LOCALISATION

Localisation is how the brain figures out the directional positioning of a given sound. This positioning of sounds can be tricky to get right within the confines of a DAW.

We can split the way our brain locates sounds into a few headings, which have been put into priority order.

Inter-aural **time** difference (ITD) - this is the time difference between the left and right ear, if we clap to the front, this will be fairly equal. However if we clap to the left, we know instantly that the sound is coming from the left, due to the sound reaching the right ear a fraction of a second later than that of the left ear.

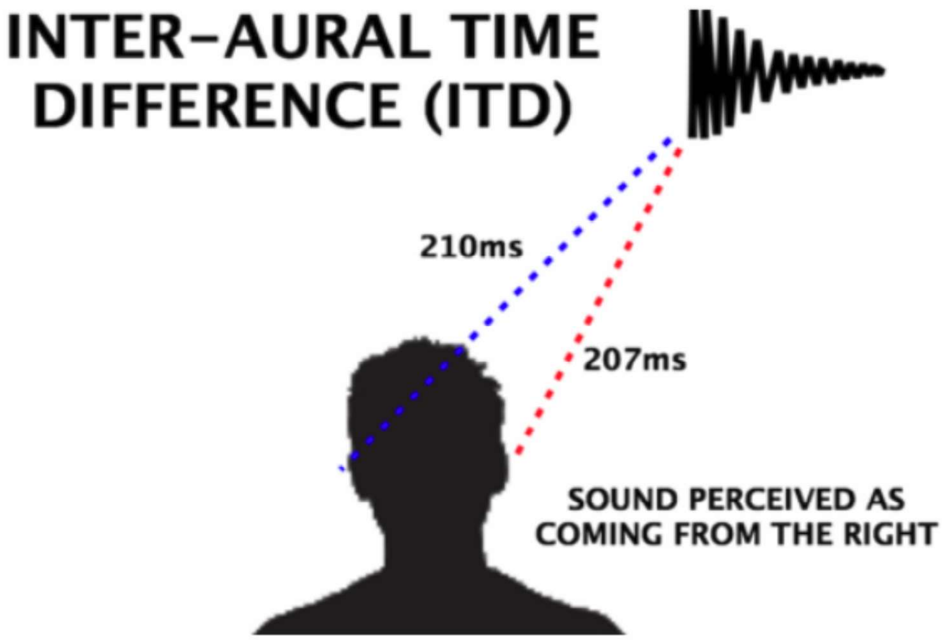
Inter-aural **amplitude** difference (IAD) - This is similar to 'ITD', however this is for amplitudes instead, and is most prevalent in the higher frequencies.

It's worth noting that 'IAD' will be overridden by 'ITD' if the two theories contradict each other. For example if we dropped a coin on the floor by your right ear, the sound would reach the right ear first, shortly followed by the left.

