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Tell The Sound Man To Crank It— Electronic Earplugs Are Ready

I recently saw Prince in concert at 3121, the Las Vegas club customized for his show. Having seen a couple of his arena shows, I already knew that Prince was one of the best live performers out there. The opportunity to see him up close was definitely worth the time and cost of getting to Vegas. But I forgot my earplugs.

I'll confess that I love it loud, especially when we're talking about Prince's top-end sound system, which was customized for the band and the club. We were so close to the stage, we could hear guitar solos directly from his Mesa Boogie amp.

After years of playing in bands myself, though, I've "notched out" a few high-end frequencies from my own hearing. I have to protect the hearing I have left. Now that I'm no longer on stage, I even wear earplugs during such decidedly non-rock-and-roll pursuits as moving the lawn and blowing leaves.

I guess I could have gone scrambling for some scraps of toilet paper to plug my ears, but the music really was just too good to muffle. Still, it was so loud that my hair was literally blown back by a breeze from the low frequencies!

ALL ABOUT THE DECIBELS • How loud was the concert? It's hard to say. But a recent story on hearing risks in *Mix* magazine says that sound engineers—including Prince's—typically keep shows above 100 dB, which audiologists consider dangerously high. Above 100 dB "is where the excitement is created," engineer Chris Rabold told *Mix*. "I like to cruise around 103, which is not terribly loud, but there are peaks in there—109 easy."

Decibel levels are a measurement of sound pressure, with pressure doubling every 6 dB. So that extra 6 dB may not sound like a lot, but in reality, it's double the trouble. Despite the danger, I agree with Rabold. High decibels are essential to the rock concert experience. The sound waves become a physical, pulsing torrent that vibrates through your entire body. It feels something like standing under a waterfall.

While you connect aurally to the music, you also connect physically to the power behind the sound. In Vegas, I was thinking about the flow of electricity from Hoover Dam, channeled via the electronics on and around the stage, ultimately converted into waves of sound power pushing through the crowd.

Mix says advances in technology give sound engineers increased consistency of volume throughout a venue, where a clean, undistorted PA can seem "deceptively quiet." The sound engineer can tailor the mix so music feels good at extreme lev-



els, dialing out the 1.6k to 3k range that's painful to the ears. As it gets easier to crank it up and enjoy the physical sensation of the live music, it also becomes more important to find ways to lessen the impact on the ear's sensitive mechanisms.

EAR PROTECTION • This creates dual opportunities for electronic designers. While many of you are devoted to designing ever-better sound systems, your counterparts are involved in creating new products for hearing protection. Good for business on both ends, I guess.

For example, Ear Inc. makes a line of electronic earplugs, ranging from in-ear music monitors to specialized plugs for sports, the military, and law enforcement. The plugs use microphones to monitor

sound and use either peak clipping or compression to filter out noise. The mics also can enhance desired low-level sounds like speech or even, for hunters, game movement.

Popular noise-cancellation headphones like those from Bose, Sony, and Sennheiser use similar technology. While headphones, and particularly ear buds, are a worry to audiologists, noise-cancellation enables users to enjoy music without turning it up to mask background noise.

In addition to my earplugs, I should have had Ear3's "personal hearing threat detector" at the show (see *the figure*). This device monitors the relative level of sound-pressure danger, flashing a green light up to 84 dB, red/green at 85, and steady red at 90. At 100 dB, it flashes red, "indicating extreme danger to hearing."

Unlike most sound measurement technology, Ear3's device has a chamber approximating the human ear canal to provide a more accurate assessment of sound pressure at the eardrum. Ear buds can be inserted into that chamber, and the company suggests those readings should be used in conjunction with the iPod's Volume Limit function to set the maximum at a safe level.

Of course, deafening music also supports the market growth for hearing aid design. But as *Mix* magazine says, hearing loss is often a taboo subject in the world of sound engineering. And since I'm trying to savor the memory of the concert, I'm avoiding any hearing aid research at the moment. ☎