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The Death of High Fidelity

*In the age of MP3s, sound quality is worse than ever***ROBERT LEVINE**

Posted Dec 26, 2007 1:27 PM

David Bendeth, a producer who works with rock bands like Hawthorne Heights and Paramore, knows that the albums he makes are often played through tiny computer speakers by fans who are busy surfing the Internet. So he's not surprised when record labels ask the mastering engineers who work on his CDs to crank up the sound levels so high that even the soft parts sound loud.

Over the past decade and a half, a revolution in recording technology has changed the way albums are produced, mixed and mastered — almost always for the worse. "They make it loud to get [listeners'] attention," Bendeth says. Engineers do that by applying dynamic range compression, which reduces the difference between the loudest and softest sounds in a song. Like many of his peers, Bendeth believes that relying too much on this effect can obscure sonic detail, rob music of its emotional power and leave listeners with what engineers call ear fatigue. "I think most everything is mastered a little too loud," Bendeth says. "The industry decided that it's a volume contest."

Producers and engineers call this "the loudness war," and it has changed the way almost every new pop and rock album sounds. But volume isn't the only issue. Computer programs like Pro Tools, which let audio engineers manipulate sound the way a word processor edits text, make musicians sound unnaturally perfect. And today's listeners consume an increasing amount of music on MP3, which eliminates much of the data from the original CD file and can leave music sounding tinny or hollow. "With all the technical innovation, music sounds worse," says Steely Dan's Donald Fagen, who has made what are considered some of the best-sounding records of all time. "God is in the details. But there are no details anymore."

The idea that engineers make albums louder might seem strange: Isn't volume controlled by that knob on the stereo? Yes, but every setting on that dial delivers a range of loudness, from a hushed vocal to a kick drum — and pushing sounds toward the top of that range makes music seem louder. It's the same technique used to make television commercials stand out from shows. And it does grab listeners' attention — but at a price. Last year, Bob Dylan told *Rolling Stone* that modern albums "have sound all over them. There's no definition of nothing, no vocal, no nothing, just like — static."

In 2004, Jeff Buckley's mom, Mary Guibert, listened to the original three-quarter-inch tape of her son's recordings as she was preparing the tenth-anniversary reissue of *Grace*. "We were hearing instruments you've never heard on that album, like finger cymbals and the sound of viola strings being plucked," she remembers. "It blew me away because it was exactly what he heard in the studio."

To Guibert's disappointment, the remastered 2004 version failed to capture these details. So last year, when Guibert assembled the best-of collection *So Real: Songs From Jeff Buckley*, she insisted on an independent A&R consultant to oversee the reissue process and a mastering engineer who would reproduce the sound Buckley made in the studio. "You can hear the distinct instruments and the sound of the room," she says of the new release. "Compression smudges things together."

Too much compression can be heard as musical clutter; on the Arctic Monkeys' debut, the band never seems to pause to catch its breath. By maintaining constant intensity, the album flattens out the emotional peaks that usually stand out in a song. "You lose the power of the chorus, because it's not louder than the verses," Bendeth says. "You lose emotion."

The inner ear automatically compresses blasts of high volume to protect itself, so we associate compression with loudness,

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says Daniel Levitin, a professor of music and neuroscience at McGill University and author of *This Is Your Brain on Music: The Science of a Human Obsession*. Human brains have evolved to pay particular attention to loud noises, so compressed sounds initially seem more exciting. But the effect doesn't last. "The excitement in music comes from variation in rhythm, timbre, pitch and loudness," Levitin says. "If you hold one of those constant, it can seem monotonous." After a few minutes, research shows, constant loudness grows fatiguing to the brain. Though few listeners realize this consciously, many feel an urge to skip to another song.

"If you limit range, it's just an assault on the body," says Tom Coyne, a mastering engineer who has worked with Mary J. Blige and Nas. "When you're fifteen, it's the greatest thing — you're being hammered. But do you want that on a whole album?"

