**The Secrets of Orchestration**

This online orchestration course is based on the curriculum lectures of “Orchestration” taught to **Azerbaijan National Conservatory** “Composition” major undergraduate students in the 2nd and 3rd semesters.

The secrets of orchestration course consist of three parts:

Part one. Orchestral Chord voicings.

Part two. Methods of orchestral texture making.

Part three. How to make Orchestral effects using different scales and harmony.

I prefer to start with lectures on chord voicing because it is 50 % of orchestration.

**Part One. Chord Voicing**

**Chapter 1. Woodwind section**

**Lecture 1. Introduction to chord voicing**

It is enough to know some basic rules for starting to chord voicing. I don't want to bother you with too much information.

First, we have to learn the following:

1. Notation rules in the score.

2. Range of woodwind instruments.

3. Harmonic series

4. Relation of timbres of woodwind instruments

5. ADSR meaning

**1. The notation rules**

The symphony orchestra is divided into 4 sections: strings, woodwinds, brass, and percussion.

Each section has its own timbres and playing techniques. I will explain all of these steps by step.

But, I prefer to teach playing techniques of instruments while the orchestration, not before the orchestration. I think this will be more useful and pleasant for students.

Let’s start!

The woodwind section is one of the main sections of an orchestra, which consists of 4 different families:

Flute family; Oboe family; Clarinet family; Bassoon family

Each family includes a lot of instruments in itself.

But we will learn only the main instruments which come across more in a concert and film music.

Flute family: flute and piccolo.

Oboe family: oboe and English horn.

Clarinet family: clarinet and bass clarinet.

Bassoon family: bassoon and contrabassoon.

This is the basic instrument’s name schedule in four different languages, which dominate in orchestral scores: English, German, French and Italian.

You don't have to memorize all of them! But, having such a list on hand will make it easier for you to analyze orchestral scores. For example, knowing the names of the instruments in French will help you when looking at Ravel's orchestrations. In my country, all Azerbaijani composers prefer the Italian language.

But I will explain in English.

Before the orchestration, the composer must set up in the score a list of instruments that he will use. Set-up of woodwinds section as follows:

Woodwind in pairs, woodwind in three’s, woodwind in four’s.

When woodwinds in pairs, there are 2 flutes, 2 oboes, 2 clarinets, and 2 bassoons player in the orchestra. During the score, the second player of each pair can switch the instrument to the other one. For example:

2nd flute player can play the piccolo. It means the player will switch the flute to piccolo. The composer should give time to switch instruments.

The same rule applies to other woodwind setups.

Depending on the music style (especially in film scoring), the composer can add or remove some of the instruments that he needs.

My lectures are based on the orchestration of woodwind in three’s, which is most useful for both concert music and film music.

When woodwinds in three’s, the alignment of the instruments will be as follows:

3 flutes. 3rd flute player can also play the piccolo.

3 oboes. 3rd oboe player can also play the English horn.

3 clarinets. 3rd clarinet player can play the bass clarinet.

3 bassoons. 3rd bassoon player can play the contrabassoon.

**2. The range of instruments**

Piccolo

The sounding range of this instrument is from **D5** to **C8**. The piccolo is a transposing instrument which means, should be written an octave lower than sounding. For example, if you have a melody in this register, the score should be written one octave lower than sounding.

Notation is written only in treble clef.

Flute

The sounding range of this instrument is from **B3** to **D7**. The concert flute in C is a non-transposing instrument and is written as sounding. This instrument is notated only in treble clef.

Oboe

**The oboe’s sounding range is from Bb3 to A6.** This is a non-transposing instrument and written as sounding. Oboe parts are notated only in treble clef.

English Horn

**The English horn has a sounding range from E3 to B5.** This instrument is a transposing instrument and written a perfect 5th higher than sounding. For example, if you have a melody in this register, in the score should be written a **perfect 5th** higher than sounding. Notation is in only treble clef.

Clarinet in b-flat

The clarinet in Bb has a sounding range from **D3** to **Bb6**. The clarinet is transposing instrument and written a **major 2nd** higher than sounding. For example, if you have a melody in this register, should be written a **major 2nd** higher than sounding. Notation is in treble clef.

Bass Clarinet in B-flat.

The bass clarinet in B-flat has a sounding range from **Bb1** to **B5**. Bass Clarinet is transposing instrument and written a **major 9th** higher than sounding. For example, if you have a melody and you want to give it to the bass clarinet, in notation should be written a **major 9th** higher than sounding. Music for the bass clarinet in Bb is written both in treble and bass clef.

Bassoon

The sounding range of this instrument is from **Bb1** to **F5**. The bassoon is a non-transposing instrument, which means is written as sounding. Notation is in bass clef, with tenor clef being used for the higher registers. Notation in treble clef is rare.

