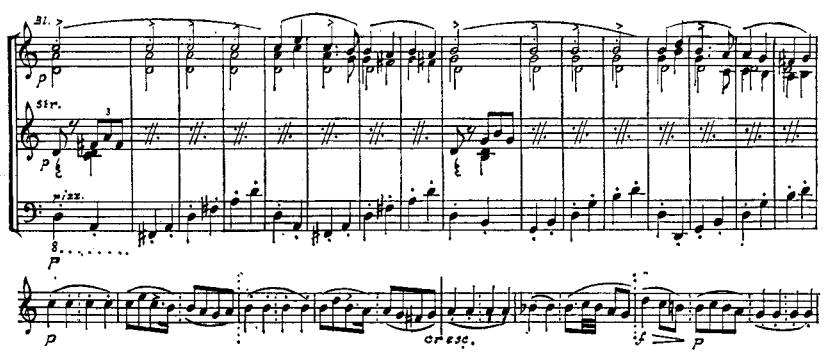
L. van Beethoven: Symphony 3 E flat major, 1st movement

from conventional patterns of harmony and rhythm *at the same time.* (Ex. 5 b.)

In Schubert's work we encounter more often what might be called a "lyrical", progressive doubling of pulse-groups or periodic formations, here again determined primarly by the distribution of the harmonic functions. An example which is instructive in several respects is offered in this connection by the finale of his C-major symphony, D. 944.

Its central theme (Ex. 6 a) has a time-signature and a bar-line notation, which can in no way give an adequate picture of the intended — and perceived — pulse-grouping. Here the structural relations can form the basis of several phenomenal levels of super-grouping. We can immediately perceive the grouping as $t_{\varphi} = 2\ t_n$, but also as $t_{\varphi} = 4\ t_n$. In addition, the infrequent harmonic changes support a grouping on a still higher level of $8\ t_n$ (which, however, within adequate tempo ranges, could hardly be perceived as a single "g_{φ}"). If we assume that the grouping $t_{\varphi} = 4\ t_n$ is both phenomenally and "musically" relevant (that is, intended by the composer), it becomes evident that the whole process *on this superior level* in Schubert is dominated by regular $8\ t_{\varphi}$-periods (comprising $32\ t_n$), which are broken only at certain points of critical importance from a modulatory and dramatic point of view (for example, through "compression" to 6_{φ} à $4\ t_n$).

It is tempting to experiment here with an alteration in the bar-line notation: for example, the one suggested in Ex. 6 b. However, we are inclined to consider this altered notation as inadequate. Why? Because we are used to interpreting such a 4/4-meter notation in this special stylistic context as indicating (or, more correctly, implying) an accent-differentiation which is not relevant in this special case. The example thus seems to reveal a great deal both about the shortcomings of conventional bar-line notation and about our habits of reading.



Ex. 6a—b. F. Schubert: Symphony C major (D. 944). Last movement. a) original, b) renotation

In this connection, it should be borne in mind that alternations between different levels of pulse-grouping within one and the same composition or movement constitute an important creative tool in music from the latter half of the 18th century and from the 19th century, in particular within symphonic music from Viennese clas-

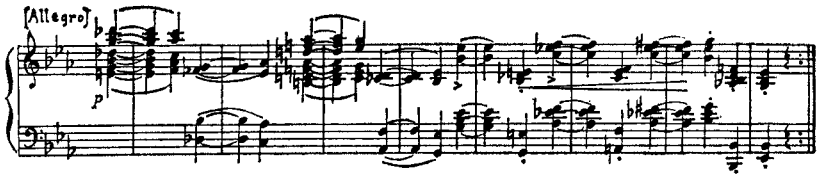
sicism to, say, Mahler and Sibelius. Such alternations between grouping-levels (which are clearly recognized in, for example, Sibelius by Ilmari Krohn and his Finnish pupils) are obviously affected by — and interpreted via — the distribution of melodic and harmonic events and corresponding phases of phenomenal movement. This confirms both the statement that the total rhythm is a product of the integration of the "elements", and the statement that this total rhythm does not correlate very well with the distribution of notation symbols into bars. The role played by these alternations in the development of the so-called "dynamic" form principles of 19th century symphonic music is an important and interesting question. The matter has been discussed now and then,[7] but has hardly led to the development of adequate methodological distinctions.[8] (It is naturally of the greatest importance also for performing artists — including orchestra conductors — to take this phenomenon into account.)

