

# General Principles of Harmony

by Alan Belkin

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## Presentation

The following is the table of contents of my book: General Principles of Harmony. Its aim is to discuss some general principles of harmony in concise, practical terms, and to provide guidance for student composers. This will not be a "theory" text, nor an analysis treatise, but rather a guide to some of the basic tools of the trade.

This book is the last in a series. The others are: Form, Counterpoint, and Orchestration.

This series is dedicated to the memory of my teacher and friend Marvin Duchow, one of the rare true scholars, a musician of immense depth and sensitivity, and a man of unsurpassed kindness and generosity.

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# General Principles of Harmony

## Why this book

Of all musical disciplines, harmony is probably the most written about. Textbooks abound, from the summary to the encyclopedic. Why add to the existing plethora of resources? While we will survey some of this material below, one thing is lacking in all of them: None convincingly connects traditional harmony to contemporary practice. Although some of these books contain a chapter or two about more recent techniques, these are usually described in summary or superficial ways, and few or no connections are made with older practice.

Harmonic relationships can be divided into three categories: those which are immediately audible; those which become audible through attentive listening, and those which can never be heard, given the limitations of the human ear and memory. In this book we will explore the first two types, and systematically exclude the third. It cannot be sufficiently emphasized that not all harmonic relationships are equally important: Their location in the piece, and, especially, their relative salience must be considered in the light of the limits of human perception in order to judge their importance

As in the other books in this series, our approach here will be to focus on principles rather than on styles. We contend that there are common principles in operation across various harmonic styles, and that understanding these principles - which arise more from how we hear than from stylistic conventions - can help the composer of today to find a personal harmonic language which makes audible sense.

Finally, we make no pretense here of explaining all harmonic languages. Our goal is more modest: we wish to outline some powerful concepts which are relevant to both classical and more recent harmony.

## Discussion of other approaches

Before starting our search for such general principles of harmony, let us list and briefly comment on the most common traditional pedagogical methods.

- Stylistic approaches: Such methods make no claim to universality, but simply aim to define "normal" harmonic practice within a given period. The best example of this approach is Walter Piston's well known textbook. By definition, such methods remain within relatively narrow stylistic confines, and make no attempt to generalize the principles therein. However, while not all principles of classical harmony are applicable outside the common practice period, the contrary notion - all harmonic thinking can be reduced to stylistic convention - leads to an absurdity: Can recent composers really have discovered entirely new ways of hearing? (I say "discovered" because they can hardly have invented new neurological structures and functions.) The

human brain's highly evolved capacities for making sense of auditory experience have surely not changed over the past few centuries.

- Another, related method, consists of intensive drill with harmonic formulas. Based on the notion that harmony, like language, uses many idioms, the goal here is to learn as many of them as possible, often by rote. While this approach does have some value in learning classical tonal harmony, the formulas learned are not generalizable outside of the source repertoire.
- Piston's method and the formula both use Rameau's theory of chord roots and inversions. The problem with this theory is that the root of an inverted chord is a theoretical concept, and not a directly audible one. While there is some truth to the notion that all inversions of a given chord can be heard as part of the same "family", there are important exceptions, as we shall see below. Worse, obvious audible facts, like the actual, heard bass line, the spacing chosen for a given chord, and its linear context, tend to be minimized by this approach.
- Approaches based on the insights of Heinrich Schenker have the advantage that they are more directly based on hearing. Schenkerian "foreground" relationships are especially useful in understanding many harmonic situations. In particular, the notions that not all chords are of equal structural importance, and that harmonic meaning changes according to linear context, are critical insights. While the Schenkerian approach was originally intended for tonal music, certain notions of harmonic elaboration can be easily applied in other contexts as well, and we shall do so, below. Less convincing are some of the more far-flung conclusions of Schenkerian analysis: As the connections posited become more abstract and far flung, they become simply inaudible, in any normal mode of listening.
- The traditional French conservatory method of teaching harmony, using mainly given basses with elaborate figures, is an outcome of continuo practice. However whereas the latter used figures as a shortcut, the pedagogical extensions of this method are extremely cumbersome, with the result that the student spends a great deal of time and effort becoming familiar with an elaborate and, finally, fairly useless numeric code. This code supplies very little insight into the way harmony and form interact, and thus provides no help in teaching the student to think harmonically for himself, or to transfer what he knows outside of the realm of tonal music.
- Schoenberg's writings on harmony deserve special mention here. As in all his theoretical writings, Schoenberg has many provocative ideas, and his teaching is based on a profound knowledge of the repertoire. A few of his ideas have influenced our approach here - notably his notion of the structural role of harmony. The main drawbacks of Schoenberg's writings are: his philosophy of historical necessity, his sometimes obscure formulations (e.g. his pseudo-Darwinian distinction between weak, strong, and super-strong progressions), and his frequent aesthetic diatribes, which today are simply very dated.
- Alan Forte's set theory, like Schenkerian theory, was originally formulated with a specific repertoire in mind, in this case non-serial, so-called "atonal" music. Also like Schenkerian theory, when carried beyond basics, it leaves the ordinary listener's capacities far behind. But within limits, it can be a useful way of creating and recognizing families of pitches (again, see below), which can help the composer give coherence to his harmonic language. Forte's main weakness is the almost complete absence of any discussion of (or even, it would seem, any interest in) what is or is not audible. For example, hearing the presence of a given three note harmonic cell through a short passage is a very different matter from hearing an eight note set through a long piece.

- Probably the best teaching work for traditional harmony is Roger Sessions' *Harmonic Practice*. Written by a composer, it explains things in psychological terms more than in terms of convention. For example, Sessions' notion of harmonic "accent" will be very useful here. Also, his exercises are the most varied and challenging for a young composer. The limits of his book are: he does not discuss the important differences between vocal and instrumental harmony, and his discussion of contemporary practice is very summary.
- Finally, Persichetti's *"Twentieth Century Harmony"* is an excellent compendium of many twentieth century techniques. Written by an eminent composer/teacher, it is practical in its approach and down to earth in its explanations. However, it does not contain much in the way of general principles which are also applicable to classical harmony, and it contains little reference to long range harmonic organization - that is, to musical form.

To summarize, what is missing in all these methods are links between tonal and other approaches. And yet such links abound. For example, while some of the specific methods of creating direction and coherence in tonal harmony cannot be transferred intact to other harmonic styles, often the principles underlying these specific solutions can be generalized. For example, as we shall see below, the principles of voice-leading are strongly grounded in the way human hearing works, and therefore, appropriately formulated, remain relevant to any harmonic style.

A final inadequacy of most current approaches to harmony is that they often ignore the interaction of harmony, counterpoint, orchestration and form. However, these categories are mere pedagogical conveniences, and not realistic descriptions of the way the musical ear breaks down information. For example, voice leading cannot be separated from counterpoint, and detailed examination of the way a chord is spaced quickly leads to questions of orchestration. For this reason, in our discussions of musical examples, often we will need to refer to several different aspects of the music in order to adequately explain what is happening. (This also underlines the importance of these examples, since they show the interconnection between various notions in ways that may not always be evident in the text.)

