# PAT 200/500
# Recording and Mixing PART 6:
# Mastering a colleague's Final Mix

**Intro:**

After recording, editing and mixing, most often the engineer will send the final stereo mix to a special mastering engineer. In this assignment, **YOU** will be the mastering engineer and you will master one of your colleagues' final mixes.

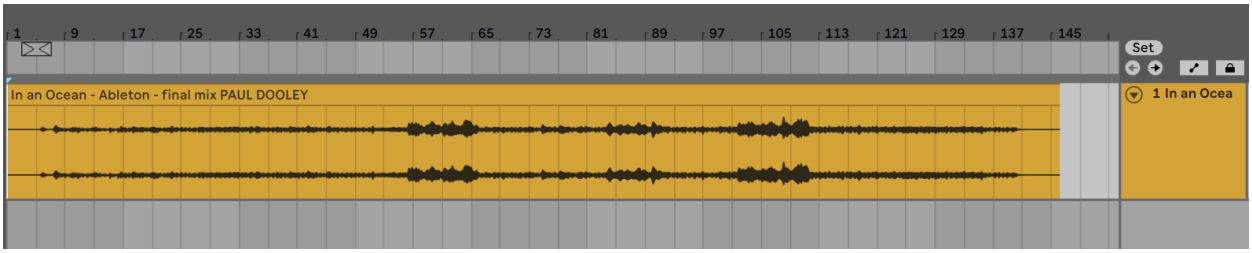
Mastering is the final step of production before a song or album is manufactured or streamed online. In mastering we try to sweeten the sound by creating punch, impact and energy, using EQ to adjust any frequency imbalances and for enhancement, compression to adjust dynamics and enhance the loudness, and occasionally imaging tools to adjust the stereo image. Mastering is also the final quality check in the audio production process to make sure there are no distortions, editing mistakes, and other errors before the music is released into the world. It is also important to note that a mastering engineer typically is trying to **enhance** what is already there rather than trying to change the sound of the mix! Where adjustments at the mixing stage might be quite dramatic, at the mastering stage they are typically very subtle! For example, an EQ adjustment in mixing might be -6dB and an EQ adjustment in mastering might only be -0.5dB!

If you are mastering an entire album, it is also your job to sequence the album and create aural and dynamic consistency.

**Part A: The Setup**
Start a new empty project. Delete the two default MIDI tracks (tracks 1 and 2) and one of the default audio tracks, leaving you with 1 audio track.

1. Download your colleague's "In an Ocean" stereo mix-down and drag it into Ableton Arrangement View.

2. Zoom out so you can see the entire song on the screen.



3. Double click the name of the audio region to view the clip settings. Make sure “WARP” mode is turned off.

4. “Save as...” and create a new project folder: “[YOUR NAME] In an Ocean MASTERING”

5. Now Duplicate the track, by selecting the track header and choosing **Edit/Duplicate**, so that you have two copies of the mix. We will use the first track to do our mastering processing and the second track for an A/B comparison to make sure our mastering is actually improving the sound of our mix. For now, **Mute** the second track.

**6. Evaluation:**

A. Take some time to listen and critically **evaluate the mix:**

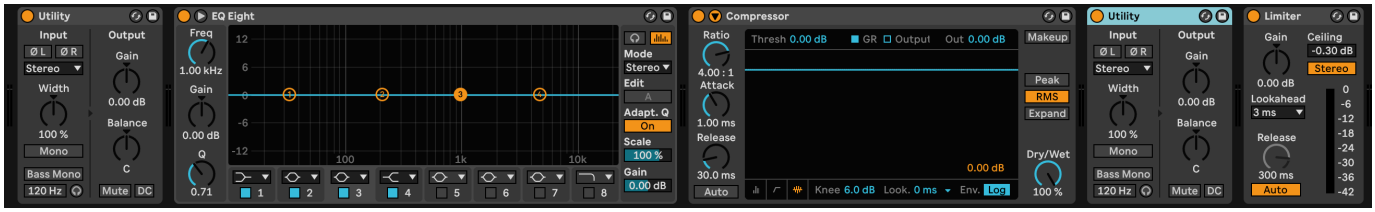
- What instruments are present and how do they fill the soundstage?
- What is the dynamic range of the track - is there a good balance between each section?
- Are there any elements that seem overly dynamic for the style of the music, is the crest factor too high?
- Evaluate the tonal balance, is the mix too dull, overly bright? Is there a build up in the lower midrange making the mix feel muddy? Is there too little or too much low end? Is the low end compromising the amount of headroom you have?
- What is the overall level of the mix?
- Do you need to do anything?
- **Write** down your observations and submit them with your master.

