

GETTING IN TUNE WITH GUITAR LEGEND

Les Paul

Audiology Today was able to sit in for an acoustics lesson with “Red Hot Red” shortly after his 93rd birthday.

BY DAVID FABRY

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Lester Polsfuss, or “Les Paul,” as he is known to guitar aficionados around the world, is a pioneer in the development of the solid body electric guitar that in many ways paved the way for rock-and-roll music. In addition, he is a prolific innovator, and has been instrumental in the development of many techniques used in the recording industry, including overdubbing, phase and delay effects, and multi-track recording. In fact, Les’s invention of the first multi-track recording device helped revolutionize the music industry, as it enabled musicians to unite independently played tracks to form a cohesive “whole,” and also permitted bands to add tracks for a fuller, “bigger” sound than previously possible. Closer to home, audiologists make use of multi-track recording every time they use masking noise with speech recognition tests. The amazing thing for many young clinicians is that although this technology is made much easier with digital techniques, the effect may also be achieved with analog, tape-based equipment. In fact, the first sequential multi-track recording, made in 1947, used wax disks, though later efforts switched to parallel recordings made via magnetic reel-to-reel tape.

Les was born in Waukesha, WI, in 1915, and took up music at an early age, playing the harmonica, banjo, and ultimately the guitar. He was largely dissatisfied with many of the early electric guitars of the era and began designing a few of his own, ultimately coming up with a solid-body design appropriately designated as “The Log,” as it was a 4” by 4” fence post fitted with a bridge, guitar neck, and electric pickup. He collaborated with the Gibson guitar company to produce the iconic “Les Paul” solid-body electric guitar that is beloved by both amateur and professional musicians.

In addition to serving as an inspiration to many because of his creations, Les has undoubtedly given at least a few audiologists nightmares, as a result of his hearing loss suffered nearly 40 years ago. Many practitioners have said that musicians and engineers are their most challenging patients, and those that combine the two interests leave many practitioners running for the door. *Audiology Today (AT)* was able to sit in for an acoustics lesson with “Red Hot Red” shortly after his 93rd birthday.

AT: Thanks for taking the time to meet with us today, Les.

LP: My pleasure—good to talk with you again, and congratulations on your new gig at the university and as editor of *AT*.

AT: Hey thanks. What can you share with our readers about the nature of your hearing loss; did music play a role?

LP: Well, I first noticed it in 1969, after I was accidentally hit in the ears by a friend, rupturing both eardrums, causing infection to set in. Ultimately, mastoidectomy surgery was required, and it left me with residual hearing loss.

AT: A lot of your musician colleagues have suffered sensorineural hearing loss over the years; Pete Townshend, Ted Nugent, and others were famous for earsplitting guitar riffs, and Nugent used to stick his head into the giant concert speakers during a performance. Because the damage to hearing takes place relatively slowly over the years, people often don’t realize the damage is done until it is too late. Any advice for young musicians?

LP: Well, I certainly wouldn’t recommend sticking your head into the loudspeakers! My best advice is, for the sake of all involved, forget power and play good music at normal listening levels.

AT: Sage advice, but easier said than done, in this era of Spinal Tap amplifiers that are primarily concerned with increasing output to “11.” Last year, the Academy started an initiative called “Turn It to the Left” (www.TurnItToTheLeft.com) that featured a song by rapper Ben Jackson. I will make certain that we send you a

copy of the CD, as its kid-friendly message conveys the dangers of noise-induced hearing loss. What impact did your hearing loss have on your musical ear—do you, or did you, have perfect pitch?

LP: I have relative pitch, rather than perfect pitch.

AT: Was it impacted by the hearing loss?

LP: Actually, I have encountered a very peculiar problem since acquiring my hearing loss. Previously, I was able to finite tune so my guitar was exactly in pitch. Now, instead of going up an octave and hearing 15 frets higher, it is slightly “off.” For example, instead of hearing a “G”, I hear an “A Flat.”

AT: I can imagine that this is problematic for performing as well!

LP: Yes, it is, as it means I sometimes play in a different key than the band. Usually I compensate pretty well, but occasionally someone will come to me and make mention that I was a little off on a particular song. I can’t understand to this day what is going on with it, but I know that it is in my ears, because the effect remains whether I am wearing hearing aids or studio headphones. It is very hard to play that way—I *know* that I am fingering the music correctly, but I hear it differently than what is in my head. Very frustrating, particularly in situations where we have someone come up to play a song with the band, and we are just supposed to fall right in and play along. I find myself needing to take cues from the other musicians to figure out what key we are in and follow the song. It reminds me of just how complex an organ the ears are.