Contrabassoon

**The contrabassoon has a range** from **Bb0 to C4. This is transposing** instrument and written a **perfect octave** higher than sounding. Notation is in bass clef. Only rarely in tenor clef.

**3. The harmonic series**

All sounds consist of partial tones. For example, when a musical instrument produces a **C2**, sound vibrates several times and other sounds also appear. The attention of the ear focuses only on the fundamental frequency. But there are also several partials, and they all sound at the same time, which you normally don’t hear. Because these partials are heard as much weaker than fundamental. Eventually, they all vibrate simultaneously and appear to us like a single **C** note.

Ok, now we know that each sound has fundamental and partial tones, which sound simultaneously.

Let me remind you that this ratio of intervals is the same for all tones.

The sequence of the intervals is as follows: **Perfect octave, perfect 5th, perfect 4th, major 3rd, minor 3rd, again minor 3rd,** and so on. For clearly explaining I am stopping at the 7th partial, because if write all partials this series goes on infinity.

Let’s have a look at all partials of the d-minor chord.

I want to analyze all low, low-medium, medium, and high chords in D-minor.

As we know, the '’normal'’ hearing frequency range of a healthy young person is about 20 to 20,000 hertz.

But, the best musical range for comfortable hearing is approximate between G3 and G5.

İn this range, the hearing experience is much greater and you hear overtones more strongly.

Therefore, the human ear easily could detect all in-tune and out-of-tune sounds in this area.

This is one of the reasons why composers write a melody in this area.

İ want to remind you once again that this range is approximate. İt could be a little bit high or low than this range.

Now let’s look at what happens if you write chords in different ranges and what we will face.

So, let’s start with a low chord.

If play **D2**, it means there are several partials, which sound at the same time with fundamental: the fundamental tone is **D2,** which we play on the piano. A fundamental tone is also called as 1st partial. 2nd partial is **D,** 3rd is **A,** 4th is **D,** 5th is **F#,** 6th is **A** and7th is **C.** To clearly explain I am stopping at 7th partial, because if write all partials this series goes on infinity.

Now, look at it carefully.

So, we have **D** and **A** notes in D-minor. Therefore, I am painting them in blue.

We haven’t **F#** and **C** notes in D-minor. Therefore, I am painting them in red.

If play **F2**, partials will be arranged as **F, C, F, A, C,** and **E-flat**. We have **F** and **A** notes in D-minor. But we haven’t **C** and **E-flat** in D-minor.

When playing **A2**, it means there are also **A, E, A, C#, E,** and **G** notes which sound simultaneously. We have **A** note in D-minor, but **E, C#,** and **G** notes are out of tune of the D-minor chord.

Let’s analyze this chord.

Conclusion. So, when you play a D-minor chord in close part harmony in the low range, you should know that **C, C#, E-flat, E, F#, and G** notes also will sound. Because these partials have a rich sound and are more audible. And these partials are in the approximate best range for human hearing range.

Let’s move to the next chord and have a look at what happens.

If play D-minor chord between low and medium-range, partials are less noticeable. Because partials gradually left the best hearing area of humans.

Next chord in the middle range. So, partials are less audible than the previous chord. Because they come out in the far away of the hearing.

If play D-minor chord in the high range, partials are completely inaudible. So, **C, C#, E-flat, E, F#, and G** notes are not risky in sounding.

Now, you know, the partials coming from low chord are more audible.

But If moved to the upper register, partials are less audible. Therefore, it would be better to delete some notes in the low range for reducing **C, C#, E-flat, E, F#,** and **G** notes in the D-minor chord.

The best choice is to write a perfect octave in the low range, but it is also possible to write a perfect fifth and fourth in the low range depending on the chord.

**4. The relation of timbres**

Now is the time to recognize the tone color of each instrument and find the relation between them. This knowledge will come in handy when making different types of textures.

It is obvious that each woodwind instrument has its own specific tone color!!!

Based on the several orchestration textbooks I've read and my personal observation, it would be better to divide woodwind instruments into three categories.

Hot, cold, and warm timbres.

It is very difficult to define tone quality in words. Therefore, would be better to explain it on a simple melody.

This is a short excerpt from the C minor prelude for piano by the famous Azerbaijani composer Gara Garayev.

The original piano version is in c-minor. But for a clear understanding of the tone quality of each instrument, I transposed it in a different key. When we start orchestrating the melodies, I will explain the best ranges of all instruments. Now, just focus on timbres.

Melody in the oboe.

This instrument has quite nasal quality. It looks like someone talking through his nose.

The oboe has a hot tone color. Hence, I add it into the hot timbre category.

Melody in the English horn.

This instrument is from the oboe family and has the nasal quality, as the oboe.

The English horn also has a hot timbre. Therefore, I add it into the hot category.

Melody in the flute.

