COMPOSITION, ORCHESTRATION & ARRANGING

PETE THOMAS

These pages are not intended to be treated as an authoritative text on the subject, (there are already many books in existence which cover the orthodox rules), so much as a practical *working* guide to writing and arranging music in a way which I have found to work well in the real world of popular commercial (and sometimes not so commercial) music. I have tried to achieve a balance between "doing it by the book" and looking at some of the realistic short cuts available. In some areas I have taken a slightly academic approach where I feel that the knowledge of certain rules (or *conventions* as I prefer to call them) are invaluable. In others I have relied purely on my experience of what happens in the music business.

Musical boundaries are being broken all the time and so these tutorials cover more than one genre, not purely orchestral and not purely pop and commercial. Although I have concentrated mostly on western diatonic music, the area with which I am most familiar, many of the techniques I describe can be applied to all types of music, traditional or avant garde and from whatever culture. It would be narrow minded and uncreative to assume that we can't apply one set of conventions to various styles of music. For many years I have been composing and arranging in many different styles including pop, jazz, rock, rhythm & blues, big band, techno, orchestral, classical, country and folk. I have been involved in writing and producing music for the film, television, radio and the record industry as well as for my own gratification and pleasure. I have often needed several different textbooks when a problem arises. I hope that these tutorials will answer many of the questions that would normally take three or four different books to cover. Inevitably I have had to omit some of the more intricate aspects and would recommend much further study in specialist areas.

These notes are designed give the intermediate musician some short cuts to creative writing. In some instances there are no short cuts but ways of avoiding some pitfalls are useful. The conventions that exist are of course a very important aspect, but not as important as that most intangible requirement: *inspiration*. I believe that at certain times we are all able to create music with a magical quality that transcends all the rules and all the studying we may do. No book can tell us how to do this, but at those other times, there's a lot to learn.

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COMPOSITION

Composition is the creation of an original musical work. It involves the creation of a melody, and in the case of a song, lyrics. The composer often supplies a harmonic and rhythmic content but in most countries the copyright in the composition exists only in the melody and lyrics. (Possible exceptions would be a work for percussion instruments with no pitch). In the case of modern dance/rap music the copyright in the composition is often claimed by the programmer, but this is a "grey area" currently disputed under current law.

ARRANGING

Arranging involves taking the bare essentials of a musical work, in some cases just the melody, and creating a means by which that work can be transformed into a musical performance. It is often the case that an arranger will also use the harmonic and rhythmic structure suggested by the composer, but will frequently desire or be briefed to change or develop these aspects.

Traditionally arranging is done by means of a written score but can also be done by communicating verbally with the musicians and relying on their memory to recreate the arrangement (Often called a "head" arrangement). In current pop and dance music computers are often used to generate sequenced backing tracks, usually referred to as programming. This is also a form of arrangement where electronic instruments are concerned (e.g. synthesisers and samplers), but is not within the scope of this book and needs to be dealt with as a separate subject. Computer programmes are also available that will translate sequenced information into musical notation, so that parts conceived aurally may be communicated in a conventional score. In this case knowledge of conventional arranging techniques can still be very useful and in many cases essential.

Arranging may involve the creation of original melodic ideas such as counterpoint and backing figures, answering phrases, introductions and so on, however the copyright ownership of the composition will always remain with the composer, along with the rights to all performing and mechanical royalties. A separate (beneficial) copyright exists in the arrangement and belongs to the

arranger. This allows the arranger to grant specific or restricted use of the arrangement by whoever has licensed such use (usually by a payment to them arranger). An arranger can be commissioned to write a piece of music either for all uses (a "buyout"), or for specific limited use. E.g. an arrangement may be commissioned solely for use on the radio. In this case a fee would be negotiated only for such usage. If the client then wishes to use the arrangement on TV, in a film, on a recording, in a lift, on a karaoke, at an exhibition etc, then they must apply to the arranger for a further licence to allow this, usually with another payment.

ORCHESTRATION

Orchestration involves taking a given arrangement and assigning it in parts to different instruments, usually in the form of a written score. An arranger may employ an orchestrator.

It is essential to gain a basic working knowledge of the instruments for which one is writing. This includes their ranges of pitch and dynamics. Many instruments produce a tone that varies depending on the pitch; for example the flute is quite weak in its lower register and in a normal acoustic environment would not be able to compete with louder instruments. Some instruments are transposing instruments; i.e. the pitch that sounds is not in the same key or octave as the written notation. Scores can be written these days with transposing instruments either notated in concert pitch (non transposed) or in their own key.

COMPOSITION, ORCHESTRATION & ARRANGING

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COMPOSITION - TIPS AND HINTS

- Know when to use rules, and when not to
- Think of the melody as a conversation, with phrases logically following one another, possibly as questions and answers.
- Repetition, development and contrast can all be used to create and release tension, but be careful, too much repetition is boring. Too much development can become obscure and too much contrast can be disconcerting. Melody writing, like all aspects of music, is about creating tension and releasing it in the "right" place. You will grab the listener's interest if the tension is not always released where expected, but holding tension for too long may not be appropriate; always be aware of the genre in which you are writing.
- If you have already conceived the chord sequence this will often tell you where the first phrase will develop, but also feel free to go somewhere else and change the chords if inspiration arrives.
- Many good tunes are very simple either rhythmically or melodically or both. Compare composing with writing poetry where one strives to say a lot with a few words.
- If you are writing a pop song try starting with a title, a riff or hook.
- The first ideas are often the best.
- Study many types of music, not just the area in which you wish to compose, and allow ideas to crossover" from one style to another.
- Analyse melodies and try to find out what makes them good.
- Try inverting or reversing your melodies. Study twentieth century compositional techniques, e.g. tone rows, chance (throwing dice to choose the notes - randomising function on a sequencer).
- Force yourself to write a tune every day. Sooner or later there have to be some good ones.
- Don't just compose with your instrument, sing or whistle as you go about your daily life and write down the good tunes. Try to remember dreams with music in them.

- Try to bring original melodic material into your improvisation rather than relying on licks and clichés. Improvisation should just be a speeded up process of composition.
- Keep a notebook, tape recorder, note down any melodic fragments
- Try to be objective. Imagine yourself not as a composer or musician but the person listening to your music for the first time. You may suddenly some superfluous passages or devices that are just there to impress people with your musical knowledge.
- It helps to be aware of your reasons for composing, whether its money, respect (self or from family and friends) fame and stardom, spiritual awareness or a desire to entertain or spread love and peace. Try and be aware of what emotions you are trying to arouse in the listener.
- Don't use rules to merely to compose, but use them to improve a tune if you think it could be better. Composition may be up to 99% inspiration: try to learn where that inspiration comes from. Some composers get it from meditating or being at peace with the world, others from the panic of fulfilling a deadline. Everyone finds inspiration in different ways.

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ELEMENTS OF MUSIC

Music is the organisation of sound into *melody* (pitch) and *rhythm* (time). This is the basic structure on which a composer (or orchestrator) will add further elements including *harmony*, *timbre* and *dynamics*.

Composition (on its most basic level of "writing a good tune") will often involve only the rhythm and melody, however in "western tonal music" the melody usually implies the harmony. Exceptions to this include a lot of pop/dance or rap music of the last two decades. Traditionally a composer or composer/lyricist team wrote the basic tune (melody and rhythm) and words along with any further orchestrational development, or else would get a dedicated orchestrator to do the latter.

In vocal music either the words (lyric) or the music could be written first, or both at the same time.

Most forms of pop and jazz music combine all the above elements. The basic melody usually consists of notes of different pitches (even rapping often varies the pitch and intonation) which are organised in time (rhythm). This is usually arranged against a backing provided by a rhythm section which can consists either of musicians or a programmed track (typically drums/percussion – bass –piano/guitar). This backing often contains a complex rhythmic and melodic counterpoint to the main melody, which can be divided into three main areas:

Bass drum patterns	Evolved from early forms of dance music and jazz where bass (and/or bass drum) plays on beats 1 and 3.	Often synchronised with bass instruments
Snare drum patterns	Evolved from early forms of jazz where snare (and/or R.H of piano) plays on beats 2 and 4 (backbeat)	Often synchronised with guitar or keyboard
Cymbal patterns	Subdivisions of beat, eg 8 or 16	Often synchronised with guitar or keyboard

In addition the harmonic changes can form a rhythm, ie the position and duration of harmonic changes can imply a strong rhythm, especially if a recurring pattern is implied.

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DEVELOPMENT OF MOTIFS

Very often a large part of composition involves expanding a very short simple idea into an entire work. A motif may be just a few notes, but careful development can make a little go a long way.

Development may be achieved by thinking about unity and variety. If the motif is repeated that is unity. If a contrasting motif follows (An "answer") that is variety. There are several stages in between if a motif is repeated but with varying degrees of changes. Using the different musical dimensions mentioned earlier (melody, rhythm, harmony, timbre and dynamics) there are many possibilities of creating logical development. You can use exact or approximate repetition of different dimensions. In composition (as opposed to arranging and orchestration) it makes more sense to start with just the three main elements (melody, rhythm and harmony)

Repeat	***Vary***
Melody	Rhythm and/or harmony
Rhythm	Melody and/or harmony
Harmony	Melody and/or rhythm

In addition one can use *approximate* repetition, especially of melody. This is often necessary if the harmony is changing and can be done by:

1. Repetition of the main contour of melody (shape)
2. Repetition of selected notes of the melody (essential pitches)
3. Repetition of melody at different pitch (exact transposition)
4. Repetition of melody using same intervals on different scale degree (tonal transposition or sequence)

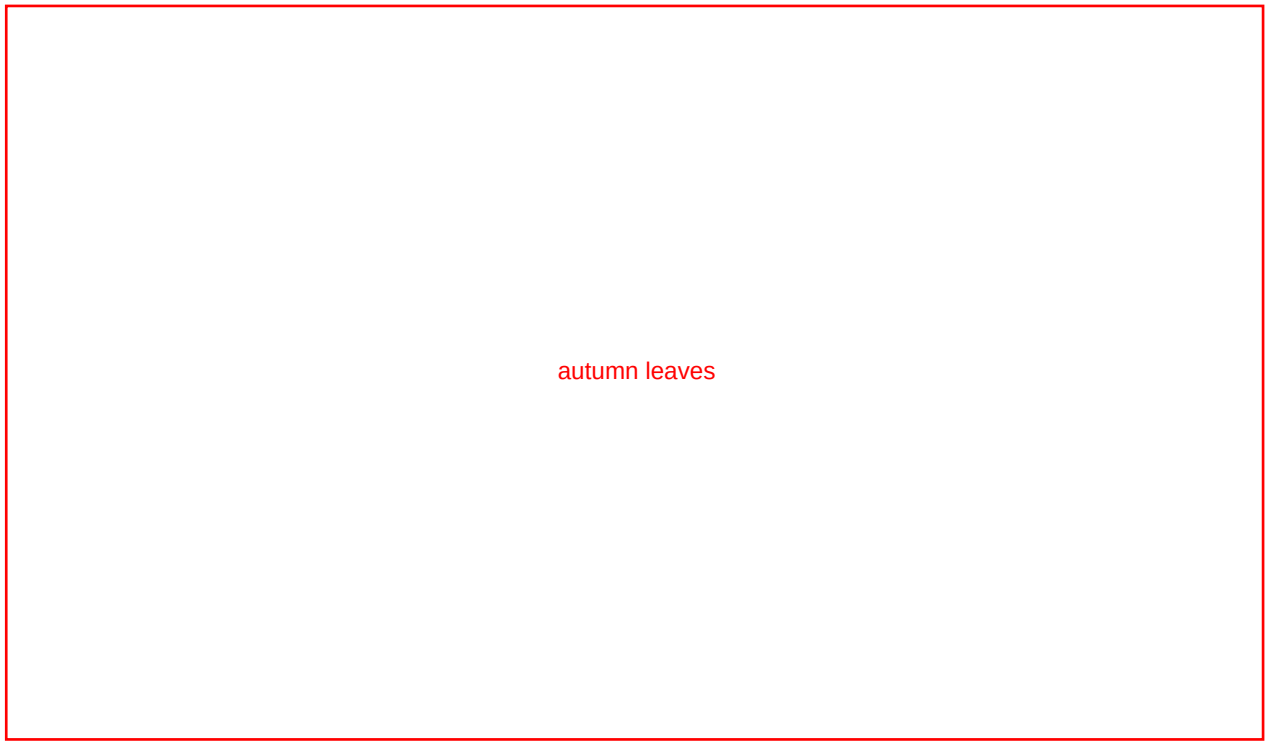
Examples:

lacucaracha

In "La Cucaracha" the opening motif is firstly repeated then followed by an answer (motif 2). Motif 1 then appears again slightly altered to fit the harmony (motif 1a), but the main contour of the melody is retained. This is then repeated (unity – it follows the same method as the opening statement) and is then followed by the another answer (motif 2a) which combines unity and variety. Unity is achieved by using the same rhythm as motif 2 but with different notes and intervals. There is already tension at this point due to the V7 chord. As the opening 4 bar phrase has a cadence from I to V7 on bar 4, we expect (and receive) the second 4 bar phrase to cadence at the same point. This is unity that is totally appropriate to a folk dance tune.

