

## Embarking On The Journey

Early steps in developing “golden ears”

By Mauro J. Caputi

**T**he quest for “golden ears” is underway! Previously, we looked at questions and addressed several issues concerning ear training and critical listening. (March 2003 issue)

The audio engineering tutorial course I’m teaching at Hofstra University is now in full swing, and students David Trovarelli and Daniel Lang are working with me on both the study of the basics of auditory perception as well as audio ear training exercises.

David has been a sound tech for six years and is currently a part-time staff member of the Hofstra audio/visual department. He has a great deal of experience in all aspects of live sound set-up, mixing, maintenance and politics, and provides the class with interesting practical insight. David will be graduating after the current term. (Employers, kindly take note.)

Dan is a math and physics (double) major scheduled to graduate in a year. He’s previously taken several audio recording classes, plays electric guitar, and relates his scientific background to the audio tutorial.

Before starting any ear-training exercises, it seemed prudent that we all test our hearing, so I borrowed an EAR Q Reference Hearing Analyzer ([www.earq.net](http://www.earq.net)) from my good friend Jimmy Wong, technical director at Evangel Church in Long Island City, New York. The EAR Q system combines a software program with noise canceling headphones, allowing us to measure our threshold hearing levels from 60 Hz to 20 kHz.

The testing results are not only useful for a quest of this type, but they also proved interesting. Of course, the two college-age students have exceptional results for both ears measured across the entire frequency range. Dan had

slight dips at 4 kHz and between 8 kHz and 14 kHz, returning to 0 dB at 16 kHz, while David had slight dips at 125 Hz, 1 kHz, 4 kHz, and 6.3 kHz, returning to 0 dB from 10 kHz to 16 kHz.

My own “middle-age” hearing response was not as spectacular, with a larger dip in the left ear at 125 Hz, considerable roll off from 500 Hz to 4 kHz, a steady increase back up to 10 kHz, and then a sharp cutoff far down at 14 kHz. However, I did have excellent low-frequency response in my right ear, for which I am truly thankful because I’d like to continue to enjoy practicing my electric bass.

### WORKING THE DRILLS

With the baseline hearing tests complete, we embarked on the quest for increasing our critical listening skills using the *Golden Ears Audio Ear-Training* course ([www.moultonlabs.com/gold.htm](http://www.moultonlabs.com/gold.htm)). We began with *Volume 1: Frequencies*, a two-CD combination of pink noise drill sets and excerpts of several different styles of music. Each drill set includes 10 examples of 12 dB boosts or cuts of the 10 standard 1-octave bands of the audible frequency spectrum from 31 Hz to 16 kHz.

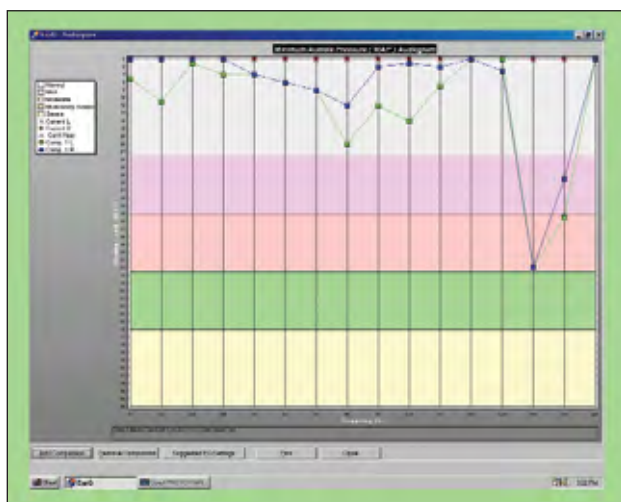
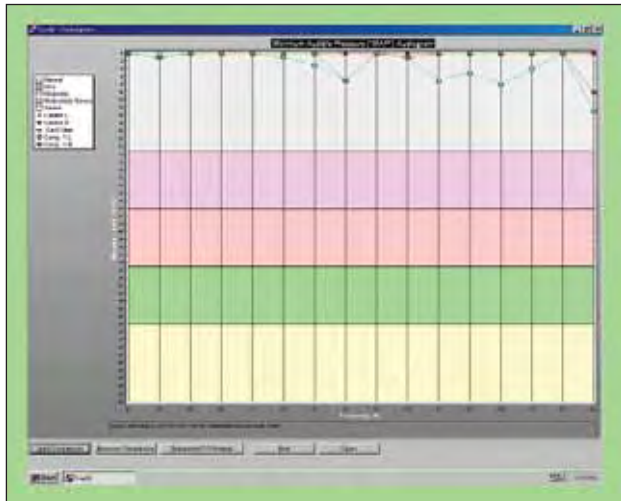
Warm-up exercises are provided prior to each drill set to help retain the EQ changes in your auditory memory. The drills then start slowly – with examples of 12 dB boosting of pink noise limited to the five lowest 1-octave bands – before progressing to other portions of the audible spectrum. The final stage offers examples including both boosts and cuts of music in all 10 octaves.