B. When making evaluations it can be helpful to have a good **reference track**. Find a track in the genre that has similar instrumentation. This can serve as a nice guide when making decisions about level, tonal balance, and stereo width. Ideally, the track should be in an uncompressed audio format (wav or aiff) and without any kind of loudness adjustment made by a streaming service or player (ie. turn Music soundcheck off). Write down the name of your reference track.

**Part B: The Effects Chain**
Let's use the First track you created to for our mastering effects chain:

1. On your Master track insert in the following order:

Utility (For Gain) - EQ - Compression - Utility (for Image Widening) - Limiter.




2. **Bypass** all of your plugins except for the first Utility Plugin

**PART C - Gain**

1. In this step we will use the **Utility Plugin** to bring the gain up so that the peaks are just under 0dBFS, aim for -1 or -2 dB. This will allow us to increase the level of the track with clean gain and without any processing side effects.

2. Find the section of the song that has the most level. **Hint**: look for the highest peaks in the waveform!

3. Adjust the Gain control until you see between -1 and -2 dB on your fader.

**PART D - Limiting** (note: even though we are adjusting this now - it should be the last plugin in your chain)

It is common to begin by inserting a **Limiter** at the end of your signal chain and to master into it. The limiter can be used to assist in achieving the desired output level for commercial release, however, care should be taken to make sure it is not negatively impacting the sound and dynamics of the mix. In this part we will get some settings roughed in and then towards the end of the mastering process we will refine them!

1. Begin by turning the bypass off on your Limiter. A limiter can also be thought of as a safety to avoid clipping - it is often a good idea to set the **Ceiling** slightly below 0 dBFS, for example: -1dB.

2. On the **Limiter**, begin by increasing the Gain level until you start to see Gain Reduction occur. Remember, the limiter acts like a compressor with a threshold set to 0db and a ratio set extremely high. So the limiter reduces the gain only when the signal is about to clip (distort). By increasing the Gain value, we are amplifying the signal going into the limiter, forcing the gain to be reduced when the signal runs out of headroom.


3. Limiting can reduce low end and introduce high-frequency distortion (especially with fast release times - if your limiter allows, turn off **Auto** and start with an attack/release time of 100ms). Try adjusting the time and see if you hear an improvement in the sound. You may also try switching the **Auto** back on to see if it produces better results.

4. How much limiting should you apply? This is a matter of taste and style, however, 1 - 3dB of Gain Reduction (GR) is typical for a master. Let's begin with a really gentle setting to start with (maybe 1 dB of GR) as we will be revising our settings later on!

5. Be sure to A/B with your level-matched mix. You can do this by pulling down the fader on the track you are mastering to match with the duplicate of the mix that you muted early in this process. Once you have them matched in level (use your ears to determine this - although the meters can help) listen to see how the limiter has changed the sound. If you notice any distortions or not enough dynamic range, try backing off.

**PART E - EQ**

Based on your evaluation of the tonal balance of the mix, explore how you can use **EQ** to improve the sound of the mix. Generally, you will apply EQ at the mastering stage in very small increments (sometimes tenths of dBs). If you find the need to go beyond +- 3dB, perhaps there are things in the mix that might need to be changed. You might find it helpful to look at a spectral analysis especially to evaluate the very low end of the mix - this can be difficult to judge without a very good monitoring system/environment.