### **Limits of our discussion**

- This book is not a harmony textbook. Both the specifics of classical tonal harmony and of many twentieth century techniques are well treated elsewhere; there is no need to cover the same ground here. What is needed is more general, unifying principles. To the extent that we will be using traditional principles in broader contexts, we shall assume that reader is already familiar with their conventional applications. Where principles are not familiar, we will explain them in more detail. To get the most out of this discussion, the reader should have a solid grounding in tonal harmony, and should also be familiar with the material in Persichetti's *"Twentieth Century Harmony"*. (N.B.: Where a twentieth century technique is well covered in Persichetti, we will not supply examples of it unless we have some extra insight to add.) Knowledge of the elementary notions of Forte's set theory (in particular: "interval class", "set", "normal form", and "interval vector") will also be useful.
- This book is not a comprehensive method of analysis. The goals of analysis are systematic in a way ours are not here; therefore an analytical method would require a very different approach. As in the other books in this series, our aim here is practical: We are simply trying to propose some basic principles about how (harmonic) hearing

works, especially those which cross stylistic boundaries, and which can therefore be useful to composers today. This is especially important given that in the recent past, systems like total serialism and aleatoric music, where the methods used to produce the music have no demonstrable relation to what any normal human can reasonably decipher by ear, were actually taken seriously. (Indeed, in some academic quarters, the preceding sentence is still "politically incorrect".) Unfortunately, anyone who spends most of their effort during composition on what cannot be heard, risks not using audible resources to the full, and consequently producing a work whose effect on the listener can only be tepid at best. While a composer may perhaps explore such systems to break out of stale habits, if the results are not at some point severely filtered through a realistic knowledge of what can be expected from a normal listener, how can the music communicate significantly?

- One final caveat: in this work we will limit our discussion to the tempered scale only. This is not to deny the interest or the musical potential of non-tempered and micro-tonal systems. Quite possibly, some of the principles mentioned here also apply to non-tempered harmony, but a thorough discussion of such harmony would require expertise I do not possess. In addition, the tempered scale is so ingrained in our notation, performance practice, and instrumental construction, that serious attempts to work outside it require groundwork in these areas which goes far beyond the scope of this book. Similarly we will not address harmony which makes significant use of portamento effects.

## **A new approach to understanding harmony**

Since mankind's evolutionary capacities and limitations for hearing and understanding relationships between tones have clearly not changed in a very long time, it follows that there must be connections in the way we hear "old" and "new" music. Recent works by Bergman (Auditory Scene Analysis), Deutsch (Ear and Brain), and Snyder (Music and Memory), shed significant, new light on these basic auditory/cognitive systems. Combined with what musicians already know and intuit about how music works, they provide a useful starting point for a more general understanding of harmony and other musical disciplines.

The main theories which will prove useful to us are those which refer to the most easily heard phenomena. (Incidentally, the aspects of cognition we take for granted are often the most complex.) The disdain with which "salience" is referred to in some current (music) theoretical literature is entirely at odds with the practical needs of the composer.

For example, some of the assumptions behind current ideas of pitch structure need to be reexamined. Recent psycho-acoustical research, as well as practical experience, lead to the conclusion that some of these notions are conventions with only limited usefulness, focussing on connections that are often quite obscure to the ear. Worse, they often do not explain what is actually heard, by even the most trained and attentive listener, and can thus lead the analyst or the aspiring composer to ignore factors much more relevant to the sonic result.

We may draw a parallel here to the exaggerated attention to chord roots which characterized harmonic theory before Schenker's ideas became widely known. Schenker's thinking engendered a corrective attention to the fact that in most situations the sounding bass line has more effect on the sense of harmonic direction than any theoretical root. Here a widely accepted theory (that of chord roots and inversions) often led to ignoring or undervaluing direct musical experience.

Similarly, the vast literature about pitch class sets and series often veers into the musical equivalent of numerology. Overemphasis on the importance of subtle intervallic relationships, especially over long stretches of time, where their aural perception is often impossible, easily leads to inadequate emphasis on relationships that are audible even to the uninitiated, and consequent misjudgment of the work's effect. Salient events are always the best pillars supporting musical architecture.

An example of a common basic assumption that needs to be mitigated is that of octave equivalence. While in the middle register C3 and C4 are clearly in some sense equivalent, comparing C1 and C7 is quite another matter. In the extreme registers, pitch discrimination is very inexact and dependant on many factors, including orchestration, duration, etc.

N.B.: unless otherwise indicated, all the musical examples are for piano solo.



*The two chords in this example include the same four pitch classes. However, in terms of perception, what does it mean to speak of them as being "identical"? The exact pitches in the first chord are quite difficult to distinguish due to their extreme register, and their short duration makes this harder still. Most important, the differences in register and spacing between the two chords have the effect of thrusting the common pitches into the perceptual background. Even if we concede that, played one right after the other, careful listening might recognize these common pitches, what if the chords are separated by several bars of other music? In this case the similarity between the two chords is a surely at best a refinement, compared to their surface contrast. Except in the case where the two are placed side by side for comparison or otherwise "pointed out" to the listener, the pitch similarity between them is thus relatively unimportant. Note that to make the listener's job easier I have used the same pitch classes. Imagine if I had also transposed the chords (at an interval other than the octave), requiring the listener to compare intervals rather than just pitch classes.*



*In this example, the first chord is the same as the second one from the previous example. The second chord here contains two new pitches, and different intervals as well. And yet the two chords seem much more similar than the pair in the previous example, because they are in the same register, share two common tones, and each contains a sharp dissonance in the middle, with richer intervals surrounding it.*

These examples raise two critical issues: how can a composer make pitch identity relationships clear to the listener, and when should other types of relationship (as in the second example) be considered more important? These questions are largely ignored in the literature, despite their vital importance for understanding musical form - which, after all, works mainly through association and memory, both of which strongly depend on surface salience. A good deal of our discussion here will therefore focus on the ways composers can create and differentiate realistically audible harmonic relationships, to fulfill various formal functions.



# Basics

## A definition of harmony

An exploration of harmony should encompass the following elements:

- Examination of the salient characteristics of chords.
- Discussion of how chords are connected.
- Discussion of the formal need for harmonic contrasts, and of how gradations of such contrasts can be accomplished.
- A realistic discussion of long range tonal relationships. Here we do not refer just to so-called "tonal" music, but also to all far flung relationships between tones.

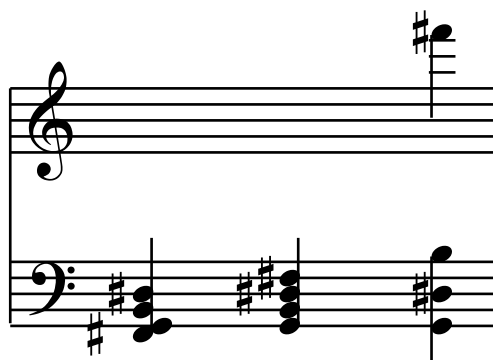
## Intervals

Chords are traditionally considered the basic units of harmony. We need to say a few words about them to start.

First, whatever the harmonic style, each interval has a distinct acoustic character. These differences are an important basis for harmonic character: for example, a chord built in 5ths will always sound more open and clear than a cluster of minor 2nds. In any style, the traditional classification of intervals into sharp dissonances, mild dissonances, rich consonances, and open consonances remains valid, simply because it is audible.

Second, assuming unity of timbre, i.e. one plane of tone, when several intervals are combined into a chord, multiple intervallic relations are formed, of which some are more important than others. Here are some guidelines for how the ear prioritizes interval perception:

- The farther apart the notes of a given interval are in a chord, and the more other notes between them, the less the character of that interval imposes itself.



