

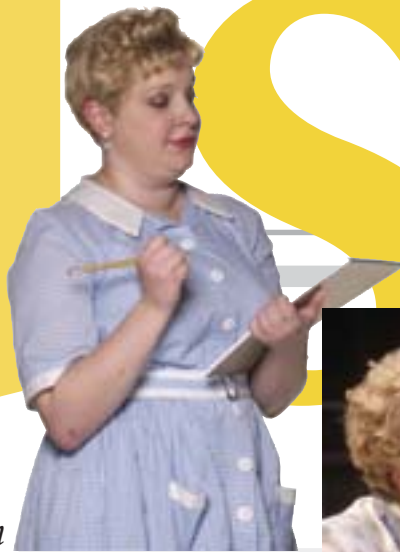
# Distinguishing SOUND.

**Theatre is all about collaboration.** Every member of a creative team (directors, designers, actors, and the many technicians involved) must work together for a show to be successful. That is especially true for the Physically Handicapped Amateur Musical Actors League (PHAMALy). Everyone needs to work extensively with the performers to make sure that their special needs are met. The sound requirements for PHAMALy shows were generally similar to the needs of non-handicapped companies, but in the 2002 production of *Once Upon a Mattress* all that changed. The role of Lady Larkin was given to actress Ali Zimmerman who was completely deaf in one ear and had, with the help of a hearing aid, only sixty percent voice recognition in the other. For this production, Ali and sound designer Matthew Swartz needed to work together to solve a problem that neither one of them had ever dealt with before.

The human ear is an amazing thing. It converts sound energy to mechanical energy and through special nerves transmits that sound signal to the brain. This allows us to perceive the pitch, loudness, and timbre that make up a complex sound wave. What happens when that signal is disrupted and the brain interprets it incorrectly? For a singer like Ali, such things could be devastating.

In 2000, at age twenty-four, Ali began to lose her hearing due to autoimmune inner-ear disease. Her life was dramatically altered. Music levels vary from about 50 dB for quiet background music to maybe 120 dB for a very loud rock band. A full orchestra can also hit a sound level of 110 dB and more, and then play a quiet passage at 20-30 dB (Ludwig 1997). With its varying overtones and harmonics, music is the most complex series of signals sent to

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By Matthew Swartz

and Ali Zimmerman

the brain. In a person with hearing loss, the signals the brain receives are changed, usually due to a physical abnormality. Most hearing-impaired people do not simply hear things at a lower volume, they may also hear things with distortion, causing pitches to be misinterpreted. Without the ability to accurately distinguish sounds, Ali began to question whether she would ever be able to perform again.

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**Ali:** At first, no one knew the cause of my illness. I went through several attacks where I could not hear, accompanied by vertigo and nausea. After a few months, the symptoms subsided and the level of hearing in my left ear stabilized almost back to normal. However, I could no longer hear anything in my right ear. I had to make adjustments and learn how to function with just my left ear. As I was getting no signal in my right ear, I wasn't worrying about any sort of distortion, but I had lost the ability to hear in stereo. Singing solo and listening to music were slightly more difficult for me, but I could continue to live my life in the way I always had.

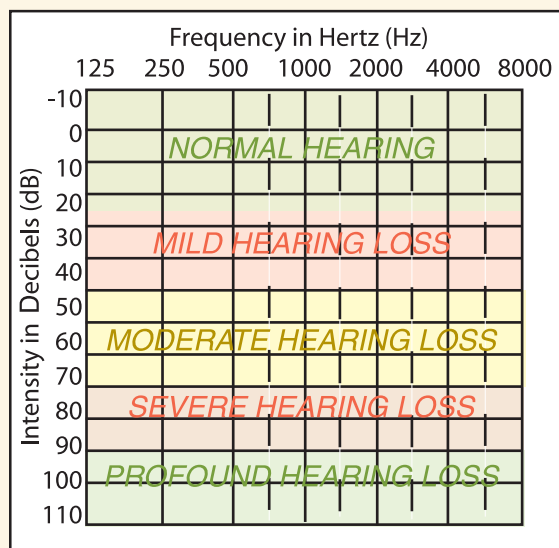
Being a theatre performer, I had to learn some things again. I could no longer hear myself and others sing at the same time. This was the most difficult problem as I had always been able to perform well in groups. With the help of a voice teacher I began performing again, yet I was haunted by the questions What if it gets worse? What if I can't sing again? I began researching the possibility of hearing aids and cochlear implants, but nothing in that research led me to believe that there was any device that would allow me to enjoy music if I were to lose more hearing. I even took a sign language class in preparation for going completely deaf and found myself starting to lip-read to re-