Listen for unwanted frequency build up or resonances to remove. This can improve the tonal balance of the master and increase clarity, warmth, and top and air. It can also remove low end muddiness and upper midrange harshness.

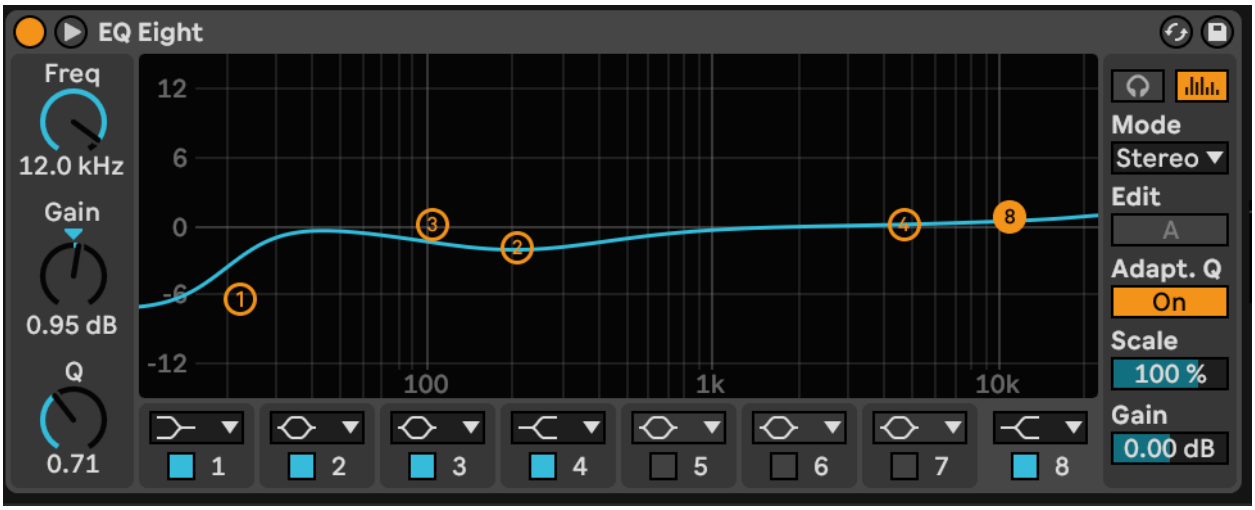
**Remember, when you EQ your master it is as if you are applying that gain adjustment to every instrument/track in the mix!** If your inclination is to make a 3dB adjustment, try only doing 1.5dB and see if it works. In other words, try half first!

1. Un-bypass your EQ8.

2. It is common to roll off below 20Hz or even 30Hz as there isn't a whole lot that we hear in that range and this often increases the amount of headroom we have. Sonically, you may achieve better results with a low shelf rather than a high pass filter to reduce phase shifting. Be sure to A/B with your level-matched mix and use the EQ bypass button frequently!

3. Next, check out the 150-300 Hz range. A lot of instruments have their fundamentals in this range and can often be a range where frequency build up can occur. You can use a peak filter to **boost** by a few dB and then **sweep** the frequency control until you hear a range of frequencies that you feel might benefit from an adjustment. Since, it is not uncommon to need to cut a little bit in this range, I prefer to actually **cut** and **sweep** as I find that when boosting and sweeping, all frequencies seems to sound unnatural and in need of cutting!

4. Use your ears! It may be the case that the mix you received is deficient in this area, in which case you may need to boost!




5. When applying EQ wide bands (low Q setting) will sound more natural and generally it is recommended to favor these. However, if you notice any resonances at a particular frequency a narrow band (high Q setting) can be used to cut these problematic frequencies.

