Artistic Orchestration

by

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This is the third volume in my series of online books on musical technique. The others cover: <u>Form</u>, <u>Counterpoint</u>, and (forthcoming) Fugue, and Harmony.

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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Introduction: why this book?

Several fine books on orchestration already exist: Rimsky-Korsakov's aptly named "Principles of Orchestration" remains as valuable today as when it was published. The excellent texts by Piston ("Orchestration") and Adler ("The Study of Orchestration") combine thorough information about instruments with useful advice about their combination.

Koechlin's monumental work ("Traité de l'Orchestration") is in a class apart: In its four huge volumes, the author generously shares a lifetime's experience as a master orchestrator and explores many subjects nowhere else to be found. Our work here is much indebted to Koechlin.

The main subject the preceding books do not cover systematically is how orchestration can express and enhance musical form. This, combined with our focus (throughout this series) on explaining musical techniques in terms of how people hear, will lead us to some useful principles.

Rimsky-Korsakov tells us that "to orchestrate is to create, and this is something which cannot be taught". Experience proves him right. Once the basic information about instruments is assimilated, it is difficult to teach the finer points of the art outside of actual composition. Transcription of piano or chamber music, often used as a teaching method, presents useful challenges, but these challenges are mainly problems of translation, not of composition. We will not deal with transcription here, as the subject is well covered in other books (see, for example, Joseph Wagner, "Orchestration").

What is orchestration? For our purposes, orchestration follows instrumentation, where the student will have learnt how instruments work, and what is reasonably playable by a good professional. The common conception of orchestration as simply assigning timbres to lines is very inadequate. Timbre is a potent aspect of musical character. Using it effectively requires a much knowledge about texture - the ways in which musical strands can be combined - and how changes of timbre affect our perception of musical form. There is in fact no area of music that is not dependant on timbre: It impinges even on the most elementary harmony exercise. The tension of an appogiatura will change drastically depending on whether it is for voices, strings, or piano. Our definition of orchestration will therefore be: Composing with timbres. Most of our discussion here will focus on how orchestration can be used to enhance various musical situations.

Orchestration is hard to teach. First, it is difficult to provide feedback for students' work: A real orchestra does not sit around waiting to try out elementary exercises. Second, if the parts are reasonably playable, and provided the coming and going of entries does not actively contradict the work's main structural articulations, it is almost as hard to write glaringly badly for the orchestra as it is to write glowingly well! This is because the orchestra's historical development has largely favored euphony of sound and flexibility of technique. The inadequacy of poor, but playable, orchestration only shows itself over fairly long spans or repeated listening. Grayness or heaviness of texture fatigues the ear, and the structure and character of the work remain unvaried and undifferentiated.

As in our previous books, we will concentrate here on general principles instead of rules of thumb. Given that orchestration is so hard to try out experimentally, this is especially important. As an example, a common rule of thumb tells the student to avoid big gaps in orchestral textures. The principles involved here are two:

*   Musical elements that are in separate registers are not perceived as being on the same plane of tone.
*   For fullness of sound, the ear requires fairly complete registral saturation, especially in the middle range.

These principles explain why large gaps may be effective in one situation, for example a quiet, playful passage, and not in another, where mass and richness are required.

Another advantage of discussing general principles is that many of our remarks will apply equally well to electroacoustic and mixed music, instead of being limited to traditional instrumental combinations. That said, our examples will be drawn from the standard repertoire, for ease of reference.

One final point: This work is not meant as a *substitute* for the texts referred to above, but as a *complement* to them. No one should expect to learn orchestration just by reading this book!

Preliminary Considerations

Remarks on Instruments

Before proceeding to our discussion of orchestration *per se*, a few general comments on the roles of the orchestral families, as well as some specific words of advice about how to treat them, are in order. Since any student studying orchestration should have already mastered basic harmony — and consequently also the norms of four part choral writing — a useful point of departure is to compare each section with the vocal choir. For students more familiar with the piano, the point of departure should be comparison with that instrument.

Strings

Like the vocal choir, the string family offers excellent homogeneity of timbre, and can play anything from the simplest monophonic line to the richest polyphony. Virtually anything that is suitable for choir will also sound well in strings. However, strings add numerous resources to those of the vocal chorus, due to their much wider range, their much greater mobility and more varied articulations, and their capacity for playing chords.

Unlike choral writing, string writing normally abounds in crossing. This allows the lower instruments to play the main line from time to time, and, most importantly, gives all the individual sections in the family freedom to move, since string instruments' ranges are so much wider then those of voices. Given the easy blend within the family, such crossing creates no special problems.

A note concerning strings pizzicato: these are best thought of as percussion sounds: While produced by strings, they have no *timbral* affinity with bowed strings.

Woodwind

Woodwinds, due to their various distinctive timbres, can provide intimate solo effects. (It is important to realize that there is a *qualitative* change when a line is assigned to two or more of the same instrument in unison, more than a *quantitative* one: three oboes are not even twice as loud as one, but the *quality* of sound becomes that of a little chorus, due to unavoidable differences in intonation. A line whose character requires a solo sound will be less effective when doubled, due to this difference in character.)

The main problem in writing for woodwind occurs when they are massed, due to their disparity of timbres, both within individual instruments (in different registers) and between them: This makes it hard to use them in blended harmonic blocks. A good policy is to consider each woodwind as being three instruments in one: a high, a middle, and a low timbre. Combinations that work well in one register can be quite odd in another. Also, each type of woodwind is, in effect, a separate choir: For example clarinets are available from contrabass to piccolo. (The double reeds, oboe, English horn and bassoon, can be considered as one family.)