In the music of a romantic composer like Mendelssohn we ordinarily encounter a light-flowing, regular and even rhythm which is relatively low in tension$_{\varphi}$ combined with a restrained, almost classicistic harmonic idiom. Schumann, on the other hand, offers many striking examples of deviation from traditional patterns. (The latter patterns are at this point inherited and their role could by now be characterized — not merely metaphorically — by the expression "the law of least resistance".) The deviations in Schumann's music are very often simultaneously harmonic and rhythmic in nature. How intimately the two components can work together here perhaps can be better demonstrated with some examples than with attempts at verbal description. (Ex. 7 a—b.) The peculiar and impressive union of rhythmic and harmonic tension at the beginning of the Manfred Overture seems to present the new situation in a nutshell.

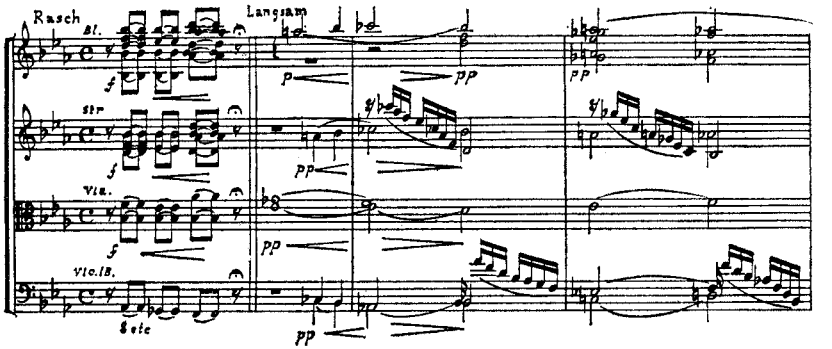
In spite of the fact that in many people's eyes the example may seem to have been worn out by use in many pedagogical contexts, I cannot refrain from drawing attention as a next step to the opening bars of the prelude to *Tristan und Isolde*. (Ex. 8 a.) Its tonal and harmonic characteristics are often described and easily perceived. Among the outstanding qualities of this thematic *Gestalt*, which has come to symbolize the "crisis" in the tonally centered harmony of the 19th

[7] For instance, by Lorenz, Schenker, Kurth and von Tobel.

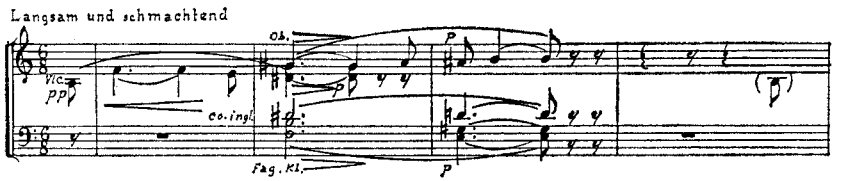
[8] Note, however, the contributions in Cooper & Meyer, op. cit.



Ex. 7a. R. Schumann: Faschingschwank aus Wien



Ex. 7b. R. Schumann: Manfred-Overture (beginning)



Ex. 8a. R. Wagner: Tristan und Isolde, Prelude

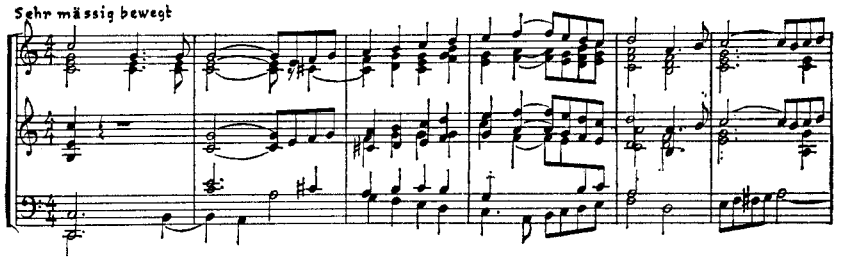
century, is a remarkable actual time span, which in this case is certainly a significant factor on the perception side. Some interpretations give values of over 20 seconds for the melody and about 5 seconds for the following rest, at least part of which belongs to the preceding theme. Compared with the values which experimental psychologists usually state as maxima for the "conscious present" or span of perceptual present-time, this value is surprisingly high. Even if we object, in this connection, that the concept of "conscious present" is not clearly defined, we are nevertheless faced with a phenomenal *Gestalt* of unusual length.