*Note how the "crunch" between the G and the F# becomes progressively less important as the two notes get farther apart.*

- If an interval is present more than once, placing instances of it adjacent to one another in the chord will emphasize the character of that interval.



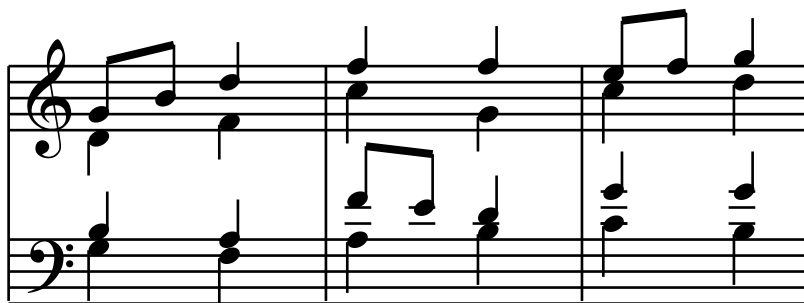
*Although both chords contain two perfect 4ths and a minor 3rd, the quartal character is more obvious in the first example.*

- The more different intervals there are, especially in adjacent positions, the more complex the intervallic character of the chord, since the various intervals compete for the listener's attention. (Too much intervallic variety is the cause of the harmonic grayness common in badly written serial music.)
- Finally, as Persichetti points out, multiple minor seconds within one chord have a "clotting" effect: They tend to obscure the sense of direction, since there are multiple harsh dissonances competing for the listener's attention.

## Chords

Harmony is traditionally defined as the study of chords, where a chord is a group of notes perceived as a unit, either due to simultaneous attack, or arpeggiation. This definition needs some elaboration if it is to be generalized.

In unfamiliar styles the only way the listener can distinguish chord tones from non-harmonic tones is if straightforward harmonic norms are established very clearly, early in the piece. This requires limiting the harmonic world, in some clearly audible way. All other things being equal, the more complex the basic harmony, the harder it is to sense non-chord tones. While there is no absolute reason for requiring non-harmonic tones, they allow for more subtle gradation and variety of harmonic effect, and allow the composer to follow his melodic impulses more easily.



*In classical homophonic textures such as this one, there are three possible situations involving notes not attacked simultaneously: arpeggiation, non-harmonic tones which*

*suggest sub-metrical harmonies (most often 7th chords), and non-harmonic tones which are extraneous to any chord in the classical vocabulary. The above example illustrates each of these three cases. What is notable here is the varying degrees of "distance" from the underlying chord vocabulary made possible by these three options.*



*In this example, we see something analogous: The clear quartal character of the whole renders the Gb definitely a non-harmonic tone, while the Bb sounds like an arpeggiation, creating less tension.*



*In this final example, the same two notes (in the same melodic line) are roughly equal in tension, since there is no simple harmonic norm in evidence. There is no distinction here between tones which define chords and those which don't. While not an insurmountable problem, this makes for a certain heaviness of harmonic effect.*

Another problem in defining what constitutes a chord occurs in stratified harmony, where various degrees of orchestral blend influence perceptual fusion. We will return to this point later.

## **Progressions**

Progression implies a series of harmonic changes, in the same plane of tone, and presumes a clear sense of which groups of notes are chords (see above). Progression is an important notion, because on it depend such critical aspects of musical movement as harmonic rhythm, and certain gradations of harmonic contrast. Psychologically, progression is a function of the amount of information (novelty) the listener faces with each event, and how successive events are related.

However, outside of familiar triadic contexts, progression is not always simple to define. However, we can point to two aspects of classical progressions which will help us to generalize the concept: gradation and direction.

By gradation we mean the degree of perceived change. If we compare the following two examples, it is clear that the first communicates a more vigorous sense of harmonic movement than the second



*There are more successive harmonic contrasts in the first example than in the second. In both examples, the rhythmic grouping suggests three chords. In the first, none of the adjacent chords contains a common tone in the same octave. Further, as indicated by the lines connecting non-adjacent notes, there is stepwise voice leading between the chords. The lack of common tones in the same register, and the multiple conjunct inner lines create a vigorous sense of harmonic action.*

*By contrast, in the second example, the multiple outer and inner voice common tones make the changes (again indicated by the straight lines) less prominent. The point here is the clear difference between the two examples. This kind of gradation of harmonic effect is very important to avoiding harmonic monotony.*

As for direction, this requires enough harmonic events for the listener to develop expectations about subsequent events. For example, a rising bass line suggests continuation in the same direction. Of course, the composer may not necessarily fulfill the expectation evoked, but it does become part of the music's perceived structure.

Here is a discussion of a more complex situation.

The image shows a musical score for four instruments: strings, clarinets, bassoons, and horn. The score is written in treble and bass clefs. The first chord is introduced by the strings, then the bassoons and clarinets. The horn then adds a melodic fragment. The second chord is introduced by the strings, then the bassoons and clarinets. The horn then adds a melodic fragment. The third chord is introduced by the strings, then the bassoons and clarinets. The horn then adds a melodic fragment.

*The first chord here appears in stages: first in the strings, followed by the bassoons and the clarinets: Each timbre adds new notes, until all are sustained together. The horn then adds a melodic fragment, which finishes on the same note as the top of the bassoon chord, thus creating a (partial) sense of resolution. However, the overall sense here is not so much one of progression but rather of gradually filling out a harmonic mass.*

*After the rest, there is a clearer sense of progression, both because each chord introduces completely different notes from the preceding one, and also because the chromatic rising bass has a simple, rising direction. Once again, the important thing here is the use of various degrees of harmonic change (progression) to vary the sense of musical movement.*

## Principles of coherence and continuity

Most discussions of harmonic coherence in the common practice period center on tonality. Outside this period, explanations emphasize relationships of chordal identity or similarity. This is a significant - and usually unnoticed - distinction. Tonality helps create musical motion, since it defines goals. A tonal progression cannot be scrambled and maintain its integrity. In the absence of tonality, analysis based only on relationships of identity or of similarity overemphasizes the "what", as opposed to the "when". Pointing out pitch cells or algorithms which give rise to all the pitch material in a work can never adequately explain why a work's harmonic construction is convincing, since music is a temporal art: The sequence of events is essential to its meaning. Even in music without a clear tonic, context radically changes musical meaning. A chord at the climax of a phrase is not equivalent to the same chord at the start of another phrase, since much of its meaning derives from how it is approached and left.

The image shows a musical score for two staves. The top staff has a chord marked with an 'X' and a slur. The bottom staff has a chord marked with an 'X' and a slur. The score shows a sequence of chords and a melodic line.

*Here the chord marked "x" is identical in both examples. However, in the first example it is clearly a subsidiary, passing chord: It is rhythmically weak, introduces no new pitches, and helps to fill in the space between the chords under the slur. The real accent here is on the last chord, which no longer stays in the D major scale, and has a richer interval (a 6th) on the bottom.*

*In the second example, the same chord is now the climax of the phrase. Not only is it rhythmically accented and longer in duration, but it culminates a progression of rising harmonic tension. The preceding chords alternate between gentler sonorities, without semitone dissonances, and harsher ones, each containing one such dissonance. The last chord contains two semitone relationships, making it, in this context, a stronger accent.*

A more useful way to think about harmonic coherence is as one aspect of a leading thread for the listener to follow as the piece progresses. This formulation encompasses both music based on classical tonal relationships, and music without them. It also links the notions of coherence and flow, which, in a temporal art, are profoundly connected. The deeper question becomes: How does the harmony engage the listener in the music's flow in compelling ways? Harmonic coherence, seen in this way, has several aspects, which we will explore below.