When writing for massed woodwinds, generally the oboe is the instrument most likely to hurt the overall blend. It will definitively color any combination, for better or for worse. As for the various heterogeneous combinations, the classical techniques suggested by Rimsky-Korsakov (overlapping and enclosure) work by making it difficult to decipher who is doing what, in effect "fooling" the ear.

When used in the same plane of tone with strings, the main function of woodwinds is to add volume ("thickness"); when used in the same plane of tone with brass, their main function is to reinforce upper partials.

Brass

Brass are more homogeneous than woodwind, but less flexible than strings. They can play melodic, rhythmic, contrapuntal, or harmonic roles equally well. They also reproduce choral writing better than woodwind: In much early music, brass, especially trombones, simply double the voices.

A few remarks: Horns are best thought of as alto instruments (beginners often place them much too low or let them wander too high). The horns' bass notes are best reserved for slow moving pedal passages: they are not suitable for singing bass lines, which they tend to render ponderous. The best arrangement for massed horns in harmony is the traditional one of 4 horns in close position in the middle of the texture (in the range of the alto voice), where the fourth horn often doubles the first an octave lower.

Piston mentions that horns are best treated in the general spirit of the natural instrument (for example with a preference for open harmonic intervals like fifths and octaves, and for generally diatonic lines); this remains excellent advice. Although horns are of course chromatic instruments now, extreme agility is not in their nature. These observations are also true of trumpets.

Trumpets can sound oddly empty in wide open spacings; trombones, on the other hand, sound full in both open and closed positions. Trombones in close writing in the baritone register are considerably lighter than horns, a useful fact to remember when using brass to accompany the human voice.

Finally, muted brass is best considered as a separate family from normal brass, so different is the timbre. When soft, muted brass are quite close to double reeds in sound; when loud, their strident sound puts them in a class apart.

Percussion

While there are various ways of classifying percussion instruments, it is most useful for the composer to think of them according to their *sound,* and then classify them into families by register and pitch. For example, metal instruments are normally "wet", with substantial reverberation, and therefore not well suited to quick, very precise rhythms. On the other hand, they can supply background ambiance very well. Wooden instruments are "dry", best used where clarity and definition are important. Membrane instruments are in between: when low they can reverberate quite long; as they get higher, their sound resembles the woods.

Percussion can function as:

*   Melody

Shostakovich, 15th Symphony, Finale, coda (rehearsal # 148): The timpani present the passacaglia theme while other (fixed pitch) percussion dance around it, and sustained string chords provide a mysterious background.

*   Rhythm

Bartok, Concerto for Orchestra, 2nd movement, beginning: The snare drum (playing without snares) presents an important rhythmic theme.

*   Resonance

Dallapiccola, Canti di Leberazione, opening: While a wide-ranging, monophonic line flows through the various sections of the choir, quiet cymbal rolls provide a haunting background ambiance. Note how the cymbals are not just continuous rolls, but are rather composed in overlapping waves.

*   Transitional sound between changing dynamics.

Bruckner, 9thSymphony, 1st movement, m. 75-6. A timpani roll, diminuendo, provides a smooth transition between the loud tutti which precedes it and the very quiet passage which follows.

As a general rule, when percussion is combined with other families in the same plane of tone, it should correspond in register to the music around it.

Human voice

Writing for voices is a too big a subject for detailed consideration here, but a few words of advice are in order.

Words must be set as intelligibly as possible. Singing by its nature strongly distorts words in favor of vowels; consonants function mainly as articulation. The rhythm, accentuation, and contour of the vocal line should follow that of the words, well spoken. They may exaggerate, *but not contradict,* the rhythm and shape of the spoken verbal phrase. There is also the added consideration that the voice cannot develop a full sound on vowels formed with the mouth closed, like the French "u". (It is not for nothing that the Italian "amore" is a wonderful word to sing!) Therefore climactic passages must be planned around important words which also permit the voice to sound out.

Voices need time to open out to their full sound; therefore very agile and/or staccato writing is a rare special effect.

More than any other instrument, the voice requires writing in a "normal" register (in the middle of the range) most of the time to avoid discomfort. Very low and (especially) very high writing must be reserved for special moments.

What is poor orchestration?

As mentioned above, it is actually fairly hard to write really bad orchestration, provided it's playable.

While we will concentrate here mainly on positive approaches to artistic orchestration, it is worth identifying the main characteristics of poor orchestration and some of the main faults which lead to them:

*   Feebleness of effect: Not using the resources available to the full to create the desired character (e.g. trying to get a percussive effect using only a few woodwinds, and with no use of percussive sounds); creating contradictory gestures (e.g. adding instruments during a diminuendo).

*   Aural fatigue, often resulting from overuse of extreme registers or very distinctive colors, or from lack of blend in harmonic blocks.

*   Grayness, usually from too much unison doubling.

*   Heaviness as a norm instead of as a special effect, caused by too much doubling, or overloading the low register.

*   Consistently dry sound, without any background resonance. (Dry sound can be effective, but not as a norm.)

*   Confusion among musical elements, due to poorly differentiated planes of tone.

*   Formal confusion, due to changes of timbre at arbitrary places, or changes not appropriate to the degree of contrast required.

*   Lack of clear character.

Basic Notions, Pt. 1

Orchestration and Form

All through this series we have maintained that any musical gesture's effect is largely determined by its placement in the work's span of time; to be successful, orchestration also needs to be seen as part of the form.