6. Continue to look for frequency ranges that may benefit from cuts due to a frequency build up or a lack of clarity. Remember, frequency level matched A/B between your master and the original mix, as well as a good reference track can be really helpful! Explore the ranges below:

    1. Low Bass: 20Hz - 60Hz
    2. Mid Bass: 60Hz - 120Hz
    3. Upper Bass: 120Hz - 250Hz
    4. Low-mids: 250Hz - 2kHz
    5. High-Mids: 2kHz - 6kHz
    6. Highs: 6kHz - 20kHz

7. Make a peak filter with a medium Q factor and -3dB of gain to help us hear the changes and we glide across the frequency range, to see if we can improve the tone by **cutting** in the ranges listed above.

8. If you feel the mix is deficient in a particular area you might need to **boost** some frequencies to improve the tone. Explore the same ranges listed above using the boost and sweep method to see if you can bring out extra detail and get a more balanced tone.

9. In **Steps 7 & 8**, if you find a frequency band that seems to work, return the gain to 0 and now slowly bring it down until you found you have done enough. Now try cutting that gain adjustment in half! (- 2dB becomes -1dB or +3dB becomes + 1.5dB).

10. You can also experiment with the Q setting to refine the range of frequencies you are EQing. Remember, broader bands tend to sound more natural!

11. Now use the **EQ bypass** for your specific band to quickly switch the EQ on and off.

12. If you think it is sounding good, compare it to your **Reference Track** to see how it sounds.

13. Does the mix lack sparkle? A 10,000-20,000Hz boost with a high shelf filter can create brightness and air. Try a 0.1-2db boost with a high shelf in this range of frequencies to add air - be carful to not over do it!

Use the chart below to assist in your EQ adjustments:

| *Symptom description* | *Possible remedy* |
|---|---|
| Bright | Reduce high frequency shelf |
| Dark, veiled, covered | Increase high frequency shelf |
| Harsh, crunchy | Reduce 3 – 5 kHz region |
| Muddy, thick | Reduce 125 – 250 Hz region |
| Lacks body or warmth | Increase 250 – 500 Hz |
| Hollow | Reduce 500 Hz region |

Source: http://www.tonmeister.ca/main/textbook/intro_to_sound_recordingch7.html#x27-3530006.1

**PART F COMPRESSOR:**

Next, you might choose to add some **compression** if the mix is feeling a bit too dynamic or to add density/glue. This is another stage in the signal path that can help you achieve a louder mix. By compressing the dynamic range you are then able to increase the overall level with the makeup gain control. This will also allow you to revisit your **limiter** settings and potentially increase the level even more. We want to make the level commercially viable, but without sacrificing the sound of the mix!

Compression in mastering is typically more gentle than you might apply in mixing - **Ratios of 2:1 and slower attacks (50 - 100ms) and somewhat quick releases (125ms) are a good place to start** - but this is of course dependent on the music. It may also be beneficial to explore the use of the **side-chain filters** to reduce the impact the low end has on the compressor.

If the mix feels like there are no dynamics then perhaps it might be best to see if changes can be made at the mixing stage. Be sure to A/B with your level-matched mix!

1. Un-bypass your compressor and set the fader of the track you are mastering on back to 0dB.

2. Adjust the **Ratio** to around 2:1, **Attack/Release** to 100ms.

3. Open the **Side-Chain Filters** by clicking on the disclosure triangle on the Ableton Compressor. The side-chain filters are what the compressor hears in its detection circuit, which is different than the audio path that we hear coming out of the compressor. If you wish to hear what the side chain filter is doing, click on the solo button (headphone icon) and try sweeping a high pass filter up to 100-200 Hz. Deselect the filter solo. Using a high pass filter, will allow for a lower threshold setting with less compression, as the bass frequencies of the mix will not trigger the compressor.