What holds it together, apparently, is the continuous dynamic changes and growth (*i. e.*, amplitude$_{\varphi}$, conditioning, among other things, loudness$_{\varphi}$ and part of intensity$_{\varphi}$) combined with the consistent use of a leading-tone motif which produces a strong tension$_{\varphi}$; the three presentations of this motif, furthermore, hook into one

another as parts of a closed progression curve. Its effect, however, emerges as early as in the first monodic phase and is affected even here by an (in the listener) ingrained tonal reference system and the expectations derived from it. The very first "up-beat" relation succeeds in stabilizing this tonal relationship by emphasizing that quality of the second tone f_1, which we usually describe as a suspension effect. The strong expressive quality in this tone (whose musically relevant qualities certainly are not very well symbolized by the notation) seems to be strongly affected by the difficulty of immediately constructing some definite rhythmic reference system. This difficulty in its turn is due both to the absolute length of the tone and to the fact that the relation between the durational values of the first two tones does not give sufficient support for any definitive hypothesis-formation about such a reference system. What is established in this respect seems mainly to be an experienced regularity in the events which occur "on the one-beats" (to use notation-language). This regularity$_\varphi$ — with infrequent supporting points because of the tempo — is the result of harmonic-melodic tension phenomena; the degree of their phenomenal intensity certainly permits us to experience accents, but hardly allows any rhythm$_\varphi$ of a motor type to develop. (To a certain extent, the subjective degree of this vague motoric rhythm$_\varphi$ can be measured by the extent to which we perceive that the established regularity goes onward to a moment of accent (and relaxation) at the rest on beat "one" in the fourth bar.)

I have discussed this example in some detail because it seems well-suited to illustrate the connection between the weakening and dissolution of the major/minor tonal reference system on one hand and of traditionally regular rhythmic-metric patterns on the other. Once again it can be maintained that what we can still describe only clumsily in harmonic *and* rhythmic terms seems to be a single phenomenon in which both these components continually affect one another. Wagner's "infinite melody" is not constructed solely on the basis of extended tonality with a great deal of chromaticism, many "false cadences", and so on; it constitutes the melodic aspect of a specific type of over-all texture with its own peculiar total rhythm. In order to bring this example and our reasoning into sharper relief we may cite still another well-known passage in which, instead, an energetically asserted, muscular, almost martial rhythm appears together with harmonic relations of a significantly more sturdy type. (Ex. 8 b.)