Key points, which need to be planned orchestrally in relation to the whole work, include:

* Accents: Moments requiring special attention from the listener. Orchestrally, accents usually require adding another sound (or changing the playing technique in some way, e.g. by using double stops in strings) momentarily. The addition must of course be proportional to degree of accent required.
* Cadences: Structural articulations are often enhanced by some change in the orchestration. This may be as minor as simply entering a lower register in the basses, or, in the case of section divisions, adding instruments or changing harmonic dispositions.
* Progressions: The most common orchestral progressions are crescendos and diminuendos, but others are useful as well, e.g.:

* Gradually rising or falling passages.
* Texture getting thicker or thinner.

Such progressions can contribute greatly to creating momentum and a sense of direction, as discussed in the first volume of this series.

* Gradation of climaxes: Usually one climax, near the end, stands out more than the others. It is important to reserve some very powerful orchestral resource or combination, which is heard for the first time at this moment.
· Overlapping and fadeouts: Overlapping is one way of bridging transitions; fading out is one way of ending a section or a movement. In both cases, the composer must graduate the disappearance (and in the case of overlapping, the arrival) of orchestral elements in even steps, allowing the music to proceed without bumps or unmotivated interruptions.

Changes of sound

Changes of timbre must be logical in the musical context: A change of sound creates a formal articulation. The normal place for orchestration to change is between phrases, sections, etc..

Within a phrase, orchestral changes will normally occur at musically significant moments: Motivic changes, climactic moments, and cadences. (Changes at other places usually sound arbitrary.)

Mozart, Marriage of Figaro, Overture, m. 59-67: Instruments are added throughout the phrase, coordinated with motivic repetitions; the last addition (flutes) arrives as an imitation.

Rate of Orchestral Change

Like harmonic rhythm (the rate of harmonic change, as opposed to simple note values) the rate of orchestral change has an important impact on the music's pacing. While it is more difficult to quantify as precisely as harmonic rhythm, since orchestral changes come in many degrees of prominence (adding a unison flute doubling to a line in the violins does not have the same impact as adding three trumpets playing chords), the rate at which timbres are added or removed, especially within a phrase, can contribute to effects of tension or of relaxation.

Mahler, 4thSymphony, 2nd movement, m. 34-46: From m. 34-42, the changes of sound are quite subtle. However, the arrival of stopped horns in m. 43, followed two bars later by the main theme transferred to woodwinds (strings have been playing previously), creates more emotional intensity. In general, the nervous character of this movement is much enhanced by the frequent, prominent, changes of timbre. Compare the beginning of the 3rd movement, whose calm character is partly the result of remaining entirely within the string choir.

Degree of continuity/contrast

The degree of timbral change corresponds to the degree of formal contrast required: A major sectional break requires more orchestral contrast then a new motive within a phrase.

A special note: A sudden change from very loud to very soft requires psychological time for adjustment. After a *fortissimo* tutti, the ear requires a moment to adapt to very quiet music; otherwise its first few notes can pass unnoticed.

Interpreting the phrasing

It is possible to enhance the contour of a phrase orchestrally. While the ordinary ebb and flow of the music will be brought out naturally by sensitive players, in cases where the composer feels the need to indicate such dynamic details explicitly - especially for main lines - they can often be better realized by subtly changing the orchestration.

The two most common cases are:

- Accents and highlights: as mentioned above, accents are achieved by momentary additions of one or more instruments, often with percussive attacks (although sometimes a touch of contrasting color can also serve this purpose). Normally what is added should be in the same register as the main line, and proportional to the overall dynamics and character.

Beethoven, 7th Symphony, Finale, 2nd theme, m. 74 ff: The sudden accents in the main (string) motive are much enhanced by reinforcement with wind chords.

- *Crescendo* and *diminuendo*: An orchestral *crescendo* is achieved by adding instruments in a well graduated order, and a *diminuendo* by subtracting them. It is especially important not to inadvertently contradict the dynamic evolution of a phrase by doing the opposite orchestrally, e.g. adding instruments during a *diminuendo*.

Beethoven, 9thSymphony, beginning: The magnificent crescendo is achieved by gradually adding instruments: violin 1, double bass, viola, clarinet, oboe, flute, bassoon, etc.

Orchestration and Dynamics

There is an important difference between absolute and relative dynamics. Every instrument has some relative dynamic control in every register. However, some instruments in particular registers simply cannot achieve certain absolute dynamics: A group of brass playing in their high registers will never be very soft; a low flute can never be extremely loud. The best rule for a beginner is: *Orchestrate your dynamics instead of just writing them as textual indications*. Especially at dynamic extremes, ensure that the instruments and the registers chosen are conducive to the dynamic level required.

As a rough guide, here is a table of what the various families can achieve in *absolute* dynamics.

	ppp	*pp*	*p*	*mf*	*f*	*ff*	*fff*
woodwind	(x)*	x	x	x	x	x	
brass	x	x	x	x	x	x	
percussion	x	x	x	x	x	x	x
strings	x	x	x	x	x	x	

(* the clarinet can play whisper soft, provided it is not written too high.)

What is important in this chart is how to achieve dynamic extremes. Strings and certain percussion, (tam-tam, cymbals, and the lower drums) can start practically inaudibly. For sheer power, nothing has the force and impact of (high) brass plus percussion.

The notation of dynamics is often problematic for beginners. A good approach is to act as though there are only four dynamic levels: pp, mf, f, and ff. First, orchestrate the passage so that the absolute dynamic level desired easily results from the choice of instruments and registers. Second, think of dynamics as character indications. Choose which dynamic of the above four best suits the passage. Third, avoid the middle dynamics (mp, mf) as starting points: these are what players do when there are no dynamics notated at all. Finally, beginners should avoid writing different dynamics for different instruments: This requires a great deal of experience, since players normally do not see each others dynamic indications, and normally tend to aim for rough balance, unless the conductor specifies otherwise.