In Autumn Leaves the opening 4 note motif is repeated in sequence with almost exactly the same rhythm, one step lower each time. This is not an *exact* transposition, it is a *tonal* transposition. The first three notes of the opening motif are the first, second and third degrees of G minor, so the third degree is *minor*. The first three notes of the sequenced repeat of this motif are the first, second and third degrees of F mixolydian (the scale that corresponds to F7) so the third is *major*.

This 8 bar "A" section is repeated, so that the rhythmic repetition of the motif builds tension which is release at the first bar of the "B" section



Exercise:

. Using the 8 bar La Cucaracha extract, add more tension at the final cadence by extending the second phrase (e.g. delay the perfect cadence by one bar).

b. Add even more tension by adding a bar at this point with a different time signature.

c. Add more tension by using more sophisticated harmony.

You will probably find that:

. makes the tune more interesting. The sort of thing you might use if arranging or composing a jazz piece but with folk influences, but that

b. and (c) destroy the "folk" feel, and though still valid as an art composition, remove it from the realms of commercial composition.

Exercise:

. Take an existing well known piece of music and develop the opening motif in different ways.

b. Take a well known existing piece of music and develop the opening motif with an answering motif.

Replace the opening motif of (b) with an original motif so that the answer still makes sense

UNITY AND VARIETY - TENSION AND RELEASE

Two very important factors in music, as well as most other artforms, are the creation of tension and release. In this chapter we will look at how tension and release can be created by combining *unity* and *variety.*

Unity	**Variety**
Repetition	Lack of repetition
Static harmony	Changing harmony
Smooth dynamics	Radical dynamics
Unchanging orchestration	Changing orchestration
Limited range of pitch	Wide range of pitch
Rhythmic continuity	Rhythmic variety

N.B. Unity does not necessarily imply monotony and variety does not necessarily imply interest.

By combining unity and variety ***tension*** and ***release*** can be created. The good composer knows when to introduce contrasting material at the right time to release that tension. (For example by repeating an idea until the point where the listener is about to get bored). Tension can also be created by the lack of repetition, by the use of many contrasting and changing musical ideas and then released by the sudden appearance of repeated or static material.

On the other hand we don't have to assume that it’s wrong to keep repeating a melodic phrase beyond the stage where it may be considered boring. There are many instances where you may wish to create a "hypnotic" or soothing effect. In this case beware that there may be a tension created by constant repetition that you don't want, so it may be worth introducing some very subtle and gradual change either in the harmony, tone colour, rhythm or melodic content. Imagine the calming effect of listening to the gentle rhythm of waves on a seashore. This rhythm is not exactly constant metronomically, neither is each wave identical. There may be changes in the background sounds (seagulls or children playing).

Sometimes variety can be created by using unexpected intervals. This can create interest but if it is overdone the interest ceases to exist as the surprise element is replaced with predictability. There's a very fine balance required in the use of such devices, which is often purely subjective, and in most cases subconscious on the part of the composer. You may decide to use a "wrong" note. For instance most people would consider a Db on a C major chord to be an unpleasant dissonance (as opposed to a pleasant or useful dissonance). However if it is "set up" or "prepared" (for example by a repeated phrase where that note does fit the harmony and the C major is then introduced) then the dissonance can make sense and become useful. One may also want to look at where the melody had come from and where it was leading.

In previous centuries harmonies which we accept as pleasing used to thought of as unpleasant dissonances, for example a suspended fourth on a chord had to be "prepared" by stating the note prior to the chord. This rule though it does have some use is largely irrelevant in the music written today. It is perhaps better to think of dissonance not as an unpleasant sound but as a harmony that possesses some tension or need to go somewhere, whether to another dissonance or a consonance (a harmony that sounds "at rest").

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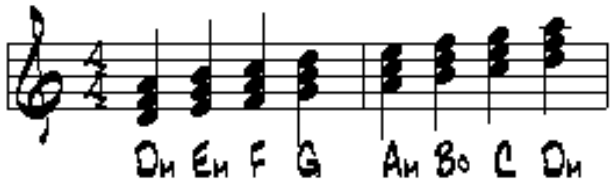
MODES

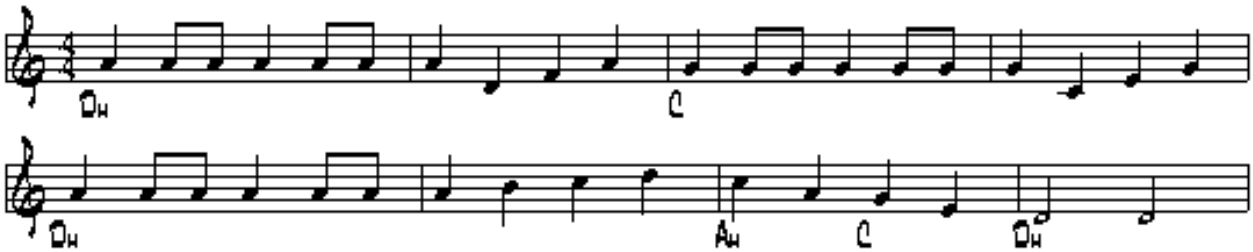
Modes can be used freely in pop music, either in a traditional form, as a one or two chord riff (eg modal jazz or riff based pop, funk etc) or as a way of finding interesting chord substitutions (modal interchange)

Traditional (melodic) use of modes

Typical examples can be found in folk music. As with conventional tonal harmony a chord can be built up in 3rds from a root note, which can be any note of the scale:



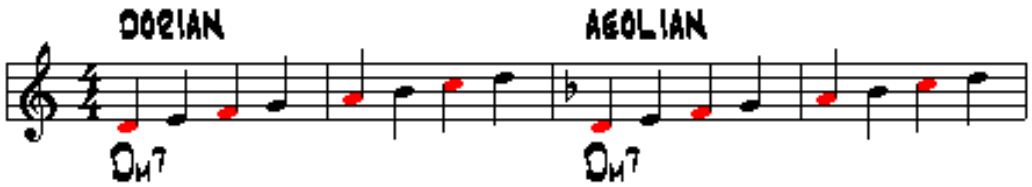
Generally the harmony is kept simple with triads rather than 7ths. The diminished or half diminished on VI would rarely be used.



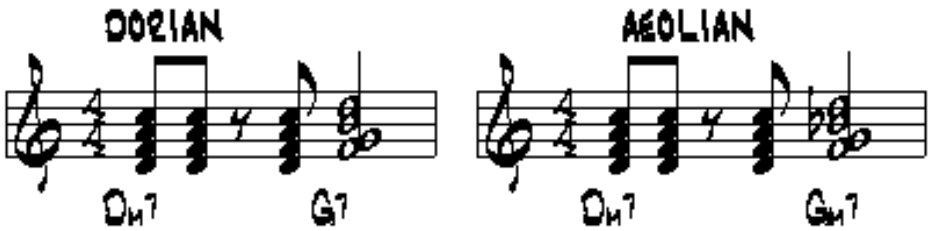
Note that in this Dorian example the VII chord (C) is used for the final cadence. One of the main features of modal music is the lack of a traditional V7 -I perfect cadence (Except, of course, the Ionian mode which is the major scale). In this example the Am could also have been continued through bar 7 to give a Vm-I cadence.

Modal Jazz & Riffs

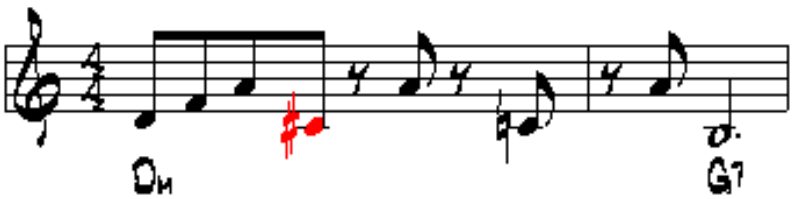
If only one chord is used for a tune, it can imply more than one mode, either for composing a melody or for improvising. This ambiguity can be used very effectively to allow the music to shift between different modes (and moods):



If two chords are used as a riff, then they will usually imply a particular mode:

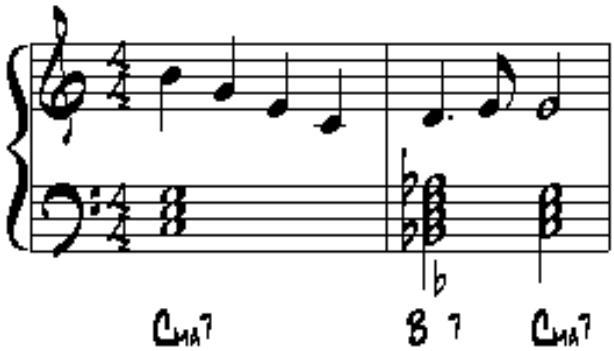


In the following example of a typical Latin riff, the C# is a passing note, so a Dorian mode is still implied, though in improvisation or composition a C# could be used either to coincide with the C# in the riff, or as a neighbour (or "leading") note.



Modal Interchange

This is where conventional tonal harmony is used but chord substitutions are used whicf "borrow" chords from a mode. In the following example a bVII chord is used to substitute for a more conventional V7. In this case you imagine that you switch temporarily from C major to C Aeolian.



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FORM

Commercial or pop music of the first half of this century was usually written as dance music or for musical shows, (stage and/or film).

The usual form of a song would be:

Verse The verse usually occurred once at the beginning and sets up the "storyline" of the song, a kind of vocal introduction.

Refrain The main body of the song consisting of two or Chorus) three sections. The first section("A"section) would usually be 8 or 16 bars and is usually repeated. There would then be a second section with a different melodic and harmonic basis (the middle 8, bridge or "B" section). The "A" section would then be repeated. We call this "AABA" form. Other forms such as "ABAC" (How High The Moon) and ABAC (Autumn Leaves) are used but are not quite so common. The term middle 8 maybe used however many bars there are.

The whole refrain or chorus may be repeated several times. Jazz and dance adaptations of popular show tunes would often omit the verse.

