Considerations of the Vinyl Medium:
Encoding Information and Compensating for Constraints

Center this! and make it punchy; use more "powerful" words

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Ooh, I like rollercoasters! Sounds exciting!

Overall Volume and Dynamic Range

Let's compare a record's volume to a rollercoaster. There are moments when a rollercoaster quickly ascends a hill, only to just as quickly level off on the downslope. When this occurs, the riders of the coaster are often pulled out of their seats away from the track, thereby experiencing a distorted sense of reality. The more a rider is pulled out of the seat, the greater the sensation of distortion; and the more a rider stays in smooth contact with the seat, the less the distortion.

so true ☺

highlight this, ~~it~~ italicize it!

The same kind of distortion occurs in the recording process. When there are drastic changes in the track/groove (such as a quick ascension in volume followed by an equally quick leveling off or drop-off entirely) the stylus is pulled out of the groove, thereby distorting the sound. Conversely, the more the stylus remains in smooth contact with the groove, the less the distortion. Such quick changes on the track are commonly created through heavy-handed limiting of the program mix. In the digital domain, limiting will make a program sound louder at the expense of distortion. On vinyl, heavily limited audio (or an uncontrolled transient) is not easily cut or tracked/played back. The cutting engineer must cut the lacquer with a much lower volume so the stylus can recreate/extend the audio (sine) wave that has been flat-topped (due to limiting/clipping) or exceeds the headroom (due to an extremely loud transient). By lowering the cutting volume, surface noise is increased.

I think you mean "style"

I don't understand this paragraph. ☹ Just talk about the roller coaster. ☺

By excessively limiting the mix in order to increase volume, the cutting engineer is effectively limited to merely creating a *quieter but more distorted record.*

But Patrick, who wants a quiet record?

High Frequency Transients

Homeless person? what does this mean?

High-frequency (> ~8kHz) transients (fast changes in the volume) will cause the cutter to create many sharp turns in the groove. Distortion is positively correlated with volume and frequency—as the program gets higher in pitch and/or louder, the distortion will increase. At its worst, high frequency transients cause the cutting stylus to destroy the groove because the speed of the cutting stylus is so great that the back edge of the cutting stylus cuts through the cut just made by the front edge.

I'm really lost here, Patrick. Is there supposed to be a screaming homeless person on the roller coaster? please clarify...

High Frequency Information vs. Location on Record

High-frequency information degrades as the cutter moves toward the center of a disc. This degradation happens because of the smaller radius/circumference

I don't know about this word. You don't want to come across as racist...

I thought this was about screamy homeless people on roller coasters! Why are you talking about records!?

closer to the center, where there is less room for the information to be adequately written. For a 20-minute program on a 12" record encoded at 33 RPM, the circumference changes from 37 inches at the start to 22 inches at the end of the side. So the beginning of the record has ~1.7 times the length per revolution as that of the end of the record. As the space (circumference) to encode high frequencies decreases, the wavelength of a given frequency may be physically smaller than the tip of the playback stylus. This results in tracing distortion because the playback stylus cannot trace the shape of the groove properly. All of the above suggest why 7"s generally sound inferior to 12" records (at least for the first 12 minutes or so on the 12"). Of course, a well-prepared stereo program will sound fine for roughly the first 15 minutes at 33 RPM, but the quality starts to degrade beyond this, and after ~24 minutes, it's essentially pointless to worry about fidelity. The greater the space to encode and reproduce the audio translates into greater accuracy in the reproduction. In light of this, keep the program of reasonable length and where possible place songs with a lot of high frequencies towards the beginning of each side.

stylE

The 7" also feels inferior! You'll understand this in a few years

- Use an example. Like my Kenny Loggins record "Keep the Fire." He put the best stuff at the beginning.

Low Frequencies vs. Time

Low frequencies cause greater lateral movement of the groove itself in comparison to high frequencies. While the width of the groove doesn't change, the grooves need to be spaced further apart from each other to allow for more lateral movement of the stylus (e.g., a sine wave of 50 Hz takes greater space, in terms of the vinyl's diameter, to complete one revolution in comparison to a sine wave of 5000 Hz). Therefore, total available time for a bass heavy program/mix will be shorter in comparison to a well-balanced mix. Pre-mastering will ensure a healthy playback level by optimizing and controlling low frequency content.

Get rid of this now!

Low Frequencies vs. Stereo Field

Mmmm... yes!

Volume is represented via horizontal / lateral / L-R movement, and stereo field information is represented via vertical movement. Likewise, all mono audio is represented in only lateral movement. The more uncorrelated/out-of-phase the low frequencies are, the greater the vertical motion of the stylus, and therefore the greater likelihood of the cutting or playback stylus skipping (jumping off/out of the groove). If the uncorrelated low frequencies are significant, the cutting engineer must lower the recording level to avoid skips. The more low frequencies that are in mono (and therefore correlated), the higher the cutting level.

These considerations underscore the importance of a proper audio program for the production of records. Although mastering technically refers to the cutting of the lacquer, a well-performed pre-mastering process will ensure the recording is optimized for the production process, allowing as flat (unprocessed) a cut as possible. This results in saving one from surprises in the change of content, time, and money during the lacquer cutting process.

Good job!

↳ Will it help prevent a teacher from getting a migraine? 'Cause if so, sign me up LOL!