Register

Normal
Registral planning is essential to good orchestration, since a change of register is obvious even to a non-musician.

Most of the time, music is centered in the middle of the range of human hearing (which corresponds to the range of human voices). This is to be expected, because in this register, the human ear easily distinguishes pitch and experiences no strain. If the desired result is a blended sonority which is to be perceived on one single plane of tone, the

layout of the music within this register normally will follow that of the overtone series: wider in the lower range and more compact getting higher, with no major gaps in the middle (such gaps tend to divide the sound mass into separate planes, which can be desirable if differentiation is needed, as in certain types of counterpoint).

Mozart 40th symphony, 2nd movement, beginning: The quiet, calm effect here results in part from the use of middle register strings, normally spaced(after the wide register tutti which finishes the 1st movement). Note how the register evolves higher during the phrase, creating a sense of gradual evolution.

High vs. low sections
It is advisable not to fill the entire audible range all the time: Occasional passages mainly in the higher or the lower range will provide valuable contrast and relief for the ear.

Brahms 4th Symphony, 3rd movement, m. 93 ff: Following the (normally disposed) tutti just preceding, the contrast of low and high chords provides a simple but dramatic contrast.

Extremes
Extreme registers should not be used constantly; they fatigue the ear. It is normal, however, for tutti passages to fill a wide range, with the bottom adding fullness and depth, and the top adding brilliance and power.

It is important to note that the number of instruments required at the extremes is considerably smaller than in the middle. For example, even in a big tutti, one piccolo will penetrate without difficulty in its highest register.

Hollow Textures
Textures with large gaps can occasionally be quite effective, although the ear tires of the effect rather quickly. This sonority also works better in softer dynamics: Loud passages with holes in the middle tend to sound unsatisfactory and rather feeble.

Mahler 9th Symphony, 1st movement, m. 382 ff: Extremely widely spaced counterpoint here gives a momentary variety to the generally rich orchestral sound.

Register Progressions

Not all passages stay in one register. Especially when working towards or away from climaxes, often it is effective to create progressions of register, either widening out from the middle in both directions, or else adding more and more high or low material. Such progressions are extremely powerful sources of musical direction.

Brahms 1st Symphony, 1st movement, m. 293-321: The intensity of this buildup comes in part from the gradual progression from the lower middle range towards the high register at the climax (m. 320).

Color

Although it will be clear by now that color is not as important an issue in orchestration as is commonly thought, variety of sound, arising from formal and emotional necessity, is of course essential. There are two main principles which make for effective orchestral coloration:

* The color must have the right character.
* Color is less the result of exotic timbres than of novelty *in the context of the piece*. Even a familiar timbre like an oboe can sound striking and novel, provided it has not been heard for a while. This is why Mozart's orchestration is always so fresh, despite using a very limited number of colors.

Sustained vs. dry sound

It is often remarked that the orchestra has no sustaining pedal. While this has obvious consequences for transcribing piano music, it also points to an important issue in orchestration in general: Resonance. Resonance is by definition a part of the background layer. In its literal meaning, it refers to echo, the effect of a "live" room. However, orchestrally, resonance can be deliberately composed, and therefore individualized.

Although in the history of orchestration, elaborate planes of background resonance only become the norm with the disappearance of the continuo, Bach (c.f. various cantatas) already shows sensitivity to the way a long held note can enrich the texture. In fact, he even goes farther, and there are numerous examples of such notes used as points of departure for important lines. This particular way of "composing" with resonance (others include the lines which dissipate into held notes, and resonance which is intermittent, or

which includes some simple rhythmic formula) gives way to more refined ways of using sustained sound in the background to enrich the texture.

Ravel, Valses Nobles et Sentimentales, Epilogue: The background held notes in the strings, set off by gentle harp harmonics, provide a shimmering halo surrounding the main motives in the winds. This conception of the background as delicate vibration is omnipresent in Ravel. Indeed, Ravel's genius in orchestration is often at its most sophisticated in his treatment of such sustained sound in the background.

Finally, it is important to note that although it is not good practice to orchestrate for long without sustained sound, occasional dry passages can be extraordinarily effective. Indeed, the distinction between "dry" (=rhythmic) percussion, and "wet" (=atmospheric) percussion is a useful one for beginners, and also for more experienced composers interested in creating variety of character. This dry/wet distinction is analogous to the need for variety of articulation (staccato/legato) from a rhythmic and motivic point of view.

Fat vs. thin sound; unison doubling.

Koechlin makes a useful distinction between loudness and volume: By "volume" he means the distinction between thick and thin sounds. For example, at any dynamic level, a horn will always sound thicker, or "fatter", than a violin. Acoustically, thick sounds tend to have stronger fundamentals than thin sounds.

Thick, or fat sounds, occur in the orchestra in two ways: as chosen timbres, e.g. the French horn, or the tuba, and as a result of unison doublings. As a rule, doubling at the unison adds much more volume ("thickness") than force.

Unison doublings fall into two types: the instruments involved may be the same or different. If they are the same, as we have already discussed (under "woodwind", above), the change from one to two instruments is more qualitative than quantitative. When different timbres are involved, new colors are created, whose success will depend on the character of the resulting sound, and its appropriateness in context.

Since overuse of unison doubling is the beginner's most common fault in orchestration, a good elementary rule of thumb is: Do not double at the unison, unless there is a definite need for more volume, or unless the particular color is exactly what is needed for character.