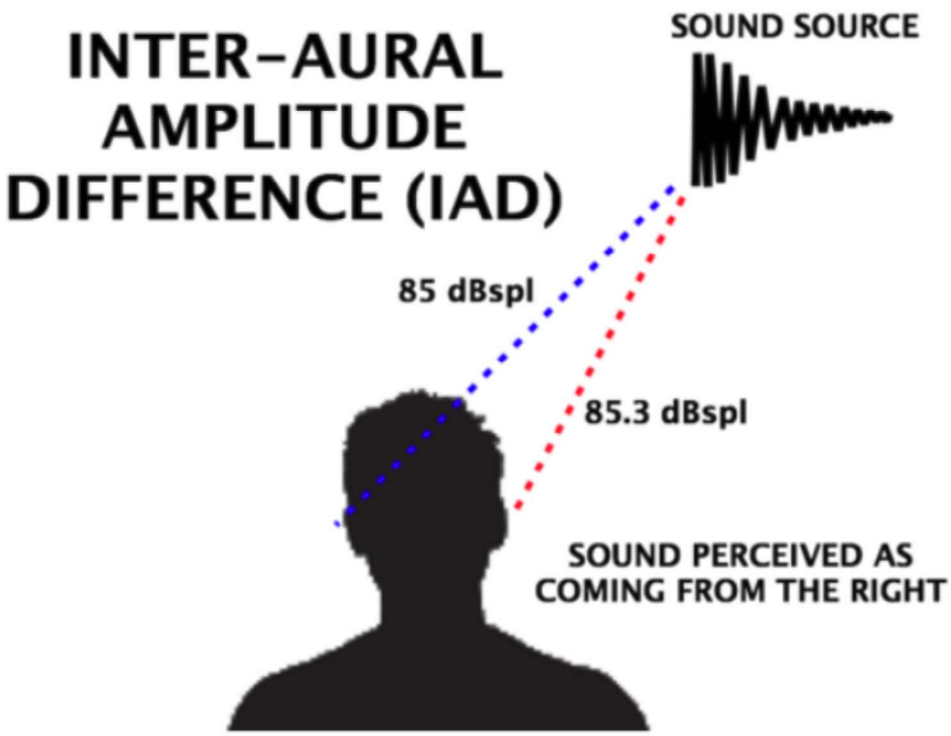
If for some reason the amplitude of the coin were louder in the left ear, our brain would still interpret the sound as coming from the right ear as the 'ITD' takes precedence over the 'IAD'.

Next we have the ears construction. Due to the shape of the ear, (the pinnae) it is designed to channel sounds into the ear canal, but the shape will muffle sounds approaching from the rear.

Because of this anatomy, our brains perceive sounds that are lacking high frequencies, to be coming from the rear. Also micro movements of the head, and differences in high frequency content in the left and right ears, help us to hone in on the sound source.



A diagram to show how the ears can make directional judgement from receiving a signal at slightly different times.



A diagram to show how the ears can judge direction by the difference in amplitude of a signal in each ear, as well as the difference in harmonic content.

LAYERING SOUNDS

With masking in mind, our ears struggle to differentiate between two sounds of similar frequency content, when played at the same time.

This means that when layering sounds, our ears don't hear two disparate sounds but simply hear one new blended sound instead. We can layer and blend different tones and textures together to create a new more complex sound

DEPTH PERCEPTION

Depth perception relies on reverberant patterns. (A reverb signals timing, in relation to surfaces around you.)

This is comparable to how bats use echo sounding to see. By listening to how their squeaks bounce back off their surroundings, they are able to map out the dimensions of an acoustic space.

Depth perception also heavily relies on the dry to wet reverb ratio. This is fairly easy to understand, the further away a sound is, the less detail and clarity can be heard, and the more the sound of the room or reverberate signal will be heard in relation to the original.

Our distance perception also relies on being able to detect the dampening of high frequencies as a sound travels though air.

As mentioned earlier Air absorbs high frequencies much more than mid and lower frequencies over large distances due to the size of their wavelength.

For us to know if a sound’s high frequencies have been rolled off, the Sound needs to be familiar to us in the first place.

A good example of this would be the human voice, Or a familiar instrument such as the piano. Our brains can then use the memory of this sound as a reference point.

PSYCHOACOUSTICS SUMMARY & KEY POINTS

- Psychoacoustics is the study of sound perception. Specifically the psychological & physiological responses associated with sound.
- Perception of light, weight and sound is non-linear, which can make it difficult to measure
- The threshold of human hearing is 0 dB SPL
- The threshold of pain is 120 dB SPL
- 0 dB SPL = 20 micro Pascal's
- The Haas effect can be used to make sounds appear wider (up to 35ms)
- Masking is when one sound is drowned out by another sound of similar frequency content
- The ear naturally shuts down to protect the cochlea when it is subject to loud noises
- Monitoring at low volumes is better for balancing
- Ears perceive sustained sounds as being louder than short sounds of the same amplitude (this is the basis for why compression is perceived as increased loudness)
- The brain uses localisation and differences in time and amplitude to place sounds within a stereo field
- Sounds with less high content are deemed as being further away than brighter sounds