Another form of popular music of this era is the Blues. Here the form is usually based on the 12 bar blues form (sometimes extended to 16 bars). The structure of the song consists of repeated verses (telling a story) interspersed with choruses, where the chorus always has the same words.

The 12 bar blues is divided into 3 phrases of 4 bars each. It is very common for the second of these phrases to simply be a repetition of the first. This is a device which possibly originated when the singer would be improvising the words, and a repeat of the first phrases would give them more time to think up the words for the third phrase.

This form originates from the "call and response" worksongs of the plantation slaves, where one person would call out a "verse" and the rest would respond with a "chorus". This form can also be seen in European folk music, early ballads and sea shanties.

The blues form became very widespread during the 50s with the advent of rock and roll (which is based on the black American style rhythm and blues) and is still very common in rock music

Modern pop and commercial music (from the 60s onwards) still uses the AABA form without the introductory verse), but the repeated "verses and choruses" form is becoming more common. Today the

AABA form is often thought of as "verse, verse, chorus, verse" and some confusion can arise between this and the original structure mentioned above, where the B section is a middle 8 and definitely not a chorus. A typical modern pop song might be *verse x 2, chorus, verse, chorus, middle 8, (verse), choruses repeated to fade.*

Verses usually have different words but the same melody; choruses have the same words and the same melody. Often the chorus is one small phrase or word, referred to as a "hook" (possibly because it is supposed to be a "catchy" tune which "hooks" the listener like a fish on a line).

In some cases the "hook will be an instrumental passage or riff which is often stated as an intro,

recurring in the middle of the song and possibly again at the end.

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COMPOSING TO PICTURE

These notes can be applied to most types of film from 30 second commercial to drama feature. There are no hard and fast rules as to the answers, but the composer will stand a better chance of creating an appropriate score if he/she spends time thinking about the questions. Sometimes the answers are obvious; sometimes they only come through a process of trial and error, even for the most experienced composers. Very often the issues are subjective, one of the composer's chief skills is the ability to understand the brief and almost get inside the mind of the director.

Music is sometimes considered by the director from the outset, but is often added right at the end after the final edit. It has an enormous bearing on the apparent pace of a film. It can make fast editing seem slower and slow editing fast.

There are different approaches for diferent film genres, e.g. it is common for musical accents and strong beats to coincide with action in traditional animation, where it can almost act as a sound effect track, but this approach with modern drama will often appear to be very "corny".

- What is the overall emotional value (fear, love, hate, liberation, ecstasy etc)
- What (emotions) can music add that is not already present in the film?
- Is it actually necessary to add anything?
- Are there places where pauses or silence would be more telling?
- Is it necessary to tell a story or just convey a mood?
- Is there a climax or turning point?
- Are there secondary "peak" moments?
- Should the music follow or contrast with the visual rhythm?
- Should music cues synchronise exactly with action, or come earlier or later?
- How does the music affect the rhythm of the film (eg the pace of the editing).
- Whose point of view needs to predominate?
- How does the music interact with dialogue, voice over,

sound effects? Does it clash or complement?

- How does the genre of the music relate to the characters or the audience?

COPYRIGHT

Usually it comes down to a judge, and is therefore very unscientific. Therefore, judgements can be very tenuous and inconsistent.

Guidelines:

Copyright is a Three Legged Stool. If all 3 legs are in position, the case for an infringement of copyright exists. If any, or all, the legs are missing, the case is weakened, and the stool falls over.

The 3 legs are:

1. Access

- Has one composer had any way of hearing another work to allow one to be a copy?
- Two writers could by co-incidence have written identical pieces, and if one writer had no access, or way of hearing the other writers work, that would not be a copy.

2. Originality

- Is what you have allegedly copied original in the first place?

Classic blues licks and riffs are often used. They are not your original composition, and you have copied them, but you are not infringing, unless someone can prove that their work was original in the first place. (E.g. most 12 bar blues chord progressions). An example of when this would be an infringement would be the introduction to Johnny B Good. This copyright belongs to Chuck Berry.

Soundalikes, style-alikes, tributes, pastiche, parody, copy. They are all much the same and things are even worse if a parody is viewed as defamation of the artist! Then there are damages as well.

3. Substance

- Is what you have 'copied' a substantial part of the original work?
- What is substantial? Very vague, and open to interpretation, but can be defined in 2 ways:

(A) Qualitative

A distinctive hook, albeit very small, can be a qualitative copy. E.g. the opening notes of the Beatles 'Yesterday'.

(B) Quantitative

If whole chunks of an original work also occur in your work, that is a copy. So, if any one of the 3 legs doesn't hold up, the case for an infringement is lessened. However, experience shows that in most court cases, only one of the 'legs' gets referred to in any detail. The others might be referred to in passing, but their emphasis is less.

Even one leg being present can give someone the opportunity to put a case, often a bogus case. Even very tenuous access can be grounds for a nuisance case, which because of legal aid might go to court and costs a fortune in legal fees, which will never be claimed back from the individual pursuing the claim.

E.g. "I lost this tape on the bus and the artist must have found it and copied it". Or, a tape gets thrown on to a stage during a live performance and the artist is photographed catching it. So, access can be proven. Both of the above have happened, and that alone has lead to an out of court settlement, rather than having the expense of going to court.

If you are doing a sound-alike (or what you should start to call a style-alike), you to a greater or lesser extent involved in copying. Be careful. You must ask whether there is access, copying of the original and substantiality. If there is, then there is a real problem.

How far can you go? Try not to go close. Even something in the style of is dangerous. If you are intent on doing a copy, muddy the edges; introduce conflicting styles, so it cannot be compared with one individual artist, track or group. Don't refer to a single work, that is lethal. Bear in mind the qualitative factor. Don't string together a chain of classic riffs. Change the key. Change the time signature. Don't give it a title that implies a link to the original.

You must also consider whether the setting (visual imagery or voiceover) may suggest a closer link to the original than you intend. As well as copyright theft there is a "passing off as" law, by which the context may have much more bearing on the vase than any off the above considerations. This can be completely outside the control of the composer if such elements are added afterwards, but the composer may still be the defendant in a legal battle.

LAYING OUT A SCORE

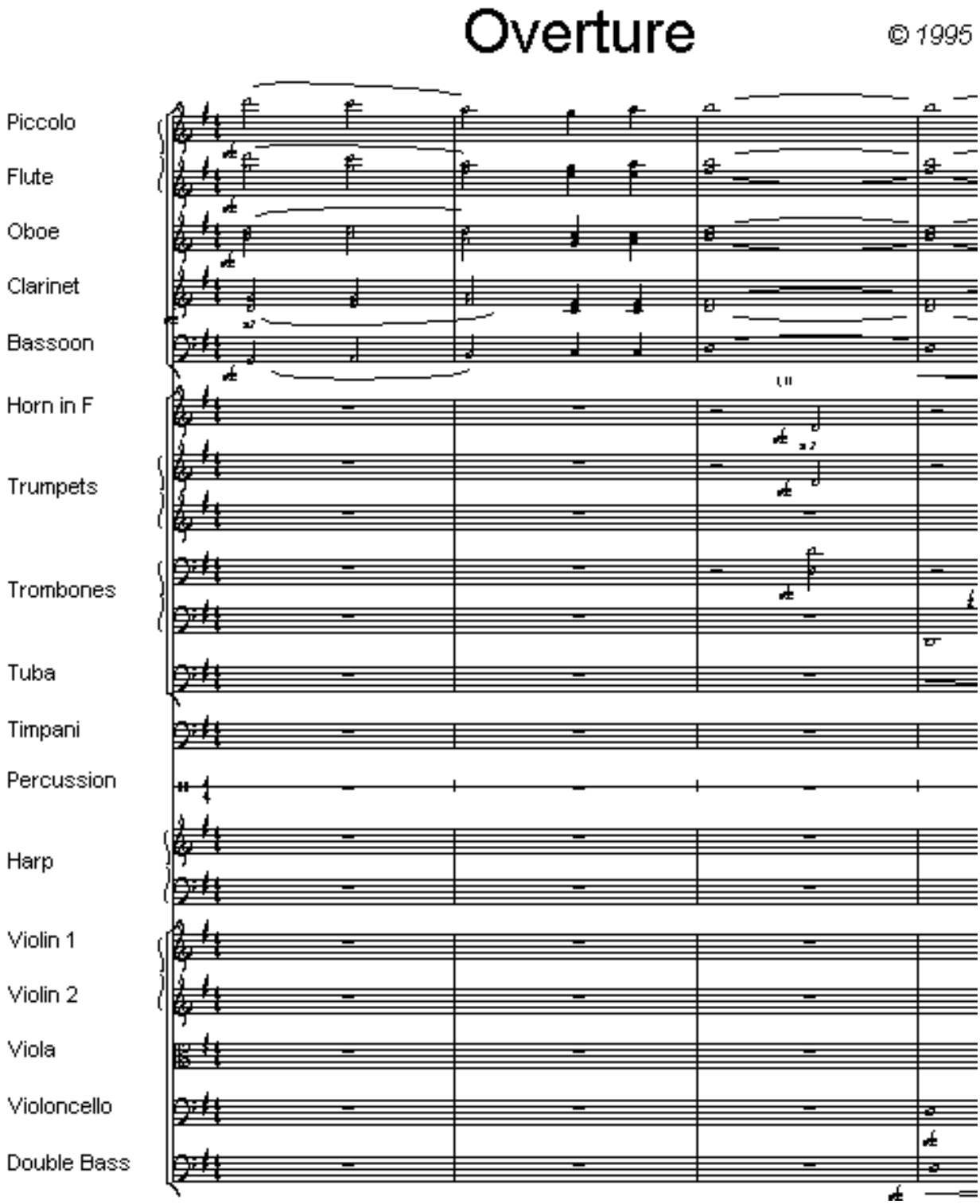
The title should be at the top centre of page one and the name of the composer and arranger on the right. It is a good idea to indicate whether the score is transposed or not (on the left).

Individual groups of instruments or sections (e.g. Brass, strings, saxophones, choir) are bracketed together down the left hand side of the staves, on every page. The names of the instruments are written to the left of each stave on the first page.