Balance: simultaneous and successive

Another important distinction discussed by Koechlin is that between simultaneous balance and successive balance. The former refers to which instruments will dominate *within* a given combination; the latter refers to certain successions of sounds, primarily when passing from very thick sounds to very thin ones, where the thin sound can seem disagreeable by comparison with the previous richness, even though when heard in another context it may not be disturbing at all. For example, after a loud, full brass passage, an oboe will sound even thinner than usual, by contrast.

As to the first type of balance, Rimsky-Korsakov lays out many excellent rules of thumb; these need not be repeated here. *If all other things are equal*, (i.e. when the force of the instruments involved is fairly equal), here are some additional guidelines:

*	The top line normally attracts the most attention.
*	The ear normally follows activity: If, say, in the string choir, all the parts except the viola are static, the movement in the viola will stand out.
*	As Koechlin points out, too much activity can distract: normally strings are ideal for accompanying the voice, but if they are playing vigorous counterpoint they will cover the voice much more easily than if they have simple long held notes. In other words, balance is not just a function of the choice of instruments, but also of what they are doing.

Basic Notions, Pt. 2

Musical Lines vs. Instrumental Parts

The orchestra groups many players together. Giving all these players something of interest to do is an important challenge in orchestration. (Strauss, speaking of Wagner, speaks of obtaining the "spiritual participation of the players".) They cannot constantly play in counterpoint; human hearing cannot follow such dense textures. On the other hand, orchestration with large amounts of doubling sounds gray, and remains uninteresting for the players.

This contradiction leads to a complex relationship between part-writing and orchestration, particularly when - as is normal, to justify the expense of an orchestra in the first place - one tries to use all of the players a fair amount of the time.

In composing an orchestral piece, most of the time there will be clear leading lines (see "Planes of Tone", below). It is normal to start composing by sketching these leading lines, and gradually fill in more details: If the result is to have audible coherence, it is best to work in terms of what can be heard most easily. However, in the transition from sketch to full orchestration, the conflicting demands of supplying the players with enough independently interesting material and keeping the result comprehensible to the listener require ways of elaborating lines which add detail without overburdening the ear. There are several ways to achieve this:

*   Sub-grouping:

By using constantly changing subgroups within the whole ensemble, the composer can create many varied   textures. Thus, all the players have interesting material to play, and the result is not overly complex.

Franck, Symphony, 1st movement, m. 171 ff: The passage from strings alone to clarinets plus horns, back to strings, and then to winds again, now without horns, provides welcome relief from the full textures which precede this section.

*   Individualized Doubling: As already mentioned, frequent literal doubling leads to heaviness and grayness of color. However, there are more sophisticated ways to double, which avoid these problems:

*   Doubling at intervals other than the unison: Doubling at the octave creates greater transparency of color, and also fills the musical space in more interesting and varied ways. Occasional doubling at other intervals, especially in the higher octaves, can also create interesting synthetic timbres (as on the organ).

Ravel, Bolero, 3 bars after rehearsal # 8: The horn, playing mf, has the main line here, doubled by higher octaves in the celesta, while two piccolos double respectively at a twelfth and two octaves plus a major third higher. This is very similar to a common organ combination (the "cornet"), which gives a rich, piercing sound.

*   Heterophony: Rather than literal doubling, each doubled part can be a ornamental variation on the same basic contour. This keeps the overall design clear, but allows for individuation.

Mozart, The Marriage of Figaro, Overture, m. 150 ff.: Although upper winds and strings follow the same outline here, the differences of detail between them keep the orchestration light and transparent, even in a tutti.

*   Doubling which becomes counterpoint and vice versa.: Doubling need not stay consistent through a phrase or section. In particular, an instrument can begin a phrase as a doubling and at some musically meaningful point (a change of motive, a climax, a cadence) become more contrapuntal, or vice versa.

Mendelssohn, 4thSymphony,1st movement, m. 140-145: Oboe 1 goes from simply doubling the main line in the strings (together with other woodwind) to supplying a subtle background counterpoint.

*   Piece-meal doubling of several other lines: Doubling may move between various lines, thus creating new lines, which do not, however, add significant polyphony to the texture.

Mahler, 9th symphony, 1st movement, m. 365 ff: Here the first horn starts as an inner counterpoint, then doubles the cello (m. 368), and then moves on to double trombone 1 (m. 369).

*   Partial doubling: Doubling may be partial, i.e. only of a few main motives in the phrase, the beginning or the end of the phrase. In other words, one doubles only highlights. The doubling can then drop out, or simply become background resonance,

settling down on a held note. The opposite (a held note becomes a doubling) is also possible.

Mahler, 4thSymphony, 1st movement, m. 318: Here flutes 3 and 4 abruptly stop doubling the first violins (reinforcing the sudden dynamic change - crescendo *into a"p" - in the latter).*

The common principle in all of these procedures is to *individualize doublings* rather than to use them mechanically. This leads to a more subtly nuanced sound and also provides more interesting parts for the players. In this way, a sort of pseudo-counterpoint is created which is an excellent way to use the full ensemble.

Planes of Tone

By "plane of tone" (Tovey's term) we refer to one instrument, or a *blended* group of instruments (not necessarily from the same family) sharing one rhythmic outline. A plane may consist of one line or a textural mass. Simultaneous planes of tone are differentiated by perceptual prominence: planes can be more or less equal, as in vigorous counterpoint, or they can fall into foreground (main lines) and various levels of background (secondary contrapuntal lines; figurations to add animation; harmonic masses; resonance).