## **Pitch and interval limitations**

An important aspect of harmonic coherence is limiting the work's pitch content. Establishing such harmonic limits, which engender norms, makes it easier to create harmonic expectations, which direct and intensify the listener's experience of musical time.

Such harmonic norms generally involve creating "families" of chords. A family is any group of chords with clearly audible resemblances. To carry the analogy farther, a family can include many members, who share some obvious characteristics, but who are also more or less individual. Thus, this notion has the advantage of allowing for many degrees of relationship.

To give only a few examples, families could be organized by:

- basing the music on scales or modes.
  - Common tones, especially in the same octave: This generates the simplest kind of audible coherence. It corresponds to the classical pedal point.

*In this example, the 1st clarinet tremolo, E-G#, acts like a classical pedal point, providing clear registral, rhythmic, and harmonic unity. However the outer parts also contribute to coherence. The flute part starts the first two phrases with the same three notes, and the final cadence note, A#, sounds like a lower neighbor to the B which starts each flute phrase. Similarly, the highest note in the first bar, A#, leads stepwise to the highest note in the second bar, C. The 2nd clarinet part is homorhythmic with and has similar voice leading to the flute part: the D# in the first bar leads to the D natural in the second; the C is a common tone, the E of the first bar is "ornamented" by the F# in the second, and the A# and the C in the last bar seem to rise out of the previous A#.*

*The last bar sounds cadential because of the less animated rhythm, the on-the-beat accent, and the softer harmony, which avoids semitone conflicts.*

*While the common tones certainly help to hold the phrase together, we can see that these various other relationships - in rhythm, voice leading, and interval tension - also help the listener to make sense of the whole. Identity relationships are thus only one aspect of a more complex coherence.*

- Allowing octave related pitches: In themselves, octave relations are not especially useful for creating harmonic coherence, probably because they are so common. However, allowing them makes possible interval and chord inversions. Since every interval has some similarity of character with its inversion, this allows for more spacious handling of the texture, while excluding drastic changes of harmonic character.
- Intervallic harmony: Transposed intervals are much less easily identified than simple common tones: The common element is a relationship. However, limiting the intervals used in a given passage to one interval plus its inversion nonetheless can define a clear, audible, character. Similarly, limiting a passage or a piece to material derived from small unordered cells ("unordered sets" in the literature) can also create fairly strong character. (Note that the larger the cell, the more intervals it contains, and therefore the less distinctive it becomes. If the total number of intervals involved is more than three or four, the cell will usually contain all the chromatic intervals, since, being unordered, non-adjacent intervals must be counted as well. This is where Forte's

notion of "interval vector", i.e. the total number of times a given interval appears within a given set as a whole, is useful. Sets with very uneven distributions of intervals tend to have clearer characters.) These techniques can be applied quite rigorously for short passages, or more flexibly over larger stretches (see below for examples and more discussion about this important distinction). Flexible applications usually involve either melodic movements which create other intervals as secondary "non-harmonic tones", or vertical stacking, which necessarily results in richer chords. Since stacks of any one interval almost always produce additional, new intervals between non-adjacent notes, this technique allows for harmonic "shading" - moving between sonorities which are highly saturated with the main interval to others where its effect is less prominent.



*In this example, the first chord is a simple quartal sonority. The outer notes, however, form a 3rd. Thus it is easy to move from the first chord to the second one, which is triadic, via the smooth stepwise movement from the A to the G. The second chord could subsequently either return to the first, acting like a neighbor chord in a generally quartal passage, or else lead into a passage of tertian harmony.*

- Since intervals have distinct tension characteristics, using chords with common tension configurations (e.g. one harsh dissonance plus one rich consonance) can unify a passage. Likewise, progressions of tension, e.g. from rich consonance to sharp dissonance, are easily followed by the



listener.

**Adagio**  
*muted violons, divisi*

pp cresc. mf dim. pp

*This example illustrates a gradual progression from gentle, open intervals to an intense climax on a major 7th (m. 6), and then back. The dynamics and registral evolution reinforce this progression.*

*Note that the progression is not simplistically linear: Overly obvious progressions tend to be boring. The best strategy is for the overall direction to be well defined, while the details remain somewhat unpredictable: The general direction of the progression allows the listener to develop expectations, but the inability to predict the exact next note maintains interest.*

### **Linear aspects: melody and bass lines; voice leading**

We have pointed out above how pitch and intervals limitations help define and unify harmonic character.

Two other traditional concepts contribute significantly to harmonic coherence: leading lines, and voice leading.

Even in contrapuntal textures, all parts are never equally important simultaneously: Interest migrates from one part to another. In simpler, homophonic textures, normally outer parts are easier to follow than inner parts. Thus, clear linear progressions in the outer parts can clarify the music's sense of direction. For example, a melodic line which gradually attains higher and higher local peaks, leading to a sectional climax, helps give coherent shape to a musical paragraph. In the same way, the combination of stepwise motion in the bass with occasional angular passages - often at cadences - clarifies harmonic direction.

Voice leading also remains a very audible force, both for harmonic continuity and for articulation. The basic principles of voice leading arise from two fundamental facts (for

experimental documentation, see Albert Bergman's Auditory Scene Analysis) : the tendency of the ear to separate musical strands by register, and the fact that voices (and most instruments) are most at ease moving by fairly small intervals. Since these are facts about human hearing, they go beyond specific styles. Constantly leaping lines are very demanding to follow and to sing. By contrast, registral continuity, as expressed by common tones, conjunct movement, and higher level stepwise outlines, is easier to follow and provides the "glue" which connects one harmony to the next.

An important consequence of the importance of registral continuity is that ornamental (non-harmonic) tones arise from the nature of hearing, since they are virtually always stepwise. They are therefore not just a stylistic peculiarity of tonal music. The fact that many systems for controlling pitch in non-tonal situations do not allow for them is a very serious limitation, both because it dampens the composer's melodic impulses, and deprives him of an effective means of weaving convincing leading lines.

### **An aside: open vs. closed harmonic systems**

This leads us to an important distinction, arising from much twentieth century music: open systems vs. closed systems. An open system imposes audible, but not rigid, constraints, providing aural coherence, while still allowing the composer's ear reasonable freedom. Closed systems are much more mechanical, limiting the composer's options at any given moment in quite rigid ways. The distinction is largely one of degree.

Advantages of open systems include:

- Because most of them came about through evolution, rather than invention, they have usually been "survival-tested" by ear: Evolution tends to filter out approaches which are not effective.
- They are flexible. Contrary to many invented twentieth century systems, they require only a reasonable preponderance of their normative sonorities, rather than 100% saturation. They thus allow the composer's ear to work in more intuitive ways and do not automatically constrain basic linear impulses, such as conjunct lines. Contrary to popular belief, there is no inherent contradiction between non-harmonic tones and coherent, non-tonal music. For example, a piece using a core harmonic cell at key points could allow for non-harmonic tones between them. As long as the rhythm and phrasing make it clear which sonorities are the structural "pillars", and as long as there are enough such pillars (reference points) to stimulate the memory reasonably frequently, there is no more need for such harmony to derive every note from the basic cell than for classical harmony to insist that every non-harmonic tone be part of a triad.