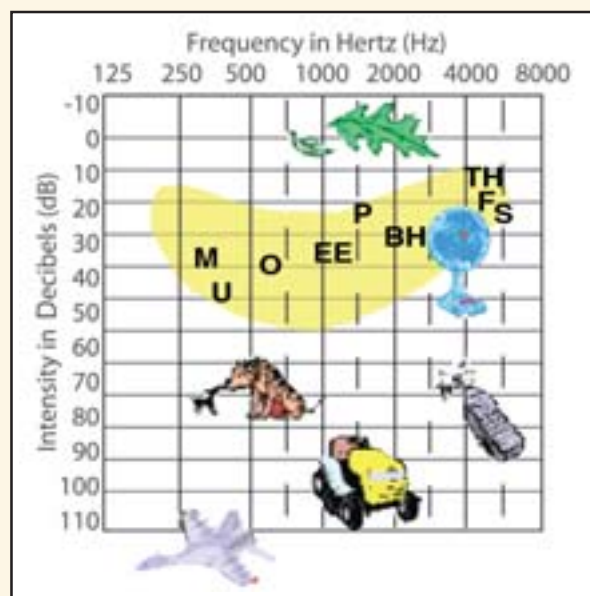
Physically Handicappd Amateur Musical Actors League's 2003 production of *The Pajama Game*. Ali Zimmerman as Babe Williams, above, and with Don Mauck as Sid Sorokin. (Photos by Eric Weber.)

# what is an audiogram?

An audiogram is a graphical representation of human hearing, recorded on paper by an audiologist. The vertical lines represent pitch or frequency and the horizontal lines represent loudness or intensity.



Basic chart of hearing loss categorizations.



Representation of where different sounds fall on an audiogram. The yellow-area shows all the sounds that make up the human voice at normal speech levels.

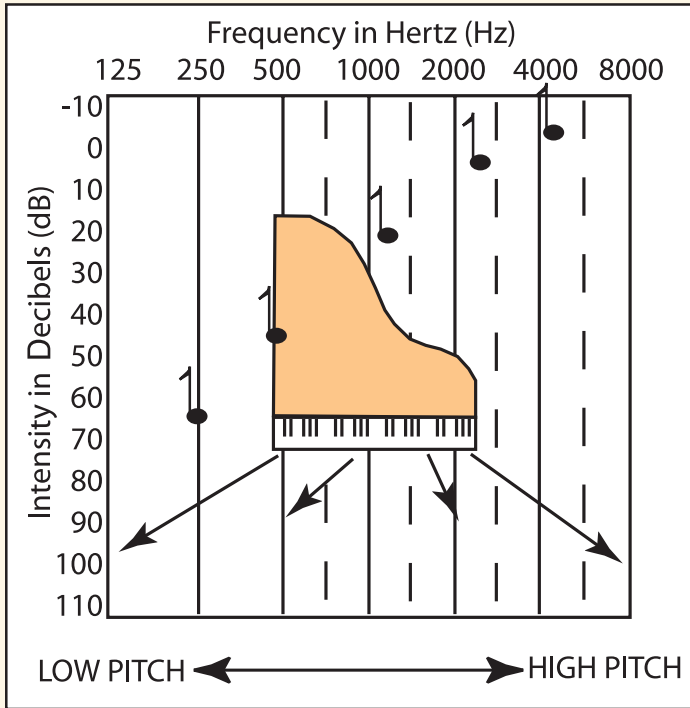
gain some of what I had lost. I also became aware of the Physically Handicapped Amateur Musical Actors League (PHAMALy), a theatre group for the handicapped. At the time, however, I did not audition with them because I wasn't ready to accept that I was really disabled.