As we have repeatedly mentioned in this series, the listener cannot pay *equal* attention to several musical strands for any length of time. Even in contrapuntal music, the ear jumps from one part to another rather than following all the parts continuously. Therefore, the composer must have a clear idea of what he wants in the foreground or the background at any given time; otherwise confusion will result.

The following are the essential principles in creating planes of tone:

* Blend: By definition, a "plane of tone" is a blended mass. *Within* a plane of tone, blend is achieved by similarity of color and rhythm, close spacing (no gaps), balance (all the elements fairly equal in force). If there are disparate timbres, as in the woodwind, special strategies, such as closely spaced overlapping, are required to trick the ear into accepting the result as a unified whole.

Tchaikovsky 5th Symphony, 1st movement., m., 411 ff: Here clarinets and oboes are interlocked for better blend, in a standard classical technique.

*   Differentiation: *Between* planes of tone, clear differentiation is essential. This is achieved by contrast of register, timbre, and/or rhythm.

Beethoven 6th Symphony, 1st movement., m. 97 ff: Here the theme stands our clearly in the upper winds, while the strings accompany below.
Planes of tone may be organized as equals (usually successively, as in dialogue), or as hierarchy.

*   In the case of a dialogue between equals, the planes must be similar both in loudness and in volume ("thickness"). Contrast comes from color, register, and rhythm.

Brahms 4th Symphony, Finale, m. 81 ff: Here quiet chords in the strings (minus double basses) alternate with chords in six woodwinds. Had the strings been louder, the woodwinds would have benefited from the addition of horns (for richness and volume).

*   In the case of hierarchical planes, each plane has its own characteristics, according to its perceptual prominence:

*   Foreground: The foreground must stand out from the other elements. Therefore it is usually louder, in a timbre with a strongly characteristic color, and prominently placed (e.g. in the soprano). Examples abound of this common situation.
*   Background: Background planes can be divided into movement and resonance.

Movement
Movement in sound is the essence of music. In counterpoint, in harmony, and indeed, in all musical form, control of movement is critical. Orchestration brings another dimension to the issue of movement: As the number of instruments increases, if all the instruments are moving on the same rhythmic plane, the effect becomes more and more ponderous. Thus the need, even in a homophonic tutti of any length, for at least mild rhythmic differentiation between parts and families.

A more interesting situation, and one which makes the orchestra's masses an advantage rather than a defect, is to supply background figuration in a secondary plane of tone. Such movement animates the texture, lightens it, and provides shading, making the overall design more subtle. Many of the greatest feats of orchestration occur in such situations, creating powerfully evocative atmospheres: Think of the start of Ravel's *Daphnis and Chloé,* Wagner's *Ride of the Valkyrie*, and so forth.

There are four basic types of orchestral movement: trills/tremolos, repeated notes, scales and arpeggiation. Any one of these can be applied simply or enhanced with contrapuntal touches (neighbor and passing notes, suspensions, etc.), making its profile more interesting and individual. They can also be combined.

*	<u>Trills:</u> *Wagner, Die Walkure, 3rd act, beginning: The "riding" theme is accompanied by trills in the winds, which add great momentum.*
*	<u>Repeated Notes:</u> *Beethoven, 5th Symphony, 2nd movement., m. 205 (coda): The theme in the bassoon is accompanied by repeated chords (alternating with rests, which reinforce the tentative character) in the strings.*
*	<u>Scales:</u> *Wagner, Die Meistersinger, Overture, m. 42, ff: The scales in the strings (note the simplified bass part) add vitality and energy to the majestic, chordal theme in the winds.*
*	<u>Arpeggiation:</u> *Brahms, 3rd Symphony, 3rd movement, beginning: Here a beautiful string accompaniment is weaved from rocking arpeggio figures in the strings.*

To be successful, this kind of movement (as opposed to straightforward foreground counterpoint), must not attract too much attention on its own. Therefore, it must be clearly set off in a weaker plane of tone; it is usually limited to one or two mildly varied motives, with a high degree of consistency, and it does not involve too many varied timbres. Often the accompaniment is lightened with rests.

Finally, quick orchestral movement can be used to reinforce direction: strongly rising and falling passages can be greatly enhanced by fast runs or scales in the basic direction of the passage, in winds or strings, harp glissandi, etc. Such movement often takes slightly different forms in different instruments, so as to create general momentum rather than one thickly doubled line.

Strauss, Die Frau Ohne Schatten; 1st act, rehearsal #6: Note how a wispy image of a rising shadow is created by several different rising figures simultaneously (combined with held notes for resonance).

Resonance
Resonance, the quietest of all planes, generally should not be noticed on its own. Therefore it is characterized by the softest timbres, the dullest registers, and the least activity. Also, resonance is usually in the same register as the foreground, so as not to draw attention to itself as something apart.

Moxart Symphony #41, 1st movement, m. 94 ff: The quiet held note in the oboe provides a subtle but poignant background resonance for the string theme.

Contrapuntal Orchestration

The main difficulties in orchestrating counterpoint are:

*   Achieving balance between the lines: Assuming all the lines are of equal importance, the simplest strategy is to give all the lines to the *same* family (or, if a thicker sound is appropriate, families - each line is doubled by a similar combination of instruments). Assigning the various contrapuntal lines to different colors (pure or doubled) requires that the colors chosen be equal in loudness and volume. This latter method is rather tiring to the ear and is best used for short passages. It is more appropriate to stratified counterpoint (see our book on <u>counterpoint</u>) than to consistent imitative counterpoint.