**Allegro**          6    6

*This example is based on a three note cell: a semitone plus a minor 3rd (B, C, Eb). The places marked "x" contain intervals not in the cell. However, the cell is still very prominent overall, these exceptional places are not strongly highlighted, and - most important - the notes in questions are easily heard as simple passing or other ornamental movements.*

Apart from the flexible kind of cellular harmony seen in the example above, other examples of open systems include:

- Families of chords, as defined above.
- Added note chords, as defined in Persichetti.
- Polyharmony, as defined in Persichetti.
- Stratified harmony. By "stratified harmony" we mean harmonic textures where richness is achieved by simultaneous, but clearly differentiated harmonic strands. A fuller discussion of this technique will be found below, under the heading "Harmony with multiple planes of tone". (Note that polyharmony can itself be considered a kind of stratified harmony, if the layers are timbrally and or rhythmically well distinguished.)

All of these techniques create recognizable harmonic worlds, while allowing the composer a great deal of local choice.

Closed systems, by contrast, severely limit the choice of notes available. Worse, they often do so to the extent that the expressive intentions of the composer cannot be fulfilled while respecting the limits of the system.

Examples of closed systems include most algorithmic, total serial, and rigid mirror procedures. The key feature of such systems is that they do not allow the composer's ear to follow its own impulses at every point. While an open system imposes just enough limitation to create a coherent sound world, the 100% saturation imposed by a closed system makes for neat, analytical unity, but usually has very little to do with how people actually hear. If,

however, the ear is to remain paramount for both composer and listener, why waste effort creating inaudible connections, and limiting audible ones which do not weaken coherence?

Much serial technique has long created problems of this sort, since the "order" in question usually has nothing whatsoever to do with what can be reliably heard even by an experienced, attentive listener. Further, chords in serial music inevitably create interval combinations not part of the row. And in any case, what is the meaning of "ordering" in a chord whose notes are heard simultaneously? (N.B.: These comments do not imply that no serial music is of any value, but just that serial procedures easily lead to unmusical thinking.)

## **Hierarchy, landmarks**

Apart from family resemblances, classical tonality provides an example of another important principle of harmonic coherence: hierarchy. The idea of "leading lines", already discussed above, provides a simple application of this notion to simultaneous strands of the musical texture. Applied to successive phrases, sections, etc., hierarchy likewise makes the listener's task much easier, by organizing larger spans into sub-sections, whose limits and relationships to each other are easier to grasp. Hierarchy, in short, allows for richer, and more complex musical structures.

We will first discuss the hierarchical functions of tonality, and then discuss how similar effects can be achieved without it.

Hierarchy applies on several levels. First, tonality itself must be based on scales with unequal intervals: If all the intervals are equal, there is no harmonic reason why one note will sound more final than any other. Within unequal scales, differences in intervals create points of relative stability and attraction. For example, in major and minor scales, the semitones are points of attraction; the leading tone is a familiar example.

On a higher level, as Schoenberg frequently points out, to remain comprehensible, music requires articulation into units that can be assimilated by the memory - phrases, sections, etc. . Such articulation is the function of cadences. Therefore, in any harmonic language, cadence is one the most important formal requirements which harmony must fulfill.

If the listener is to follow music of any length, he requires gradations of cadence. Such variety of punctuation makes phrases easier to perceive, and clarifies their relation to each other: Hierarchical tonal cadences tell the listener how far away he is from "home", i.e. the tonic. In tonal music, this hierarchy of cadences is well known, and need not be listed here.

On a yet higher level, not only does a tonal center provide a useful point of reference, but it also allows for the creation of secondary centers, allowing for more degrees of punctuation, and thus making large scale coherence easier to grasp.

This points out the necessity of audibly underlining important notes and chords, in effect treating what happens between them as ornamentation (or, to use the Schenkerian term, prolongation). This kind of underlining makes it easier for the listener to parse large forms by ensuring that landmarks are easily noticed, and memorable.

These distinctions between harmonic reference points and harmonic ornamentation, and the way reference points are approached and left - in other words the way they are pointed out to

the listener - are critical for understanding the interaction between harmony and form. Even in relatively simple tonal harmony, the tonic will often not be recognizable after substantial harmonic digression, unless it is thus pointed out, through coordination with other aspects of the music. (How many people notice that many classical operas - for example, Mozart's Magic Flute - do not end in the same key in which they start?) Such pointing out is achieved by methods like:

- accent: extremes of pitch, strong contrast of duration or orchestration;
- building up to such important moments, with crescendi, rising lines, gradual tempo change;
- repetition, for emphasis;
- directed cadential progressions;
- isolation (silence on both sides).

Without such cues, one must assume that listeners somehow memorize the absolute pitch of a work's tonic, and remember it despite all intervening harmonic activity. This is patent nonsense. (Incidentally, such a more realistic view of tonality also sheds light on what Robert Simpson, in his book *Carl Nielsen, Symphonist*, calls "progressive tonality", seen in composers like Nielsen and Mahler, where a movement finishes in a different key from where it began. The interesting point about such forms is not the simple observation that they do not end where they begin, but that they may dramatize the search for a tonic. As Simpson points out, the first movement in Nielsen's 5th Symphony is a particularly good example of this procedure.)

How can the composer create cadences and cadential hierarchy in the absence of classical tonality? First, all cadences, in any style, require coordination with rhythmic resolution and accent. Even in classical tonal harmony the only difference between V-I progressions within a phrase from those at the cadence is often rhythmic. Strong cadences combine pitch resolution with rhythmic resolution. While it is harder to achieve a sense of cadence without a regular beat, cadence still will coincide with a sense of rhythmic arrival, or at least break or dilute the rhythmic flow.

Here are some other aspects of the notion of cadence which can be generalized:

- A cadence always represents a change in the tension level, most commonly a reduction: The Latin "cadere" means "to fall". Falling lines usually sound like endings, perhaps by analogy with the tendency of the human voice to fall at the end of sentences.

**Adagio**  
*muted violons, divisi*

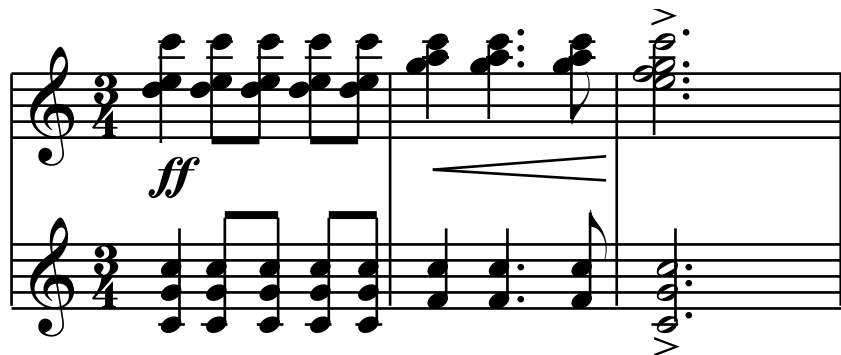
1 2 3  
*pp* *cresc.*  
 4 5 6  
*mf*  
 7 8 9 10 11  
*dim.* *pp*

*Here cadence is created by the combination of a falling line, a reduction in interval tension, and the arrival of a long note on a strong beat.*

- Since "articulation" means setting something apart, cadence is signaled by doing something different from what precedes it, i.e. deviating from some regular harmonic pattern. For example, a phrase with a stepwise bass may become more angular, or vice versa. Likewise, established harmonic rhythm often changes at the cadence. Both of these techniques require some harmonic regularity and predictability during the phrase. (Incidentally, such changes can also be used to indicate climaxes; however the latter are associated with increasing intensity rather than reduced tension. A cadence can also sometimes be climactic.)