AT: Wow, you have just described perfectly the “cocktail party” effect, but from a musician’s perspective. The integration of musical “context” from the rhythm, hand position, and lipreading cues is analogous to what many people do in background noise to compensate for the fact that a good portion of the speech is inaudible.

LP: You are right on. A few years ago, I was at a dinner party with a retired broadcaster who asked me how I was getting along with my hearing aids. I said that despite the fact that they help a great deal, it is also a tough thing to live with. He agreed, and spoke of how he only understood around one out of every five words at a cocktail party, and felt himself slowly receding from public situations. When multiple people are talking at once, he really struggles to get a full sentence from people so he could “climb on board” and participate in the conversation.

AT: There have been a number of studies that have shown that depression and isolation increases in



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LES PAUL HIGHLIGHTS

- 1915** Born Lester William Polsfuss in Waukesha, WI. Becomes interested in music at age 8, picking up the harmonica, then guitar. Played semi-professionally by age of 13.
- 1941** Unhappy with the electric guitars of the era, invents, "The Log," made of 4" by 4" fence post with a guitar neck and electric pickups attached, plus two detachable body sides. It was one of the first solid-body guitars of its time.
- 1947** Capitol Records released "Lover (When You're Near Me)," recorded in Paul's garage studio. It was the first record featuring a recording procedure known as "multitracking," which revolutionized the way records were made.
- 1950** Hosted 15-minute Les Paul Show on NBC radio with wife, Mary Ford.
- 1952** Gibson Guitar Corporation builds the first Les Paul electric solid-body guitar, with two "soapbar pickups" and a gold top. Later in the decade, "humbucking" PAF (Patent Applied For) pickups were added, as well as a sunburst "flametop" color. Late 1950s flametop Les Pauls are considered by guitar collectors as the "Holy Grail" of electric guitars, valued today anywhere between \$200,000 to \$750,000.
- Early 1960s** Les Paul guitar production ceases.
- 1968** Gibson reintroduces the Les Paul guitar, due to high public demand after the guitar had been associated with guitarists like Eric Clapton, Michael Bloomfield, Peter Green, and Keith Richards in the mid-1960s. It is still in production today.
- 1978** Inducted into the Grammy Hall of Fame, along with his wife Mary Ford (who died the previous year).
- 1983** Received Grammy Trustees Award for lifetime achievement.
- Late 1980s** Returns to live performances, playing on Monday nights at the Iridium Jazz Club in New York City.
- 1988** Inducted into Rock & Roll Hall of Fame. Honored with a Cinemax special, which included appearances by Eddie Van Halen, B.B. King, and many others. Included in Hollywood, CA, Guitar Center's RockWalk.
- 2005** Included in the National Inventors Hall of Fame for development of solid-body guitar
- 2006** Received two Grammys for his most recent album, *Les Paul & Friends: American Made World Played*.
- 2007** Recipient of the 2007 National Medal of Arts, presented in a White House ceremony by President George W. Bush. Subject of feature length documentary titled *Chasing Sound: Les Paul at 90*, later broadcast on PBS American Masters series.

Sources: Wikipedia, Pabst Theatre Web site (www.pabsttheater.org/les-timeline.html).

people with untreated hearing loss. Your example is an excellent reminder for people to see an audiologist to evaluate their hearing if they are noticing more difficulty in social situations. A lot of audiologists have said that musicians and engineers are their biggest challenges, because they have the technical background and critical ear to really explain exactly what they would LIKE to hear. Would you say that you find yourself intimidating to audiologists? Got any good stories?