To an average listener, a wide dynamic range creates a sense of spaciousness and makes it easier to pick out individual instruments — as you can hear on recent albums such as Dylan's *Modern Times* and Norah Jones' *Not Too Late*. "When people have the courage and the vision to do a record that way, it sets them apart," says Joe Boyd, who produced albums by Richard Thompson and R.E.M.'s *Fables of the Reconstruction*. "It sounds warm, it sounds three-dimensional, it sounds different. Analog sound to me is more emotionally affecting."

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Rock and pop producers have always used compression to balance the sounds of different instruments and to make music sound more exciting, and radio stations apply compression for technical reasons. In the days of vinyl records, there was a physical limit to how high the bass levels could go before the needle skipped a groove. CDs can handle higher levels of loudness, although they, too, have a limit that engineers call "digital zero dB," above which sounds begin to distort. Pop albums rarely got close to the zero-dB mark until the mid-1990s, when digital compressors and limiters, which cut off the peaks of sound waves, made it easier to manipulate loudness levels. Intensely compressed albums like Oasis' 1995 (*What's the Story*) *Morning Glory*? set a new bar for loudness; the songs were well-suited for bars, cars and other noisy environments. "In the Seventies and Eighties, you were expected to pay attention," says Matt Serletic, the former chief executive of Virgin Records USA, who also produced albums by Matchbox Twenty and Collective Soul. "Modern music should be able to get your attention." Adds Rob Cavallo, who produced Green Day's *American Idiot* and My Chemical Romance's *The Black Parade*, "It's a style that started post-grunge, to get that intensity. The idea was to slam someone's face against the wall. You can set your CD to stun."

It's not just new music that's too loud. Many remastered recordings suffer the same problem as engineers apply compression to bring them into line with modern tastes. The new Led Zeppelin collection, *Mothership*, is louder than the band's original albums, and Bendeth, who mixed Elvis Presley's *30 #1 Hits*, says that the album was mastered too loud for his taste. "A lot of audiophiles hate that record," he says, "but people can play it in the car and it's competitive with the new Foo Fighters record."

Just as cds supplanted vinyl and cassettes, MP3 and other digital-music formats are quickly replacing CDs as the most popular way to listen to music. That means more convenience but worse sound. To create an MP3, a computer samples the music on a CD and compresses it into a smaller file by excluding the musical information that the human ear is less likely to notice. Much of the information left out is at the very high and low ends, which is why some MP3s sound flat. Cavallo says that MP3s don't reproduce reverb well, and the lack of high-end detail makes them sound brittle. Without enough low end, he says, "you don't get the punch anymore. It decreases the punch of the kick drum and how the speaker gets pushed when the guitarist plays a power chord."

But not all digital-music files are created equal. Levitin says that most people find MP3s ripped at a rate above 224 kbps virtually indistinguishable from CDs. (iTunes sells music as either 128 or 256 kbps AAC files — AAC is slightly superior to MP3 at an equivalent bit rate. Amazon sells MP3s at 256 kbps.) Still, "it's like going to the Louvre and instead of the Mona Lisa there's a 10-megapixel image of it," he says. "I always want to listen to music the way the artists wanted me to hear it. I wouldn't look at a Kandinsky painting with sunglasses on."

Producers also now alter the way they mix albums to compensate for the limitations of MP3 sound. "You have to be aware of how people will hear music, and pretty much everyone is listening to MP3," says producer Butch Vig, a member of Garbage and the producer of Nirvana's *Nevermind*. "Some of the effects get lost. So you sometimes have to over-exaggerate things." Other producers believe that intensely compressed CDs make for better MP3s, since the loudness of the music will compensate for the flatness of the digital format.

As technological shifts have changed the way sounds are recorded, they have encouraged an artificial perfection in music itself. Analog tape has been replaced in most studios by Pro Tools, making edits that once required splicing tape together easily done with the click of a mouse. Programs like Auto-Tune can make weak singers sound pitch-perfect, and Beat Detective does the same thing for wobbly drummers.