*In this example, cadence is achieved by the arrival of a fresh note (E), as well as by an accented leap into a new, lower register. Also, the many repetitions in the preceding measures create a rather slow harmonic rhythm, so that the final change is even more marked. Note how drive to the last note is also reinforced by a crescendo.*

- A cadence provides resolution or culmination - at least locally - of directional forces. Progressions (using the term as defined earlier) established within the phrase are culminated or dissipated.



*The main elements making the last chord here sound final are its rhythmically accented position and its duration, and the fact that it contains a cluster, for the first time including a semitone, which creates greater tension (accent): There is thus a progression in the level of dissonance.*

- If unequal scales are used, the smallest intervals can create an effect analogous to leading tones.



*The scale on which this theme is based (E-F-G#-B-C#-D#) provides two semitone relationships, above and below E. This makes the cadence's direction especially clear, especially since these two semitones are prominently placed right before it.*

- An acoustically clear interval, like a 5th or an 8ve in the bass can help establish stability at the cadence.



*Here the low fifth in the final chord, combined with its longer duration, and the fact that it culminates a falling gesture, make for a clear sense of resolution.*

As for hierarchy in non-tonal contexts, tonal polarity - the establishment of secondary centers - can fill this structural function, as can varying degrees of rhythmic stopping, and the use of mitigating factors during cadences (e.g. motivic anticipation of the next phrase, elision, etc.). The important thing here is that the technique chosen must allow for easily audible gradations.

Compare the two cadences for the following phrase:

The image displays two musical staves, labeled A and B, for piano solo. Both are marked 'Moderato'. Staff A begins with a forte (f) dynamic and ends with a piano (p) dynamic. Staff B begins with a forte (f) dynamic and ends with a piano (p) dynamic. Both staves show a sequence of chords and melodic lines in the right hand, and a bass line in the left hand. The final chords of both staves are highlighted with a bracket and a downward-pointing arrow, indicating the low fifth mentioned in the text.

*Phrases "A" and "B" differ only in their final chord. Phrase "B" sounds more final than phrase "A" because the final chord contains more common tones in the two hands, reducing harmonic tension in the generally polychordal context.*



# Principles of movement, interest and of variety

## General aspects of harmonic accent

Obviously music whose only virtue is coherence is simply boring. If the "thread" mentioned in the previous chapter is to hold the listener's attention through a whole piece, it requires both continuity and contrasts. These contrasts come in varying degrees, normally in proportion to the length of the piece: The longer the piece, the more novelty is needed. Varying the music's contour thus contributes to the sense that the music breathes, contributing to an organic feeling of tension and release.

Renewal of interest operates on all time scales. It always involves novelty: something different from the preceding norm. Novelty creates musical "questions" and thus becomes propulsive: first it attracts the listener's attention, and then calls his previous expectations into question.

In general terms, such questions, or accents, involve one or more the following:

- rhythmic stress
- change in the level of harmonic tension (e.g. dissonance, in a classical context)
- different density of texture
- change in register
- new timbre(s)

## Creating momentum and renewing interest on various structural levels

### Locally

On a local level, the following elements are propulsive:

- Active tones: as mentioned previously, in any unequal scale some notes are more active than others. These notes create instability, pushing the music forward. (This is one reason why music which relentlessly exploits the total chromatic scale, especially with no particular focus, quickly becomes gray and uninteresting.) Active tones change the level of harmonic tension.
- Unequal intervals within a chord: If all the intervals in a chord are equidistant, the effect is static or ambiguous. Classical examples include the diminished 7th chord and the augmented triad (both of which, incidentally, are extreme cases, since even when continued outside a single octave they introduce no new notes, unlike, say, a stack of 4ths). Unequal intervals create tension and momentum. Note however, that if the number of different intervals becomes too great, and especially if the spacing includes multiple, adjacent sharp dissonances, the chord will tend to "clot" (Persichetti's term), bogging down the harmony, since no clear focus of tension can be discerned to suggest subsequent direction.



*The first chord here is neutral in direction, due to the stacked perfect 4ths. The second chord is much less stable, due to one single different note (B natural), which engenders a variety of stronger intervallic tensions.*

- Leaps: Since conjunct motion is the norm for both singing and hearing, a leap is a special event. Even in situations where leaps abound, larger leaps will stick out, perhaps because the physical effort required to produce them on most instruments subtly inflects the rhythm.
- Compound lines (lines which leap regularly between two or more registers, compressing into one continuous line multiple strands of voice-leading): Such lines keep the listener in a constant state of tension, because there is usually at least one strand unresolved.

## Higher Levels

On higher levels, the following (harmonic) elements contribute to interest and momentum: variety of harmonic rhythm, and modulation. We will discuss these individually.

## Harmonic rhythm

By "harmonic rhythm" we mean the rate at which chords change, especially when the outer voices move (this is independent of the surface rhythmic values, which may include harmonically static repeated notes and trills). Harmonic rhythm determines how much new (harmonic) information the brain must process in a given time. Even in textures where there is no simple harmonic norm, the rate of arrival of new pitches powerfully affects the music's momentum.

Harmonic rhythm is always felt in relation to a norm; once this norm is established, all other things being equal, faster changes "raise the temperature", while slower changes calm the atmosphere. Of course arbitrary changes are also possible, but they quickly lose their novelty, since the listener cannot develop meaningful expectations about them. However a change from irregular harmonic rhythm to more regular harmonic rhythm can create a sense of structural stability, and vice versa.

(piano solo)

The image shows two staves of musical notation. The first staff is labeled '(piano solo)' and begins with a dynamic marking of 'f'. It consists of two staves: a treble clef staff and a bass clef staff. The treble staff contains a sequence of chords, and the bass staff contains bass notes. The second staff continues the sequence, ending with a final chord marked 'f'.

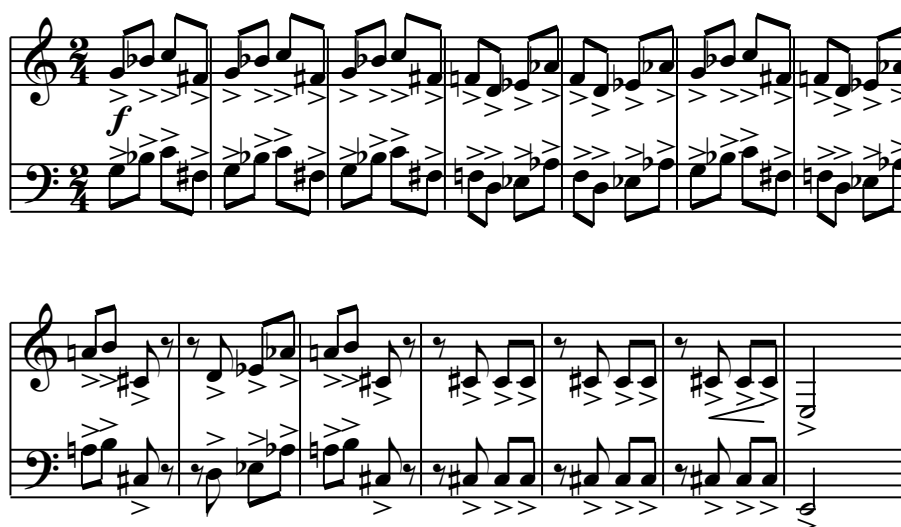
*This variant of a previous example plays with the listener's expectations of harmonic rhythm. The first three repeated measures create a sense of stability, which is disrupted by the new notes in the fourth measure. The return to the opening pattern suggests a repeat of the process but there quickly follows even more novelty. Finally, the return of stability with the repeated C#'s makes the sudden arrival of the final E more dramatic.*

Finally, consistency of harmonic rhythm can help unify the music within a section, while change in harmonic rhythm can help to define differences between sections.