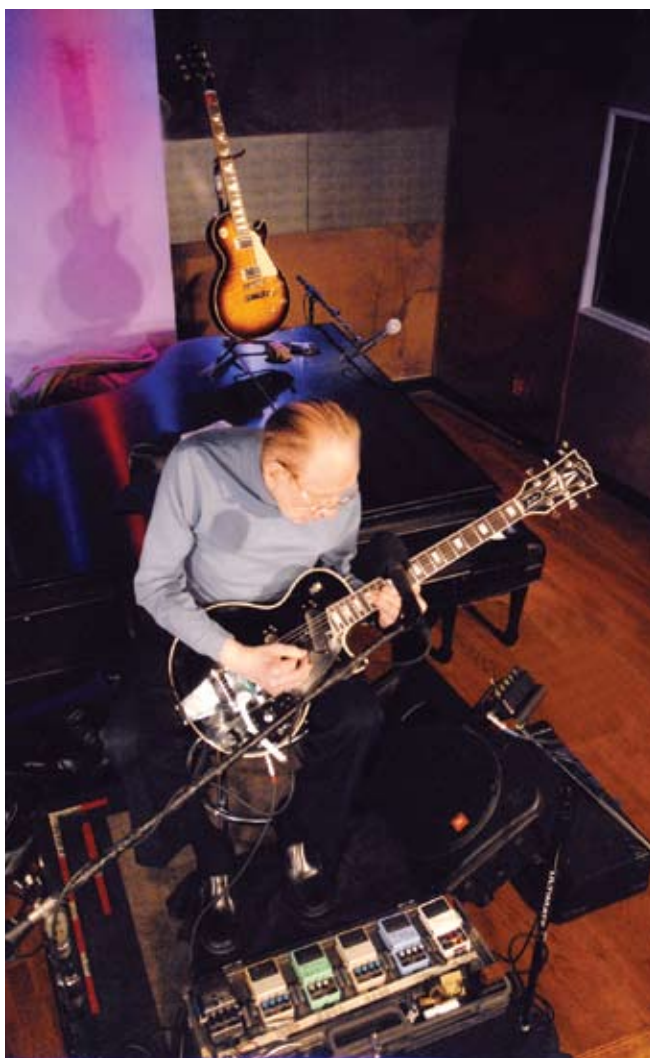
LP: Well, many audiologists are not as well-informed as they should be regarding the products they dispense. This begins with the lack of information provided by manufacturers regarding the technical details of the hearing aids they produce, and extends to the design of rooms used to evaluate hearing aid performance, in that it is an artificial environment not representative of the real world.

AT: Fair enough; one of the biggest challenges during the past decade has been the shortened product "life cycle" from introduction to extinction, which dropped from around 4 years a decade ago to 18 months at present. Nothing resembling the production run of the Les Paul guitar, first introduced in the early 1950s and is still produced today. That is not an excuse, by any means, but it is somewhat difficult to remain current when products are changing so quickly. It is, nonetheless, our responsibility, and I have seen many generational changes with Baby Boomers, who demand technical details much more so than their parents. You are just ahead of the curve.

LP: The challenge doesn't end with the audiologist, however. Many times, I have asked to speak with the technicians, engineers, and even CEOs of the companies making hearing aids, and I have seen firsthand how difficult it is to get information about sampling rate, digital delay, and signal paths. Sometimes I think it would be better to play "dumb," but I can't help myself.

AT: Yes, so in answer to my question, I think that your perseverance has likely intimidated AND frustrated a few practitioners over the years, but I know that the bottom line is that your focus is to improve sound quality and speech intelligibility of music through hearing aids. In your opinion, why do most hearing aids not reproduce music well?

LP: Well, of course, the goal should be that when you play music, it should sound as similar as possible to the real thing; this applies to other sounds as well. The problem is that although the person knows what music should sound like, or at least what it did sound like, the hearing loss impacts the way that it sounds now, even under the best of circumstances. In terms of improving hearing aid performance for music,



Les Paul rocks out in the studio.

however, extending the bandwidth is important to capture more of the harmonic structure than is necessary for speech. Some musical instruments have harmonics that extend to 20 kHz. The other thing to be careful of is to not modify the frequency response so much as to alter the sound quality for a specific instrument. If you were to play a Stradivarius violin and boost the high frequencies by 18 dB from natural, it would sound terrible. So, changing the low/high frequency balance by necessity changes sound quality. This is the second reason why many hearing aids don't sound good with music. Finally, for music, you don't want limiters and automatic level controls to restrict the dynamics. Obviously, you need to prevent loud sounds from hurting your ears, but the limiters mess up the sound. Music is a more dynamic signal than speech, so it stresses the system.

AT: Your partnership with Gibson has been a very successful one; would you ever look to collaborate with the hearing aid industry to develop a “Les Paul” signature hearing aid or algorithm that would be designed to optimize music? I could see a cool case

in “Heritage Cherry Sunburst” with gold hardware—that would be cool!

LP: Yes, if a “Les Paul” hearing aid could do what I wanted it to do, I would want to develop it, and get it into the hands of people who can't afford hearing aids. I know that it is not a trivial problem, but I would love to do this some day.