In the late summer of 2001, after I had completed a leading role in a musical with a local community theatre, my fears were realized. I woke up one day and could not hear in either ear. Eventually, I wasn't able to hear anything quieter than a lawn mower. After a visit to the University of Iowa Hospitals and Clinics, the leading cochlear implant research facility in the U.S., I started steroid therapy and regained enough hearing in my left ear that I no longer qualified for an implant but had lost most of my hearing. My audiogram (see page 19) showed I was no longer considered "profoundly deaf," but only "moderately deaf."

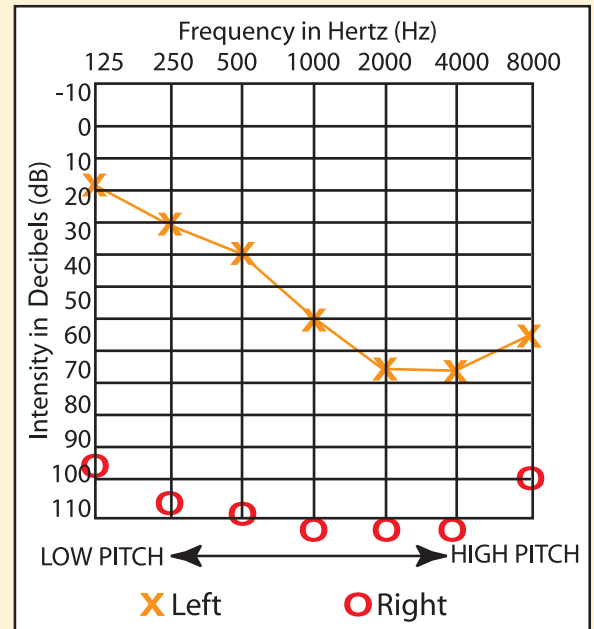
I struggled to find a way to enjoy music. With the aid of headphones, I tried to listen to a CD of a woman singing with just piano accompaniment. She sounded like she was singing underwater and the piano sounded like it had been recorded in a tin can. Eventually, I found that I could turn the bass level down and treble level up on the stereo and lie on the floor underneath the speakers to make things sound a little more normal. That way I could also feel the vibrations through the floor to help keep the rhythm. It was still far different from what I remembered music to be like.

In October of 2001, I saw a new audiologist, Dr. Kelly Halligan. She convinced me to try a hearing aid in my left ear. Others had told me it wouldn't do me any good as hearing aids only amplified sound. I tried a new digitally programmable behind-the-ear hearing aid. Immediately, I was shocked at what I could hear. After several months, my brain adjusted to the new signals it was now receiving and I found that I could hold a conversation with someone without having to do much lip-reading. The music that I was familiar with from before I lost my hearing became enjoyable again. I learned that auditory memory is just like muscle memory; for instance, I would be in a restaurant where there was background music playing and while I could tell there was music playing, I wouldn't be able to distinguish instruments or know what song it was. If someone told me what song it was and it was a song I had known before, my brain would instantly be able to hear the music almost correctly—there was still distortion, but the music was at least recognizable.

Audiogram examples reprinted with permission from the American Association of Audiology. See *Understanding Your Audiogram* by Dr. Allan S. Mehr ([www.audiology.org/consumer/guides/uya.php](http://www.audiology.org/consumer/guides/uya.php)).



Representation of musical pitch on an audiogram.



Ali's audiogram from September 2001. It remains the same today.

Eventually, I began singing again. It wasn't easy and I became frustrated; the desire to perform on stage again was overwhelming. I was desperately scouring the audition notices in *The Denver Post* when I saw a notice for *Once Upon A Mattress*, to be produced by the Physically Handicapped Amateur Musical Actors League (PHAMALy). PHAMALy's mission is to enable persons with disabilities to showcase their talents and abilities through live productions and to make the performing arts more accessible to everyone. They only cast actors with a physical or mental handicap, as defined by the Americans with Disabilities Act (ADA). Based on their mission, I decided that if I was to perform again, then this group might provide the environment and support for that to happen.