### **Modulation and Harmonic Transition**

In music with clear tonal centers, moving to new tonal regions for contrast is an obvious way to underline structural articulations. It is also a very sensitive means of creating contrast, since it allows for everything from mild local changes to strong long term shifts.

In music without clear tonal centers, modulation acts like a simple extension of harmonic rhythm: the arrival of new pitches is easily noticed, and the rate of their arrival influences the sense of musical momentum. Even in non-tonal situations one can create gradations of modulation, simply by controlling the number of new notes which arrive within a given span of time.



*Again, note the way the varying rate of arrival of new pitches in this example creates temporary tonal stability and varying degrees of contrast. The final E is more contrasting than the previous changes since it does not reuse any previously explored pitches.*

Technically, the process of modulation is essentially the harmonic aspect of the art of transition. As in musical form in general, transitions can be sudden or gradual, and can lead to closer or more remote contrasts.

A useful technique for planning modulation is:

- determine the appropriate degree of contrast for where one is in the form;
- determine whether a gradual or a more abrupt change is required (abrupt changes occur more rarely than gradual ones, since they are more disruptive to the music's flow);
- bring in new notes in ways which attract the ear (as accented notes, peaks, resolutions of suspensions, etc.). Create momentum towards the new notes with melodic, rhythmic, or textural progressions.
- the more gradual the change required, the more important it is to create a neutral area, often containing elements of both tonal zones, and to arrange the arrival of the notes gradually.

Note that the changing the rate of modulation (an extension of the notion of harmonic rhythm) can also create effects of increased or decreased musical movement. As discussed in our book on musical form, incremental progressions - e.g. in the rate of modulation - allow the composer to create expectations. Such expectations, both fulfilled and unfulfilled, connect the musical present and future to remembered events in the past in a pseudo-causal way, thereby unifying larger stretches of music, through suspense.

Also, where the music uses such progressions, whether in the rate of modulation or in other aspects of the music, a sense of direction will result. Where there is direction, there is also climax, i.e. a sense of culmination and arrival. Such climaxes are outstanding moments, which the listener will easily remember.

## **Transitions between various types of Harmony**

We have discussed various techniques above which aim to solve an important problem: creating clear, audible, and coherent harmonic character. But it is not necessary or even always desirable to use just one harmonic technique over a whole piece. Provided the transition is smooth, it is quite easy to move from one harmonic technique to another. The main way to achieve this is via common elements. (Persichetti has an excellent discussion of this subject on p. 271-5; there is no need to cover the same material here.)

Of course, some procedures can be more easily linked than others, given the desirability of some common ground between the starting point and the ending point. For example, added notes can easily link up to polyharmony or vice versa, and intervallic harmony can easily lead to cellular harmony using the same interval(s). On the other hand, certain other techniques are harder to connect, for example diatonic modal harmony is not easily transformed into cellular harmony.

Changes in harmonic technique can be applied locally or over larger stretches. The main difference in making such transitions between sections is that they need stronger emphasis, to make clear to the listener that the change marks an important formal joint. Various means for achieving such emphasis have already been discussed above .

Here is an analysis of changes in harmonic technique within one small piece.

Musical score for a piano piece, measures 1-29. The score is in 3/4 time and features various harmonic textures. Measures 1-5 show a sequence of three-note clusters in the right hand, with dynamics ranging from forte (f) to pianissimo (pp). Measures 6-7 introduce a more open sound with a sixth under a perfect fourth. Measures 8-9 continue with three-note clusters. Measures 10-12 feature chords with a more open fifth sound. Measures 13-17 show a mix of three-note clusters and chords. Measures 18-23 feature a forte (ff) dynamic with more complex harmonic structures. Measures 24-29 conclude with a variety of textures, including three-note clusters and chords, with dynamics ranging from forte (f) to pianissimo (pp).

This example shows various types of harmony combined in the same piece. The piece begins with small, three note clusters, which arrive on a more openly spaced secundal chord (m. 3). The second phrase is identical to the first, except for the cadence chord (m. 5). The only difference between the two cadences is the new middle note, A. This note is conjunct with the corresponding note in m. 3 (B->A), creating a voice leading connection. In m. 5 it introduces a more open sound, made up of a sixth under a perfect 4th. The next phrase (m. 6-7) alternates three note clusters with chords containing a more open 5th sound, aurally prepared by the 4th in m. 5. The alternation is a simple neighbor note movement. M. 8-9 pick up the bottom two notes of the cadence in m. 7, and begin a new,

*mirror harmony, which lasts until m. 10. Note that the left hand has the middle note omitted, to lighten the texture. This mirror harmony leads to a slightly freer, polychordal texture in m. 11-12. Note how the degree of harmonic tension between the hands diminishes into the cadence at m. 12, which is just a plain 7th chord. M. 13-16 echo the piece's beginning, but with 3rds instead of 2nds, and with clusters only at the cadences. M. 6 is similarly echoed in m. 17; the chords on the offbeats are simple neighbor chords. M. 18-19 pick up the quartal/quintal sound from the on-the-beat chords in m. 17, and move, with increasing harmonic tension, via conjunct voice leading, to the climax of the piece, the dense polychords in m. 20-21. The outer voices continue conjunctly into m. 22-23; the spacing however opens up somewhat with the 5th chords on the first beats of m. 22-23. M. 24-25 echo m. 8-9, but with freer polychords, guided by contrary motion in the outer parts into the cadence in m. 25. M. 26-27 echo the opening phrase, however here 3rds are interspersed with the clusters. The cadence chord in m. 27 contains both a 5th and a minor 2nd (which recalls the previous clusters). The bottom note of the 5th in turn acts as a leading tone into the bass of the final phrase: a simple neighbor note motion starting on C. The 7th chord flavor in m. 27 also prepares the 7th chords of m. 28. Final resolution takes place with the C minor chord with an added Ab in the last bar.*

*Note how all the harmonic transitions occur through common tones, simple, stepwise voice leading, or clear intervallic associations between successive harmonies. Motivic elements help to hold the piece together as well.*

## Harmony and Texture; Orchestration and Harmony

One unsettling aspect of most books on harmony is that, in reducing harmonic textures for analytical purposes, they dilute or remove some of the most salient harmonic effects: the way the notes are disposed in musical (registral) space, and the composer's choices of doubling and timbre. Any pedagogical or analytical regime which does not thoroughly discuss what is most audible - and these dimensions of sound are not just details - is bound to remain musically feeble.