The flute has mouth pronunciation. Like someone is speaking with a half-closed mouth and lip.

This instrument has a cold timbre when compared to an oboe. Hence, I am adding it into the cold category.

The piccolo is a small type of flute. This instrument has a cold tone color.

Melody in B-flat clarinet.

The clarinet has mouth pronunciation. Like someone is speaking with an open mouth or open lip.

Also, this instrument has a cold timbre, when compared to an oboe. Hence, I am adding it into a cold category.

What about the bass clarinet in B-flat.

The bass clarinet is from the clarinet family and has a cold timbre, as normal clarinet. I add it into a cold category.

Bassoon.

There is a lot of idea about the tone color of this instrument. Rimsky Korsakov wrote in his “Principles of Orchestration” book: “The four families of wind instruments may be divided into two classes: a) instruments of nasal quality and dark resonance – oboes and bassoons (English horn and contrabassoon); and b) instruments of “chest-voice” quality and bright tone-flutes and clarinets (piccolo, bass flute, small clarinet, bass clarinet).”

Samuel Adler wrote in his “The Study of Orchestration” book: “Although the bassoon, by virtue of its double reed and conical shape, is related to the oboe, its tone is less nasal.”

Some orchestral performers describe their instruments as buzzing and slightly mellow timbre.

I agree with all my teachers. Finally, I think we can describe this instrument as follow.

This instrument has 2 kinds of pronunciation at the same time: larynx and nasal.

When the player starts playing, you first hear the sound of the larynx, a little like a resonant baritone singer.  This is dominated by mellow timbre. But you can also hear a slightly nasal tone color.

This instrument is not hot like an oboe, and not cold like the clarinet.

Hence, I prefer to add this instrument into the warm category.

The second reason, when clarinet and oboe sound in a chord, they sound contrasting. Because the clarinet has a cold, on the contrary, the oboe has a hot timbre.

But, if share the chord between bassoon and clarinet, they don’t create hard contrasting sound as oboe and clarinet combination.

Therefore, the bassoon is best classified in the warm category.

The last instrument is the contrabassoon.

This is very hard to say “which is the contrabassoon timbre” below the **C2** (roughly).Because, it sounds more “buzzy” and dark, due to slow vibrations of tones. But when contrabassoon plays above the **C2**, it sounds like a bassoon.

Hence, this instrument goes into warm timbres.

I want to tell you one more important point!!

These type of classification (hot, warm, cold) of the instruments are not possible approximately above the **C6**. Due to the higher and less audible harmonics, all instruments sound slightly similar in tone color.

For example, oboe’s **F6** approximately is the same as flute’s **F6**. They sound a little bit similar.

Conclusion, the timbre difference between two instruments is possible below the **C6,** which is easy to detect it.

**5. ADSR**

İn our world, every sound has an own sound production time. This is the law of physics.

ADSR is an acronym that stands for Attack, Decay, Sustain, Release, which shows how sound appears over time.

The black line shows the time.

When a player starts playing an instrument, the “Attack” refers to the time which sound go from silent to loudest level.

“Decay” is the time for the initial falling off to the sustain level. In other words, the sound goes from peak to sustain.

“Sustain” is the time during which sound remains at this level.

“Release” is the time it takes sound to move from the sustain to its silent. Release typically begins when a note is let up.

Each instrument sound has own ADSR properties, depending on slow or fast attack time, also slow and fast release time.

I will explain it on example!

To show the exact difference, I chose snare drum and bass drum.

The snare drum has a fast attack time in producing, which means that the sound goes to the peak very quickly. Let’s listen to it.

The Bass drum has a slow attack time in producing, which means that the sound goes to the peak very slowly. Let’s listen to it.

If both instruments are played simultaneously and with the same dynamic, we first hear the snare drum.

What about release time?

If the player stops striking the snare drum, we get a fast release.

On the contrary, bass drum has a slow release time, which means instrument still vibrates after stopped striking.

It’s the same with the drum set. The snare drum has a fast attack, on the contrary kick drum has a little bit slow attack. In pop music, in order to match the attack time of both instruments, sound engineers shorten the attack time of the kick drum sound file using various plugins. This makes the beats more energetic.

You can ask me! Is it important to know?!

Answer is yes!!!

Because, ADSR properties also refer to woodwind instruments, and this is the one of the main reasons why instrument dominate over the different instrument.

For example, oboe and flute.

Oboe has a fast attack time in sound production. On the contrary, flute has a slow attack time. Let’s listen. You will understand what I mean.

This difference between two instruments makes the problem in balance. To solve these kind of problems we will utilize another method.

That's enough for today’s lesson!

1. How to share three part harmony between woodwinds section?

2. Which and when instruments dominate over the different instruments?

3. How to get balance in chord voicing?

4. Which instruments can change place in chord voicing?

5. After each lectures students will get home assignments!!!