4. Adjust the threshold until you see 1-3dB of compression.


5. Adjust the makeup gain so you are level matched when you bypass the compressor.

6. Pull your volume fader down to level match with your unmastered mix and A/B. Have you improved the sound? If so, then return the fader back to 0dB

**PART G Imaging (optional):**

With imaging, we may spread out the stereo field to create a greater sense of space but may inadvertently lose focus on the center of the mix. Many mixes don't require any image processing at all - especially if the mixing engineer has done a nice job of utilizing the stereo field. Apply this effect with caution as it can sound exciting at first but quickly become unnatural and gimmicky! Use your reference track to compare your stereo image!

1. Let's use the second **Utility** plugin we added to our chain.

2. Activate **Bass Mono** and lower the bass mono frequency to around 80-100 Hz. Bass Mono converts the signal to mono below the bass mono frequency. This is a common practice when mastering for vinyl but not necessarily used when mastering for other formats. It is dependent on musical genre as well. If we feel we want less width in the bass, this can be a good technique. **Note**: You can also solo the mono bass signal by clicking the headphone button.

3. Now try increasing the **Width** percentage. This will result in a wider sounding mix. As mentioned above, this can sometimes sound exciting at first, but it is very easy to take it too far, so proceed with caution!

4. Leave your **Width** setting and try toggling the Bass mono setting to see what you like better.

5. Now, try bypassing the **Utility** plugin, to see if it is improving the master. You may not even want to use it!

**PART H Limiting again!:**

In this final limiting step, we will maximize the volume and refine our settings.

1. Return the volume fader on the track you are mastering on to 0 dB

2. Try adjusting the gain to bring your master to the level of your Reference Track. You will first need to bring your reference track up to full volume and make sure the application does not have any automatic leveling turned on (Music/Preferences/Playback: "Sound Check" should be unchecked).

3. Adjust the Gain setting until you are satisfied. Be sure to keep an eye on the amount of gain reduction and try to keep it under 3 dB of gain reduction. You have the ability to make the final mix very loud, but the sound will have less dynamic range.

4. Listen closely to the transients, such as drum hits, as too much compression and limiting can reduce impact. Also, listen for distortions and harshness - too much limiting can be fatiguing to listen to!

5. Once you have settings you're happy with, pull your volume fader down to level match with your unmastered mix and A/B using the solo button. Have you improved the sound?

6. Return the master track's fader back to 0dB.

**Final Notes:**

Mastering is an art form and there are many more techniques, adjustments, and approaches that are beyond the scope of this assignment. However, repeated practice of this approach should get you quite far and produce decent results! EQ, Compression, and Limiting are the fundamental elements and where most of the work happens. It is also not uncommon to revisit settings of your various processing stages as you refine your final master. Iteration and comparing to a quality reference track are key!

**Part G: Final Bounce**

1. Make sure the master fader and the track's fader that you mastered on is set back to 0dB.

2. Select the clip on your master track, ensure it is soloed, go to the file menu, then "Export Audio/Video".

3. In the "export" dialog box, make sure to use the following settings:

Encode PCM (uncompressed audio)
File Type: Wav (best for use with PCs and Macs)
Bit Depth: 24 bit (all sounds were recorded at 24 bit)
Sample Rate: 44100 (all sounds were recorded at 44100 khz) Dither options: No dither (only used when reducing the bit depth) Normalize: Off

4. Do not use other software while the bounce is in progress!

5. Name the wav file:
**"[COLLEAGUE'S NAME] MASTERED BY [YOURNAME]"**

6. Open your bounced/mastered wav file, and **carefully listen to it from start to finish,** to make sure everything sounds correct.

Congratulations, you have mastered your first song!

**Written Summary:**

Now that you have completed the master for your peer please write a short description of what you were trying to achieve with your master. You might discuss what you did to improve the: dynamic range, tonal balance, loudness, and width of the stereo image. Please also comment on 2-3 things they might try and improve in their mix. For example: maybe the verses were too quiet relative to the choruses, too much snare drum, or the vocals too quite, etc…

Add these notes to your Observations from Part A and submit directly to the canvas assignment text box.

See Canvas for Submission details.