There are conventions as to the order in which the instruments appear from the top of the score, e.g.:

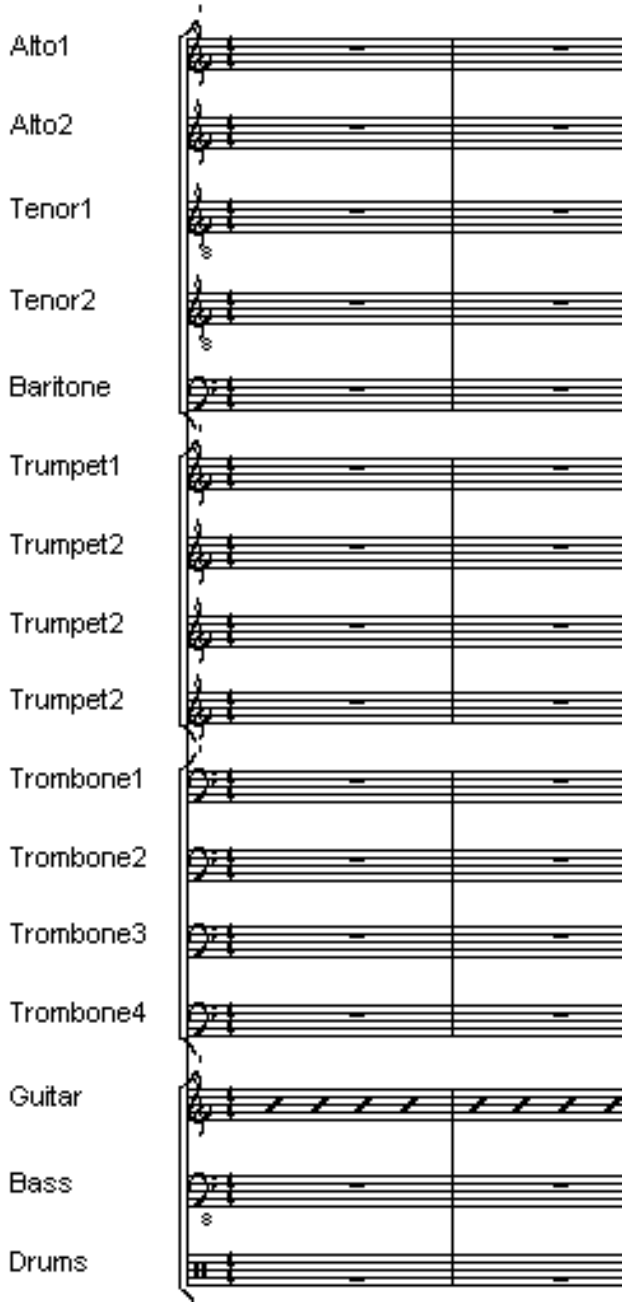
ORCHESTRA

- Woodwind
- Brass
- Percussion (Timpani, non-pitched, pitched
- Keyboards etc
- Strings



JAZZ ORCHESTRA (BIG BAND)

- Saxes (Woodwind)
- Trumpets
- Trombones
- Rhythm section



Each "family" of instruments is given its own staff. Where there are more than two parts to a staff, two or more staves may be used. Clarity is very important at this stage especially if your score is to be copied into individual parts by a copyist, who must be able to understand your intentions. Three or four instruments playing "block" chords may be written on one staff, but where complex polyphony would make this difficult for the copyist to decipher use another staff. A good rule is to imagine that you didn't write the score, then imagine yourself having to copy the score onto individual parts.

When writing for an unconventional line up it will probably help you to put the highest instrument at the top of the score and work down the page to the lowest, while keeping the rhythm section at the bottom.

Notes and rests should be written so that each beat is vertically aligned on different parts.

PLANNING THE SCORE

Useful tips:

- Make a rough sketch of the arrangement. E.g. intro, statement of theme, backings, counterpoint, solos, ensemble passes, modulations, restatement of theme, climax, coda. Decide on instrumentation for various sections and choose keys appropriate to the instruments. Use the ideas we mentioned for composition regarding unity and variety. Having planned the entire arrangement don't be frightened to change as you go along if you feel inspired.
- Fill in the melodic lines and make a note of the harmony in chord symbols throughout. With vocal scores fill in the vocal line and lyric. (The latter is more important than it first appears as you may wish to make a musical comment on certain words)
- The same ideas regarding variety and unity that apply to composition can also apply to your arrangement whether it’s an entire symphony or an improvised jazz arrangement. Just as we think of the melody creating and releasing tension the shape of the entire arrangement can do this as well. For instance we can think of repeated verses building tension and a chorus bringing release. In the case of jazz arrangements the composer will often rely on an improviser to develop the material. Here the improvisation is just an extension of composition, the good improviser thinks (either consciously or subconsciously) about building and releasing tension, repetition and development of ideas.

THE ENSEMBLE

The string section consists of violins (1st & 2nd), violas, violoncellos (usually abbreviated to cellos or celli) and double basses. There are conventions as to the ratios of instruments; e.g. a large orchestral ensemble may consist of 16 first violins, 14 seconds, 12 violas, 10 cellos and 8 basses (16, 14, 12, 10, 8).

Smaller ensembles would use a similar ratio (12, 10, 8, 6, 4 - 8, 6, 4, 3, 2) In pop and commercial music the basses will often be omitted as their role is covered in the rhythm section. Arco (bowed) passages would sound muddy, and pizzicato (plucked) as played by orchestral players would obstruct the feel or groove of an electric bass or a jazz double bass. A typical 20 piece studio ensemble might consist of 6,6,4,4. Smaller sections (less than 12) will sound weak at the extreme top of the range and will have more of an intimate "chamber" sound. Problems of intonation are more noticeable with smaller sections.

You needn't stick to "quartet" parts of 1st and 2nd violins, violas and cellos; you can subdivide how you feel (divisi). E.g. if you have 8 violins you could have 4 on one part, 2 on another, 2 on another. If you have 4 violas you could divide these into 2 and 2. However the smaller the ensemble the weaker it will sound if you employ too much divisi. You must mark at the top of the score how many players per part, and any changes of divisi as the score progresses (e.g. " divisi a4 or just "a4" means 4 players).

The string section is incredibly versatile. Unlike most other instruments the string family possesses an equality of tone throughout the range. Very fast passages are usually no problem.

Extreme changes of dynamic are possible in a very short space of time. The strings, either as an ensemble or solo, are capable of a great deal of emotional expression, though this quality disappears outside the range of the human voice (D1 - E5). Long passages of strings tire neither the players' nor the listeners' ears. A sustained tone of indefinite length can be produced.

RECORDING

Strings are normally recorded using a stereo pair of mics and often with close mics on each section (1sts, 2nds, violas and cellos) or each desk (each pair of players). Close miking will allow you to alter the natural balance (e.g. violas or 2nds louder than 1sts) or fake a natural balance if for example you don't have enough of one instrument. This will obviously lose out on natural ambience.

Small ensembles can be made to sound bigger with the use of double tracking but beware, double tracked strings can sometimes sound phased. On analogue tape a solution is to transpose the overdubbed part and varispeed the tape machine. With hard disk recording it is easy to double track with different tunings (slightly up and down) and delays (positive and negative) to partially simulate the effect of more strings. It can often be useful to add real strings to MIDI strings (and sometimes vice versa – not so easy)

STYLE

String players should not be expected to interpret quavers as "swung". Write dotted or triplet notes, however unless you require a corny sound it is not a good idea to write a jazz feel for string players. Unless they are experienced recording session musicians they are only used to following a conductor and hence may tend naturally to play behind the beat of a drummer or click track. If

this happens don't shout at them, they are not wrong but just playing in their own genre. A few polite words with the leader will usually solve any problems.

TONALITY

Irrespective of the range of the instrument, there are specific characteristics. In his book Principles of Orchestration, Rimsky-Korsakov describes the top string of each instrument as:

Violin	brilliant
Viola	biting and nasal
Cello	chest voice
Double Bass	penetrating

The other strings also have characteristics and are worth investigating further if you want to study string writing in depth. (See Rimsky-Korsakov, Adler, Piston) It is also a good idea to find a friendly string payer and get them to demonstrate all the possibilities and limitations of the instrument.

BOWING

There are specific markings for bowing: a down bow (marked ï) means that the bow is started from the part nearest the player's hand (the heel or frog), an up bow (marked V) is started from the tip. A down bow can be heavier and will usually occur on a down beat of a phrase, but a skilled player can play with no audible difference between up and down bows. Marking the bowing may speed up your rehearsal but it is also acceptable to ask the section leader to take care of this, and unless you are a string player yourself it is often best to leave this aspect to the expert.

A slur will indicate that all the notes encompassed will be played in a single bow (legato). The more notes required in one bow the less forceful the sound as the bow has to move more slowly.

This table shows some of the many different types of bowing:

Legato	A group of notes played smoothly in one bow
Staccato	Short up and down bows (notes are half length). Bow may or may not leave the string. Indicated by dots placed over/under the note
Spiccato	Staccato with a bounced bow. Usually used for faster passages. Slurred staccato Short notes played in the same bow
Detache	A cross between legato and staccato, Indicated by a line placed on or under the note.
Loure	A succession of notes slightly separated played on the same bow. Indicated same as detache but with a slur
Marcato	Heavy, separate stroke with a pressed accent played near the heel
Jete	Bouncing the top of the bow to create repeated notes in one bow. (Indicated by slurred staccato)

Tremolo	Small but very rapid up and down bows. Can sound dramatic, ethereal, "scary" or cliched if overdone. Measured (e.g. semiquavers) written with two slashes, unmeasured with three. A *fingered* tremolo is similar to a trill but with an interval larger than a whole tone.
Col Legno	Using the bow upside down.
Ponticello	Bowing close to the bridge - a thin sound
Sul Tasto	Bowing over the fingerboard - sounds "hazy"
Flautando	Bowing close to the fingerboard - sounds flutelike
Glissando/ Portamento	Sliding from one note to another, indicated by a line between the notes.
Sul G etc	This means all notes played on the G string, can apply to any other string as requested e.g. Sul A

Modo Ordinario on the part indicates back to normal.

PIZZICATO

This means plucking the strings with the finger (the right hand middle finger unless indicated for left hand with "+"). Allow time to change between arco and pizzicato passages. It is quicker to change to pizz after an arco upbow and quicker to change from pizz to an arco downbow)

Not suitable for very fast passages or notes higher up the strings (e.g. on violins higher than C above the treble clef, violas F below that, cellos F above middle C) unless doubled with woodwind, as the notes are less resonant.

DOUBLE STOPS

Two or more notes may be played at once (provided, of course, that they are on different strings). Double stops are indicated by bracketing the notes together. They work particularly well with cellos. Thirds, sixths and tenths are best for tuning; fifths, fourths and octaves can be tricky.

3 note stops are difficult to play quietly and should include at least one open string.

4 note stops should include two open strings and have to be played slightly arpeggiated.

Double stops allow for more notes in the chord, however if the notes required are impractical the parts can be split (divisi) when you have a large enough section, e.g. where there are two notes on a 1st violin part half the players can be directed to play one note and half the other. Don't worry unduly about writing impossible or difficult double stops as the players will usually automatically play them divisi.

VIBRATO

One of the characteristics of string playing is vibrato (vib) and will usually be employed unless specified (N.V.). When a section uses no vibrato the result is a cold, icy sound. Vibrato can add a romantic feel but is corny if overpronounced or used to excess. It is very expressive on solo passages.

Note: vibrato is not possible on open strings, if you want a G below middle C to be played with vibrato, voice your chord so that this note is played by the violas or cellos. Likewise the C below

middle C should be played by the cellos and not the violas.

INTONATION

In general intonation is not a problem for string players. Vibrato helps intonation (as it does with wind and brass instruments) as the slight wobble above and below the pitch tends to average out into the correct pitch. Larger string ensembles can actually benefit from slight discrepancies in intonation, as this creates a "chorus" effect. If a large violin section were all playing absolutely in tune with each other it would not sound so large. (This is not desirable with quartets or small sections so beware of writing unison passages for fewer than four violins. Large intervals can sometimes make intonation problematical, more often with leaps upward than downward.

MUTES

A mute is an attachment that clips onto the bridge. The result is a beautiful soft and ethereal sound, which is very useful for a different tone colour. Allow at least two bars rest to attach the mute. (Longer if the player has left it in the boot of their car).

Parts are marked "Sordini" or "mutes".

HARMONICS

A harmonic is the result of lightly touching the string with the left hand instead of holding it down on the fingerboard. There two sorts:

Natural Harmonics

Played on open strings by touching the string on various nodes (divisions of the length of the string, e.g. half way up, a third, a quarter etc). Notes easily available are: One octave, an octave and a fifth, two octaves, two octaves and a third. To notate, write the pitch required and place a small "o" above the note.

Artificial Harmonics

These are produced by touching the string a perfect fourth above a stopped note. The harmonic is two octaves higher than the stopped note and is indicated by placing a diamond on the stave one fourth above the fingered note.

Harmonics do not work well for melody, but are good for tremolo and special effects. In quiet passages they sound cold and transparent, in loud passages they sound cold and brilliant. Can be used pizz but sound weak.