We started working with the drill sets about three weeks before spring semester classes began, in order to get a head start before the demands of homework, papers, and projects



A key to the “golden ears” castle?

# Listening Zone



Ear Q Audiograms showing the relative state of the hearing of younger guys David (top) and Dan (middle) as well as “middle-age” Mauro (bottom). Key to these charts: gray = normal hearing for an 18- to 25-year-old with no hearing loss or health problems; pink = mild loss; beige = moderate loss; green = moderately severe; and yellow = severe.

increased. It's a good thing, too, because the bottom line is that the drill sets take a great deal of time and concentrated effort!

I was rather surprised to discover that the drill sets are more strenuous than any of my electric bass practice sessions. They take hard work if you're serious about improving critical listening skills. But with anything that's worthwhile in life: *no pain, no gain*. A genuine commitment must be made to practice at least a few set times each week, just as bands must schedule regular practice sessions.

## THE ROUTINES

Twice each week, the three of us meet for the audio tutorial class. We spend a few minutes at the beginning of each class discussing our experiences with the drill sets, which examples gave us the most problems, what we did to get through them, and so forth.

David has gotten into a routine of spending just 20 minutes per drill set session. He is serious about gaining the skills, but feels they'll come naturally with a more relaxed pace.

Meanwhile, Dan follows the guidelines in the *Golden Ears User's Guide*, listening to all 10 examples of a drill set straight through. However, if one particular example has an elusive EQ change, he replays it again once or twice, detects the octave change, writes down his answer and then continues. At the conclusion, he listens straight through all examples in the set while looking at the answer sheet to check his progress.

I employ this latter method... to a point. About midway through the second CD, it became increasingly difficult for me to hear the EQ changes on only one audition of an example, so I've chosen to repeat each individual example up to 10 times before continuing to the next.

Sometimes after the first two auditions of an example, I didn't perceive any EQ change at all. Eventually I would hear the change, but then it would take many more reviews until I could tell which octave band was being boosted or cut. Second guessing is a persistent problem throughout.

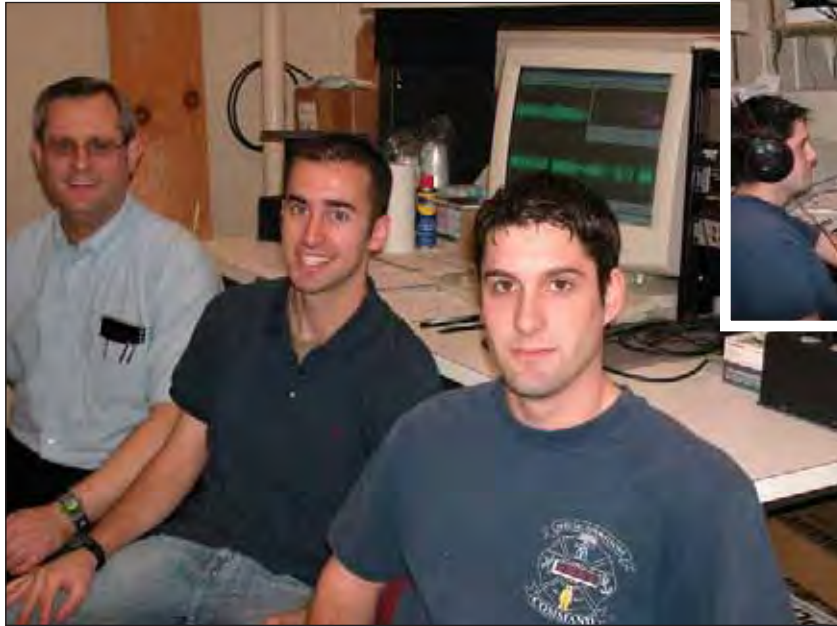
Most of my listening is done via high-quality headphones to block out background noise, while David likes to do his practice sessions with some type of outside noise going on, presenting what is more of a “real-world” live sound context.