In 19th and also 20th century music numerous interesting and

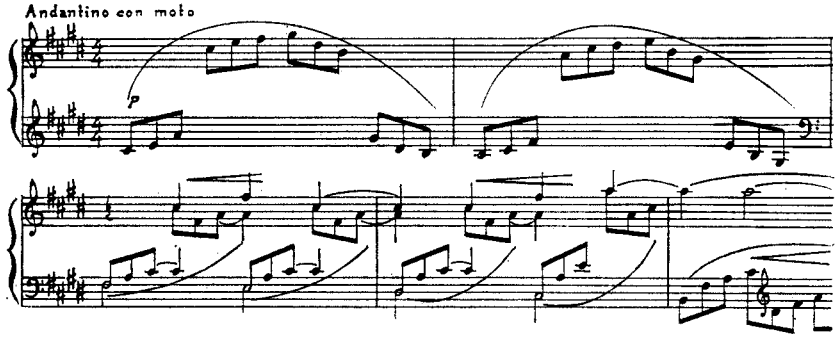


Ex. 8b. R. Wagner: Die Meistersänger, Prelude

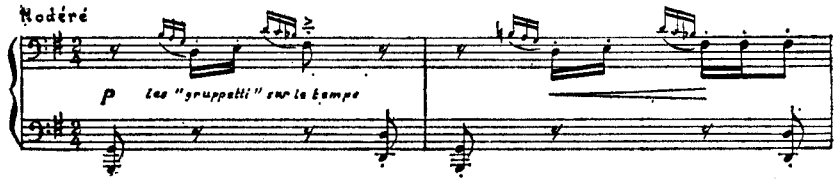
stylistically relevant deviations from this main tendency could be pointed out. Nothing could be more erroneous than to imagine that the phenomenon of covariation which we have been emphasizing is some sort of "natural law". Such a way of thinking would lead back again to a narrow dogmatism, according to which a number of outstanding creative solutions would have to be classified as anomalies. An interesting question to raise instead is to what extent one can talk about and locate, in the last 150 years, certain divergencies, that is, non-covariations, which result from the fact that tradition has functioned more strongly or more effectively in relation to one "element" than to another (that is, during a time when these "elements" were definitely part of the composers' conceptual equipment and habits of thought).

Much can be said for the argument that the tradition-bound rhythmic-metric schemes have, in many cases, been maintained parallel with a more and more unconventional treatment of dissonance and more and more marked trends toward "free" tonality. But here too it must be emphasized that the bar-lines are not always reliable and unambiguous symbols of the rhythmic-metric reference system used. New problems arise in the interpretation of the total rhythm when new harmonic relations are taken into consideration, since a new set of tone-combinations can certainly very well be imagined to imply in principle similar kinds of phenomenal accent and tension relations as those which were implied earlier by more strongly convention-bound (and perhaps simpler) harmonic means.

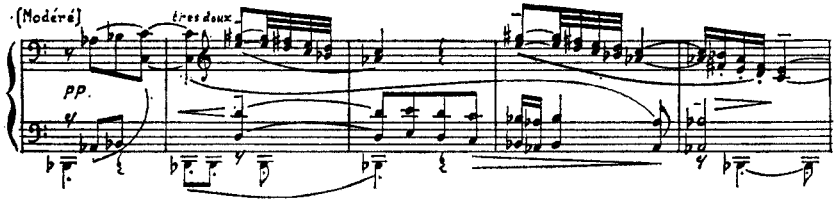
Questions as intricate as these cannot be dealt with further in this discussion, however, and strictly speaking we lack the methodological apparatus which would be required for such an investigation. In the remainder of this paper we shall merely carry forward up to our own time the main trends which have been sketched above.



Ex. 9a.



Ex. 9b.



Ex. 9c.

C. Debussy: Arabesque no. 1 (ex. 9a); "Minstrels" from Préludes I (ex. 9b); "Voiles" from Préludes I (ex. 9c)

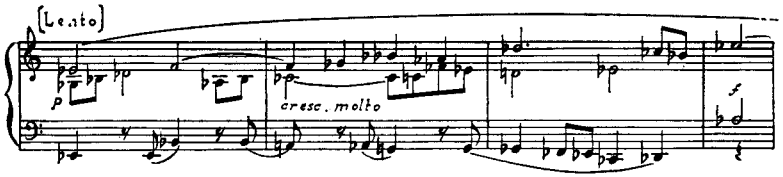
In the history of tonality Debussy obviously occupies a key position; this fact seems to become more and more clearly established as our historical perspective on his contributions grows. It is well known that in many of his works one finds the traditional centering of tonality weakened or even almost eliminated and also finds examples of marked weakening of motor-conditioned pulse-grouping. Both these facts, however, are expressed as negations; a description in positive terms of the extraordinarily consistent and fastidious principles of selection which guided Debussy in each separate work would certainly be more relevant. Within the framework of a description of that sort the phenomenon of covariation between harmony and rhythm would probably become highly relevant again, as the brief examples appended here can perhaps intimate. (Ex. 9 a—c.)

During the time between the world wars and during the last fifteen years, we have been faced with such a kaleidoscopic assortment of stylistic tendencies, whether prompted by schools, determined by fads, or of an individual nature, that a survey of the leading trends and decisive changes would be extremely difficult and cannot even be tentatively suggested here. But what can definitely be stated about the present situation is that a great many of the conventions which held sway during the 19th century have been nullified in a number of significant works by significant composers. Secondly, we can state that in many cases these changes hold true for what, in accordance with conventional terminology, we call "melodic" as well as "harmonic" and "rhythmic" relations; nevertheless these changes do not always seem to have taken place in a similar degree in these three areas. This latter assumption holds true with reference to the scores of a great many contemporary composers.