LIMITATIONS

Very fast passages are not practical where there are too many intervals of fourths and fifths or in the extreme upper limits of the range (e.g. above A5 on the violin). However repeated notes or tremolo are very effective in this range.

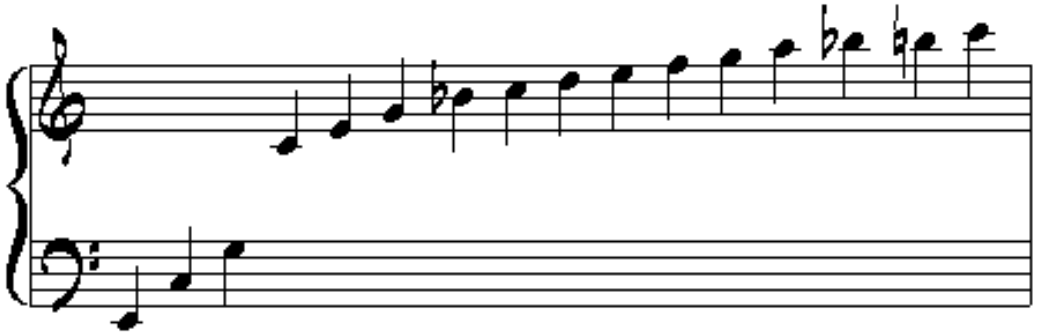
Strings will often not compete in strength or blend well brass.

In the conventional ensemble, the natural blend is such that the 1st violins and cellos will stand out more than the 2nds and violas.

BRASS

Brass instruments are capable of great power, but also subtlety and variety, especially with the use of mutes, which are placed in the bell.

The sound is produced by vibrating the lips together against the cup shaped mouthpiece (called buzzing). Greater lip tension produces notes of the harmonic series, based on the fundamental determined by the length of tubing (*). For example a brass instrument with an 8ft length of tubing can play a C below the bass clef (C1). By tightening the lips or embouchure the noytes of the *overtone series (harmonic series)* become available:



and theoretically upward chromatically though this would be well above the normal range. Early instruments were limited by the notes available on one fundamental but modern trumpets, horns and tubas change the length of tube thus creating different sets of harmonics by the use of valves. The trombone uses a sliding tube to change the length (except in the case of the less common valve trombone).

The range of any brass instrument varies from player to player. Some principal or lead players specialise in high notes and can extend the range by an octave or more, but unless you know the players you are writing for it is best to stick to the conventional range.

It is especially important to appreciate that playing a brass instrument is physically very tiring. Plenty of rests are a good idea: when a brass player's lip "goes" the first thing to suffer is the range, and high notes may "crack". As the high notes are not usually quiet the result has a less than pleasant effect on the music. Rest passages are a good idea not just to save the players lip but also for the sake of the listener, as the sound of "wall to wall" brass can be tiring on the ear.

The orchestral brass section usually comprises three trumpets, four horns, three trombones (including a bass trombone) and one tuba. The jazz big band usually has four trumpets and four trombones (sometimes including a bass trombone).

The French horns are often referred to in orchestral circles simply as "horns", and in fact this term is more correct as they are not French at all. However in jazz and popular music the term "horn" has come to mean any instrument that is blown, so a three piece horn section in a soul band will usually consist of a trumpet, saxophone and trombone, *not* a "French" horn.

Orchestral brass players traditionally play without vibrato, jazz or showband players may use vibrato so if you don't want it mark the part "N.V."

"Lip" trills are possible on brass instruments and are executed by tightening and loosening the jaw muscles or "embouchure". More effective in the upper registers due to the closeness of overtones.

Glissandi (sliding from one pitch to another) are possible and effective on brass instruments, usually in an upwards direction, but are cliched on the trombone and may imply a "dixieland" style. Glissandi on the trombone are limited by the position of the slide, and further study of the instrument is advised if you want to use them in your writing.

"Bending" notes downward (by up to a semitone on trumpet and obviously more on trombone depending on the position of the slide) is also possible.

Fluttertongue and "growling"(as on woodwinds) are useful effects.

All brass instruments can be muted to reduce the intensity of sound but in the case of trumpet and trombone mutes a diverse range of tone colours can be achieved by the wide variety of mutes available for these instruments. If you require mutes mark the part accordingly (muted or con sordino). Unless you specify which type of mute the players use the straight mute.

This table shows the characteristics of the main trumpet and trombone mutes:

Straight	A bright, poignant sound
Cup	A colourless, nasal sound. The tone becomes more muffled the further the mute is placed into the bell (Tight cup).
Harmon	Tube out A sharp, shimmering sound. (Notably used by Miles Davis) Tube in the hand is used to create a "wah wah" effect by opening and closing over the mute (notated "o" for open and "+" for closed). Comic (laughing) effects achieved on descending chromatic notes
Bucket	A very soft mellow sound.
Plunger	Based on the plumber's rubber sink plunger, this is used for bluesy "vocal" or "wah wah" effects. Can be notated closed or open as for the harmon

A return to unmuted playing is marked senza sordino or open.

In addition to the mutes the hand can be used over the bell. If you want to be adventurous you could use many household or obscure objects as mutes: teapots, pineapples, hamsters.

(FRENCH) HORNS

The horn is a transposing instrument in F, i.e. it is written a fifth higher than it sounds. In orchestral writing the key signature is usually omitted and all accidentals written on the part as they arise. These days this is pointless and would advise the use of key signatures as normal.

The horns appear on the score above the trumpets, even though they are lower in pitch. This is possibly because although they are a brass instrument the mellow sound has a great affinity with the woodwinds, with whom they achieve a good blend. The horn in classical music is a member of the wind quintet as well as the brass quintet.

The sound in the lower octave is weak and easily covered. The middle range has a tone that can vary between dark and bland. Often used for sustained chordal or "pad" type accompaniment which can become monotonous if overdone. The horn can sound lyrical and "heroic" when used solo or in unison, and higher up the range it is strong and bright.

Trills are possible but difficult. Very fast passages and large leaps are not advisable. Logical melodic lines help the player to pitch notes accurately.

It is common practice to "interlock" harmony parts, i.e. the 1st and 3rd horns are given the top two harmonies and the 2nd and 4th horns the lower two.

The horn can be muted either with a mute or with the hand (stopped tones). These are produced by placing the hand in the bell (marked "+") and produce a sharp slightly edgy nasal sound. A return to normal playing is marked "o".

TRUMPETS

The trumpet can be the most dominating acoustic instrument of any ensemble, especially in the higher end of its range (above the staff) where quiet notes can be difficult. The very low end can be dull, the lower and upper middle range can be lyrical, clear and still capable of blending with care. The high notes can be very punchy and powerful. Fingered trills are possible on all notes, lip trills on notes above the staff.

Many lead players can extend the range, but this can be an unpredictable ability which diminishes as the lip gets tired. If you require any extra high notes rest the player well either before or afterwards.

The most common trumpet is the Bb trumpet (the only trumpet in general use in jazz and pop) which is written a major second above the sounding pitch. Other instruments associated with the trumpet are the cornet and flugelhorn (both in Bb). The cornet is used mainly in brass bands, the flugelhorn is a very common double for all jazz trumpet players and has a mellower sound.

Often in big band writing if one of the trumpet players specialises in jazz improvisation they are written on third or fourth trumpet. It can be a good idea to give them a rest from the section before and after a solo, (a good idea for any instrument in fact).

Other trumpets in use in orchestral work and their transposition:

Instrument	*Sounding*	*Written*
C Trumpet	C	C
D	D	C a whole tone lower
Piccolo tpt in Bb	Bb	C a minor 7th lower

TROMBONES

The trombone is a non transposing instrument written in the bass clef (although some brass band players treat it as a transposing instrument in Bb) The tenor clef may be used for high passages, but is unusual outside orchestral writing. The trombone is very versatile, and can blend well with other instruments. The slide is used to vary the fundamental notes upon which the overtones are based, and there are 7 positions of the slide. The lowest notes in normal use are the second partial, so in each position notes are available as in example (*). It is quite agile, though slide movements can become awkward lower down where a player has to jump quickly from a note where the slide is fully extended to (7th position) to one where the slide is fully retracted (1st position), as the low notes are only available in 7th position. (Higher notes are available with various alternative slide positions) Some trombones have an F trigger which solve this problem by allowing an alternative slide position for the low notes.

The bass trombone is basically a tenor trombone with the F trigger and a larger bore. (Although a tenor trombone with the F trigger can play same range as the bass, the low notes (7th position) are not as strong). Modern instruments have an "E" trigger allowing them to play the low B.

As with trumpet players some trombonists can extend the range upwards but the same limitations apply to stamina.

The normal range can be extended downwards by the use of pedal notes (the fundamental of the overtone series) most commonly used on the bass trombone as an effect where the notes tend to "growl".

All the mutes indicated above are available for the trombone but due to their large size trombonists do not carry them all unless asked to beforehand.

TUBA

This is the bass instrument of the brass family, is non transposing and written in the bass clef. It has a rich warm sound and is quite versatile dynamically and surprisingly agile. It blends well with all other instruments but like all low instruments requiring breath, ample rests must be allowed for the player to breathe.

The tuba can be muted.

WOODWIND

Woodwinds are so called because the tone is generated by the player's breath and originally all instruments were made of wood. The main woodwind instruments in modern western music are: flute, oboe, clarinet, bassoon and saxophones. Each instrument is subdivided into a "family" of different sizes and pitches, (e.g the flute family: C flute, piccolo, alto flute, bass flute) The basic orchestral woodwind section consists of flutes, oboes, clarinets and bassoons, usually with two, three or sometimes four players for each instrument or family of instruments. In the orchestra the "1st" or lead player will usually play the main instrument of the family and the 2nd, 3rd or 4th players will play any other instruments as required. (When a player plays more than one instrument this is referred to as doubling)

As a section the woodwinds have the greatest variance of tonal and dynamic characteristics between the individual instruments. This means that each instrument has a very different character, allowing a great deal of variety of expression within the section. For the same reason it may be difficult to achieve a blend within the woodwind section, without a great deal of knowledge and experience of their tonal and dynamic characteristics. Close intervals in the harmony help with the blend but due to the rich overtones of most woodwinds wider intervals low down are inadvisable. This is of course true of all instruments but more so of woodwinds.

When writing for woodwinds care must be taken to make sure sufficient rests are allowed for breathing, especially in the case of oboes and bassoons which are physically tiring instruments to play for sustained periods. Circular breathing (breathing in while still playing a note) is possible but not practised by most players and is still tiring and usually only used by improvising soloists.

With all woodwinds the notes are generally started by the tongue making an action as if pronouncing the syllable "tu" either against the reed or in the case of the flute against the upper part of the mouth. It is the action of "tonguing" or not which differentiates the different types of phrasing or articulation: Where phrases are not marked by slurs or staccato dots all notes should be lightly tongued and given their full length. The action of normal tonguing should not be an audible sound, rather it is just the way to start a note precisely. Different types of articulation and effects:

Legato	The phrase is marked by a slur. The first note only will be tongued and the phrase will sound very smooth.
Soft legato	Every note is lightly tongued, sometimes with the syllable "du" instead of "tu".
Staccato	Notes played shorter (usually half their length. Every note is started and stopped by the tongue.
Double tonguing	The player tongues very fast alternating the syllables : "tu, ku". Works best on the flute.
Triple tonguing	The same as double tonguing but alternating "tu,ku,tu"
Flutter tongue	The player vibrates the tongue as if rolling the syllable "rrrr"

Traditionally when writing for woodwinds the flutes (or piccolo if their is one) usually play the top part, followed downwards in pitch by oboes, clarinets and bassoons. This is not only because of the range of each instrument but also because of the various strengths and weaknesses of parts of each individual instruments range as will be discussed later. If the chord is high the clarinets may be voiced above the oboes.