After months of preparation, I won the part of Lady Larkin, a supporting role with a lot of singing. At first I was apprehensive about working with disabled actors—I had never spent any time with anyone with a disability before and suddenly people surrounded me with all sorts of different afflictions. My inability to understand what they were saying only added to my fear that I wouldn't be able to competently do this show. After a few weeks of rehearsals, I'd grown comfortable enough with the people to call them my friends and my brain had gotten used to hearing their voices. I was beginning to understand what they were saying to me. But singing, especially on a stage and with a group was still a challenge, and I began to wonder if I could really do a performance. Everything a hearing person hears, from echoes, to cues, to soft piano, to the other performers, was still out of reach for me.

When tech week rolled around, my life once again took a dramatic change. Director Steve Wilson had the foresight to discuss my hearing loss with Matt Swartz, a sound designer with the Denver Center Theatre Company who had worked with PHAMALy the year before. When I met Matt a world of technology was opened up to me that I had no idea even existed.

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**Matt:** My first sound design for PHAMALy was for *Damn Yankees*. I was in my second year with the Denver Center Theatre Company where I worked in the Space Theatre, the same theatre PHAMALy uses during the summer. My first venture into working with them was the same as working with any other group doing a musical. It was in my second year that I received an e-mail from PHAMALy's production manager, Melanie Mayner, letting me know that there was a

*Everything a hearing person hears—from echoes, to cues, to soft piano, to the other performers—was still out of reach for me.*

cast member this year who was hearing impaired. She would be playing Lady Larkin, one of the female leads. Melanie and Steve wanted me to come into a rehearsal and talk to Ali about her hearing loss and what we could do to help out. Ali told me that it was hard for her to hear the piano and all the voices clearly. What would work best would be if there were ways to boost the level of the piano for her and not drown out all the voices. As this was new territory for both Ali and me, I needed to go and do some research.

The next day I went in to meet with the DCTC's director of sound, John Pryor. We discussed the issues that needed to be addressed and looked into if there was anything specifically designed to help hearing-impaired singers on stage. We could not find anything that was readily available that would do what we needed it to do, so we started looking at what we already owned. John suggested the Shure PSM 600 Wireless Personal Stereo Monitor System.

The sound department usually uses the PSM 600 as a remote speaker system. If a speaker needed to move on a piece of scenery or in a prop that moved around a lot we would use the system. They are designed mostly for musicians to use in place of onstage monitors. They allow a higher gain before feedback out of microphones. They also allow a cleaner, clearer signal that goes directly into an in-ear monitor. We realized this was exactly what we needed to do; to mix a signal specifically for Ali that we could send to her and have it not affect the rest of the house mix. Now we just needed to find an earphone that would work with the system and with Ali. We pulled a few of the ear-bud earphones and I brought them into rehearsal to see which would work best.

Just before rehearsal started, I met with Ali and explained what the system was and how it worked. I let her know that the plan was to create a mix specifically for her. We would be able to adjust the volume on whatever she needed to hear and we could equalize the sounds specifically for her. I presented her with the different earphones that we had so she could play around with them and decide which would work best for her. Rehearsal began and Ali and I started try it out to see if it would work. I was hoping it would, since I wasn't sure where to go from there if it didn't.

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Ali: I was very apprehensive when Matt handed me the box. I was afraid that it wouldn't help, and I was also very insecure at my own abilities. I thought that if the production team was bringing someone specifically to help me then I must have not been doing a very good job.

In order to use the technology, I had to remove my hearing aid and use the earphones that went with the monitor. This was very difficult for me, as I had grown so accustomed to my hearing aid that it was like a security blanket. When I first heard the signal Matt was sending me in the monitor, I felt like my head was going to explode. There was too much sound and everything I heard was all a jumble; I couldn't distinguish voices from piano or even recognize that's what I was hearing. There was no way this was going to work. I put my hearing aid back in and rehearsal went on. Matt and I both left the theatre that night extremely frustrated and without any ideas as to what to do next.

The next day, I developed a migraine—probably from my brain trying so hard to interpret the sound from the night before. I went on with my daily routine, finishing my workday with a trip to the gym as usual. I pulled out my CD player and headed for the treadmill.