*   *Beethoven 7th Symphony, 2nd movement, m. 185 ff: All the counterpoint is in the strings.*
*   *Mahler, 5th Symphony, Finale, rehearsal #3: The contrasting themes are assigned to massed strings and massed upper woodwind. Note the violin trill, which adds extra animation.*

*   Marking entries: In counterpoint with frequent imitative entries, it is sometimes effective to treat the beginning of an important entry as an accent, orchestrally enhancing the first few notes in some way.

Mahler, 5th Symphony, Finale, m. 136: Doubling the first few notes of the strings with the horn (in a luminous register) helps mark the beginning of a new section.

*   Integrating the overall result into a coherent whole, and avoiding dryness. The Baroque *basso continuo* is a response to the need to bring contrapuntal textures into coherent wholes. While short passages in closely related timbres may occasionally be presented "as is", it is usually a good idea either to add a complete harmonic plane of tone in the background, covering the middle register in particular, or to leave sustained "trailers" (held notes at the end of a phrase) behind the main lines from time to time. This helps avoid overly dry textures, and also mitigates the aural fatigue created by having only foreground parts.

Mahler, 5th Symphony, 3rd movement, m. 799: The vigorous, tutti counterpoint is drawn into a rich whole by the sustained trombone chords.

The tutti

One can speak of a tutti when at least three of the four orchestral families are present. Since the number of instruments in such a grouping will inevitably exceed the number of (audibly distinguishable) real parts, the challenge of the tutti is create a coherent, rich whole, where all the elements contribute something meaningful.

The acoustical realities of orchestral balance limit the number of ways a tutti can be organized: brass and percussion are by nature the loudest sounds, and certain combinations, e.g. putting the woodwind in the middle register where the full brass is playing loudly, simply cannot work. Thus we reach the paradoxical conclusion that the more instruments are playing, the less ways there are to combine them! Many contemporary composers are led by this fact to write for the orchestra as a collection of chamber groups; at times this approach is enhanced by unusual spatial setups, which can create interesting stereo effects. However, it seems to me that if one writes for orchestra, all the instruments should play together at least some of the time.

Usually tutti passages are loud, but the occasional soft tutti (for example in the first movement of Beethoven's 9th Symphony, m. 469 ff) can be very effective; often the sound has something menacing about it, like a great power restrained.

The main ways of organizing a tutti are:

*   All families have complete harmony, including all the main elements in the music, but the details and part-writing are independent in each family. This is the most common method; it gives a rich sound, without grayness. (Sometimes winds and, more rarely, strings, are left empty in the middle register when a large brass section is very fully scored; they would not be audible in this register over the brass, in any case.) The overall harmonic unity guarantees coherence, and the differences between the families create subtle variations in color.

Wagner, DieMeistersinger, Prelude, beginning: Each family has independent partwriting. Although the winds start off doubling the main melody in the violins, by m. 7 they are already adding new details of their own.

*   Each musical element is given to a different family. This method has the advantage of bringing out each musical element clearly, differentiating it from the others by timbre.

Tchaikovsky, 5th Symphony, Finale, m.474 ff: While strings play the main melody in octaves, horns and winds provide two important contrapuntal accompaniments. The repeated note accompaniment is in lower brass plus double basses.

*   The third method is simply to literally double all the parts in each family. While occasionally suitable for short, vigorous passages, this method usually sounds heavy, and leads to a gray sound.

Summary: What is good orchestration?

We are now ready to provide a checklist of criteria for good orchestration, complementing our list, given earlier, of the characteristics of poor orchestration.

Good orchestration must:

* 	Make formal sense: Changes of orchestration must arrive at appropriate places, with appropriate degrees of contrast.
* 	Supply sufficient variety and freshness of color to maintain interest.
* 	Enhance the phrasing.
* 	Ensure clarity of the various musical elements. Every element should be audible.
* 	Ensure that every element contributes something individual, allowing for what Richard Strauss (referring to Wagner's polyphonic style, in the preface to his revision of the Berlioz treatise) calls the "spiritual participation of the players".
* 	Be as easily playable as possible, always using the simplest means to create the desired effect.
* 	Create richness (usually through multiple planes of tone).
* 	Have clear character.
* 	Use the whole ensemble effectively.

Orchestral Accompaniment

When the orchestra is used as an accompaniment for a (vocal or instrumental) soloist, the main problem is how make full use of the orchestra, while not drowning out the soloist. If the orchestra is too often reduced to discrete murmuring in the background, the overall effect is feeble.

The basic principles for using the orchestra as accompaniment are as follows:

*   Bring out the soloist as much as possible *by contrast*, whether of timbre (e.g. violin solo vs. woodwind), of register (e.g. accompany a cello solo with only upper strings, or of rhythm (e.g. make the solo line more active than the accompaniment).

Beethoven, Violin Concerto, 1st movement, m. 102 ff: a small wind ensemble accompanies the (very high) violin.

*   Lighten the orchestra by aerating the texture with frequent rests, plucked or staccato basses, and limit held notes in the accompaniment to dull or weak registers.

Prokofiev, 2nd Violin Concerto, 1st movement, m. 171 ff: Note the short rests in the wind and lower string motives, as well as the other strings pizzicato*.*

*   When great force is required, consider using the soloist in alternation with the orchestra: This gives the illusion that the orchestra confronts the soloist as an equal.

Beethoven 5th concerto, 1st movement;, m. 304 ff.

*   If the solo timbre is not present in the orchestra (e.g. the human voice), discrete doubling of the solo line may be appropriate. Generally such doubling is less obtrusive at the octave than at the unison.
*   To avoid thinness in the orchestral writing, create richness by multiple planes, even if each plane only contains a few notes.