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"You can make anyone sound professional," says Mitchell Froom, a producer who's worked with Elvis Costello and Los Lobos, among others. "But the problem is that you have something that's professional, but it's not distinctive. I was talking to a session drummer, and I said, 'When's the last time you could tell who the drummer is?' You can tell Keith Moon or John Bonham, but now they all sound the same."

So is music doomed to keep sounding worse? Awareness of the problem is growing. The South by Southwest music festival recently featured a panel titled "Why Does Today's Music Sound Like Shit?" In August, a group of producers and engineers founded an organization called Turn Me Up!, which proposes to put stickers on CDs that meet high sonic standards.

But even most CD listeners have lost interest in high-end stereos as surround-sound home theater systems have become more popular, and superior-quality disc formats like DVD-Audio and SACD flopped. Bendeth and other producers worry that young listeners have grown so used to dynamically compressed music and the thin sound of MP3s that the battle has already been lost. "CDs sound better, but no one's buying them," he says. "The age of the audiophile is over."

(On the next page: Top artists and producers sound off on the sound wars. Plus: Check out waveforms to see what dynamic compression looks like, and more.)

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Sounding Off on the Sound Wars: Top Producers and Artists Speak Out

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This is what I think is happening: Everybody has iPods, so you can't get them that loud. So they have a algorithm called a "finalizer" — it's not that new, but the way people are using it is new — and it makes your music sound louder. People will ruin their records and CDs. I was really stunned by the CD the guy gave me when I listened to it at home — it sounded crazy! It was like, abort mission! Supposedly it sounds fine on your iPod, but if you take the CD and put it on your hi-fi CD player you can hear the digital clipping. It's a big news story over in England."

— **Kim Deal**, on mastering [the new Breeders album](#), *Mountain Battles*



"Compression is a necessary evil. The artists I know want to sound competitive. You don't want your track to sound quieter or wimpier by comparison. We've raised the bar and you can't really step back."

— **Butch Vig**, producer and Garbage mastermind





"We're conforming to the way machines pay music. It's robots' choice. It used to be ladies' choice — now it's robots' choice."
— **Donald Fagen**, producer and Steely Dan frontman

"I believe that if a vocalist is hyper-tuned, it's less personal. I have no aversion to using Auto-Tune when I have to. But I think listeners can hear it."

— **Brendan O'Brien**, producer of Pearl Jam, Rage Against the Machine and Bruce Springsteen's *The Rising* and *Magic*

"I think there's been a huge shift in how people listen to music. They used to get as good a stereo as they could. Now they want an iPod. And the audiophiles have moved on to multimedia. But to get the content to people, you have to play by their rules."

— **Matt Serletic**, Matchbox Twenty and Collective Soul producer and former chief executive, Virgin Records

"A&R people like the compressed aesthetic because they can take it to the radio. They think if they want to have a hit record they have to spend a lot of money so they want to cover themselves. But if you think about the classic records, none of them are squashed."

— **Mitchell Froom**, producer of albums by Los Lobos, Elvis Costello and others

"I find it quite interesting, and I think its instructive, that if you focus on one area of the music business — you could generally call it music for people over twenty-four — and you look at the last ten years and look at records that have come out of nowhere, that no one's putting any money behind and have takes off, the two things that come to mind are the Buena Vista Social Club and Norah Jones. And those records were made in the most old-fashioned ways you can imagine." — **Joe Boyd**, producer of several Richard Thompson albums and R.E.M.'s *Fables of the Reconstruction*

"I cant tell you how many times someone comes in and plays me something he wants mastered and I'll say, 'Do you want to make it slamming loud or retain some of this great sound?' They'll say, 'We want to keep it really pristine.' Then the next day they'll call me and say, 'How come mine isn't as loud as so and so's?' "

— **Bernie Grundman**, mastering engineer

"With the Beatles or Rolling Stones, they'd be a little sharp or flat, but no one would care — that was rock. Now if someone's out of tune or out of time, they treat it as a mistake and correct it."