When I came back from the gym, the frustration was overwhelming. I thought to myself, "There has to be a way to make all of this technology work together." Then it all clicked. When I listened to music on my portable CD player at the gym, I didn't need special earphones, I just used a Williams Sound Neckloop Telecoil Coupler that interfaced with my hearing aid. The telecoil is a simple cord I wear around my neck that plugs in to any standard headphone jack. Why not try using this same loop with the monitor system at the theatre? Every modern hearing aid is equipped with a telecoil setting, normally used to hear on the telephone without getting feedback from having the earpiece next to the microphone on the hearing aid. The T-coil setting turns the hearing aid microphones off, eliminating all background noise. The only signal received in the hearing aid is a magnetic field generated by the telephone or the induction loop (Palm 1999). I took every piece of hearing equipment I had to the theatre, knowing this was my last chance to find a way to perform.

The next rehearsal was actually our six-hour tech rehearsal. I asked Matt to give me the personal monitor again, explaining to him what I wanted to try. We would use Matt's PSM box, only this

time instead of earphones we would plug my loop into it and use my hearing aid. Again, the sound I heard at first was an indistinguishable jumble, but this time it only lasted a little while. I quickly started to pick out individual voices (including my own) and the piano became clearer and clearer. We worked on my special sound mix, focusing on the sounds, instruments, and pitches I needed most to be able to perform. I quickly became more comfortable with the pitches I was hearing and being able to get my cues, both musically and verbally. Most of all, for the first time since the hearing loss started, I almost felt normal on a stage. I also discovered an unexpected perk. Because the sounds in my hearing aid were from the sound console, I was able to listen to the actors onstage and understand what they were saying, even when I was sitting backstage!

That night, I had another pounding headache, but it was worth it. We'd figured out what we needed. At the end of rehearsal, I didn't want to give the monitor back to Matt. I wanted to be able to hear that way all the time. I spent the evening in tears, both out of sadness that I was in the position I was in the first place, but also out of happiness that I was once again able to hear music and sing.

We continued to fine-tune the mix and work together to ensure that the technology would continue to work through performances. In performance I was able to switch between using the T-coil setting to hear the music and the normal setting to hear the dialogue. A simple movement of my hand to my ear was all the audience could see. Most were not even aware I had any sort of hearing problem.

The following year, I got the leading role in *The Pajama Game*. About a month before technical rehearsals, I suffered from another attack in my left ear that made my hearing distorted again for another few days. During the recovery period from that attack, I couldn't sing or hear my cues during rehearsals. Once again, Melanie Mayner stepped in and contacted Matt.

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Matt: Melanie e-mailed me to let me know Ali was having an attack and they were not sure how bad it was going to be. They were afraid that Ali was losing even more of her hearing and that she may not be able to do the show. They wanted me to come in and work with her to make sure that it was still feasible for her to do the leading role. That ended up moving up my load-in date and I got everything up and running the next day to support Ali in rehearsals.

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Ali: Once again, I found myself scared that I wouldn't be able to complete the show. Steve Wilson even asked me if I wanted an understudy, as he was also understandably fearful that I couldn't complete the show. Thankfully, the attack only lasted a few days, and my hearing level returned to where it had previously been. Matt and I were then able to have several weeks of rehearsal time together before the show opened, during which I was able to build up my confidence that I was completely capable of playing the role.

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Matt: It also gave us more time to work on and perfect the mix that Ali needed.

Despite many problems with her hearing aid and loop during performances, Ali put on a good show. It was clear she felt confident in what she was hearing and she knew what she was doing. There was one performance where her loop cord broke and she relied on her usual hearing aid microphones. I wasn't made aware of this until intermission; Ali was performing so well without the PSM that I couldn't tell she wasn't using it. It was amazing the transformation she went through from being a scared, hearing-impaired individual at the beginning of *Once Upon A Mattress* to the strong confident performer she was at the end of *The Pajama Game*. The potential for this type of technology to help other people in her situation is huge.