### Spacing and register

The overtone series remains a good overall guide to harmonic clarity. Generally, the more a chord is laid out like the overtone series - spacing with wider intervals on the bottom and the smaller intervals above - the more it will favor blended resonance. Clear acoustic intervals, like 8ves and 5ths, on the bottom tend to "ground" the harmony, regardless of what is above.



*These second chord here is simply an "inversion" of the first. (This example once again points out the meaninglessness of "inversion" in chords with many different chromatic notes.) Note the enormous difference in effect between the two chords. The first chord sounds like a colorful elaboration of an A minor harmony, due to the octave A in the bass and the supportive fifth above it. The second chord sounds rootless, since the only acoustically strong interval is the 5th C-G, hidden in the middle parts.*

Of course a composer may legitimately want expressive effects like dark, close chords in the bass, to suggest confusion or heaviness of spirit. But these are special effects, and should not result inadvertently.

Another point: As we have seen previously, harmonic tension is always softened by registral separation: The ear is less inclined to associate widely spaced dissonant notes with each other. At the most extreme, such gaps create separate planes of tone.

One last point about register, referred to earlier because of the way it mitigates the principle of 8ve equivalence, is its relationship to clarity and character. Pitch clarity is always greatest in the middle register, where human hearing has evolved to make the most precise distinctions.



Harmonic character changes dramatically according to register. (In teaching composition, it is often useful to suggest to students that they try harmonic effects in various registers before settling on the "default" middle range.)

## Doubling

Apart from spacing and register, choice of doubling is important as well. One problem with classical serial writing is its rigid avoidance of 8ve doubling. Not only does this make clarity in the extreme registers of the orchestra almost impossible, but it also closes off many interesting harmonic effects, which use doublings to color a chord in particular ways. In other words, although octave doublings do indeed change the flavor of the harmony, that is no reason always to avoid them; a better goal is to use them in ways that are intentional and expressive.

Doublings are not all equivalent in effect; here are some guidelines to their use.

- Doubling of notes in individual chords emphasizes whatever character the doubled note participates in. Doublings of bass notes add more solidity than doublings of middle notes, and adjacent doublings (unseparated by other notes) are more noticeable than non-adjacent ones.



*Notice the effects of different doublings in these three chords. In the first chord, doubling the A on the bottom gives it the feeling of a root, as does the fifth above it. In the second chord, doubling the D#, in semitone conflict with the E, creates more tension, and a heavier sound. In the third chord, doubling the C, consonant with both the G# and the E, gives the chord a richer sound.*

- Doubling of entire lines within one plane of tone is more a question of orchestration than of harmony, and thus need not be discussed here. However doubling between planes of tone, unless very transient, helps to encourage aural fusion.

Finally, it is worth mentioning that organ registration, with its use of "timbral" doublings, including doublings at pitches other than the octave (mutation stops), can provide interesting testing ground for artificial timbres. The classic example of this technique is in Ravel's Bolero.

## Timbre

Another element often ignored in traditional harmony study is the difference in effect between instrumental and vocal writing. Suspensions written for the piano are very different when played by the organ; attacked dissonances, difficult for voices, are easier for strings. In fact, even comparing instruments, timbre influences the sound of any interval. Clusters are quite aggressive on the organ, but soften enormously when played by strings (possibly because slight, continuous fluctuations of pitch in the latter provide some inner mobility). 8ves and 5ths in brass instruments have a richness and fullness unequaled by the same intervals played by woodwinds. Low, closely spaced chords in trombones have a richness which is very different from their (relative) heaviness when played by horns. In short, once beyond the most elementary work, harmony cannot and should not be separated from orchestration.

## Harmony with multiple planes of tone

A chord is normally perceived as a unit. However it can also include subgroups ("planes"), particularly if the orchestration encourages such "streaming", through registral and/or timbral separation. Here is an example.

The image shows two musical staves, A and B, illustrating different orchestration techniques for the same chord. Staff A shows a homogenous string chord with notes G, B, and D. Staff B shows the same chord with trumpets playing a dissonant interval (G/Ab) over a string chord.

*In "A", when a homogenous family (strings here) plays the chord, the highest two notes are heard as enriching and blending with the overall mass. The same chord, orchestrated as in "B", presents two separate timbral layers: a background string chord, and a foreground dissonance in the trumpets. Our hearing of the harmony will now focus much more acutely on the dissonance G/Ab, leading to different expectations about the music to follow.*

The point here is that virtually all harmony books assume complete and continuous unity of tone. In real life, however, there is a world of expressive potential to be explored in multi-layered harmonic textures, and in various degrees of blend between planes of tone. Further, such stratification is an effective means of exploring harmonic complexity without creating heaviness and inertia. This is especially true if the various layers are distinguished by distinct interval characters, timbral and/or registral separation, and rhythmic independence.

## Criteria for evaluating harmony

Following our discussion of harmonic principles, we can now specify what poor harmonic construction - in any style - sounds like. Signs of inadequate harmonic sensitivity include:

- unmotivated inconsistency of harmonic worlds;
- simultaneous, contradictory characters (lack of clear expressive intentions);
- inappropriate or seemingly random accents;
- inappropriate or seemingly random holes or dead spots;
- greyness, lack of contour (not enough variety of texture, no sense of breathing);
- lack of momentum;
- lack of formal articulation, or badly placed articulations.

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## Pedagogy

Here are a few suggestions for teaching harmony:

- Usually the "rules" of harmony are presented as black and white: avoid parallel octaves, false relations, etc. . This primitive guidance is only useful for a rank beginner. In practice, harmonic effects depend on context, and the real issue is that the composer must be very sensitive to consistency . For example, in Debussy's *La Cathédrale Engloutie*, parallel fifths and octaves are part of a consistent sound world, and therefore do not stand out inappropriately. In teaching, a better approach is to "grade" harmonic situations on a scale according to aural prominence. Such a focus on gradations (scales of dissonance, accent, modulatory distance, etc.) develops the student's ear for finer distinctions, and encourages more refined musical judgement, which is transferable to other situations in a way that rigid rules are not. Here is an example:

The image shows a musical score with two staves (treble and bass clef) and three measures labeled A, B, and C. Measure A shows a parallel fifth between the outer voices (soprano and bass). Measure B shows a parallel fifth between the inner voices (alto and tenor), while the soprano has a melodic line. Measure C shows a similar texture to B, but with a different voicing of the inner parts.

*In "A" , in a normal four part polyphonic context, the parallel 5ths between outer voices are flagrant. However in "B", the parallel 5ths are much more subtle. They are in the inner parts, and the soprano distracts attention away from them through activity. In a homogeneous timbre, the (correct) voice leading in "C" is virtually indistinguishable from that in "B".*

- Sing and play: Harmony is ear training. The student should regularly sing individual parts while playing the others.
- Try alternatives: Often a fictitious recomposition of a harmonic passage with different voice leading or a different cadence will prove enlightening.
- Look for the leading part(s) at any given time: Harmony is not a democracy. In most harmonic situations, certain notes contribute more to the overall effect than others. For example, cultivate the habit of searching for which intervals in a chord most influence its character.
- While it is useful to begin harmonic study with four part vocal textures (since a texture of four homogeneous parts is a good compromise between fullness and linear independence, and everyone has a voice!) harmonic study eventually include writing, in various numbers of real parts, for piano, as well as composing for various small ensembles, to explore the interrelation of harmony and orchestration in more detail.

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