— **Ted Jensen**, mastering engineer

(On the next page: A look at what compressed waveforms look like. Plus: Links to loudness resources on the Web and a list of tracks where you can hear the difference for yourself.)

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Loudness War

Since the mid-1990s, engineers have used dynamic compression to make CDs louder and louder. These waveforms show how loud contemporary recordings have become:

Nirvana

"Smells Like Teen Spirit"

Back in 1991, even the loudest rock wasn't always loud: "Smells Like Teen Spirit" has plenty of fluctuations in its volume — so when Kurt Cobain screams, you feel it.



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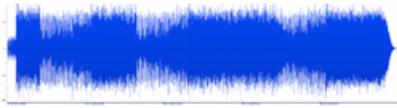
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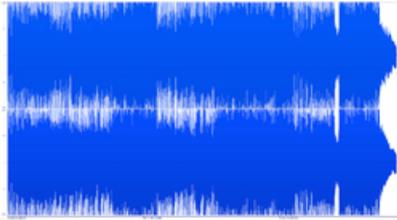
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**Arctic Monkeys****"I Bet You Look Good on the Dancefloor"**

This 2006 track is a prime offender: The sound wave is cranked to the limit, and it stays there for nearly every second of the song. Have a headache yet?

**U2****"With or Without You" (Original)****U2****"With or Without You" (Remastered)****How does MP3 work?**

MP3 reduces a CD audio file's size by as much as ninety percent, with an algorithm that eliminates sounds listeners are least likely to perceive — including extremes of high and low frequencies.

What is dynamic range compression?

This studio effect reduces the difference between the loud and soft parts of a piece of music — recently, mastering engineers have used it to make sure every moment on a CD is as loud as possible.

Want to see more? Make your own waveform comparisons and send the images to us [here](#). We'll make a gallery and post in on [RollingStone.com](#).

(On the next page: Links to loudness resources on the Net. Plus: A list of tracks that'll let you hear how dynamic range has changed.)

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Planet of Sound: Loudness Resources on the Web

Turn Me Up!

This organization of producers and audio engineers wants to encourage artists to bring dynamic range back to music by certifying albums that comply with certain standards.

"The Loudness War," a YouTube video

This video explains why dynamic range matters in terms anyone can understand.

Loudness War entry, Wikipedia

The Wikipedia entry on the "Loudness War" has solid, if slightly technical information about the conditions that have led artists and labels to limit the dynamic range of their music.

"Everything Louder Than Everything Else," Austin 360

This informative and well-written article was one of the first to address the lack of dynamic range in the mainstream media.

"Imperfect Sound Forever," Stylus

This magazine article about the "Loudness War" is full of interesting examples.

"Over the Limit," Prorec.com

This informative article uses graphics of waveforms from five Rush albums to illustrate the decline of dynamic range.

(On the next page: From Dylan to Fall Out Boy, a list of tracks that'll let you hear how dynamic range has changed.)

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Hear It For Yourself

Here are three recent albums noted for their depth and dynamic range — and three that are way too loud

GOOD

Modern Times, Bob Dylan [[Listen](#)]

Not Too Late, Norah Jones [[Listen](#)]

Raising Sand, Robert Plant/Alison Krauss [[Listen](#)]

On these albums, the music breathes: Check out the true-to-life sound of Dylan's "Thunder on the Mountain."

BAD

Alright, Still Lily Allen [[Listen](#)]

Californication, Red Hot Chili Peppers

Infinity on High, Fall Out Boy [[Listen](#)]

These are so unrelentingly loud that the sound is nearly distorted. The choruses on the Peppers' "Scar Tissue" are no louder than the verses.

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