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Ali: During *The Pajama Game*, John Moore from the *Denver Post* wrote an article on the system Matt and I were using. That article eventually made it across the Internet in various communities for hearing-impaired and deaf individuals which led me to increase contact with Wendy Cheng, a violin player in Washington, DC, who has a cochlear implant. Wendy is founder of the Association of Adult Musicians with Hearing Loss (AAMHL), a group of musicians who all are hearing impaired and still play or sing professionally or for fun. The group mainly connects via an e-mail list, but the DC-area members perform together on a regular basis, with a performance at the Self Help for the Hard of Hearing (SHHH) conference in July of 2005. Many members of the group read the article

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on our technology and have been trying similar things with their cochlear implants and hearing aids. More than half of the hearing-impaired individuals responding to a recent poll by SHHH say they enjoy music through patch cords, FM systems, or other special cords (Boswell 2004). Several famous musicians also use the same system by Shure in their concerts to receive a clearer signal, eliminate background noise, and protect their own hearing (Shure 2005).

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Matt: Last year, Ali decided not to do PHAMALy's show, *Guys and Dolls*, but I had the opportunity to work with Lyndsey Giraldi, another hearing-impaired actress. Lyndsey has more hearing than Ali and didn't wear a hearing aid, so we were able to use the PSM system using a regular earphone instead of any special modifications.

I've come to realize that when collaborating with someone, solutions to difficult problems do not always need to be complex. Sometimes the solution can be as simple as taking something that already exists and using it in a way that you had realized it could be used. The success that Ali and I had finding a solution for her problem came from communication. Neither of us had the knowledge to do this separately, but together we could do it easily. If Ali and I hadn't spent time talking about what worked and what didn't, we could never have discovered the perfect technology to enable her to perform flawlessly.

### RAISING AWARENESS

Distinguishing sounds is something most people take for granted. Ali did. Matt did as well, although from a different perspective. Early in Ali's hearing loss, a friend told her that sometimes, when an individual with a certain expertise is thrust into a challenging new environment, they often bring with them a new energy and disruptive influence on the new environment as they meet the challenges being faced. As a sound designer, Matt's job essentially was to focus on bringing the performance to the audience and had for the most part not really dealt with actors and their needs. It was a job, not a vocation. Interestingly, Matt didn't fully understand how much his collaboration with Ali that first year meant to her. The short time they had worked together had restored Ali's ability to perform, and her faith in herself. A simple thank you card from Ali after the show closed provided the catalyst for Matt to understand the importance of that experience, not only for Ali, for for himself. Since that time, they have worked to improve the collaboration between the technical crew and actors. Simply put, their aspiration is to bring this new collaborative technology and interaction to other theatres. It's about raising awareness and opening doors. Matt's journey continues as he pur-

sues learning from the Deaf West touring production of *Big River* in Denver. Ali's intention is to perform musical theatre, not just with PHAMALy, but with any company. So far, community theatres have been apprehensive about working with her. She's even been told she that while she was the best performer at auditions she didn't get the part due to concerns about "the hearing thing." Undaunted, Ali continues to audition and act in musical theatre, knowing she has overcome her limitations. Ali and Matt are working together again this summer on PHAMALy production of *Joseph and the Amazing Technicolor Dreamcoat*. The collaboration will continue. ❖

**Matthew Swartz** is in his sixth years as a resident sound designer for the Denver Center Theatre Company. He has designed sound for PHAMALy productions for four years.

**Ali Zimmerman** is an actress and board member for PHAMALy, as well as co-founder of Dreamwell Theatre in Iowa City, Iowa. She is also recently certified in Assistive Technology Applications from California State University – Northridge's Center on Disabilities.

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Personal monitor systems are available at most music stores and can be purchased online at FullCompass.com. Prices range from around \$800 to over \$3,000.

Hearing aid induction loop cords can be purchased from Williams Sound. varying from \$69-\$190 at [www.soundclarity.com](http://www.soundclarity.com) or from your audiologist.

For more information visit PHAMALy's Web site at [www.phamaly.org](http://www.phamaly.org), AAMHL's Web site at [www.paulwendy.com/aamhl](http://www.paulwendy.com/aamhl), or Ali's Web site at [www.dreamwell.com/hearingloss/](http://www.dreamwell.com/hearingloss/), or e-mail Matthew Swartz at [hyde8@aol.com](mailto:hyde8@aol.com).

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