Even using the headphones, 31 Hz and 16 kHz have been very difficult for all of us to hear. EQ changes at 31 Hz are extremely subtle, especially when deciding if the octave was being boosted or cut.

I was able to detect EQ changes at 16 kHz even though my hearing drops off sharply at 14 kHz, because the bandwidth is just wide enough to reach down to 12 kHz – just within my audible range. Changes at these two octave extremes actually started to become more noticeable with practice, because the EQ changes were much softer for me than those at the adjacent octaves of 63 Hz and 8 kHz.

The lower octaves (63 Hz, 125 Hz, and 250 Hz) became easier for me to detect faster than the other octaves. (I guess all those years of critically listening to electric bass lines from rock, blues, and jazz tunes in my car have paid off!) I could also discern 12 dB boosts at 1 kHz right away because of the “annoying” sound of the resulting music.

# Listening Zone



The intrepid team getting busy on their quest. Above: Mauro, Dan and David in the audio engineering tutorial classroom. Right, working on critical listening. (Photos by Lori Castoria)

However, determining the differences between the upper octaves – 2 kHz, 4 kHz, and 8 kHz – is still one of my weak areas, probably due to my irregular hearing losses in that range. I also confuse an octave cut with a boost, i.e., a 12 dB cut at 500 Hz is the actual EQ change, but I perceive it as a 12 dB boost at 2 kHz. The removal of lower frequencies sounded to me like boosting at higher frequencies.

Eventually, I've learned to recognize that a cut was occurring and boosts would become more obvious. A major clue to hearing a boost was hearing an increase in the overall loudness of the music, while a cut would not produce a similar perception.

## ENERGY IN THE OCTAVE

Unfamiliar musical selections have made the drills more difficult, even if the music is enjoyable to listen to. Some musical excerpts have little energy in the octave regions that are being changed, increasing the difficulty level. Most likely, these examples are included to challenge those whose critical listening skills are more sensitive and well developed.

Toward the end of the second CD, a musical selection from a rock song very familiar to me is used, and the

EQ examples seem to jump right out of my headphones – they sound so obvious. I was elated to see my nearly perfect score was accomplished with little difficulty for this song.

David, Dan, and I have managed to complete the entire *Volume 1: Frequencies*. Do we have “golden ears” yet? I have a better awareness of the presented octave EQ changes, which may mean that my auditory memory time has increased.

Dan has noticed a marked improvement in fixing the EQ while listening to music at home – he no longer just guesses which frequencies were causing the audio to sound “muddy.” Using WinAmp EQ, he's now becoming more adept at fixing the sound knowing beforehand which frequencies need boosting or cutting.

At his church, Dan was able to assist a few times working the mixing console, adjusting the proper EQ controls to improve the sound. He is finding it amazing to apply his new critical listening skills after a relatively short period of ear training time.

David is also discovering a noticeable improvement. He recently mixed for three local bands at Hofstra, and the time it took to EQ the house was definitely reduced. He used to ran-

domly go through all the EQ controls depending on what he heard. Now he's hearing the specific frequencies that need adjustment far better than before, and his mixes are sounding more natural and closer to the way the individual bands want to sound.

But how are we going to objectively assess our new critical listening abilities?

When I attend church services now, and listen to vocalists sing with prerecorded background music, I take the time to listen critically for any EQ problems that need correction. Of course, these aren't drills, and I'm not at the mixing console to apply any changes to fix problems that I think my ear detects.

Without this essential feedback, objective assessment cannot be made because it's not clear if the problem exists or not. Maybe my students and I should get together to listen to a round of examples with an outside volunteer at the EQ controls to boost or cut. Then we can make our guesses, discuss our reasons for them, and get the correct answer from the volunteer.

We still have three more volumes (six more CDs) of training to complete, including changes in effects, signal processing, delay, reverb, and master frequencies. Next time we'll review these drills as well as present ideas for improving them. And we'll also offer thoughts on developing new journeys in the quest for “golden ears.” ■

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