Two identical instruments in unison may have intonation problems, but three or more are fine due to the "chorus" effect of slight tuning differences.

Some woodwinds (and brass) are transposing instruments. The notes and key signatures that are written are different to the notes and keys that sound. The reason for this is so that a player does not need to learn a new set of fingerings for each different instrument that they double on. E.g. traditionally the note that sounds when three fingers of the left hand and four of the right are stopping the holes in the instrument, that note is called "C", whether its an actual "C" as with the flute, an Eb as with the alto or baritone saxophone, a Bb as with the soprano or tenor saxophone and so on. This allows an instrument to be made in many different sizes and pitches without causing the player too much difficulty. An instrument that sounds the same note as written is said to be in concert pitch.

SAXOPHONES

Saxophones are made of brass but they are classed as a woodwind instrument because of the method of tone production: the vibration of a single reed. The saxophone was invented in the 19th century and was largely viewed as a novelty instrument.

Composers such as Bizet and Ravel made it acceptable in classical music and innovators such as Coleman Hawkins paved the way for acceptance as a serious instrument in the field of jazz and popular music.

There are many sizes of saxophone but only four are used widely, the soprano, alto, tenor and baritone. The saxophone has two "registers", the upper register is an octave higher than the lower register and has a slightly less reedy sound. Saxophones have a wide dynamic and extremely wide tonal range and blend well with most other instruments, but can dominate in an orchestral context. Conventionally they are played with vibrato except in unison passages where vibrato (unlike with strings) does not help the tuning.

At the bottom end (Bb - D) the saxophone is not very agile and difficult to play quietly except with the use of "subtone", a very warm and breathy effect usually only used on the tenor in a jazz solo context (E.g. Ben Webster). It is hard to make a smooth transition from subtone to full tone and is best avoided unless writing for a specific player. The high notes on tenor and baritone (D - F) are not always a good sound and should be avoided in section writing. Some players can extend the upper range quite considerably through the use of harmonics achieved by unorthodox fingerings and tightened jaws. (e.g. David Sanborn, Michael Brecker). Although this ability is becoming widespread it is still not advisable to write harmonics unless you are familiar with the player and it is especially unadvisable to write them for a section as the tuning can be unpredictable.

The saxophone is a transposing instrument:

Instrument	*Sounding*	*Written*
Soprano	Bb	C a major 2nd higher
Alto	Eb	C a major 6th higher
Tenor	Bb	C a major ninth higher
Baritone	Eb	C an octave and a 6th higher

The conventional big band line up consists of two altos, two tenors and one baritone. (AATTB)

Many saxophone players double (i.e. they play more than one instrument). It is common to expect at least one or two players in a section to double on soprano saxophone, flute or clarinet. Less common doubles are piccolo, oboe and bassoon.

The soprano can be used as the lead instrument instead of the lead alto either for a change of tone colour

or to play higher notes. Clarinet lead is also possible but may sound like Glenn Miller.

One or two saxophones work well with one or two brass instruments to create a classic "soul" type horn section. Two or three tenors and baritone work well to create a "rock & roll" section.

During the 60's (following the arrival of the electric guitar) the saxophone went out of fashion but with the advent of funk style bands in the 70's (such as Tower Of Power, the Average White Band, etc) and the adoption of rock and pop elements into jazz the saxophone has seen an enormous resurgence of popularity in current commercial music. In general modern commercial saxophone players have a harder and more penetrating sound than earlier players. Initially the saxophone was used in military bands and dance bands to supply a softer contrast to the brass, similar to the role of strings in the symphony orchestra. Some soloists in the 40's adopted a harder and more cutting sound to be heard above the rest of the band.(E.g. Illinois Jacquet, Coleman Hawkins). Modern players are often the only sax player in the band, therefore blending with other saxes is not an issue, but competing in volume and tonally with electric instruments can be.

All trills are possible with the exception of low B-C# and C#-D#, but in general the lowest notes may be clumsy for trilling and are best avoided.

Although very rapid passages can be played, repeated notes (each note has to be started with the tongue) cannot be played as quickly as they can on brass instruments unless double tongued, a technique not widespread among saxophone players.

FLUTES

The main flute is the C flute (usually referred to simply as "the flute") with a range of three octaves upwards from middle C, (though many professional instruments extend down to B below middle C). The piccolo is an octave higher, sounding an octave higher than written. The alto flute is 4th lower and sounds a 4th lower than written. The bass flute is an octave lower and sounds an octave lower than written.

The sound is generated by blowing air across a hole in the instrument.

The flute and piccolo are quite weak in the lower part of their range, stronger and sweeter in the middle and shrill at the top end where they can be difficult to play pianissimo. The piccolo is normally used for high parts, but its lower register though weak can have a strangely useful silvery quality. The alto and bass are full and sonorous in their low register, but less useful higher up. Low flutes are easily drowned out by other instruments in an acoustic situation but as the sound is lacking in overtones it blends well with other instruments, especially strings or muted brass.

The flute is usually played with a vibrato generated low in the lungs or diaphragm, which causes the sound to pulse in amplitude rather than purely in pitch like other instruments.

Most trills are possible except low B-C, B-C#, C-Db, C-D#, and C#-D#. Trills and fast passages are sometimes difficult in the top 4th (G-C).

OBOES

The oboe is a double reed instrument and has a "nasal" quality and a uniquely characterful sound. The low register is very strong and sometimes heavy, the middle range is very sweet and expressive and the high end can be weak. Its penetrating tone does not blend well but its colour when added in unison to other instruments can often add great interest.

The other main instrument in the oboe family is the cor anglais which is pitched a 5th lower and is written a 5th higher than it sounds. The low notes are deep and rich, higher up the sound becomes mellower and finally thin and pinched.

It can sometimes be hard to start a phrase on a low note, or play low notes delicately. Some low trills are difficult depending on the make of instrument. As the oboe and cor anglais have such a characteristic tone, they are best used economically.

CLARINETS

There are many shapes and sizes in the clarinet family, the commonest being the Bb clarinet followed by the bass clarinet. The A clarinet is only a semitone different in pitch from the Bb but was originally introduced to cover keys that were difficult for the Bb clarinet, however modern mechanisms make this less of a necessity, and the clarinet is now an extremely agile instrument. Unlike other woodwind instruments the difference between its lower and higher registers is a 12th rather than an octave, causing a problem area known as the "break". These are the top two or three notes of the lower register which can sound very weak, although top professional players will generally have no difficulty with these notes. The clarinet has no problems with dynamic versatility apart from the extreme upper end which may be difficult to play pianissimo. The lower register is rich and deep, sometimes with a "haunting" quality, the upper register is clear, bright and expressive.

The bass clarinet sounds best in its lower register where the sound is very warm and rich, with a possibility of sounding sinister.

This table shows the instruments of the clarinet family and their transpositions:

Instrument	*Sounding*	*Written*
Eb clarinet	Eb	C a minor 3rd lower
Bb "	Bb	C a major 2nd higher
A "	A	C a minor 3rd higher
Basset horn	F	C a 5th higher
Alto clarinet	Eb	C a major 6th higher
Bass clarinet	Bb	C an octave and a tone higher
Contrabass "	Bb	C two octaves and a tone higher

BASSOONS

Like the oboe the bassoon has a "nasal" quality to its sound but less obvious and it blends rather better, especially with low strings and other woodwinds. It is a non transposing instrument written in the bass clef. It is very sonorous low down, its mid range sweet and expressive becoming thin at the top. It has the ability to sound noble and lyrical as well as humourous when used in staccato passages. Large intervals upwards are no problem but some downward leaps can be. Low notes are difficult pianissimo.

The contrabassoon is pitched an octave lower, and sounds an octave lower than written. Its low notes are obviously its forte but sometimes take a little time to "speak". They require a considerable amount of breath so appropriate rests should be given to the player to accomodate this.

Trills on the bassoon are no problem apart from some at the low end: A#-B, Bb-C, B-C, C#-D, C#-D#, E-F#, G#-A, though some professional instruments may have advanced mechanisms to allow these.

THE RHYTHM SECTION AND KEYBOARDS

Rhythm section writing can be problematic, as you often want to give the player freedom to ad lib, but within certain parameters or boundaries. In addition some drum or bass patterns that are often improvised are very complex to notate and are often unreadable at sight to all but the very best reading players, who are not always the best or most versatile "feel" players. This is especially true in the case of drum "fills".

KEYBOARDS

Piano and electric piano

The piano is a non transposing instrument written on two staves, treble and bass clef. Usually the treble clef is played by the right hand and the bass clef by the left hand, but there are of course many instances where you may deviate form this. You may wish to write out an exact part or supply a "guide" part, which will allow the pianist more freedom.

With many pop and commercial styles it is acceptable to give the pianist chord symbols and an indication of the rhythm, either by writing the name of the rhythm (eg bossa nova, jazz ballad etc) at the top of the part or by writing a rhythmic figure in the first bar (or two bars if it is a two bar pattern) and the indication "similar..."

If you wish the player to use the rhythm as guide and to make their own contribution to the feel you could indicate this with "similar ad lib".

It is conventional when giving a piano player chord symbols to also give them the bass part in the bass clef. This does not necessarily mean that they should play the part in unison with their left hand but so that they know what the bass player will be playing and be able to voice their chords appropriately and avoid clashes. It can often be useful to give the pianist vocal cues (essential with colla voce parts where the pianist is accompanying a singer and there is no steady tempo), or any other cues that might be useful (brass stabs, instrumental lead lines, drum fills etc).

The piano can be useful to double up in unison with other instruments to give colour, especially useful with woodwinds.

Some conventional styles of accompaniment:

1. Bass notes and block chords. This is a very simple form of accompaniment, liable to sound rather corny.
2. Arpeggios. These will usually be rising or alternately rising and descending. The lowest note is often the root but not necessarily if their is a separate bass part.
3. A tremolo between two important notes of a chord (e.g. 3rds, 7ths)
4. Repeated block chords. This can be very powerful.
5. Sustained chords (pad). Sustains on piano can be enhanced by tremolos or "rolls".
6. "Stride" style. (Left hand bass in two, right hand chords on back beat). Often works best for solo piano as bass player would need to play in unison with the left hand. Good for 30s style.
7. Boogie. As above but left hand bass in four and right hand chords on off-beat quavers)

Electric Organ

Much of the above can apply to organ, obviously sustains are very useful but the sound can become wearing. With the use of a "Leslie" (rotating loudspeaker) more variety and intensity can be applied, there are usually two speeds: fast and slow.

Synthesize.

A very useful instrument but due to its enormous versatility and variety is beyond the scope of these notes Its use in arranging must depend on your own knowledge of its capabilities. If you intend to use synthesizers it is best to learn to program them or hire a competent programmer.

Celeste

A tinkly sound which can be used well in unison with woodwind or strings for a "pretty" effect.

Accordion

Associated with folk styles in many countries, can be used to impart the cliched "Parisian" or Italian street song flavour. Melodically it works very well in unison with flutes or clarinets.

Harp

The harp is tuned diatonically, chromatic tones being made available by a series of pedals. Writing for the harp is very much a

specialist area, as many parts written as for keyboard are unplayable. I would recommend getting friendly with a harpist to be given a practical demonstration in the possibilities and impossibilities of harp playing.

Many harpists these days read chord symbols and simple parts can often be written with a lead line and chord symbols, but its best to know in advance that the harpist is happy with this.