Bizet, Carmen, 1st act., Scene 1, "Andante un poco" (five bars after the end of the opening chorus). Short string chords (alternating low and high) accompany two counterpoints to the voice: high violins in a triplet figure, and a few woodwinds in half notes. The effect is rich but extremely transparent.

Appendix: Some Pedagogical Ideas

Examples from a character glossary

It will be obvious by now that artistic orchestration expresses and enhances musical form and character. To help the student think about musical character, a useful exercise is to compile a "character glossary". The idea is to list every orchestral resource which can contribute to creating a given character. While no individual passage will use all of them, this method encourages thinking about musical character when making orchestral choices.

As an example we offer a glossary entry for "mysterious":

*   Very soft, vague sounds: low strings, "wet" percussion.
*   Blurred design: heterophonic doubling of a few motives, so that no single contour predominates.
*   Background resonance, as soft as possible (string harmonics, cymbal rolls *ppp*), possibly subtly changing from time to time.

Outline sketches as a teaching tool

A problem in teaching orchestration is that transcription of existing music never gives the student the opportunity of creating a complete orchestral texture on his own. A useful solution, as an intermediate step between transcription and composition, is to use outline sketches ("skeletons"), which the student must elaborate, often in more than one way. A skeleton consists of a melodic phrase or two and a figured bass line. The student has to decide where to place the melody, how to fill in the harmony, and must imagine a full-fledged accompaniment.

Learning orchestration from the repertoire

In studying the orchestral repertoire, the student needs well graduated examples to start with. Composers like Mahler and Ravel, wonderful orchestrators though they are, are not suitable for beginners since their textures are often very rich and complex.

An excellent starting point is Mendelssohn: His orchestration is classical in spirit, economical, simple, and always effective. Mendelssohn's partwriting is straightforward,

his orchestration perfectly balanced, and his figuration imaginative without being overly elaborate.

Tchaikovsky is a logical next step, progressing towards a larger orchestra. Again, his orchestration is effective, clear, and easily understood.

Bizet's *Carmen* is a basic text for orchestration with voices.

Mozart, although he uses an orchestra smaller than Mendelssohn's, has more complex and refined methods of partwriting, and therefore should follow, rather than precede the former. Beethoven introduces many novel orchestral ideas, and, properly understood, his approach to the orchestra will greatly increase the student's sophistication.

More advanced orchestration begins with Wagner, in particular the richness of his orchestral polyphony *as a norm*, and the way he uses the enlarged orchestral families.

After these models have been assimilated, the student will be prepared for more complex orchestral styles.

Orchestral simulation

Recent advances in computer technology have made possible fairly realistic simulation of the orchestra. Such simulation is very common in film music, and can be used as a valuable pedagogical tool, since rarely does a student have sufficient access to real ensembles as needed, to try out every idea. Also, simulation permits learning from mistakes more easily than with a real ensemble, where the sheer work of regenerating and printing corrected parts makes the immediate tryout of alternative versions impossible.

That said, there are several provisos:

*   Simulation is not a substitute for listening to real orchestras. Without a great deal of knowledge and experience of real ensembles, good simulation is impossible. In particular, balance among electronic sources does not resemble real ensembles at all, and must be adjusted appropriately.
*   Simulation will not remedy poor musicianship; in fact the first requirement for good simulation is *to play in each part, in real time, in a musical, phrased manner*. Good keyboard skills are essential. This is the only way to get a natural sounding result.

*	Orchestral simulation is easier than chamber or solo simulation, since the individual instruments are heard less often alone, and defects in the sounds are less noticeable.

*	Where budget permits, simulation can be much improved by recording a few of the main parts with real instruments, and using synthetic sounds to fill in the rest.

*	Vocal simulation is not currently satisfactory.

My own experience is that while a good orchestra is always more exciting than a good simulation, a good simulation often sounds better than a poor orchestra.

While there is no point in recommending specific machines for simulation here (they still are changing too rapidly), some advice on getting realistic results with each orchestral family may be of use.

*	Strings: Use different sounds for each section, and not just a generic string patch. For each section, at a minimum there is a need for one patch with a fast attack, and another with a slower attack. Since strings playing legato are never absolutely synchronized, the notes should be slightly overlapped. Chords should be slightly arpeggiated. Long notes should usually have some dynamic evolution (often realized with midi controller #7).

*	Woodwinds: Solo winds need especially expressive playing. Make sure that the dynamics and articulations chosen fit the instrument.

*	Brass: This is the hardest group to simulate, since brass change more over their (large) dynamic range than other sounds do. It is essential to have different samples at various dynamic levels, and also some way of creating natural crescendi and diminuendi. To some extent this can be approximated by taking a loud brass sound and programming a filter to open, following a midi controller as needed. Also the resonance created between brass instruments in a real ensemble (the metal of each instrument vibrates slightly in sympathy with the others playing around it) is very prominent and creates strong beating effects that enrich the sound considerably. To simulate this effect, some discrete chorus must be applied to any brass group sound.

Finally, simulation is always made more realistic by a panning setup which imitates the normal geography of the orchestra.

Conclusion

The most important conclusion to be drawn from our study of orchestration is that orchestration can bring out and enhance *any* aspect of the music. Once the composer gets into the habit of thinking about how timbre can mark and enrich important formal points, clarify and bring into better focus details of rhythmic design, as well as of harmony and counterpoint, orchestration becomes what it should be for maximum artistic effect: An integral part of composition itself.

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