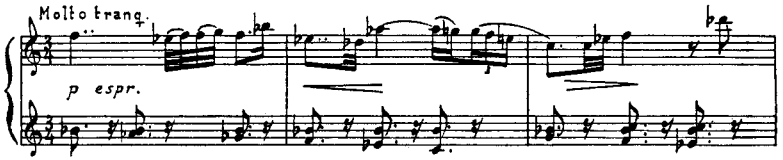
But here there is a trap, perhaps not only for the musicologist but also for the composer. There is no rule that prescribes that the traditional notation system must always and consistently be suitable for all new stylistic purposes. For practical reasons, the very use of this system, even when it has become inadequate in several respects (for instance, for recording dodecaphony on a five-line stave, the properties of which are defined by a basic diatonic scale, and with he help of accidentals also derived from a diatonic system), can lead to both real and apparent errors which are often difficult to detect. It goes without saying that the traditional notation may still function effectively enough as a conventional signal system for the performers' actions, their movements on keyboards, and so on, even if shortcomings can be pointed out in that connection too (for example, with regard to the relationship between written accidentals and actual intonation).

It is perhaps important, moreover, to state specifically that the evoking of motor-conditioned rhythm$_\varphi$ of course does not necessarily imply certain specific kinds of tonal relations. No matter how the tonal relations may be constituted, there always remains the possibility of creating satisfactory stimuli for such types of rhythm$_\varphi$ through suitable organizations of the sound events with respect to metric, dynamic, "articulatory" and other relations. This, however, does not mean to say that the kinds of total rhythm which have thus arisen are identical with those that existed previously.

Concerning the 20th century I shall merely mention some typical cases, mainly by raising certain questions about them, which should under any circumstances be included in a more detailed investigation.



Ex. 10a.



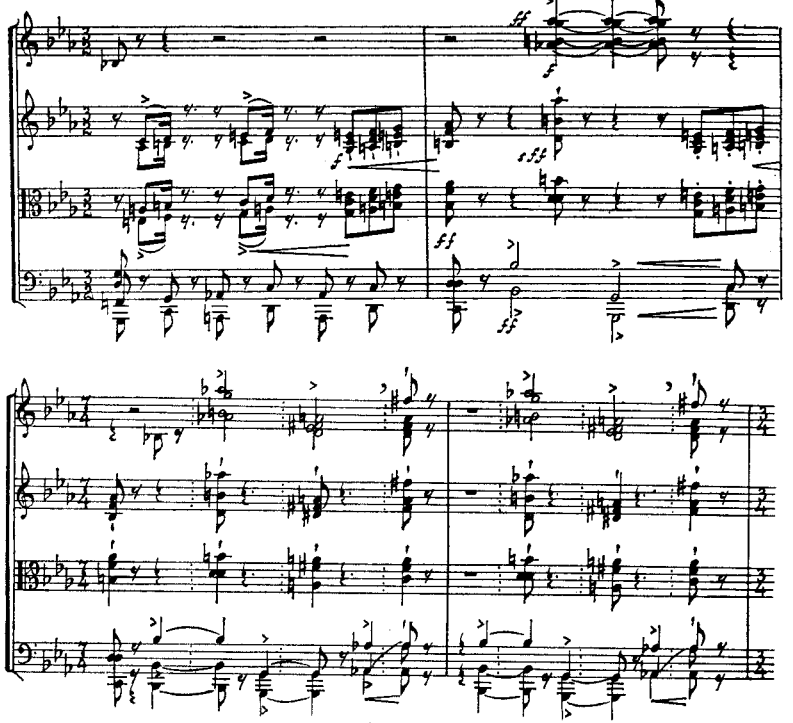
Ex. 10b.

Paul Hindemith: Ludus Tonalis, Fuga Prima in C (ex. 10a); Interludium [No. 9] (ex. 10b)

In Hindemith's work, the publication of his pedagogical treatise "Unterweisung im Tonsatz" (1937/39) marks somewhat of a dividing-line (in the latter half of the 1930s) around and after which his own artistic consideration for the well-planned "Gefälle" and "Stufengang" according to "Reihe I" and "Reihe II" produces increased stylistic consistency — with the accompanying limitations. It seems fairly obvious that these trends converge with a rather pronounced retention of regular rhythmic-metric or total rhythm patterns which quite clearly have their roots in central European (in particular German-Austrian) 19th century traditions, and are often distinguished by a vital or heavy motoric character. (Ex. 10 a—b.)