A very useful "cliche" is the glissando. This can be written in full (*) or the first and last notes can be connected by a line and the implied notes indicated by a chord symbol(*).

GUITAR

The guitar is written in the treble clef and sounds an octave lower than written. It can function either as an accompanying instrument (rhythm guitar) or as a solo voice (lead guitar).

It is very rare for an arranger to write guitar chords in full notation, as many chord voicings possible on a keyboard are unplayable on a guitar. Chord parts usually consist of chord symbols with a rhythmic guide as with piano.

Obviously the acoustic guitar (either nylon or steel strung) is limited dynamically unless it is close miked, but the electric guitar is very versatile, especially with the use of effects such as wah wah, distortion (amp or fuzz box), phaser, flanger, tremolo, compression etc. Apart from wah wah which can be used on rhythm guitar, most of the effects are used for solos and lead playing and are used at the players (or producer's) discretion,

so the arranger is not required to have a thorough knowledge but it is worthwhile to investigate what is available. The sound of an electric guitar is often very personal to the player and will vary depending on the make of guitar and the amp settings or effects used. These days the guitar is even more versatile if the player has a "midi" guitar or interface which will allow the instrument to trigger an unlimited range of synthesized sounds.

The electric guitar can blend with any other instrument, depending on the player's chosen sound so some tactful direction may be necessary at rehearsal or on a session.

Many playing effects are available. Notes can be "bent" upwards by pushing the string or strings across the frets with the left hand or in either direction with the use of a "whammy" bar.

Harmonics are achieved as with all string instruments by lightly

touching the string on a node with the left hand. The note has a pure bell like quality.

The standard tuning is (upward from the sixth string) E, A, D, G, B, E though the strings can be tuned in many different ways.

Some specialised styles:

"Slide" or "bottleneck" guitar is a style originally used by early blues players. The instrument is often tuned to an open chord and played with a glass tube held across the strings with the left hand to create a sliding (glissando) effect. Slide playing may require harder strings or a higher "action" (the distance between the strings and the fretboard) than normal. many slide players use specialised instruments such as the "Dobro" or "National Steel".

Hawaiian guitar is a style that also involves sliding and is usually played on a "lap steel" guitar which as the name implies is played on the lap with the fretboard facing upwards.

Pedal steel is usually used in country music. The instrument has ten strings and a system of pedals changes the tension of the strings, creating a glissando effect.

Other stringed instruments:

Banjo

Typical in dixieland (4 string banjo) or country (esp. bluegrass) where the 5 string banjo is used. In dixieland playing the banjo is usually a rhythm instrument, even when taking solos the players usually play chords rather than single lines. The banjo can be used as a melodic instrument in many styles to add an unexpected and sometimes even slightly oriental flavour. Tremolos work well. The 5 string banjo with its associated fingerpicking style is very much a specialist instrument. When writing bluegrass parts it is best to give chord symbols and allow the player to improvise.

Mandolin

Used in folk music of many cultures. (Notably Italian). Tremolos are very effective and are often the trademark of the mandolin.

Guitar accompaniments can be developed in the same way as piano (see above), though tremolos in accompaniments are unusual.

BASS

The double bass as used in jazz, pop, folk or country is usually

played pizzicato as a rhythm instrument, though arco is sometimes used by jazz soloists. It is rarely used in modern pop music where bass parts are played on electric bass guitar or synth.

The bass guitar is tuned in the same way as the double bass, though some modern instruments have a lower (5th) string tuned to B. Many bass players also play fretless bass which is capable of smooth glissandi and a very expressive pronounced vibrato.

Bass parts can consist purely of chord symbols and a rhythmic guide, but unless you know the player well it is much better to write a notated part as well, even if you allow them freedom to ad lib. As with piano parts you could notate the first bar and then give chord symbols with the indication similar.

There are conventions regarding the writing of bass lines:

Walking bass.

This is a style most associated with jazz, but is sometimes used in rock & roll, blues and country. It consists of quarter notes played in a mixture of scales and arpeggios. A good rule of thumb is to have the root (or bass note implied by the inversion required) on the first note of the chord. You can include triplet

or 8th note "ornaments" but I find these are best left to the player's no doubt infinite good taste and discretion.

"2 in a bar".

Usually half notes in 4/4 time, but the same conventions apply to "1 in a bar" in 3/4 or any time signature. Often alternating roots and fifths but a the last note of a chord should be a root. Exceptions are when the root is moving down a 5th (or up a 4th) the 3rd can be used as a leading note (*), or a 5th of a I chord can go to a 5th of V (*).

DRUMKIT

The conventional drumkit consists of:

- A stool on which the drummer sits,
- A bass drum played by a foot pedal,
- A pair of "hi hat" cymbals played by another foot pedal,
- A snare drum
- A floor tom tom (abbreviated to floor tom) one or more smaller toms
- A ride cymbal (a single large cymbal usually played

rhythmically)

- Various other cymbals used for accents and effects (crash, splash etc)
- Cowbell, woodblock and triangle (optional)

Sticks are the normal way of playing drums and will be used unless indicated otherwise. Mallets have a softer ringing effect. Brushes have a less defined swishing effect.

The bass drum part often emulates or has some relation to the bass part.

The snare drum has a set of "snares" which are stretched across the lower head to give the drum a crisp, rattling sound. The snares can be turned off to produce a dryer more tom like sound. The snare is hit with a stick, often though by no means necessarily, to supply a rhythmic "backbeat" (beats 2 and 4 in 4/4 time). The backbeat is a characteristic of rock and roll and many forms of funk drumming. A loud accent can be played by hitting the drum head with the tip of the stick and the rim with the side of the stick simultaneously. This is called a rimshot and is very effective either with or without a crash cymbal. A "clicking" effect can be achieved by placing the end of the stick on the head and tapping the rim with the side of the stick. This is called a "sidestick" and is often used in the bossa nova rhythm to emulate the claves (see Latin percussion). It can also be used effectively to supply a soft backbeat in jazz or rock in quiet passages.

The high hat or ride cymbal usually play a steady rhythm (8th or 16th notes).The high hat can be opened by the footpedal (indicated "o" or closed "+"). Open notes are used singly, closed notes can be repeated (*). The high hat and ride are not usually played simultaneously, though sometimes the foot pedal only of the high hat is played during a ride rhythm to supply a subtle backbeat.

Crash cymbals will often mark accents or the beginning of a section (verse, chorus etc), and are usually played along with a bass drum accent.

Toms are played either rhythmically or used effectively in fills.

The drums are written in the bass clef or percussion clef. Conventionally the drums appear on the stave as in ex (*), but variations are possible as long as you indicate which drum is to be played.

Drum parts cause more problems than other rhythm section parts as one always has to choose whether to keep simple and allow the

drummer freedom or to risk a part that may be too complex with the result that the drummer is so busy deciphering it that their feel suffers. Most Latin American rhythms can be indicated by their name and a very simple first bar followed by repeat bars. Good drummers have very good ears and will quickly embellish a simple part to fit an arrangement, but it is often useful to give cues such as brass stabs or phrases. This is especially important in jazz big band arrangements, where drums phrasing with the lead section is typical.

Sometimes you can write a rhythmic pattern without specifying the particular drum and allow the drummer freedom to choose or experiment.

It is useful to indicate the tempo in BPM and whether the 8th notes or 16th notes are played straight or "swung" as in swing or shuffle styles.

If you are copying drum parts I find it is very helpful to write 4 or 8 bars to a line (where the the music is in 4 or 8 bar phrases of course) so that the drummer can glance at the music rather than keep their head glued to the part and count bars at the expense of their creativity. However many bars in a phrase it is logical to start a new section at the beginning of the line and indicate at the end of a line how many bars in the line.

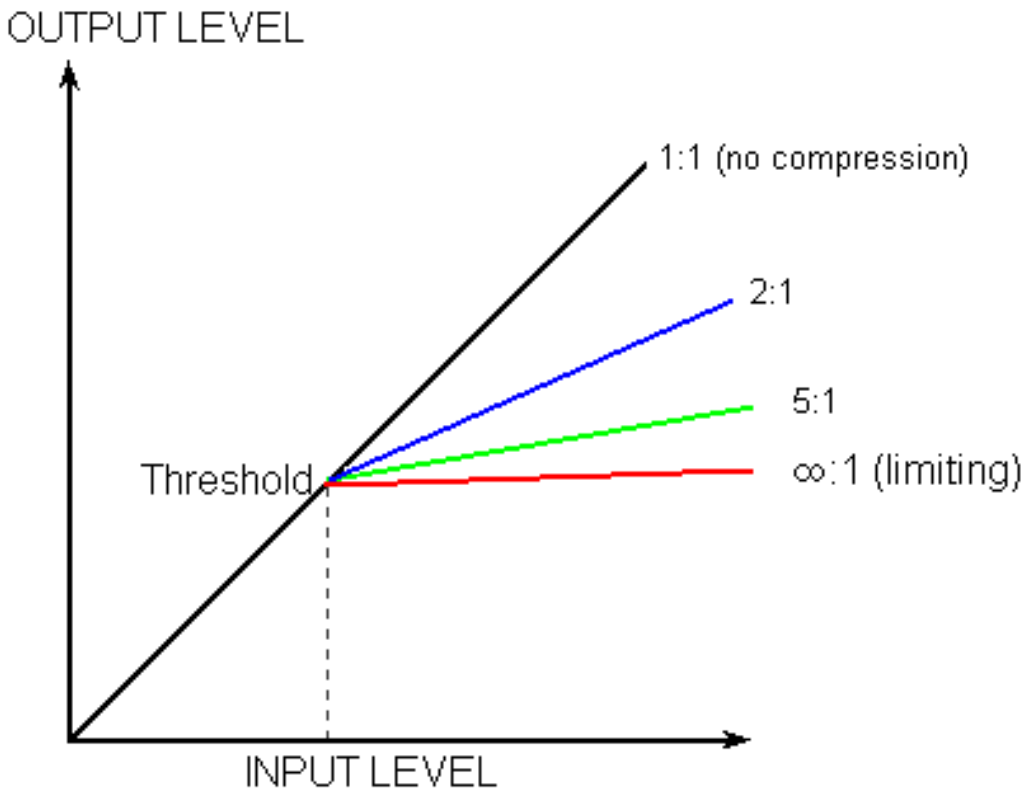
In jazz arrangements it can be effective to alter a drum pattern slightly when going to a middle 8 or a solo section. For instance changing from high hat to ride, or changing from 2 beats in a bar to 4.