AT: Aside from the above, what one or two things would you change about hearing aids today?

LP: I would make hearing aids that enable you to get in the shower, and that work better on the telephone. Right now, the only way that I can live with a hearing aid on the telephone is to use the speakerphone.

AT: But that obviously presents challenges if you want to have a private conversation. You have been a longstanding proponent and supporter of allowing patients to “self-program” their own hearing aids; this isn't surprising, given your technical background, but do you really think that the average hearing aid user is ready to start adjusting hearing aid gain and output?

LP: That's a very interesting question. Years ago, I often said that I wished I didn't have to go through an audiologist to get hearing aids; just send me the disk and cables and I'll get it the way that I want it. But I find myself running into the same limitations, and I have a critical ear. Even if the hearing aid was capable of sounding just the way that I want it to, I'm not sure that the average person would be decisive enough to fine-tune it with the same precision as an audiologist.

AT: I appreciate that perspective. The closest that we can come to “self-adjustment” at present is the “datalogging” feature found in many hearing aids that records changes in volume control from prescribed settings. Perhaps the next step will be to enable separate adjustment of bass/treble controls by the patient in real-world settings, with associated datalogging or self-learning to optimize speech intelligibility and sound quality across listening environments. Would that do the trick?

LP: It might, but only if the adjustments were precise and fast.

AT: Well, I have been trying to master Social Destruction's “Story of My Life” on my Les Paul Wii guitar on Guitar Hero III—maybe we could develop some kind of Hearing Aid Hero game that would enable listeners to adjust different hearing aid parameters in diverse listening environments to correctly identify vocal or musical passages. We could call it “Tune-o-matic” as inspired by your original guitar bridge. The question is whether we would include a whammy bar or wah-wah pedal.

LP: I think that you have been playing too much Wii, but I like the concept! By the way, I am not fond of either the whammy bar or wah-wah pedal.

AT: Really? Don't some models of Les Paul guitars use whammy bars?

LP: Yes, my first guitar used a whammy bar made from a coat hanger. For a lot of my early recordings, however, I placed my wrist behind the bridge of the guitar and used my hand as a whammy bar, which worked great. Many of the whammy bars in use have trouble staying in tune. Although I was involved in the development of the wah-wah pedal, and enjoyed monkeying around with it because it was an effect, I just haven't found a lot of use for it in my music.

AT: In addition to your work with the whammy bar and wah-wah pedal, you were the first person to record music with a multi-track recorder, which enabled a wide range of studio effects to be incorporated, which revolutionized the way that music is recorded. Today, with digital recording technology, it is possible for audiologists to create "virtual" acoustic environments in the clinic; do you see much utility for these techniques in the hearing aid fitting process?

LP: Yes I do. At the present time, the audiologist sets the hearing aid up in a test room that has its own resonance and peculiarities. Speech or music is played, and the audiologist might ask if sounds are natural or comfortable, but when I leave his office, I might go out in the parking lot, where there is wind and traffic noise, and then I might go home and go through the roof when I hear the sound of dishes clanking together. If these sounds could be accurately reproduced in the clinic, it would help with setting the hearing aids properly before I leave for home. In fact, they had a system like this when I visited the Cleveland Clinic a few years ago.

AT: One last question: if you had to choose one medium to record in today, would it be analog or digital?

LP: It depends on the instrument I was using—if it was the guitar, I would probably choose analog, because the majority of people don't want to hear the second harmonic and all its relatives. For other instruments and for access to special effects, however, I would put my money on digital.

AT: Hard to argue against it, and yet there is something very "real" about an analog recording, because you know that the signal has not been doctored extensively. Many pop stars today make use of pitch correction, vibrato, and host of post-processing tools that are so sophisticated that you have no idea how their voice sounds naturally.

LP: You have done your homework; let me ask you—are you a musician?

AT: Well, as a drummer, the adage goes, I hang out with musicians, but I also fall victim to being confused when a piece of sheet music is placed in front of me. I like to say that I have excellent temporal resolution but lousy spectral resolution.

LP: Well, I have two drummers in my family, and I would say that if you have a good ear and good rhythm you have nine-tenths of it licked. The other part is persistence and dedication.

AT: I guess that it is never too late to learn to read music, so I will put that on my "to-do" list. We have covered a lot of ground today—thanks for the visit, Les.

LP: I am very happy to see someone is interested in improving these problems; happy to hear from you. **AT**

ABOUT THE AUTHOR

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