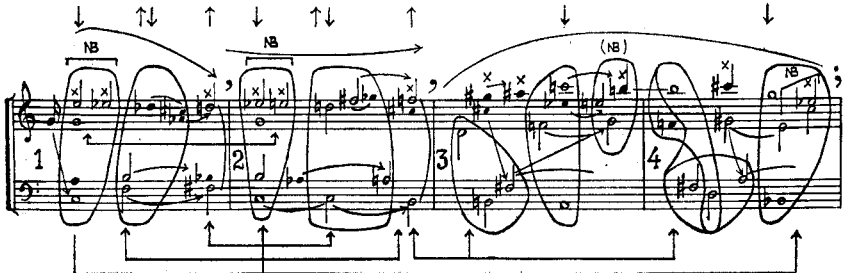
In the works of composers approximately contemporary with Hindemith, such as Stravinsky and Bartók, completely different rhythmic and tonal conditions prevail, and even this simple statement seems to suggest that using the concept of covariation can still be fruitful. About Stravinsky, for example, we can ask whether it would not be possible to find unequivocal relationships between his highly personal rhythmic-metric "mosaic technique" and his equally personal types of tonality, which seem mainly to be constructed on a "pan-diatonic" basis in many of his works. (Ex. 11.)

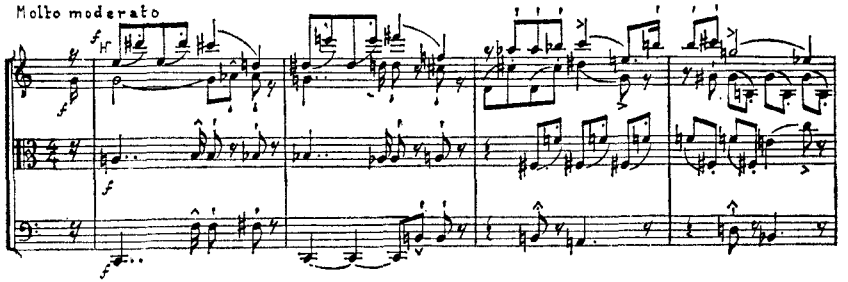
To what extent can the description of the combinations of "hyper-romantic" heritage in gesture and expression, "classicistic" tendencies in the use of meter and of over-all form types, and the adoption of a consistent twelve-tone technique in Schoenberg be improved if we allow the concept of total rhythm to direct our line of investigation? Unfortunately, many authors have too often been content, when analyzing dodecaphonic works, merely to ascertain how the twelve-tone rows have been used, as if this single aspect were



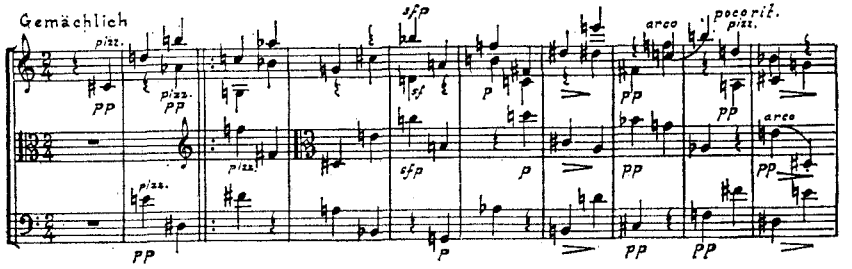
Ex. 11. I. Stravinsky: Concerto E flat, 3rd movement

structurally and esthetically decisive. In Schoenberg's work, however, the factors which are not pre-determined (and they are clearly in the majority) should reveal a great deal more about his style and technique. If we consider, for instance, the beginning of the last movement of his third string quartet (Ex. 12), these other factors are strongly in the foreground and can very well be studied independently of whether the twelve-tone technique is used or not. In this example, a marked motor quality is established by patently traditional means: not only through the distribution of different kinds of movement and the details of articulations, but also through the occurrence of repetition (t_n 1—2), the regularity of grouping (t_n 1—2, 3—4) *and* specific tonal relations, which are tentatively suggested in the accompanying figure.