Where a repeated pattern is played without variation it is possible to write "play 16 bars similar"

COMPRESSION

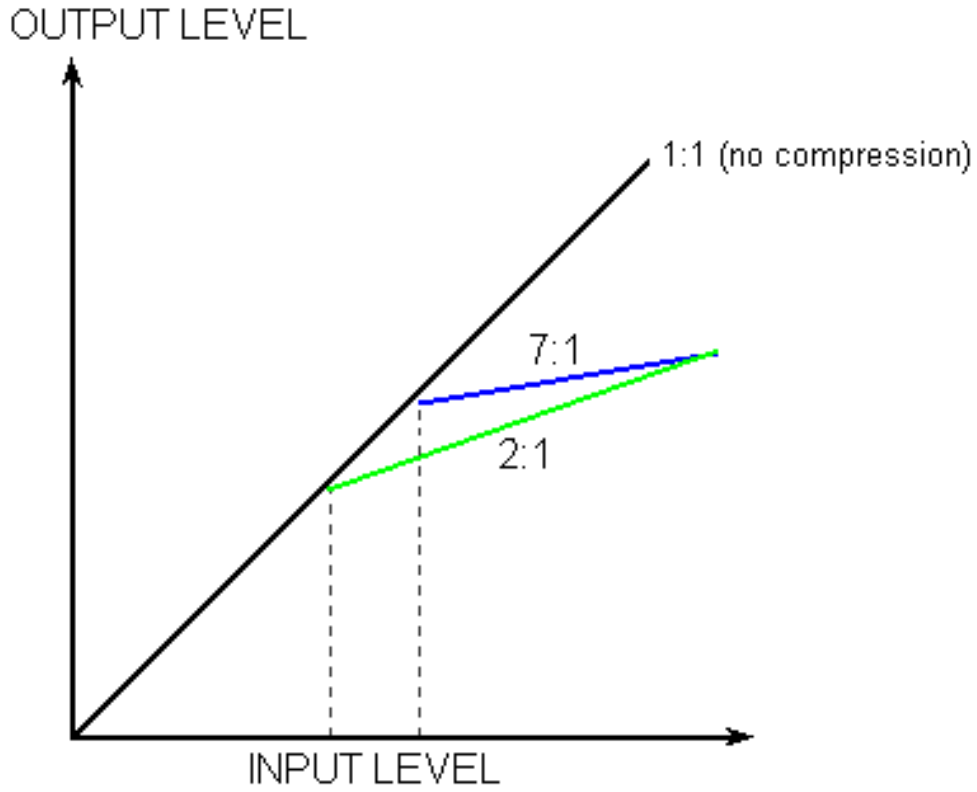
Basics

The aim of a compressor is to reduce the range of dynamics of an audio signal. Any parts of the signal louder than a certain THRESHOLD are reduced. The amount of reduction is relative to the level of the signal and expressed as a RATIO. If the ratio is set at 2:1 the signal *above* the threshold is reduced to half its original, if the ratio is set to 5:1 the signal above the threshold is reduced to one fifth of its original. (NB if the ratio is set as high as possible, usually infinity:1, the signal above the threshold is reduced to practically the same as the threshold and is referred to as LIMITING.



In this graph a 45o line represents equal input and output levels, ie no compression (1:1) ratio.

The *amount* of compression is based on a *relationship* between the threshold and the ratio. Low thresholds and high ratios give you more gain reduction, i.e. more compression, but neither threshold nor ratio on their own will determine the amount of gain reduction. You can achieve the same gain reduction by a high ratio and a low threshold as you can with a low ratio and a high threshold:



As you can see the permutations are quite complex. Although the amount of compression is similar, it is only the same at one point. Whether to use high ratios or low threshold or both is a subjective decision and usually based on trial and error or years of experience.

This is not the end of the story. Usually the point of compressing a signal is to get the whole signal louder. Most compressors have a gain reduction meter. Sometimes there is a switch to change an input gain meter into a gain reduction (GR) meter. You can tell from this how much compression has been applied. Having reduced the loud bits by a certain amount, you can then adjust the gain make up by the same amount. This effectively brings the loud bits back to their original level, but at the same time brings the quiet bits up to a level *higher* than they were originally. Many software compressors can do this automatically.

You can apply compression to single tracks of a multitrack recording or to a finished mix.

Why Compress?

A wide dynamic range is often ideal in a live acoustic performance, however recording and broadcast media generally have limitations. Peaks of audio need to be below the level at which distortion occurs. The grooves of a vinyl record can only cope with so much level until the needle jumps. Digital media only allow levels up to 0dB. Analogue tape causes distortion when the level is too high. With very dynamic music, once the peak level is set at a practical maximum, the low levels may well be close to the level of unwanted noise, e.g. tape hiss, vinyl surface noise, background sounds. Many radio stations compress the output signal as very quiet passages of

classical music can become totally inaudible on car radios that have to compete with the car's engine noise and the sounds of other traffic.

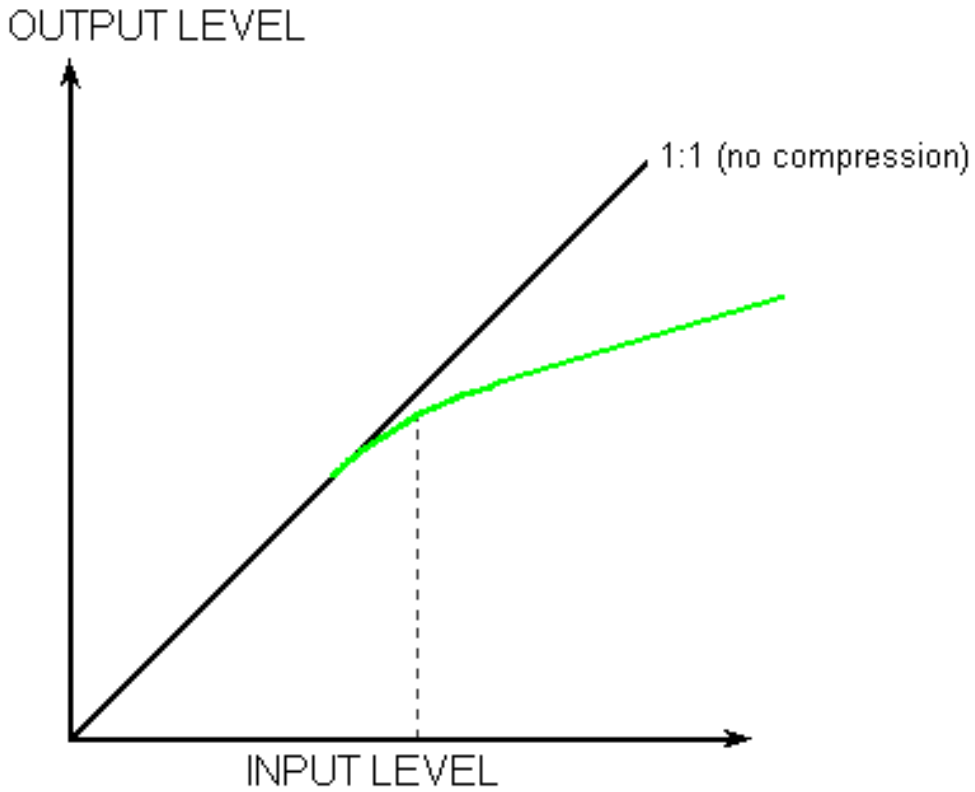
It can be useful to compress single tracks to avoid quiet words of a vocal, or quiet notes of a solo instrument getting swamped by the backing.

A combination of compression and automatic gain make-up on instruments with a natural decay will create a sustained sound.

Different compressors can affect the actual sound of a signal, in some cases this can be desirable, in some cases a more transparent compressor is required.

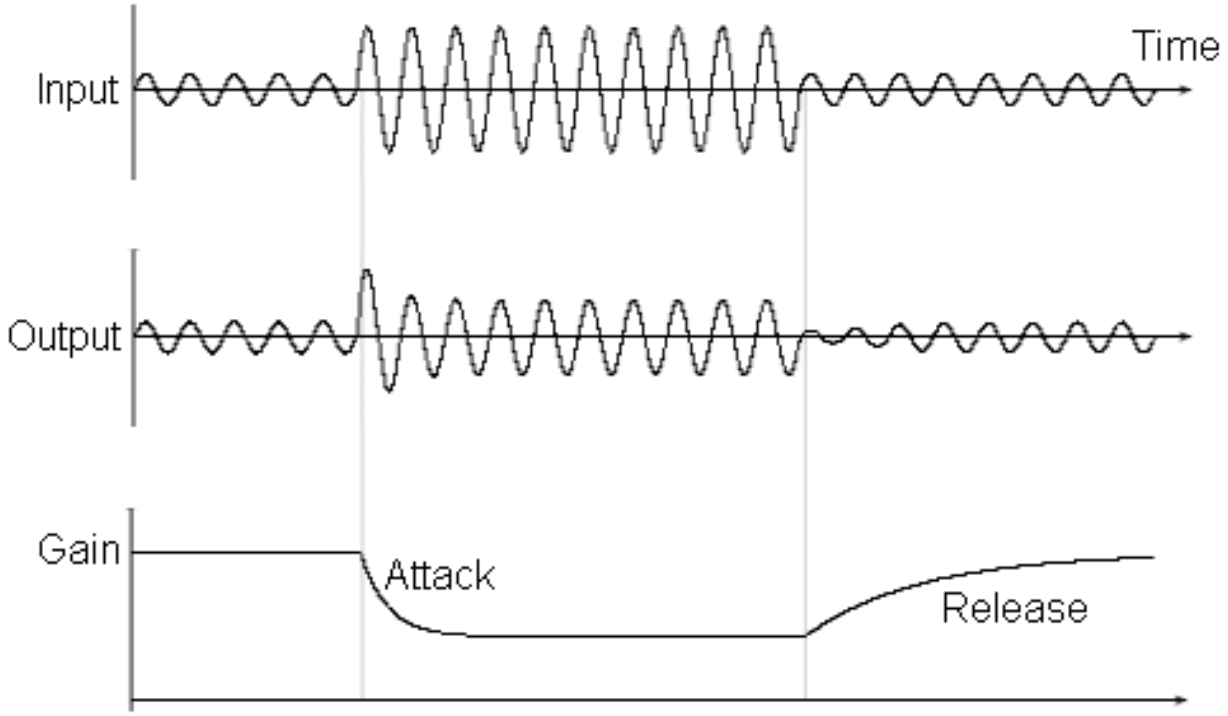
Hard or Soft?

In the graphs above, compression occurs as the signal hits the threshold. Some compressors gradually apply compression as the signal approaches and after it has crossed the threshold. This is shown on the graph as a curve and is often described as a soft knee compression as the graph can be seen as the thigh, knee and calf of a leg:



Speed

There are often two more controls on a compressor, ATTACK and RELEASE. The speed at which the level decreases as the signal crosses the threshold is determined by the Attack control, and the speed at which the level increases after the signal drops below the threshold is determined by the Release control:



A fast attack means that compression kicks in immediately. This can sometimes have an adverse effect on the tone of an instrument or the amount of punch, especially bass drums. The best settings are found by trial and error, but a good starting point is a medium to fast such as 100-200 ms.

Problems to Watch Out For

Compression can affect the tone of an instrument, either because of the inherent sound of the compressor, or because the peaks of an instrument may have a different tone to the troughs, so reduction in level of the peaks relative to the troughs changes the overall tone. This can be especially true when applying fast compression to instruments with broad vibrato.

Be careful when compressing an entire mix. Very often in pop music there is a bass line which is generally constant in level. If there are sudden very loud peaks such as brass stabs, the compressor will lower the whole track at that point, with the result that although you may get an overall levelling of dynamics and increased loudness, the bass line will dip at this point and lose its flow. This is sometimes called pumping. This problem can be overcome by using a multiband compressor, which splits the signal into different frequency ranges, and compresses them individually. In the above case the brass stab would be compressed, but the lower frequencies can pass through a lower band of the compressor with no or very little compression. It is usually best to mix a track with very no or very gentle compression, then apply compression at a later stage (final mastering).

Tips & Hints:

Start with a ratio of between 2:1 and 7:1, medium-fast attack and medium release then gradually lower the threshold until you get gain reduction of about 5 dB. You can then

set the output gain make up to compensate, eg if your gain reduction is 5 dB, set the gain make up the same to bring the peak level back to its original. Then gradually speed up attack until it gets noticeable and back it off slightly.

If you are using compression on a vocalist, ask them not to back off the microphone for loud bits. Singers often do this when singing live, but usually a constant distance from the microphone is better in a studio. If they suddenly back off, the vocal sound will suddenly get more ambient which may not be good if you want an "in your face" sound. A good compressor will cope with a a large range of dynamics without changing the sound drastically.