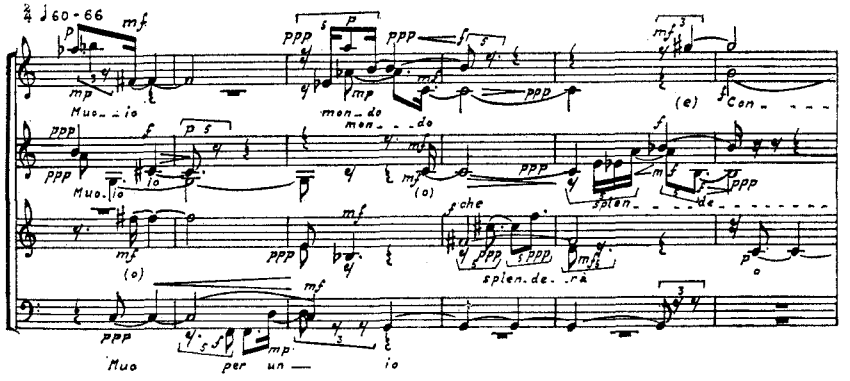




Ex. 12. A. Schoenberg: String Quartet no. III, op. 30, 4th movement



Ex. 13, A. Webern: String Quartet op. 28, 2nd movement



Ex. 14. L. Nono: Il canto sospeso, 2nd movement

About some of Webern's works we may ask the question: to what extent is the surprising metric regularity only so to say an artifact of the notation system, in so far as the notation certainly indicates a particular case of "meter$_\varphi$" (or just regularity$_\varphi$?) but perhaps makes insight into the perceptively relevant rhythm$_\varphi$-structures more difficult? (Ex. 13.)

The composers who experimented during the 1950s with so-called serial music, that is to say, with techniques based on the serial ordering of several physical variables, believed that they had achieved a perfect "integration" of the different elements or parameters and thereby obtained guarantees of "complete structuring".

Undoubtedly, they achieved something which, within the framework of mathematical calculation and on music-paper, could be described as an example of a conscious striving for covariation; concerning the existence of any similar integration on the perception side, however, both the composers' theoretical writings and their compositions often leave us in ignorance. In that respect, the technique however can have guaranteed that certain classes of conventional structures and associations do *not* affect or occur to the listeners. And such negative esthetic goals have certainly often motivated technical calculations of this kind. (Ex. 14.)[9]

That, finally, electronic music — or electrophony — permits the utilization of completely new sounds and new temporal relationships, even if they are not actually "unlimited" in number, is a fact which at the moment does not seem to lead anywhere other than to the commonplace conclusion that new examples of covariation are both possible and probable. I shall refrain from taking a position on the question of whether such examples can be considered to exist already.

In summary, the following points should be emphasized. The current terminology and descriptive systems of music theory need to be given serious reconsideration at several points. This will probably have to take the form of liberation from traditional handicraft doctrines and of getting a closer link with — or at least active impulses from — methods developed within the theory of science and in psychology. This is particularly the case in the handling of conceptual distinctions and definitions. It seems to be at this point that most remains to be done. Many kinds of illustrations of the lack of clarity and the shortcomings which are still inherent in so-called music theory could be selected. Here we have chosen to suggest how, among other things, the conventional separation of melody, rhythm and harmony has perhaps hindered the development of a synthetic yet unbiassed way of thinking about structural relationships in music, particularly with respect to what we call tonality. It seems impossible to describe tonality effectively — even in its most unequivocal and stable manifestations within multipart music — exclusively in "harmonic" or "melodic and harmonic" terms, that is, without referring directly also to what, in accordance with the present trichotomy, we

[9] Compare in this connection K.-H. Stockhausens concepts *Dauerоktave*, *Formantrhythmen*, and so on, presented in Die Reihe 3 (1957) and used, for example, in his composition "Kontakte".

call rhythm. It may be that a satisfactory description of this kind will not be possible until the conceptual system has been developed to the point at which it permits both distinct differentiation between physical, notational, perceptual and other aspects, and a comprehensive exposition of the structures of musical processes in accordance with corresponding, descriptive systems.